Miami Valley

Priority Climate Action Plan

January 2024 Draft

Prepared for

Miami Valley Regional Planning Commission

Prepared by

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MIAMI VALLEY
Regional Planning Commission

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Executive Summary

Through the Climate Pollution Reduction Grants, the Inflation Reduction Act (IRA) appropriates grants to regions and states for developing and implementing plans to reduce greenhouse gas (GHG) emissions. The Priority Climate Action Plan (PCAP) is the first of two plans for the Miami Valley, identifying projects that could be funded in a second funding round from CPRG. It will be followed by the Comprehensive Climate Action Plan (CCAP), which is a more systematic analysis and engagement process.

The PCAP involved the development of a GHG emissions inventory for the three counties in Miami Valley- Greene, Montgomery and Miami, as well as contextual analysis of trends and drivers of energy and emissions.

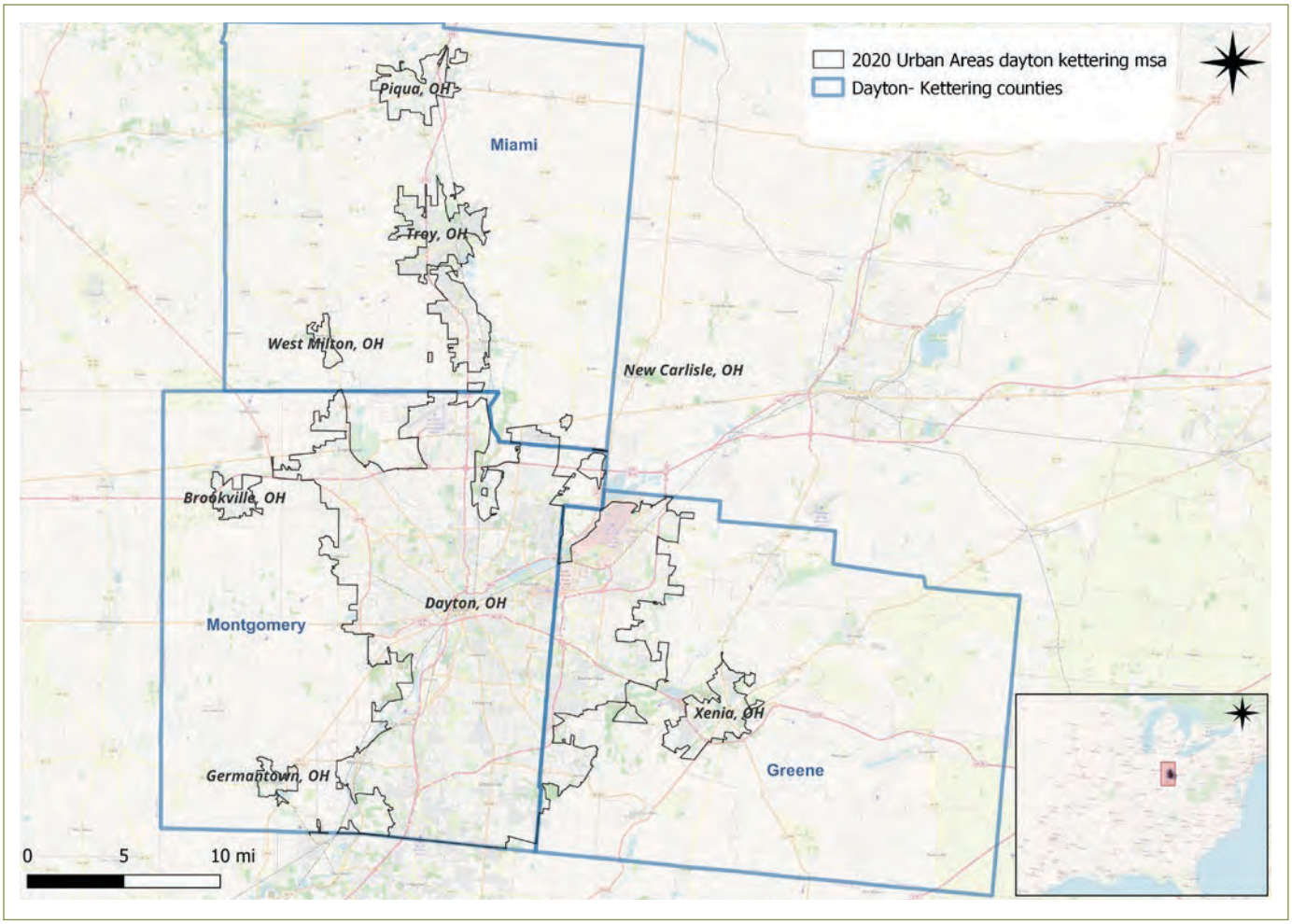


Figure E1. Map of the Miami Valley region which forms the geographic scope for the PCAP

Like many regions in the US, Miami Valley has the twin challenges of electrifying heating and transportation and cleaning the electricity system in parallel, both of which will require major investments. Cleaning the electricity system will cut total GHG emissions in half; the technologies required to enable this transition are already cost-effective. Decarbonizing transportation and heating involves technologies that have an incremental upfront cost, but are lower cost to operate. These technologies are also readily available.

The residential sector is the largest source of GHG emissions; supporting measures in this sector will not only generate new employment opportunities, but also improve the quality of housing and affordability of housing across the region.

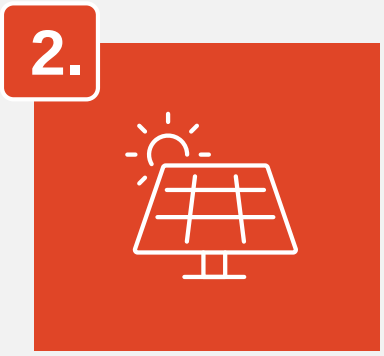
The energy transition will be aided by opportunities for efficiency including measures such as building retrofits, increasing the walking, cycling and transit mode shares, as well as by the electrification equipment itself- electric vehicles and heat pumps are more efficient than the incumbent technologies. Maximizing efficiencies minimizes the need for additional electrical capacity, reducing the overall energy transition costs. There is an added benefit in that increased efficiency also reduces the operating costs for households and businesses, and provides a revenue stream to finance the investments required.

With these insights in mind, an engagement process identified possible priority projects through a survey, interviews with representatives of interested parties, engagement with relevant agencies, outreach to Low Income and Disadvantaged Communities (LIDAC) and engagement with committees of MVRPC.

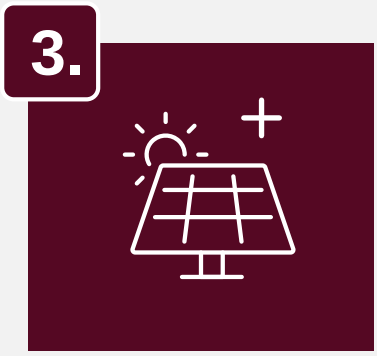
Nine possible projects were identified (see the following pages with the summary diagram of the projects identified and Table E.1, in which each of them is described).

The Nine PCAP Projects for Miami Valley

Clean fleets



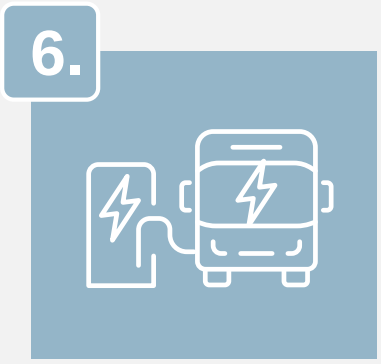
Virtual Power Plants



Virtual Power Plants Plus

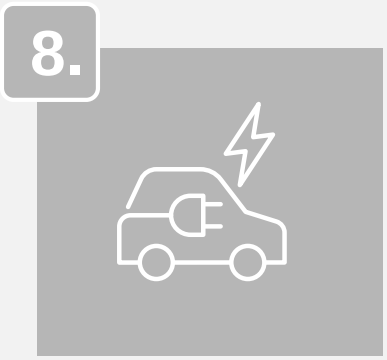
Neighborhood Deep Retrofit Program

Sugarcreek Waste Facility Upgrade



Transit transformation

Carbon sequestration



Clean cars for all

Active transportation

Table E1. PCAP Projects for Miami Valley

	Project Title	Description
1.	Clean fleets 	Electrifies fleets for park authorities, including electric vehicles, UTVs and mowers and charging infrastructure. The project will also include building capacity amongst agency staff for electrification.
2.	Virtual Power Plants 	Develops a regional virtual power plant (VPP) led by a regional aggregator, Sustainable Ohio Public Energy Council (SOPEC). The first projects will consist of solar installations by the City of Dayton at the Valleycrest Landfill, the Dayton International Airport, and other assets (such as city wellfields). These sites will be the initial sites to launch the VPP program regionally.
3.	Virtual Power Plants Plus 	Builds on the VPP project in Measure #2. Revenues from VPP+ projects will be directed to a revolving loan fund, which will be used to support additional solar, weatherization and transportation electrification projects. This mechanism will enable VPP+ to undertake five times or more the number of projects with the same investment. The revolving loan fund will be capitalized by CPRG phase 2, but can also incorporate funds from other federal and state grants, philanthropy, private investment and public sector investments. VPP+ combines the strategies of aggregation and revenue recycling to scale clean electricity and building efficiency, reducing the consumption of and demand for electricity, and reducing household and small business energy costs in a transformational model.
4.	Neighborhood Deep Retrofit Program 	Targets LIDAC neighborhoods for deep retrofits, building on the Energiesprong concept from the Netherlands, which has subsequently been developed in the US, including RetrofitNY in New York and REALIZE in California and Massachusetts. A new building stream will support the construction of new net zero housing on vacant lots, providing an incentive for infill construction and the incremental capital costs of the net zero construction elements (design, insulation, heat pumps and solar systems). Resilience and peak management strategies such as batteries can also be included. Infill construction ensures that residents can walk, cycle or take transit to destinations, avoiding the cost, energy consumption and GHG emissions of vehicular travel.

5.	Sugarcreek Waste Facility Upgrade 	Develops a thermal drying facility at Beavercreek and/or Sugarcreek WRRF to produce a beneficially usable, Class A dried product in lieu of landfilling. The project also avoided 600 sludge truck round trips per year.
6.	Transit transformation 	Adds three charging stations so that Greater Dayton Regional Transit Authority (RTA)'s buses can go "off wire" to add range beyond their current routes into LIDAC areas, a novel and transformative approach for an electric trolley system. The infrastructure required for the bus chargers will be leveraged to include level 2 charging stations for the public use. The project will also include the electrification of the Flyer, a free downtown route and the addition of a new route.
7.	Carbon sequestration 	Assembles and connects open space properties as identified in Miami Valley Open Space Plan and multimodal trails and promotes ecological restoration with tree planting and native grasses. The project will increase tree canopy and carbon sequestration potential of active transportation trails, with a focus on low-income and disadvantaged neighborhoods at highest risk of extreme heat. It will also promote creative reuse of vacant lots and brownfields for ecological restoration and carbon sequestration in LIDAC neighborhoods.
8.	Clean cars for all 	Provides incentives to help lower-income consumers living in priority populations to replace their old higher-polluting vehicles with newer and cleaner transportation. Participants have the option of a purchase or lease of a new or used hybrid, PHEV, or ZEV replacement vehicle, or an alternative mobility option such as an e-bike, voucher for public transit or a combination of clean transportation options.
9.	Active transportation 	Supports active transportation programming alongside investments in active transportation infrastructure across the Region, with a specific focus on LIDAC communities. Programming will target safe routes to school and workplace travel, helping people switch to walking, cycling and E-bikes, while supporting the development of the necessary infrastructure.The program will also test active transportation interventions such as funding car free days in neighborhoods,

The GHG impact of each project was quantified and the possible impacts on LIDAC were evaluated spatially. The projects were also evaluated against the criteria identified by the EPA for Phase 2 funding.

Table of Contents

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This report has been undertaken to address the requirements of the EPA's CPRG program. Reasonable skill, care, and diligence have been exercised to assess the information provided for this analysis, but no guarantees or warranties are made regarding the accuracy or completeness of this information. This document, the information it contains, the information and basis on which it relies, and factors associated with the implementation of the Priority Climate Action Plan are subject to changes that are beyond the control of the authors. The information provided by others is believed to be accurate, but has not been verified.

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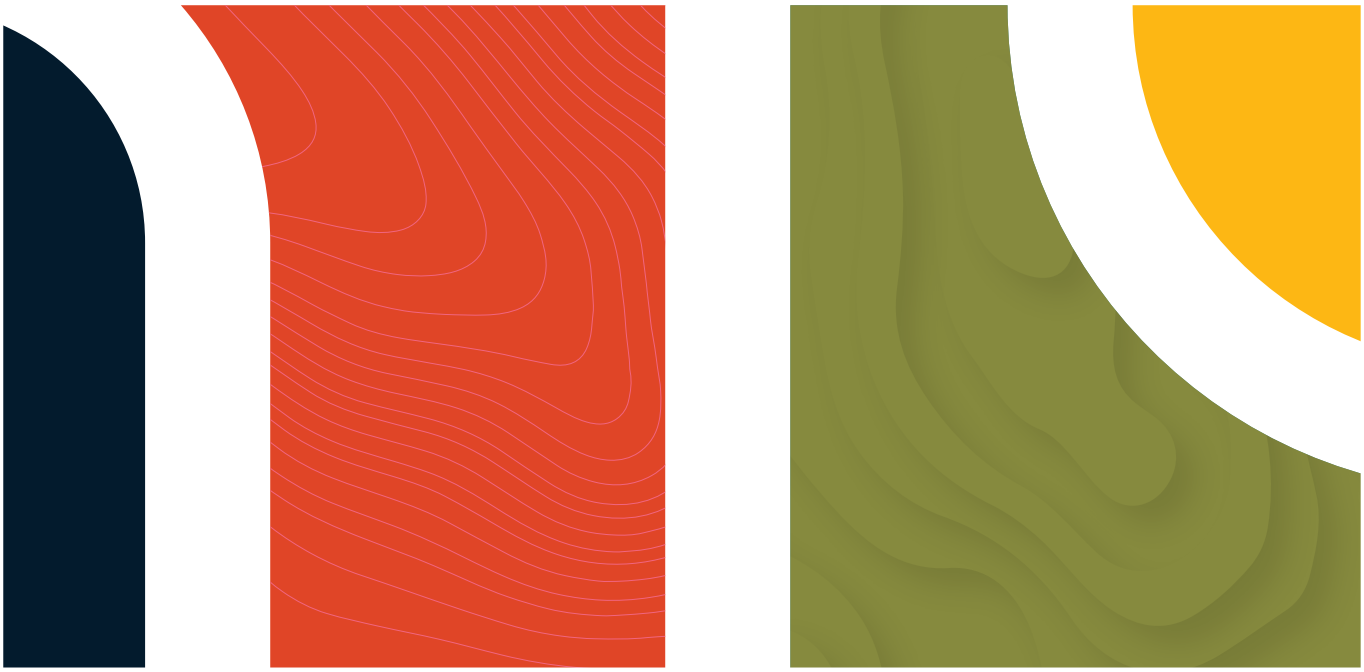

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Definitions and Acronyms

Abbreviation	Definition
CEJST	Climate and Economic JusticeJustice Screening Tool
CPRG	Climate Pollution Reduction Grants
EJScreen	Environmental Justice Screening Tool
FUDS	Formerly Used Defense Sites
GRMI	Greater Region Mobility Initiative
HACV	Heating, Ventilation, and Air Conditioning
IRA	Inflation Reduction Act
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
MVLTROG	Miami Valley Long Term Recovery Operations Group
MVRPC	Miami Valley Regional Planning Commission
LIDAC	Low-income and disadvantaged communities
PCAP	Priority Climate Action Plan
PPA	Power Purchase Agreement
RAPCA	Regional Air Pollution Control Agency
RMP	Risk Management Plan
RNG	Renewable Natural Gas
GDRTA	Greater Dayton Greater Dayton Regional Transit Authority
SOPEC	Sustainable Ohio Public Energy Council
TIP	Transportation Improvement Program
VPP	Virtual Power Plant
VMT	Vehicle miles traveled
WRRF	Water resource recovery facilities

Key Energy and Emissions Units

GHG emissions

1 ktCO2e = 1,000 MtCO2e

Energy

1 MMBTU = 1.055 GJ

1 MJ = 0.0001 GJ

1 TJ = 1,000 GJ

1 PJ = 1,000,000 GJ

1 GJ = 278 kWh

1 MWh = 1,000 kWh

1 GWh =1,000,000 kWh

List of Figures

List of Tables

1 Introduction

1.1 Climate Pollution Reduction Grants (CPRG) Overview

Section 60114 of the Inflation Reduction Act (IRA) appropriates $5 billion to EPA to develop and implement plans to reduce greenhouse gas (GHG) emissions. Through the CPRG program, EPA is seeking to achieve three broad objectives:

- Tackle damaging climate pollution while supporting the creation of good jobs and lowering energy costs for families;
- Accelerate work to address environmental injustice and empower community-driven solutions in overburdened neighborhoods; and
- Deliver cleaner air by reducing harmful air pollution in places where people live, work, play, and go to school.

CPRG includes two phases. Phase 1 provides grants to develop plans to reduce GHGs, while Phase 2 provides funding to implement measures from the GHG reduction plans. Priorities for the planning grant are described in Table 1.

Table 1. CPRG Planning Grant Priorities

Theme	Description
Analytics	Improve understanding of current and future GHG emissions in order to prioritize actions that reduce such emissions and harmful air pollution where citizens live, work, play, and go to school, particularly in nonattainment areas for the National Ambient Air Quality Standards (NAAQS) for criteria air pollutants.
Programs	Adopt and implement ambitious policies and programs to reduce GHG emissions and accelerate decarbonization across multiple important sectors (e.g., industry, electricity generation, transportation, commercial and residential buildings, agriculture/natural and working lands, and waste and materials management).
Partnerships	Collaborate closely with other entities in their state, region, municipality, and/or air district to develop coordinated plans based on best practices.
Financing	Explore opportunities to leverage sources of funding and financing from the Inflation Reduction Act of 2022, Bipartisan Infrastructure Law of 2021, American Rescue Plan Act of 2021, and Creating Helpful Incentives to Produce Semiconductors and Science Act of 2022.

Theme	Description
Innovation	Stimulate innovative technologies and practices to reduce GHG emissions and associated co-pollutants in hard-to-abate sectors.
Transformation	Prioritize actions and policies that will be durable, replicable, and provide certainty in pollution reductions.
Economic development	Reduce climate pollution while building the clean energy economy in a way that benefits all Americans, provides new workforce training opportunities, and effectively addresses environmental injustices in disadvantaged communities.
Monitoring and evaluation	Adopt robust metrics and reporting programs to track emission reductions and important benefits throughout the jurisdiction and in disadvantaged communities.

1.2 The Priority Climate Action Plan (PCAP)

The first deliverable of the CPRG planning grant is the PCAP. The primary objective of the PCAP is to identify near-term, high-priority, implementation ready measures to reduce GHG emissions, which can be submitted as projects under the implementation phase of CPRG. The PCAP includes a GHG inventory, quantified GHG reduction measures, a low-income and disadvantaged communities benefits analysis, and a review of authority to implement the measures.

A Comprehensive Climate Action Plan (CCAP) will be completed following the PCAP. The CCAP provides the scope for more detailed modeling, technical analysis and community engagement, and will represent a detailed roadmap for decarbonizing the Miami Valley.

1.3 The Role of Local and Regional Governments

Local governments can have a considerable impact on reducing GHG emissions in the community. By developing a quantitative understanding of the community's GHG emissions (i.e., the GHG inventory) and systematically identifying the actions for change (i.e., climate action planning), local and regional governments can influence the level of community GHG emissions now and many years into the future. Land-use planning decisions made today will have environmental and socio-economic impacts over the next 100 years. In the case of infrastructure investments and land-use plans, the consequences can continue for centuries. These decisions can "lock-in" emissions, where past decisions limit options to transform the current situation and increase the costs of future decisions. In the context of climate change, planning decisions regarding longer term investments are among the most urgent.

In addition to planning policy, local and regional governments have multiple roles that can support and enable GHG emissions reductions, including as:

- **A mobilizer:** Local governments can engage people, municipalities, and other organizations around a vision, goals, objectives, and targets. For example, local governments can lead community engagement programs or bulk purchasing of renewable energy on behalf of citizens.
- **An innovator**: Local governments can directly or indirectly support innovation through targeted investments, partnerships, and/or policies that support low-carbon projects or enterprises, reducing risk for investors, partners, and community members. For example, local governments can develop electric vehicle (EV) infrastructure to support electric vehicle adoption.
- **A collaborator:** There are multiple opportunities for collaboration in the energy transition including with other levels of government, transit authorities, utilities, businesses, non-profit organizations, neighborhoods, and governments in other parts of the region, state, and world. Collaboration can take the form of shared targets, policies, joint projects, and investments.
- **An investor**: Local governments can use access to low-interest capital to make investments directly in building retrofits and renewable energy technologies. Alternatively, or in tandem, local governments can enable investments by third parties. For example, local governments can levy local improvement charges as a way to finance building retrofits.
- **An implementer**: Through policies and incentives, local governments can support businesses and households in making the clean energy transition. For example, local governments can amend building code requirements to mandate or incentivize Passive House construction.
- **An incubator:** Local governments can cultivate the development of new technologies or applications that enable the low-carbon economy by supporting and attracting new and existing businesses and creating a hub or ecosystem in which the businesses and organizations support each other. Examples include a low-carbon business park or incentives for different levels of building performance that stimulate innovation by builders.

1.4 A Framework for Climate Action Planning

“Reduce, Switch, Produce, and Offset and Sequester” is a simple mantra to follow in energy and emissions planning (Figure 1). Adapted from similar approaches such as Reduce-Reuse-Recycle (from the waste sector), and Avoid-Shift-Improve (GIZ, 2011) (from the transportation sector), this framework provides guidance on an overall approach to community energy and emissions planning.

To start, prioritizing reductions in energy consumption will reduce the level of needed needed investment in renewable energy, and result in energy cost savings. Maximizing energy consumption reductions and energy efficiency opportunities reduces total energy costs and per unit energy costs by reducing the overall build-out of the electricity system, which is logistically complex and capital intensive.

The second and third steps are to switch to locally-produced renewable electricity, which will maximize local economic benefits and the resilience of the electricity system. The final step is to offset and sequester any remaining emissions to reach net zero.

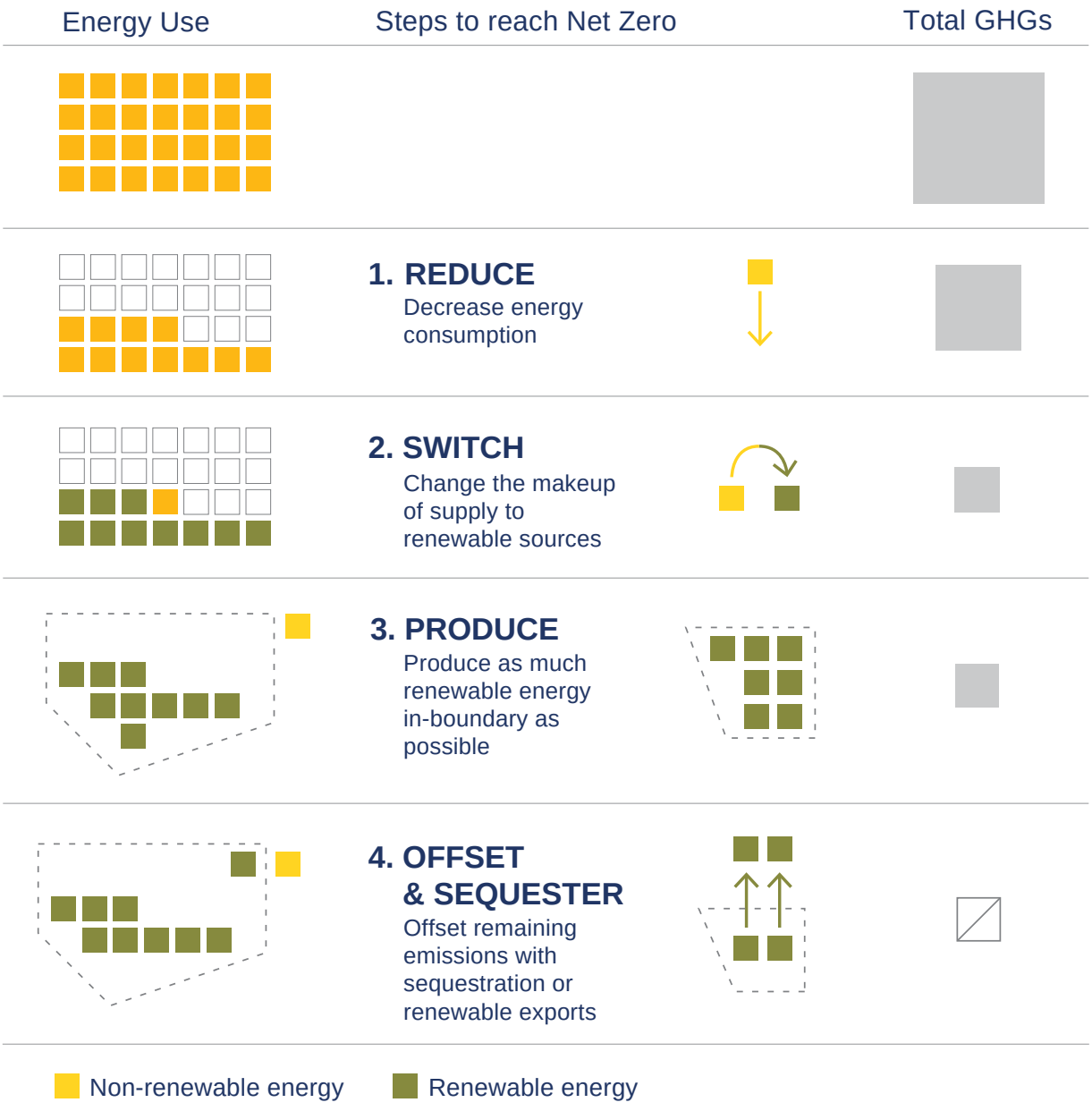


Figure 1. A Systematic Approach to Reducing GHG Emissions.

Other key considerations are to identify actions and investments that will improve durability and avoid lock-in patterns of behavior and capital. From this perspective, the first priorities are land-use planning and infrastructure planning, including development density or intensity, mix of land uses, energy supply infrastructure, and transportation infrastructure. The second priorities are major manufacturing or production processes including industrial processes; choice of transportation modes; and building and site design. The final priority is energy-using equipment including transit vehicles, motors, appliances, and HVAC systems.

The approach of reduce-switch-produce-offset guided the development of Miami Valley's PCAP actions.

1.5 Climate Action Is Economic Development

Decarbonizing the the Miami Valley's transportation, buildings, waste management, and energy supply requires new investments. Many of these investments can save local residents, businesses, and governments money, primarily as a result of efficiency gains, while stimulating innovation and new business opportunities. The investments also require work - and workers - to install heat pumps, retrofit homes, and build infrastructure. The scale of the investment and work required means that a climate action plan can act as a major economic development strategy for a region.

1.6 PCAP Process

The process used to develop the the Miami Valley's PCAP (Figure 2) included four streams of activities: coordination, technical analysis, engagement and outcomes.

Measures were identified based on findings from the context review, GHG inventorying, and engagement with agencies, LIDAC communities. Measures were prioritized based on criteria developed to reflect both local priorities and EPA's evaluation criteria for CPRG Phase 2. MVRPC's Water and Environment Subcommittee and Board served as the key decision-making and advisory bodies over the course of the PCAP development (see PCAP process diagram on next page).

PCAP Process.

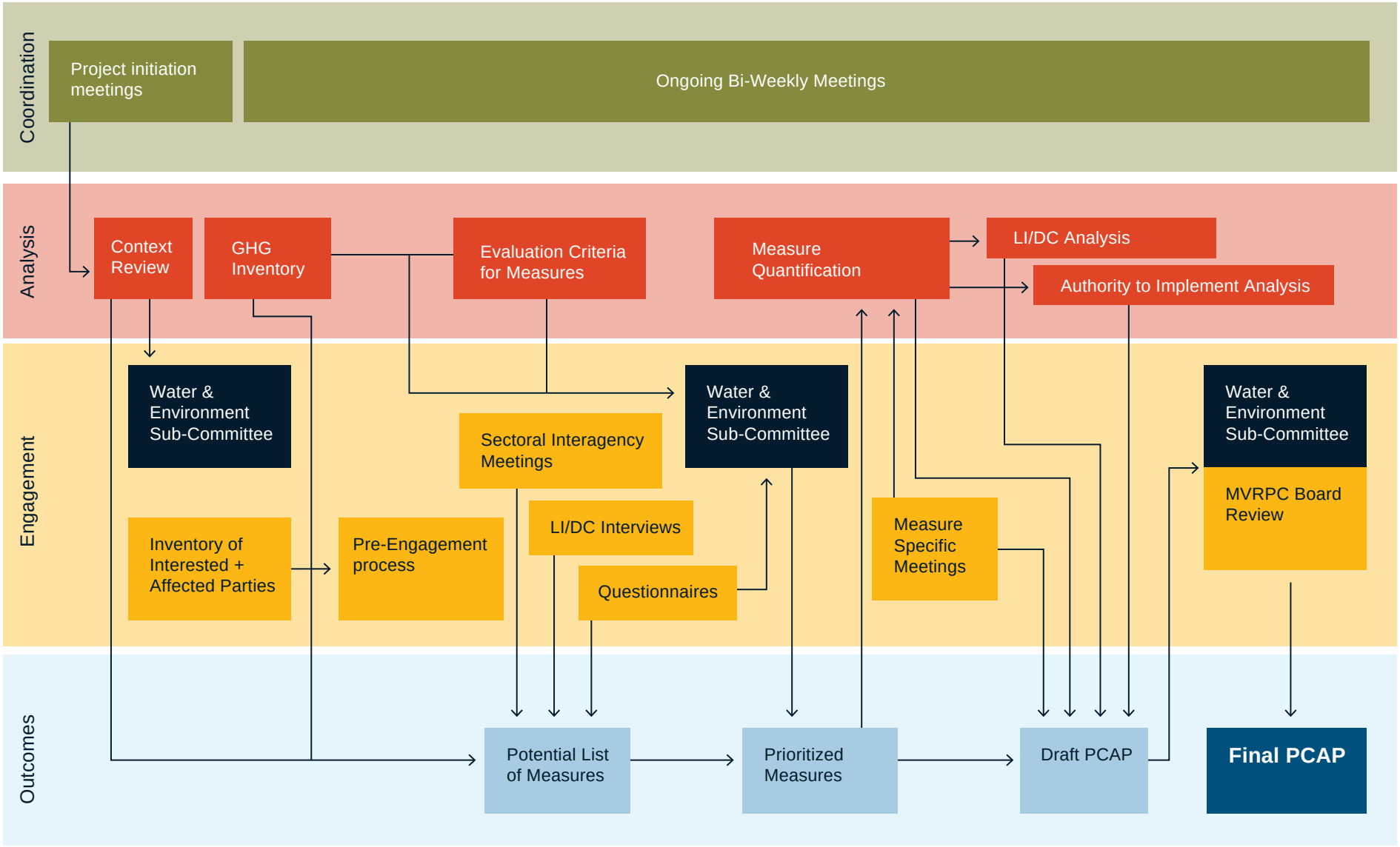


Figure 2. PCAP Process.

2 Project Background

2.1 Context

Climate change is a particularly complex challenge because it occurs over a relatively long timescale, its impacts vary across locations and time, and solutions must touch on every aspect of human endeavor within a short and urgent time frame.

The Impacts of Climate Change for the Midwest

Selected excerpts from the Fifth National Assessment (USGCRP, 2023)

- One of the most direct ways that people experience climate change is through changes in extreme events. Harmful impacts from more frequent and severe extremes are increasing across the country—including increases in heat-related illnesses and death, costlier storm damages, longer droughts that reduce agricultural productivity and strain water systems, and larger, more severe wildfires that threaten homes and degrade air quality.
- Each additional increment of warming is expected to lead to more damage and greater economic losses compared to previous increments of warming, while the risk of catastrophic or unforeseen consequences also increases.
- In the 1980s, the country experienced, on average, one (inflation-adjusted) billion-dollar disaster every four months. Now, there is one every three weeks, on average. Between 2018 and 2022, the US experienced 89 billion-dollar events. Extreme events cost the US close to $150 billion each year—a conservative estimate that does not account for loss of life, healthcare-related costs, or damages to ecosystem services.
- The impacts and risks of climate change unfold across interacting sectors and regions. For example, wildfireswildfires in one region can affect air quality and human health in other regions, depending on where winds transport smoke. Further, climate change impacts interact with other stressors, such as the COVID-19 pandemic, environmental degradation, or socioeconomic stressors like poverty and lack of adequate housing that disproportionately impact overburdened communities. These interactions and interdependencies can lead to cascading impacts and sudden failures. For example, climate-related shocks to the food supply chain have led to local to global impacts on food security and human migration patterns that affect US economic and national security interests.

- The risk of two or more extreme events occurring simultaneously or in quick succession in the same region—known as compound events—is increasing. Climate change is also increasing the risk of multiple extremes occurring simultaneously in different locations that are connected by complex human and natural systems. For instance, simultaneous megafires across multiple western states and record back-to-back Atlantic hurricanes in 2020 caused unprecedented demand on federal emergency response resources.
- Some communities are at higher risk of negative impacts from climate change due to social and economic inequities caused by ongoing systemic discrimination, exclusion, and under- or disinvestment. Many such communities are also already overburdened by the cumulative effects of adverse environmental, health, economic, or social conditions. Climate change worsens these long-standing inequities, contributing to persistent disparities in the resources needed to prepare for, respond to, and recover from climate impacts.

2.2 Miami Valley Background

The geographic scope of this Priority Climate Action Plan covers the Dayton-Kettering Metropolitan Statistical Area ("Miami Valley") in Ohio. The Miami Valley includes Greene County, Miami County, and Montgomery County.

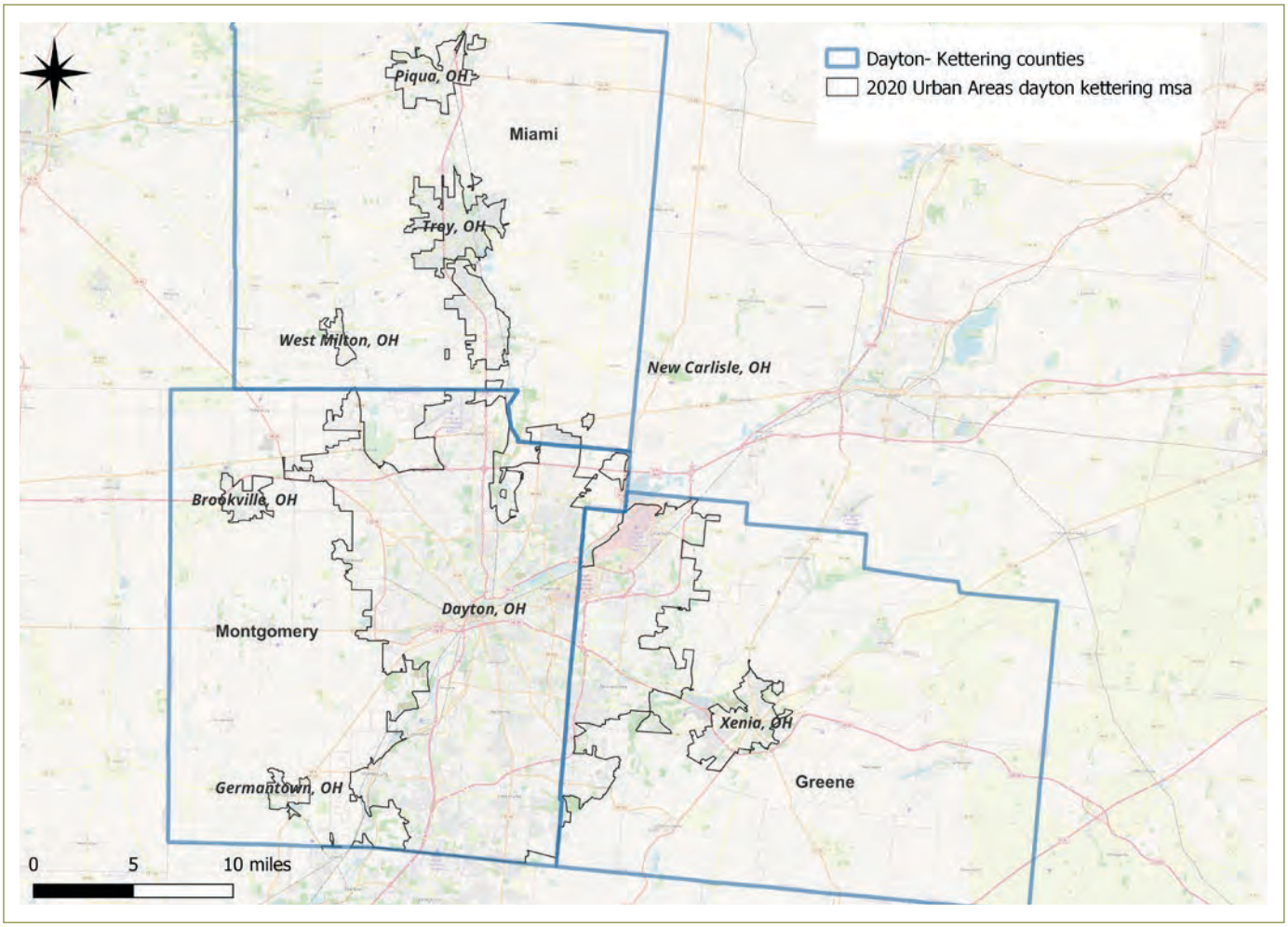


Figure 3. Map of the Miami Valley region which forms the geographic scope for the PCAP.

According to the 2020 U.S. Census, Miami County's population is 108,774; Greene County's population is 167,971; and Montgomery County is 537,316. In total, 14% of the total population is Black, 4% are of two races (non-Hispanic/Latino), and 3% are of Hispanic origin (Figure 4).

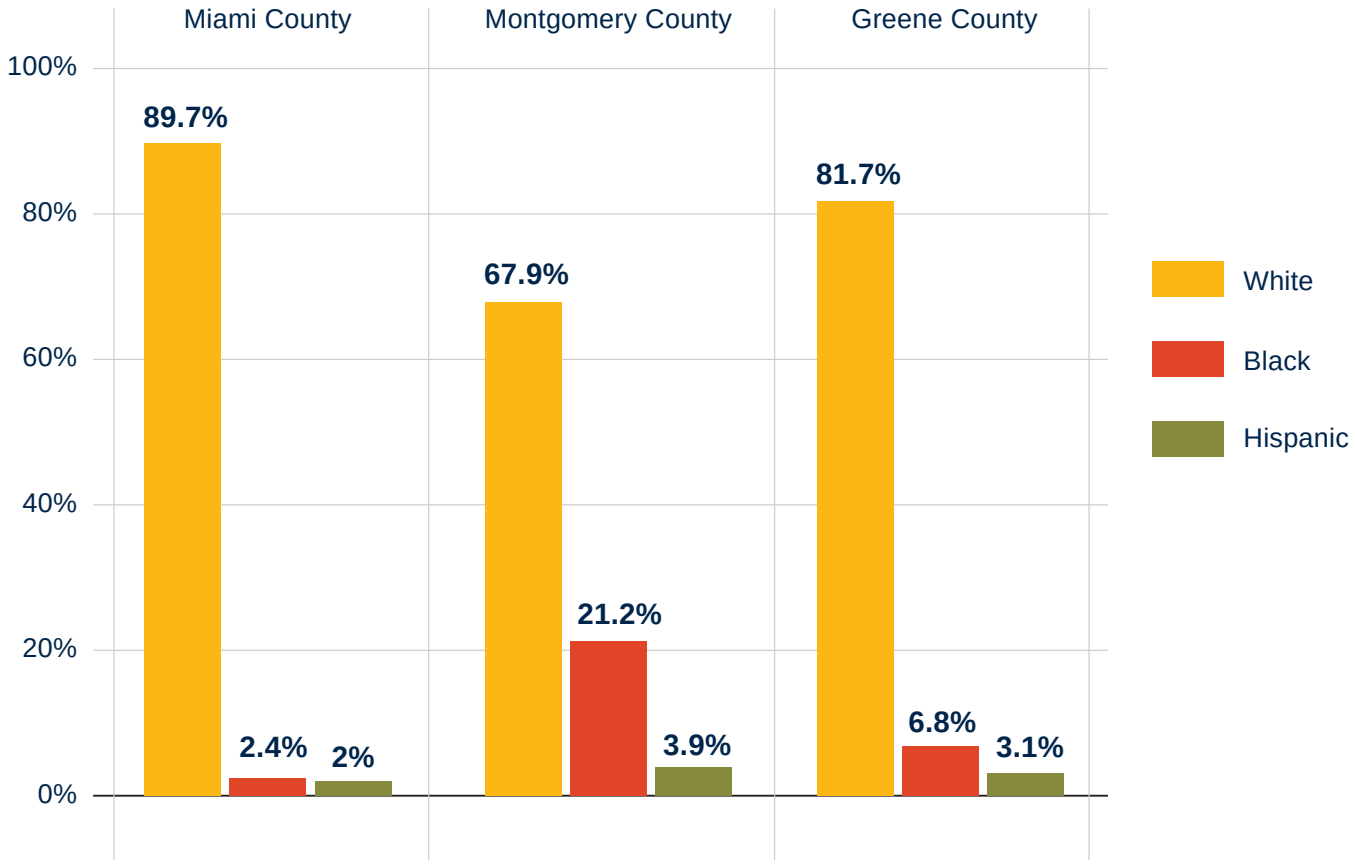


Figure 4. Population's ethnic composition of the three counties. Source: adapted from (MVRPC, 2021a).

Since the previous census in 2010 (MVRPC, 2021a), Miami County's population has grown by 6.1%, Greene County's by about 4%, and Montgomery's by 0.4%.

While more than 60% of total inhabitants are under 50 years old, the population is aging, illustrated by the relative share of children (Figure 5).

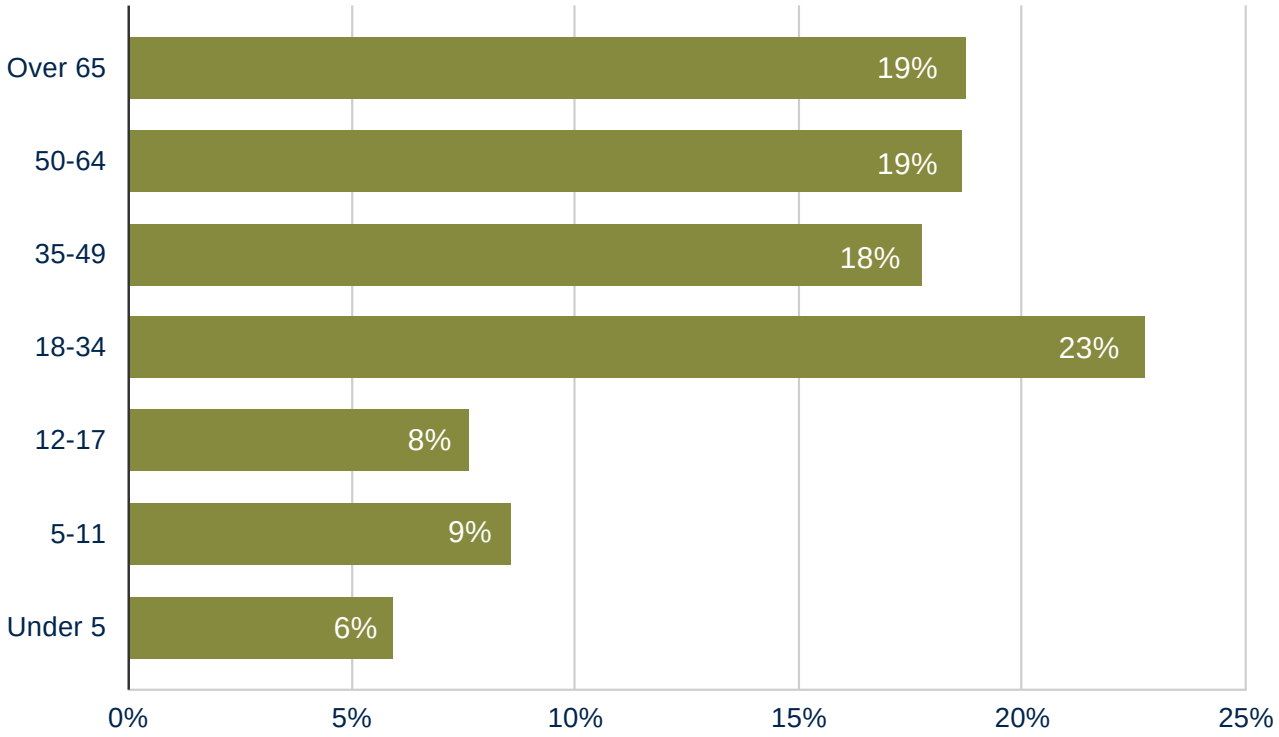


Figure 5. Population by age range (%), Miami Valley. Source: (ReplicaHQ, 2023).

Incomes in Miami Valley are lower than the national average (Census Bureau, 2021), with a median household income of $72,000 in 2022 just under the national average of $75,000. More than 50% of the population has incomes less than $75,000 and more than one third of the population has incomes less than $50,000. However, wages have increased over time, such as a 45% increase in average wage in the utilities sector, 44% in construction, and 38% in finance and insurance from 2004-2016.

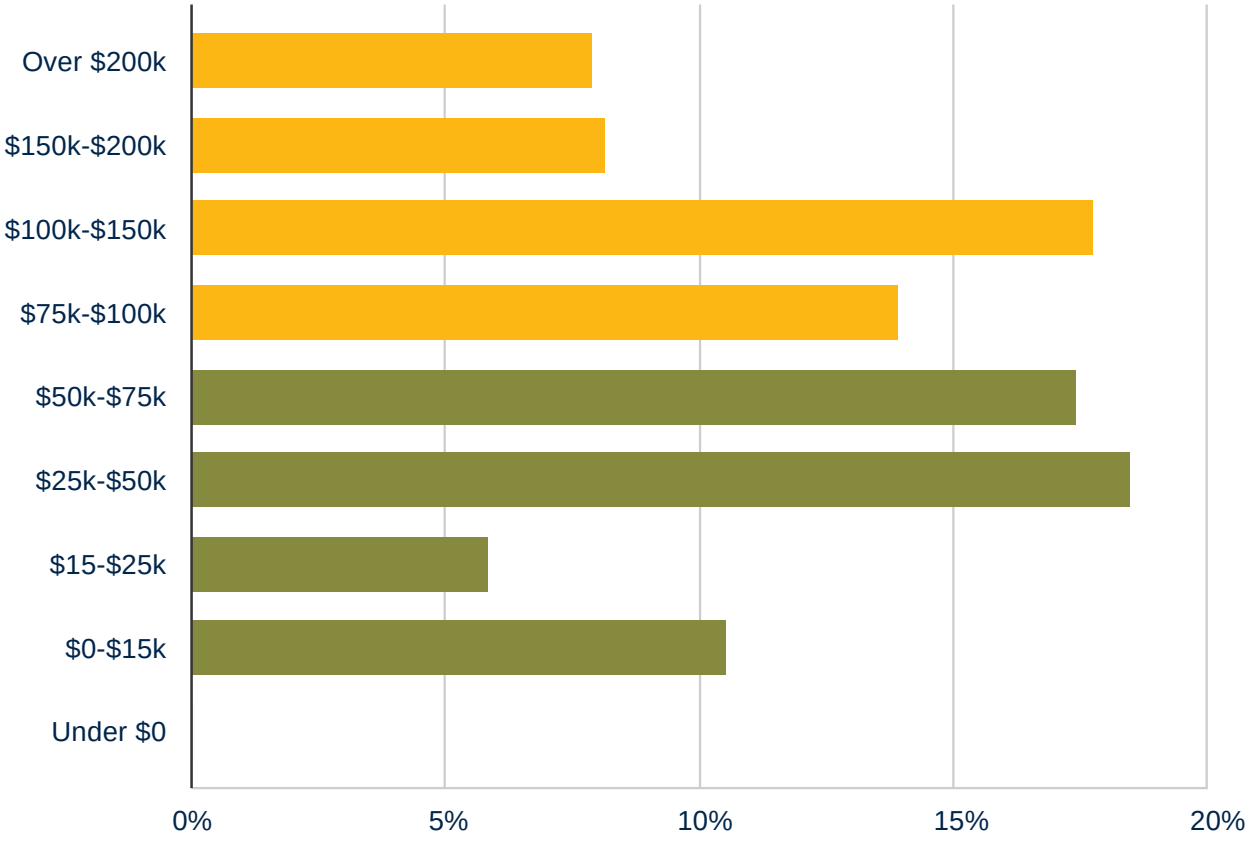


Figure 6. Median Household Income (2022 dollars), Miami Valley. Source: (ReplicaHQ, 2023).

The leading sectors of the regional economy are the public sector and government, health care, manufacturing, and retail. Most jobs are located in Montgomery County. There is a disproportionate concentration of government jobs in Greene County, and manufacturing jobs in Miami County.

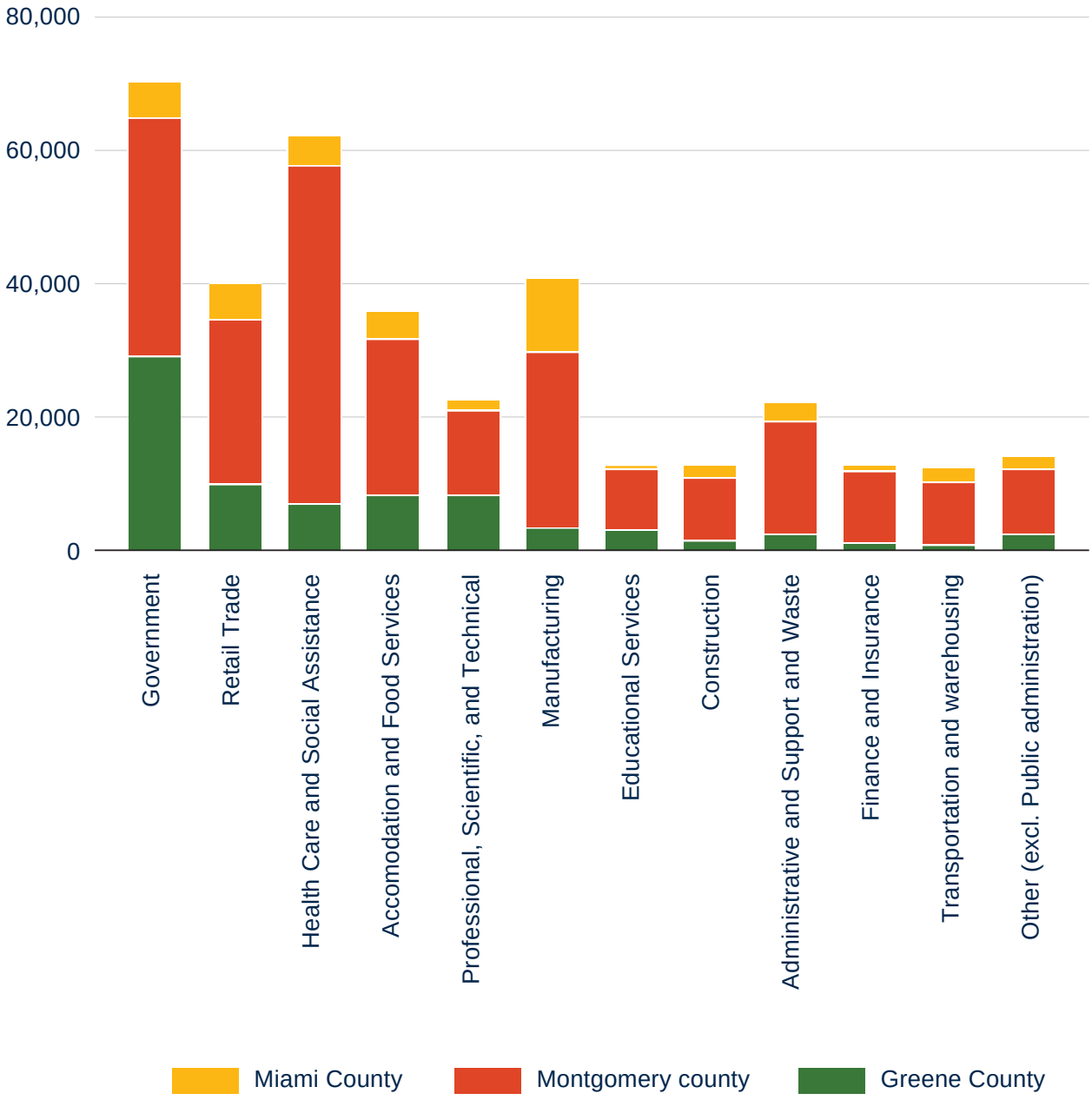


Figure 7. Total number of jobs per sector per county. Source: (MVRPC, 2022a).

The region has moved from an economy focussed on production to one focused on services post-2008 recession, increasing the number of jobs in healthcare and social assistance (29% increase in jobs by 2016 since 2004), as well as in transportation and warehousing, while employment in utilities and manufacturing has decreased since 2004. The Wright-Patterson Air Force Base is the largest single-site employer in Ohio.

2.3 Climate policies, actions, and programs in Miami Valley

Climate action in Miami Valley has a long history through different policies and plans although none of the three counties involved in this PCAP process has previously developed a Climate Action Plan.

The City of Dayton's Strategy for a Sustainable Dayton (2020) includes projects designed to reduce air pollution and implement renewable energy projects amongst other priorities such as enhancing groundwater and surface water, enhancing climate adaptation, improving waste management, developing community gardens, and improving transportation. (Dayton City Commission, 2020). In 2021, Dayton declared a Climate Emergency and committed to 100% clean, renewable electrical energy by 2050. Other city targets include:

- Purchase 100% renewable energy for municipal electricity consumption by 2035;
- Purchase or secure 100% renewable energy for community electricity supply by 2040;
- Purchase or secure 100% renewable energy for all sectors by 2050;
- Convert 100% of the city fleet to electric or renewably-powered vehicles by 2035.

Dayton's Active Transportation Plan 2040 (City of Dayton, 2023a) proposes the expansion of the cycling road network by 124 miles of on-street bikeways, 12 miles of shared pedestrian pathways, 10 miles of sidewalks, adding to the current 1,800 miles of sidewalks in the region. Targets are included for all modes of transportation, incorporating the "Complete Streets"[1] principles recommended in Dayton's Transportation Plan 2040, with projects designed to improve pedestrian experiences, bike lanes, infrastructure, codes, and education, transit signage and transit infrastructure. Dayton developed an electric vehicles strategy in 2023 (City of Dayton, 2023c), which includes the objective of its entire municipal fleet by 2035.

[1] Complete Streets overview: Complete Streets welcomes all users. They make it easy to cross the street, take the bus, bicycle to work or school, and deliver freight. They also acknowledge the importance of private automobiles, and maintain access for motorists while increasing space for these other modes. Complete Streets are designed to enable safe and convenient access regardless of age, ability, or mode of transportation.

The City is installing EV chargers at public buildings and city-controlled parking garages, and supporting installations on private properties. This strategy is intended to ensure equitable access to all community members.

At a regional level, MVRPC developed the Greater Region Mobility Initiative (GRMI), which increases mobility opportunities for non-driving populations (e.g. individuals with disabilities, elderly, and low-income), serving around 6,000 individuals for approximately 118,000 trips across an 8-county region (MVRPC, 2022c). MVRPC also manages the "Miami Valley Rideshare" program, funded through the Ohio Department of Transportation, offering a free rideshare service for those who work, live, or go to college in the area. The program matches people with carpools or group bike commutes and offers van rentals for larger carpool groups. Registrants also receive 80% off the cost of a ride service home four times a year for emergencies.. The Miami Valley Transportation Improvement Program (TIP) (2024-2027) (MVRPC, 2023a), implements the targets in the 2050 Long Range Transportation Plan[2] (MVRPC, 2021b). The TIP is a four-year implementation schedule for transportation projects within Greene, Miami, Montgomery, and northern Warren Counties, including investments in highways, bikeways, and transit. Another example of regional collaboration led by MVRPC, contributing the active transportation efforts, is through the Plan4Health initiative (MVRPC, 2022b), which supports information sharing, capacity building, and collaborative approaches to improving public health through active transportation, for example.

In terms of energy generation, Dayton is part of the "Mayors for 100% Clean Energy" national initiatives sponsored by the Sierra Club, as well as "Ready for 100%". Communities across Ohio, including in Montgomery and Greene counties are part of the Sustainable Ohio Public Energy Council (SOPEC). SOPEC implements an electric aggregation program allowing municipalities to opt for and purchase power from renewable generation suppliers, and secure electricity rates. The Miami Valley Communications Council has also formed an electric energy aggregation program serving multiple suburban communities in all three counties in the MSA. Community members have also formed a solar co-op, the Miami Valley 2023 Solar and EV Charger Co-op (Solar United Neighbors, 2023).

Solid waste management in the counties focuses on recyclable materials, and regulating hazardous and debris disposal. Each county has a Solid Waste Management District Plan, which identifies the current state of the management and describes programs and projections for solid waste generation, recycling, and disposal. In Miami County composting is the preferred method of organic and yard waste treatment, treating approximately 11,000 tons of food and yard waste in 2018. Miami and Montgomery Counties have 18 composting facilities (Miami County, 2021; Montgomery County, 2019). GreeneCounty has developed a proposal to treat sludge and deviate it from landfill disposal, the Thermal Drying Facility Feasibility Analysis. This proposed facility will be located in the Sugarcreek Water Resource

[2] It is a 20+ years multimodal strategy and capital improvement program developed to guide the effective investment of public funds in transportation facilities.

Recovery Facilities (WRRF). Dayton's Department of Water (DOW) signed a 20-year agreement with a company DTE Biomass Energy to implement an anaerobic digester for wastewater treatment. The resulting biogas will be sold to DTE, which will process it into renewable natural gas (RNG) for distribution through pipelines (City of Dayton, 2023d).

Dayton's Housing Policy aims to create more homeownership opportunities, especially in black/brown communities that have been impacted by segregation practices of the past, and strengthen rental housing options, among other outcomes. The policy aims to support homeowners with financial support to develop new construction or preserve existing affordable housing, though it does not explicitly mention incentives or support for housing retrofits (City of Dayton, 2023b), sustainability or green standards, renewable energy, and energy efficiency.

2.4 Vulnerability, Risks, and Adaptation

The City of Dayton's Climate Change Vulnerability Assessment for Stormwater identified climate impacts, including:

- Over the last several years the city has experienced a 0.9°F increase in average annual temperature, with spring experiencing the greatest amount of warming (a 2.2°F increase). Average air temperature is projected to rise 3°F to 5°F by the mid-21st century.
- Night-time temperatures are rising, and the number of cold days (< 32°F) is declining.
- Annual precipitation is changing too: in the last decades, Dayton has experienced a 28.5% increase in annual precipitation, with the greatest change happening in fall (53.3% increase, amounting to roughly an extra 3.8 inches). Total annual precipitation will likely increase in the future, though types of precipitation will vary (i.e., more winter precipitation in the form of rain).
- Severe storms are increasing in the frequency and intensity, with the City experiencing a 71% increase in the total volume of rainfall in extreme precipitation events (most extreme 1% of storms) annually.
- The central area of Dayton's lower elevation, greater impervious surface cover, and concentration of stormwater infrastructure at high risk of failure makes it most vulnerable to flooding.
- The heat island effect is most severe in the southeast area of the City.

More frequent precipitation in shorter periods means more frequent flooding of roads, culverts, and bridges/bridge approaches; with each flood event having the potential to disrupt the ability to travel and the need to reroute around the flooding. In the long term, more frequent flooding can lead to erosion of the soil which supports roads and

bridges, thus shortening the lifespan of infrastructure. Regional bike trails, many of which are built along waterways, are also likely to be submerged more frequently and for extended periods.

Counties have placed different efforts to deal with hazards and developed varying disaster recovery strategies. All three counties have a County Hazard Mitigation Plan (Greene County, 2020; Miami County, 2023; Montgomery County, 2020). In some cases, such as Miami County, the hazards analysis included not only weather or climatic hazards but also pandemic impacts, hazardous materials, invasive species, terrorism, and transportation disasters. In two out of the three plans, the counties identified climate change as a factor in increasing the severity and frequency of a number of hazards (e.g. thunderstorms, invasive species, heat islands, drought, wildfires). Projects under the category of hazard mitigation are eligible for FEMA's Hazard Mitigation Assistance Program.

The Miami Valley has an elevated risk for tornadoes. On Memorial Day 2019, a series of tornadoes ripped through the Dayton Region ranging from F0 to F4 spanning over three counties with the largest tornado hitting the most underserved communities, in Montgomery County. A significant amount of damage was sustained across Greene, Miami and Montgomery counties impacting nearly 6,000 homes. Additionally, Miami County has seen an increase in localized tornadoes each year since the 2019 tornado outbreak. To ensure the region remains resilient to these natural threats, MVRPC is coordinating a cooperative strategic plan for resiliency to facilitate successful disaster recovery.

2.5 Observations

As a component of the context review, an analysis of key trends that underlie patterns of GHG emissions was undertaken.

2.5.1 Vehicle mode share dominates

When private auto trips and auto passenger trips are summed, vehicular trips account for 86.7% of normal weekday trips (2.85 million trips total) in Miami Valley in Spring, 2023 (Figure 8, next page). Walking accounts for 10.8% of trips while cycling, transit and taxi represented 0.8%, 0.41% and 0.33% of trips respectively. On average, there were four trips per day per tripmaker and the average trip length was 9.3 miles, while the median trip length was 4.1 miles (Figure 9, next page).

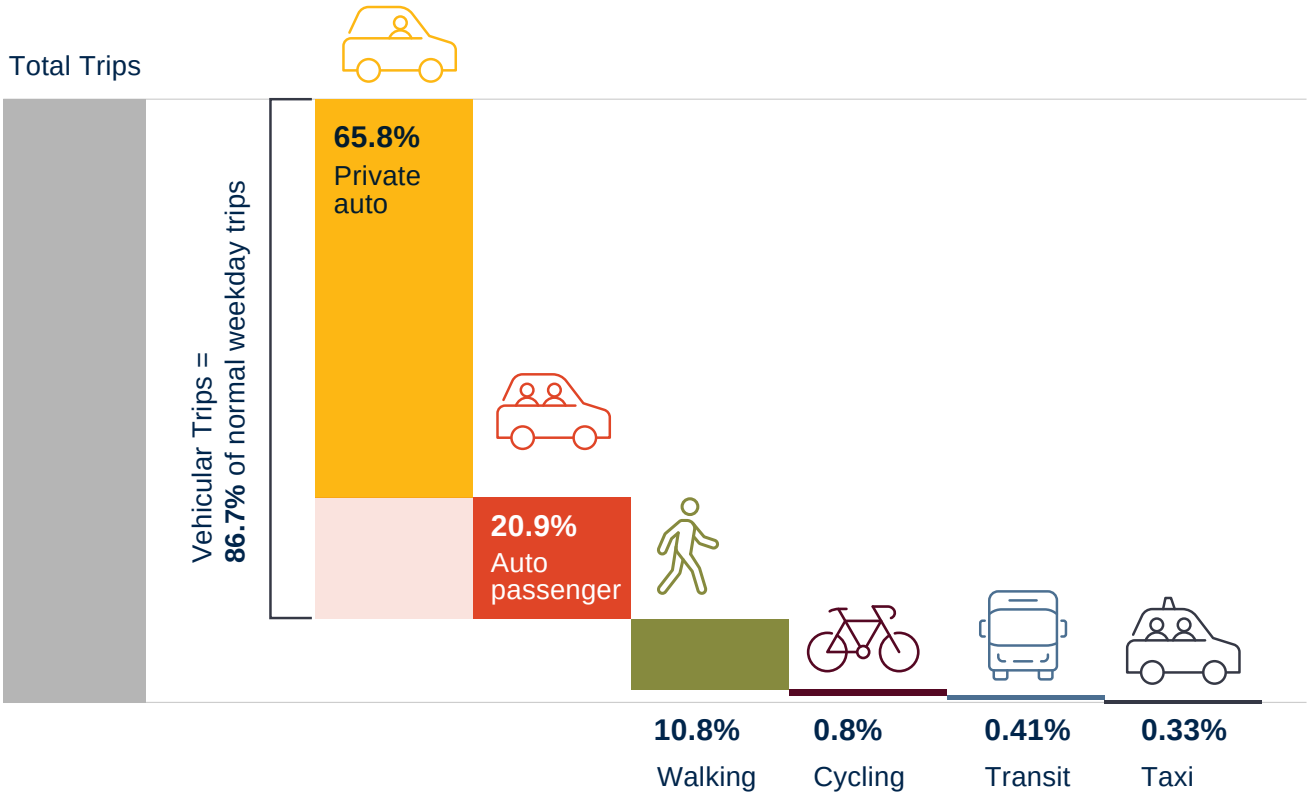


Figure 8. Mode share for a typical workday, spring, 2023. Source: (ReplicaHQ, 2023).

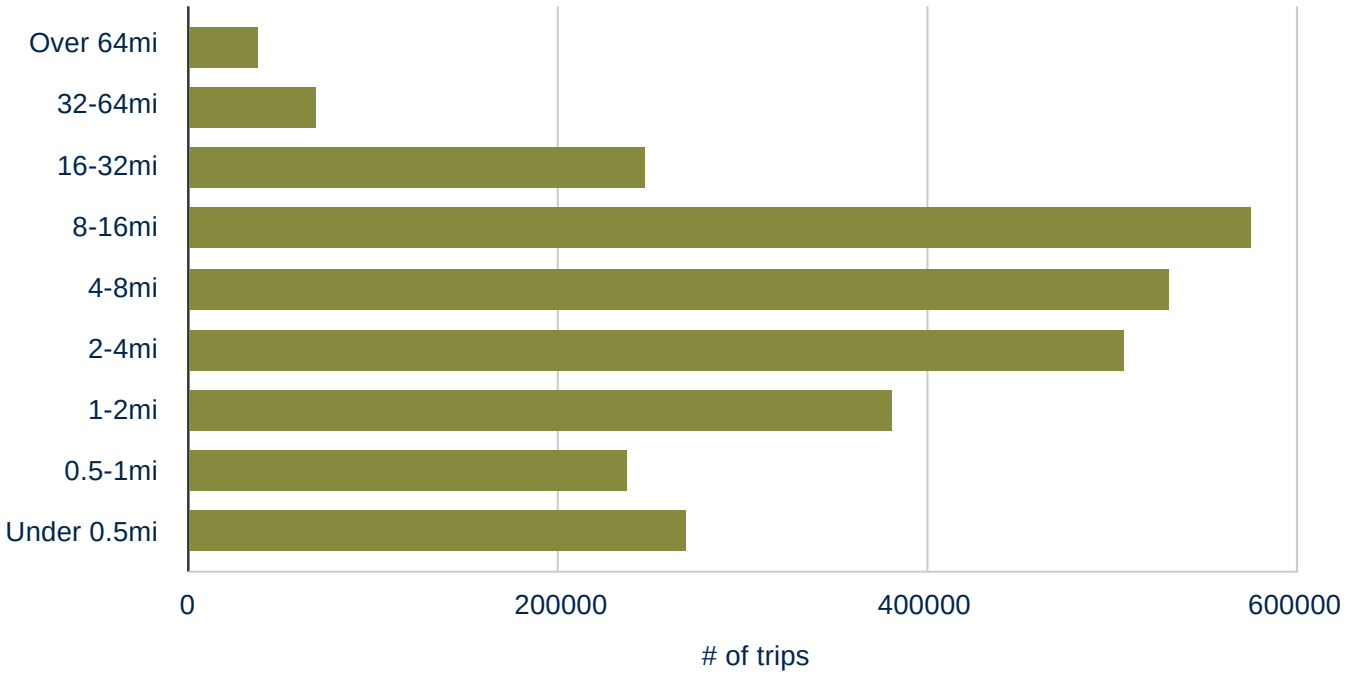


Figure 9. Trip length for a typical workday, spring, 2023. Source: (ReplicaHQ, 2023).

There are 743,000 vehicles in Miami Valley; 69% of households have 2 or more vehicles and 29% have 3 or more vehicles.

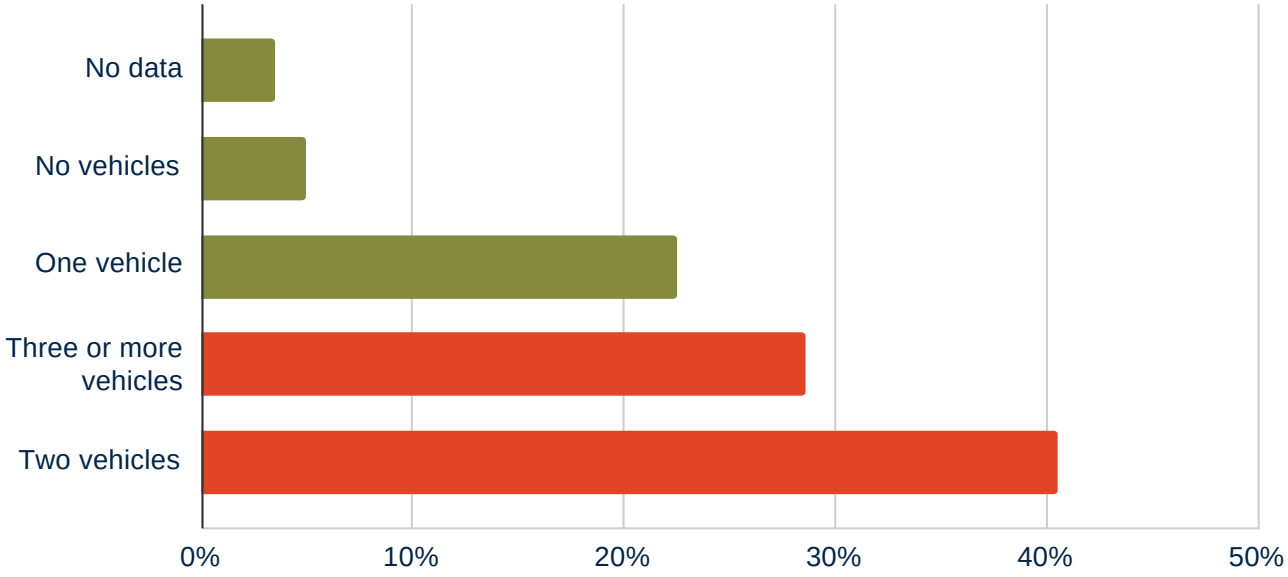


Figure 10. Total vehicles by number of vehicles per household, 2023. Source: (ReplicaHQ, 2023).

Average daily VMT per resident in Miami Valley ranges from 3.5 to 52.8, a ratio of 15 times. In general there is a correlation between rural areas and greater distance, and vice versa, urban areas and shorter distance. Vehicle operating costs are higher for rural areas due to the increased distances that people travel.

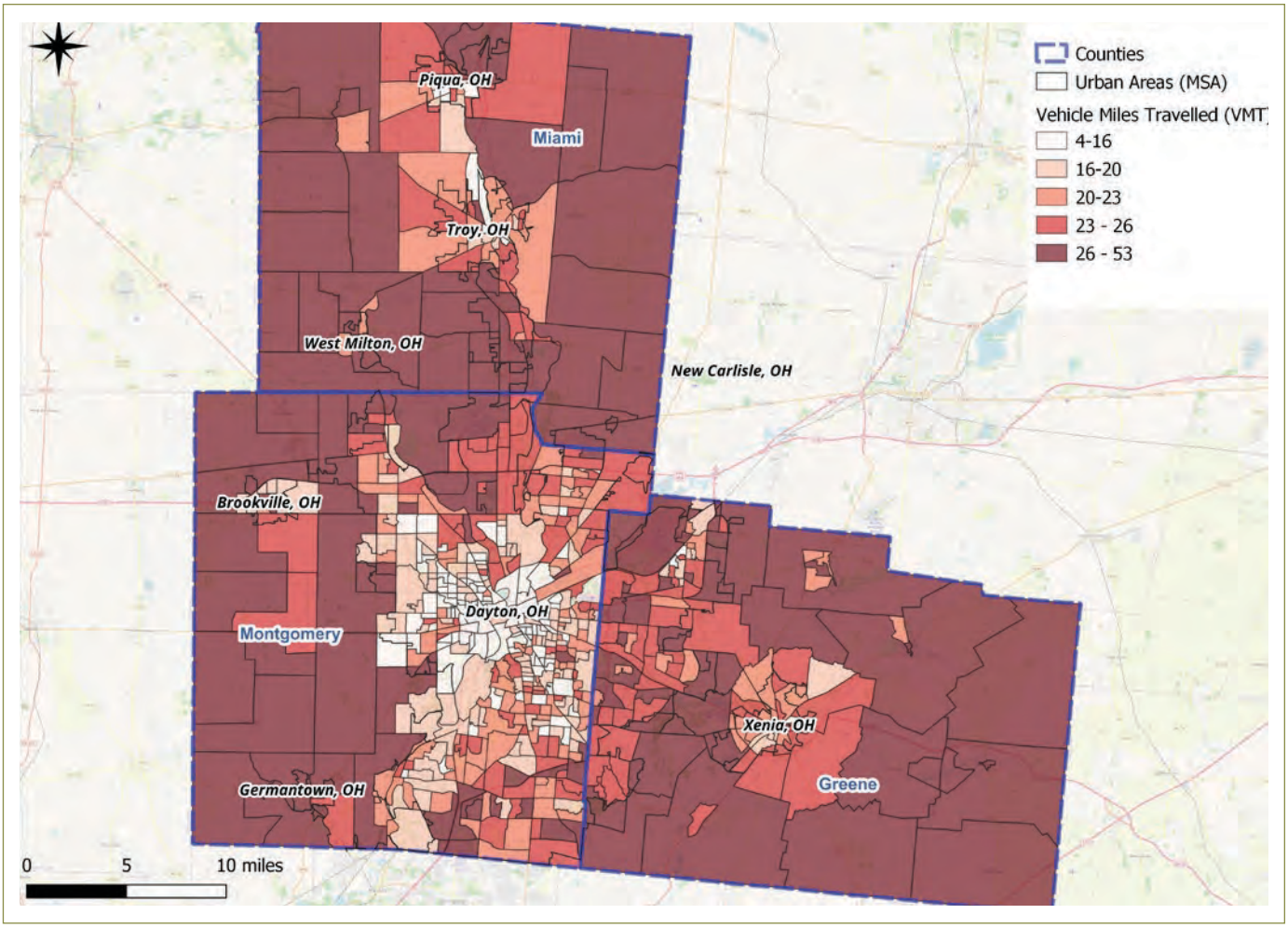


Figure 11. VMT per resident by block group, typical workday, spring, 2023. Source: (ReplicaHQ, 2023).

2.5.2 EV adoption is low

In spring 2023, there were just 8,090 daily trips by battery electric vehicles in Miami Valley, representing 0.4% of the 1.9 million daily vehicular trips on a typical weekday (ReplicaHQ, 2023). For reference, Santa Clara County, CA, the jurisdiction with the highest EV share of VMT in the US, share of EVs was 7.2%. Montgomery County is ranked 126th amongst US counties, behind other counties in Ohio, Cuyahoga (118), Hamilton (116) and Franklin (109).

2.5.3 Homes are poorly insulated, if at all

Detailed data on the characteristics of buildings is not available for Miami Valley. The National Renewable Energy Laboratory's ResStock (Reyna et al., 2022) and ComStock (Parker et al., 2023) databases provide performance characteristics for buildings in Ohio, which are used as representatives for Miami Valley.

Of the 5 million homes in Ohio, NREL indicates that 50% are uninsulated and 84% have R-11 or less in the walls. Just under 70% of homes are single family and of these 60% are uninsulated (Figure 12).

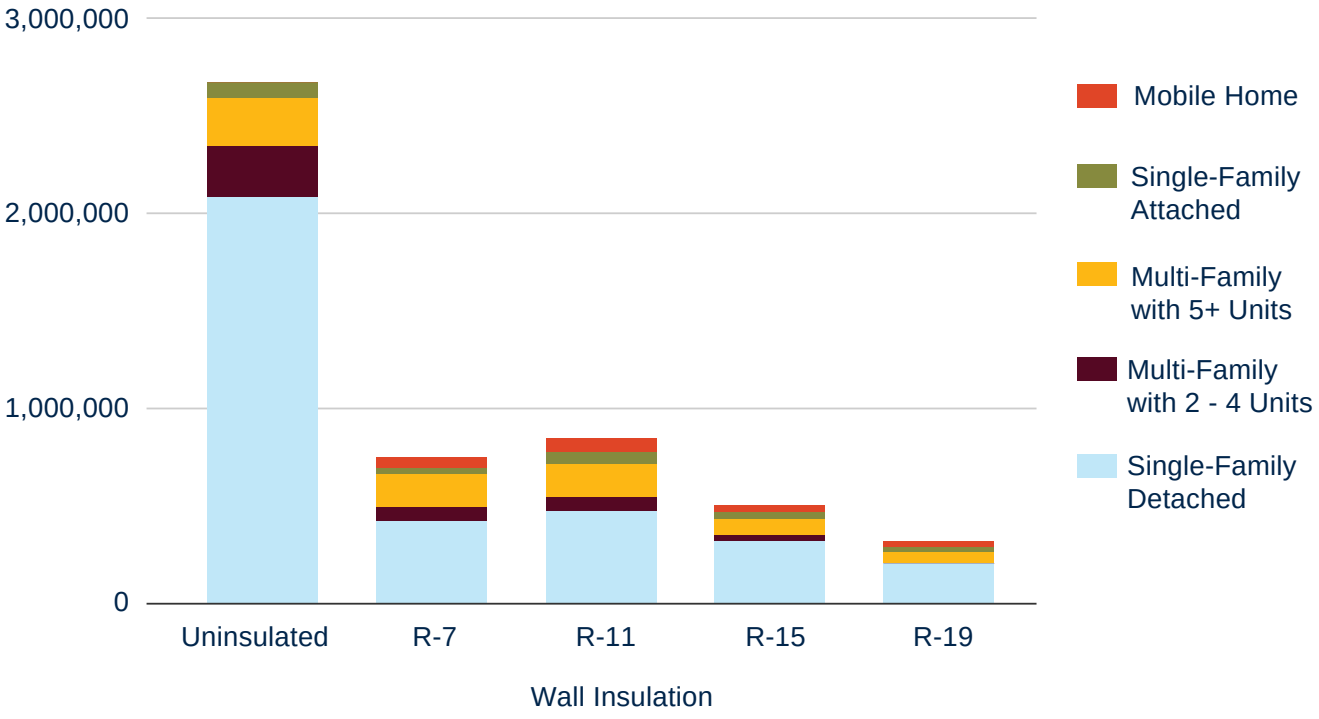


Figure 12. Dwelling stock by level of wall insulation, 2023. Source: (Brossman et al., 2023).

2.5.4 Heat pump penetration is low

Because of their efficiency , and ability to provide heating and cooling using electricity, heat pumps are a key technology for decarbonizing energy systems. In Ohio, most homes are heated with furnaces (61%), followed by electric baseboards (10%) and boilers (10%). 67% of the fuel consumed is natural gas, followed by electricity (24%). Heat pumps account for 4.4% of total heating systems. Replacing the electric baseboards with heat pumps is a potential electricity savings for the State.

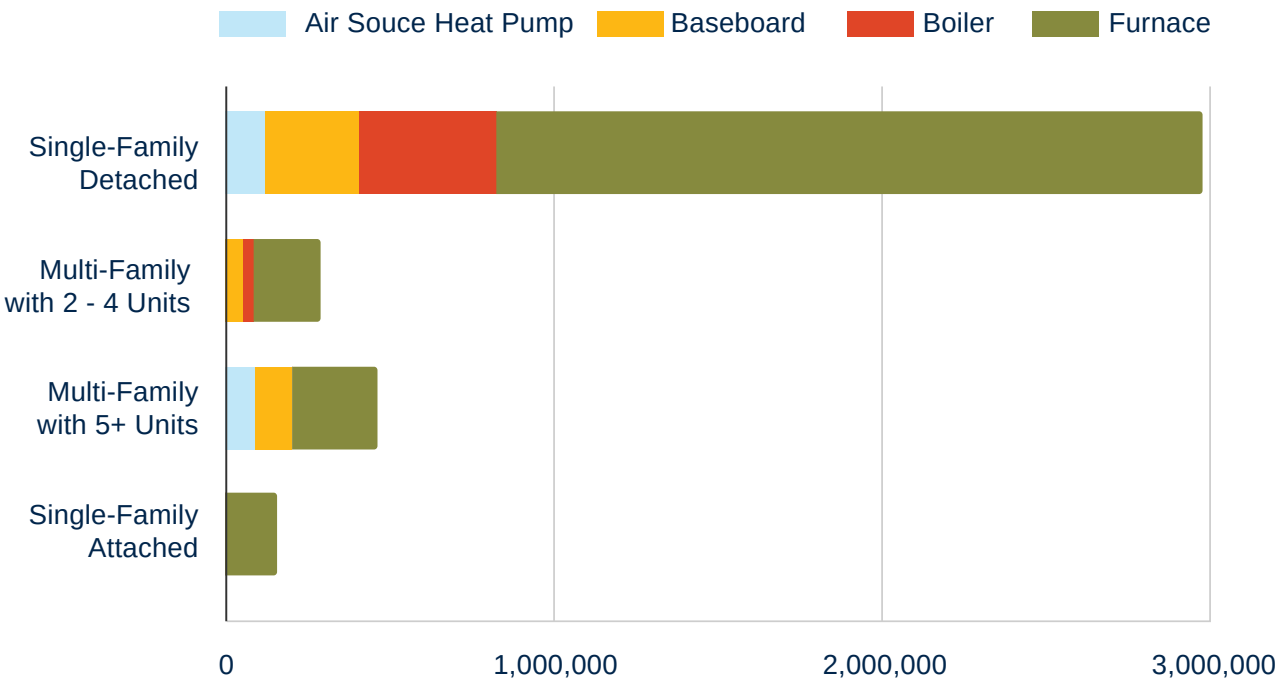


Figure 13. Dwelling stock by heating system, 2023. Source: (Brossman et al., 2023).

2.5.5 Electricity is dirty

Electricity in Ohio is relatively GHG intensive, at 1,162 lbs CO2/MWh in 2022 (EPA, 2023c). In 2021, Ohio had the twelfth most GHG intensive electricity at 1,215 lbs CO2/MWH in 2021 (EPA, 2023a). In comparison, the state with the cleanest electricity is Vermont at 44.83 lbs CO2/MWH, followed by Washington at 203 lbs CO2/MWH.

3 Engagement

3.1 Interagency Coordination

Interagency coordination occurred at multiple scales:

- Meetings with the Regional Air Pollution Control Agency (RAPCA) and SSG were coordinated for the development of the QAPP
- Four meetings of the MVRPC Water and Environment Sub-Committee informed the development of the PCAP.
- Project steering committee members participated in US EPA Technical Assistance Forums.
- Seven meetings between CPRG coordinators from across Ohio enabled sharing across jurisdictions and with the State.
- MVRPC staff met regularly with US EPA Region 5 Staff for monthly check-ins.
- Thematic meetings with specific agencies on (transportation, buildings, energy) were convened to evaluate possible PCAP projects.
- Dedicated coordination meetings were organized for specific measures and possible PCAP projects.

3.2 Community Engagement

3.2.1 Stakeholder Mapping

MVPRC prepared a database of stakeholders by category to inform subsequent engagement activities.

Table 2. List of Stakeholders by Category

Category	# of individuals identified
Government	18
Community Benefit Groups	21
Business & Industry	23
Environmental & Climate Action	43
Utilities	40

Category	# of individuals identified
Technical Advisory Group	56
Environmental Justice Academy	21
Water & Environment Subcommittee	135
MVRPC Board	93
Institute Steering Committee	15
LIDAC	26

3.2.2 Modified Pre-engagement

The engagement activities are coordinated using the International Association of Public Participation (IAP2) framework. The first step in this process is pre-engagement, which involves interviews to understand how to effectively engage interested and affected parties (i.e. stakeholders) and the community. The pre-engagement process informs the development of the Community Engagement Plan. Pre-engagement interviews help us identify baseline knowledge about the project among interested and affected parties, preferences for engagement, community groups that might otherwise be missed, and other potential issues and opportunities for the engagement process.

Due to the short timeline for developing the PCAP, the community engagement plan resulting from the pre-engagement process will be implemented in the CCAP. The pre-engagement process was modified to also identify project opportunities for the PCAP, and was focused on the low income and disadvantaged communities.

In order to thoughtfully engage diverse and interested individual community members from the onset of this project, 10 interviews were conducted using a randomized selection from the stakeholder map.

Interviews will be conducted by phone or Zoom by staff from the SSG team. Interview questions, as well as a short project backgrounder, will be provided to interviewees in advance. The interviewer types notes during the call, and notes are shared with the interviewee by email for confirmation and any corrections/additions.

The interview questions were as follows:

1. What is most important to you, for MVRPC to consider, as we begin this planning process?
2. What concerns, if any, do you have about this project?
3. Tell me how you think stakeholders will be engaged best? What, if anything, hasn't worked in other engagements you have seen?

4. What communications approaches do you think could be most successful in reaching people interested in this project?
5. Who is essential for us to speak with, during this pre-engagement phase of the planning process?
6. What are the initiatives in the region that are most successfully benefiting the communities they serve? Are there insights that relate to climate action planning?
7. What projects (programs, policies, infrastructure, etc.) do you hope will be included in MVPRC's forthcoming climate plans?
8. Are there partnerships or collaborations that could help drive climate action?
9. Do you have any last thoughts or suggestions for us at this time?

3.2.3 Pre-Engagement Observations

The following key messages from the pre-engagement process will guide ongoing engagement processes and the development of the community engagement plan for the CCAP.

- **Climate action planning is perceived as expensive and not as high a priority:** To maximize the impact of the PCAP, MVRPC needs to listen to and align with different stakeholder groups and their needs. When setting goals, it is essential to consider the input and priorities of the community. This process involves the community in decision-making and ensures that their feedback is sought and validated. Clear communication about the community engagement processes is essential.
- **Financial and staffing barriers impede participation:** Relevant materials and equipment are costly, as is expertise. Individuals and businesses aspiring to take action have limited options to engage without access to funds.
- **Historical issues present unique challenges:** Predominantly Black communities face unique challenges due to historical issues like redlining and racism and are often being the last to benefit from environmental initiatives. The accessibility and adoption of electric vehicles (EVs) are an emphasized need, as are more charging stations in these areas. Additionally, measuring climate pollution and its impacts in marginalized areas, including schools and businesses, is highlighted as critical, especially with high lead levels in homes. Policies need to be in place to achieve environmental justice.
- **Targeted outreach:** Outdoor enthusiasts, such as naturalists were identified as a strategic approach for effective outreach.
- **Making linkages with climate impacts:** There is an opportunity for grassroots engagement in rural areas with significant immigrant populations familiar with climate change's effects in their home country; however, they may

need to be made aware of the causes or linkages. Organizations like ABLE and the Legal Aid Society of Southwest Ohio have collaborative efforts and relationships with these populations. Longtime residents of the Miami Valley region may have noticed significant changes in weather patterns over time, such as intense storms, unseasonal weather, and tornados in the region. Basement flooding is another example of the effects of climate change that may be familiar.

- **Targeted engagement and messaging is critical:** Public forums are standard but are insufficient. Personalizing solutions to resonate with specific communities will ensure the relevance of the work, as well as educating the community about local and regional climate issues, including the impact of climate change on health and children. MVRPC's involvement in a cooperative grant from the EPA focused on community well-being and the next Environment Justice Academy cohort could be an opportunity for climate action outreach and engagement.
- **Social media for coordination:** Social media is particularly beneficial for promoting events and disseminating information. The effectiveness of communication relies on its simplicity; overcomplicated messages are less engaging. Various outreach tactics are suggested, including webinars, podcasts, and local event participation, with data collection facilitated through questionnaires. Other suggested tactics include multiple technologies, such as Zoom and WhatsApp, real-time media streaming on social media platforms, and short-form videos.

3.3 PCAP Project Solicitation

MVRPC prepared a project submission form, which was distributed widely throughout the region.

Eleven projects were submitted to this form, which provided one input for the PCAP project long list.

4 Greenhouse Gas Inventory

4.1 Emissions by sector

GHG emissions for Dayton Kettering MSA in 2021 totaled 11 MMtCO2e, with the majority of emissions coming from the residential sector (47%), followed by commercial/institutional (29%) and industrial (24%).

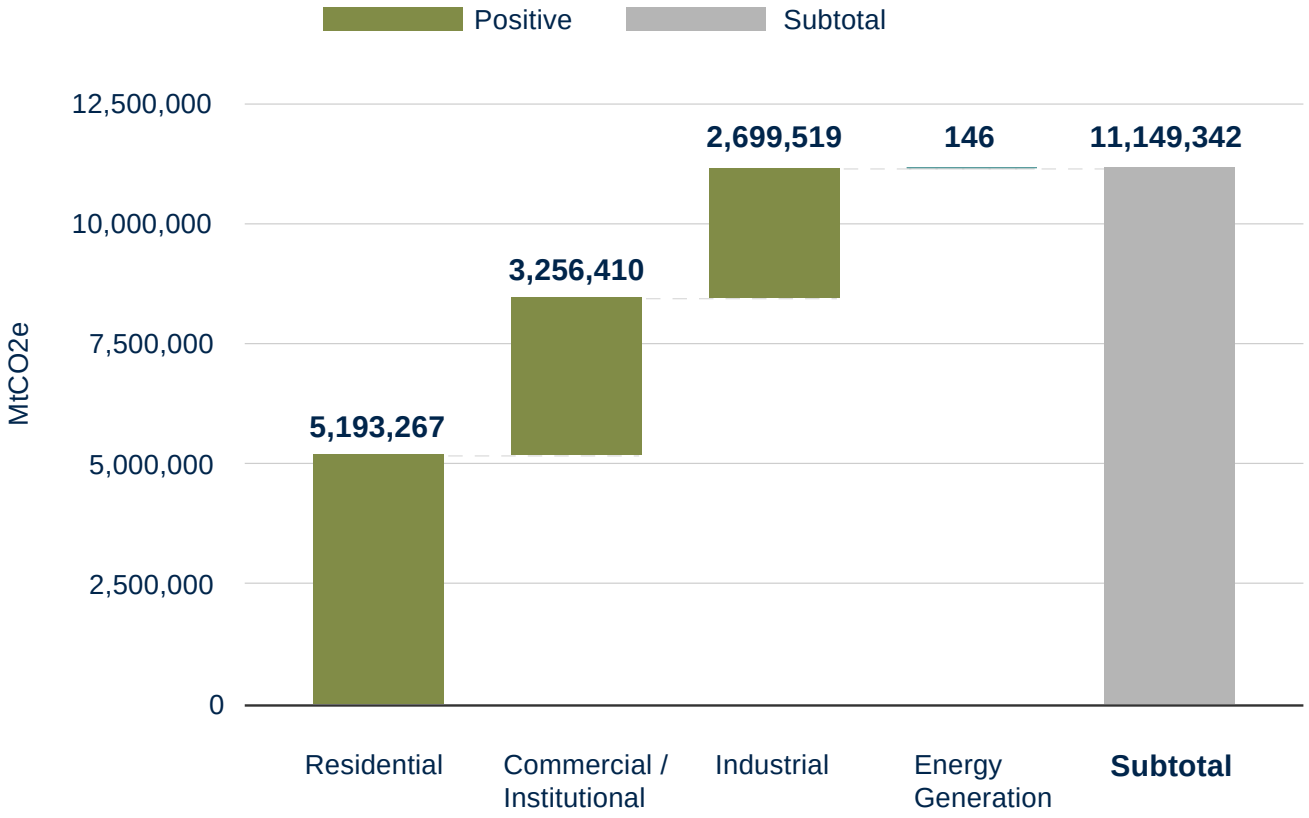


Figure 14. GHG Emissions by Sector, 2021, excluding agriculture and forestry. Source: SSG analysis

GHG emissions in the residential sector are dominated by transportation emissions (47%). The commercial/institutional and industrial sectors are dominated by emissions from electricity (50% and 52% respectively).

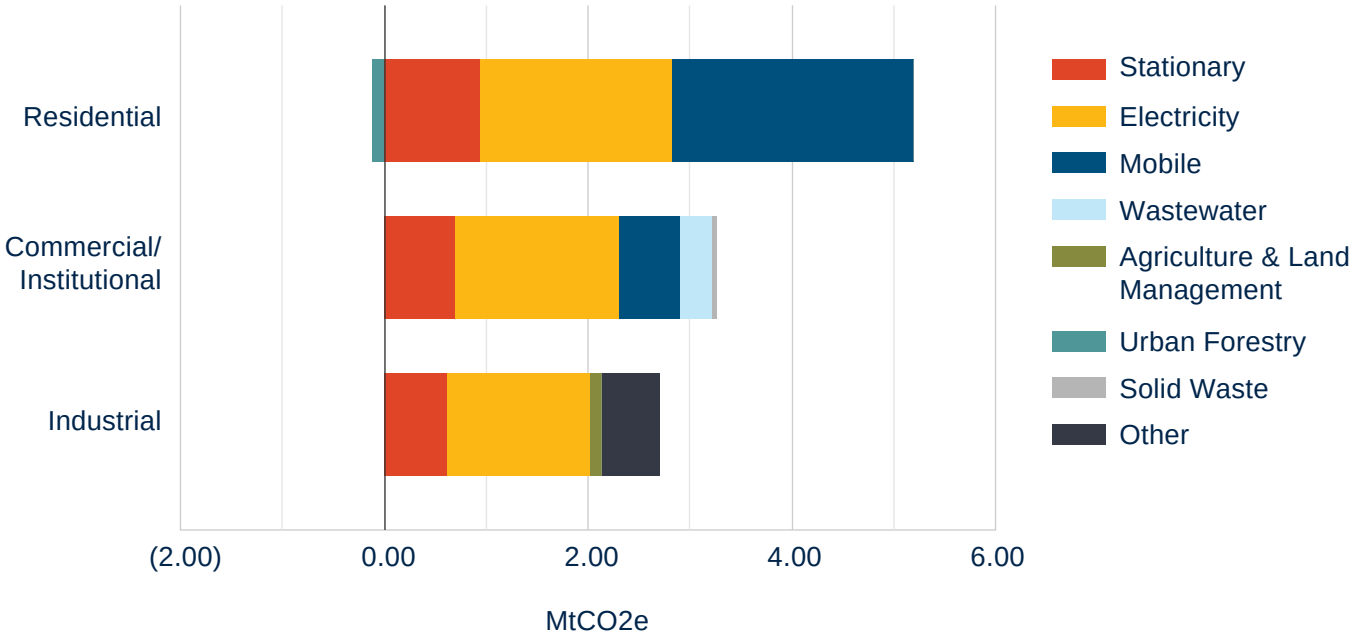


Figure 15. GHG emissions with sectoral components, 2021.
Source: SSG analysis

4.2 Emissions by sub-sector

Electricity is the major source of GHG emissions overall (43% of the total), followed by transportation emissions (28%) and stationary emissions (natural gas) (20%). Decarbonizing electricity would cut the region's GHG emissions by nearly 5 MMtCO2e.

Wastewater treatment, agriculture and land management and waste management represent less than 4% of the total emissions (<0.5 MMtCO2e). Urban forests reduce emissions by 0.1 MMtCO2e.

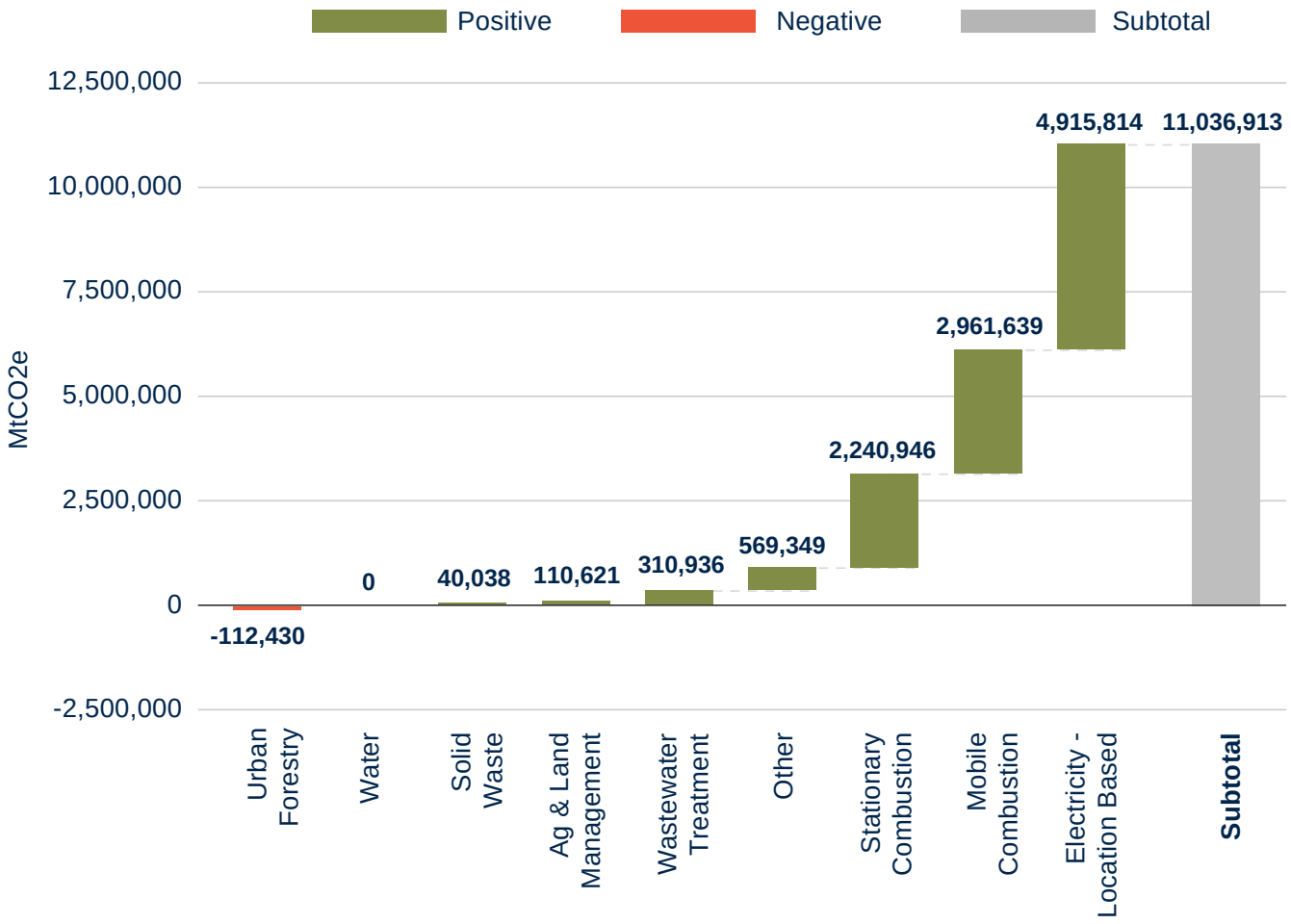


Figure 16. GHG Emissions by Sub-Sector, 2021. Source: SSG analysis.

4.3 Emissions by scope

Scope 1 GHG emissions total 6.3 MMtCO2e while scope 2 GHG emissions were 4.9 MMtCO2e, which are primarily emissions resulting from electricity generation outside of the MSAs boundaries. No GHG emissions from scope 3 were tracked.

Table 3. Reporting Sectors.

Scope	Definition
Scope 1	GHG emissions from sources located within the boundary of the MSA.
Scope 2	GHG emissions occur as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the boundary of the MSA.
Scope 3	All other GHG emissions that occur outside the city boundary as a result of activities taking place within the boundary of the MSA.

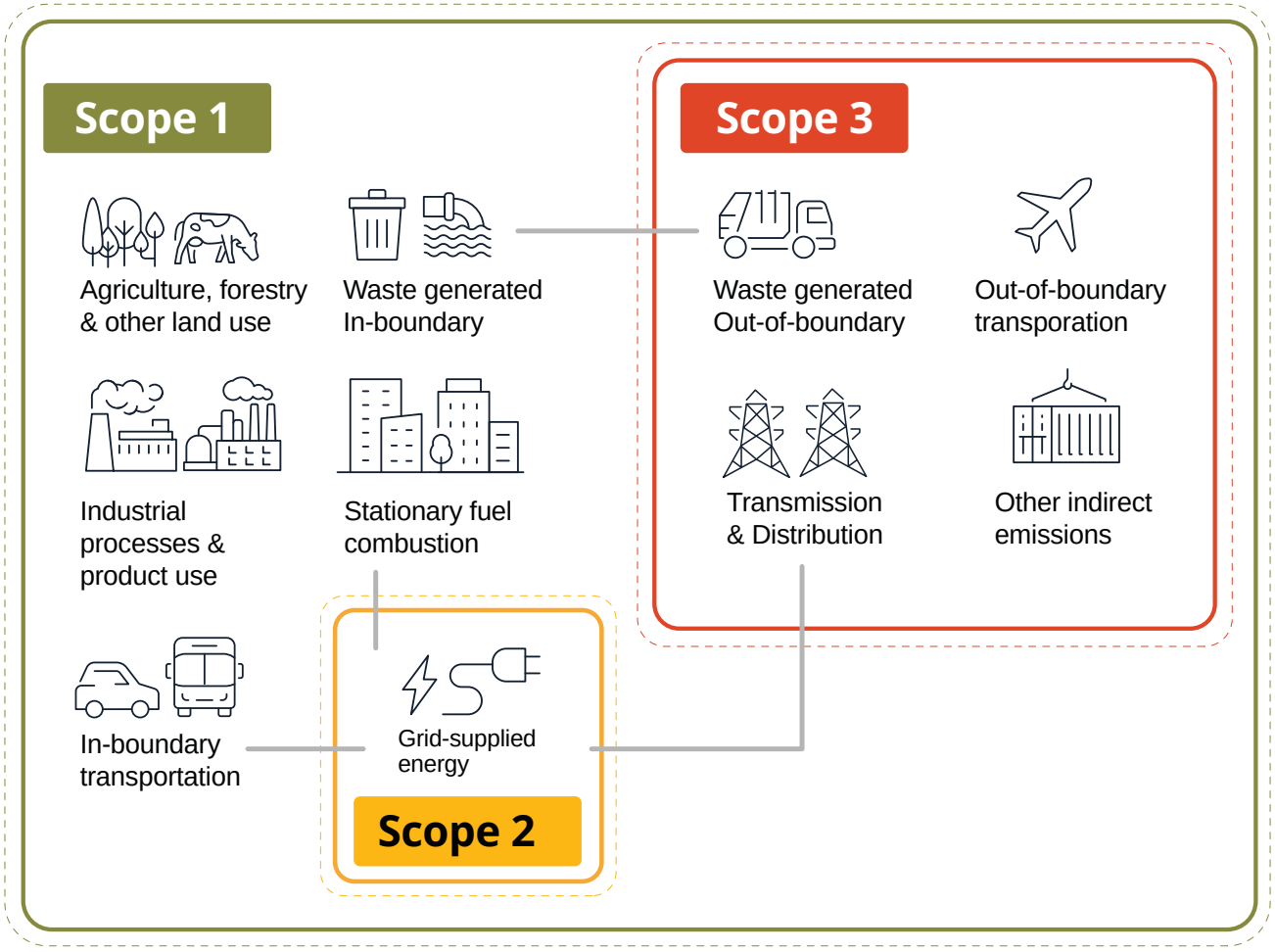


Figure 17. Illustration of Scopes.

Scope 1 GHG emissions dominate the inventory, while scope 2 emissions are from electricity. This inventory does not report on any scope 3 GHG emissions.

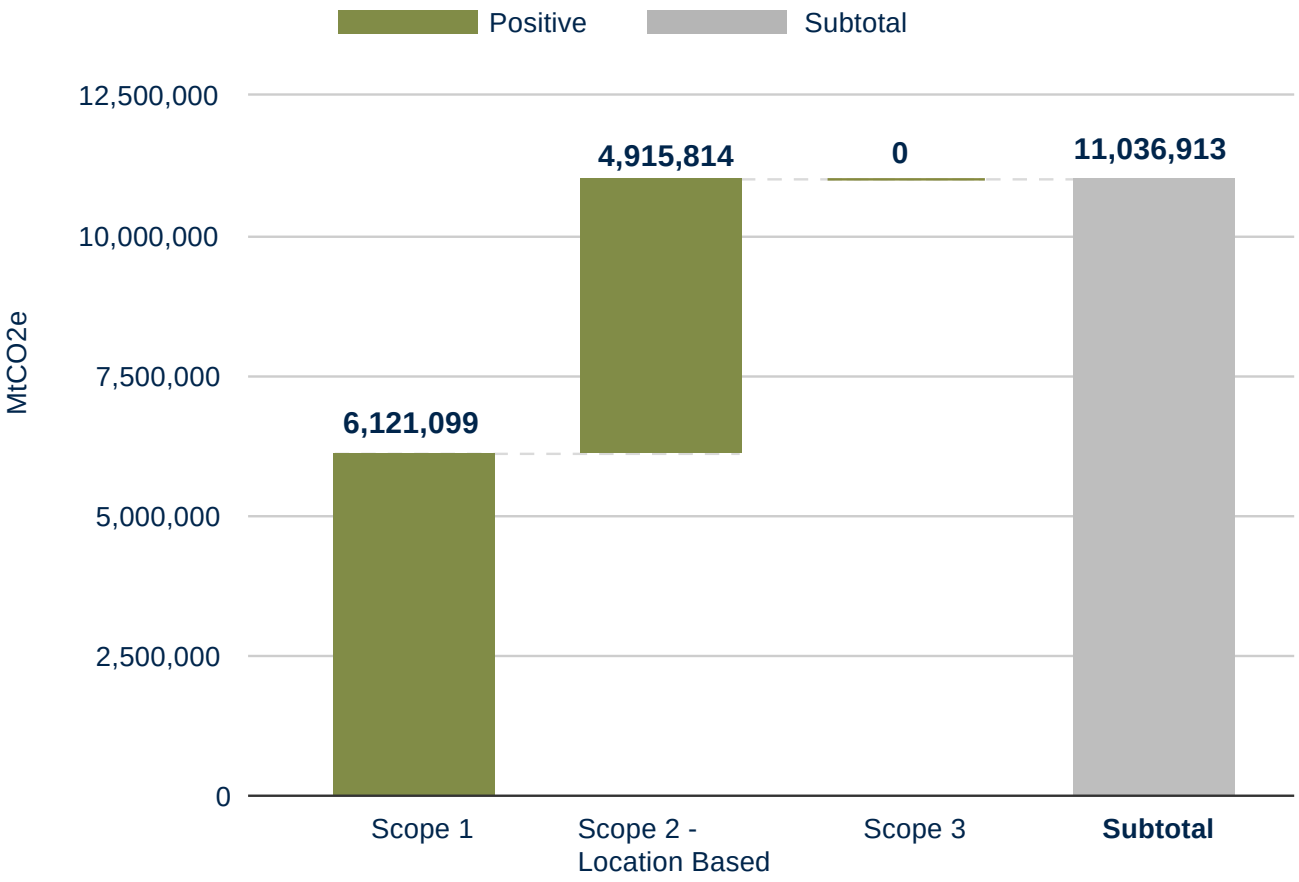


Figure 18. GHG Emissions by Scope, 2021. Source: SSG analysis.

4.4 Emissions by gas

When all the GHG emissions have been normalized to carbon dioxide equivalents (see section 3.3 on Global Warming Potential), CO2 is the dominant source of emissions (see Figure 19 on next page).

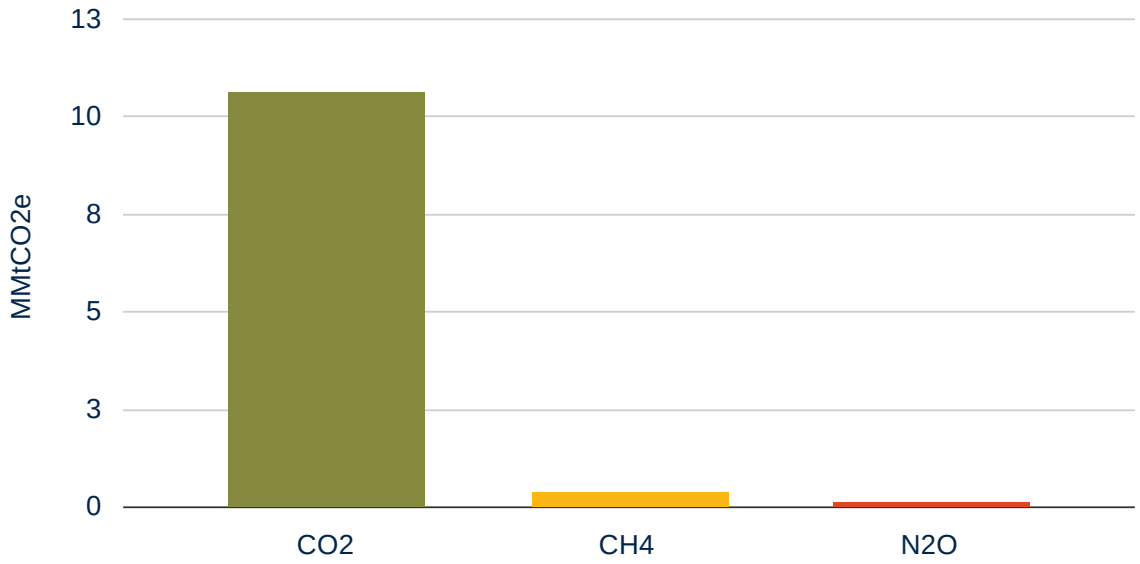


Figure 19. GHG Emissions by source, 2021. Source: SSG analysis.

CO2 emissions are directly correlated to combustion with fossil fuels, as illustrated in Figure 20.

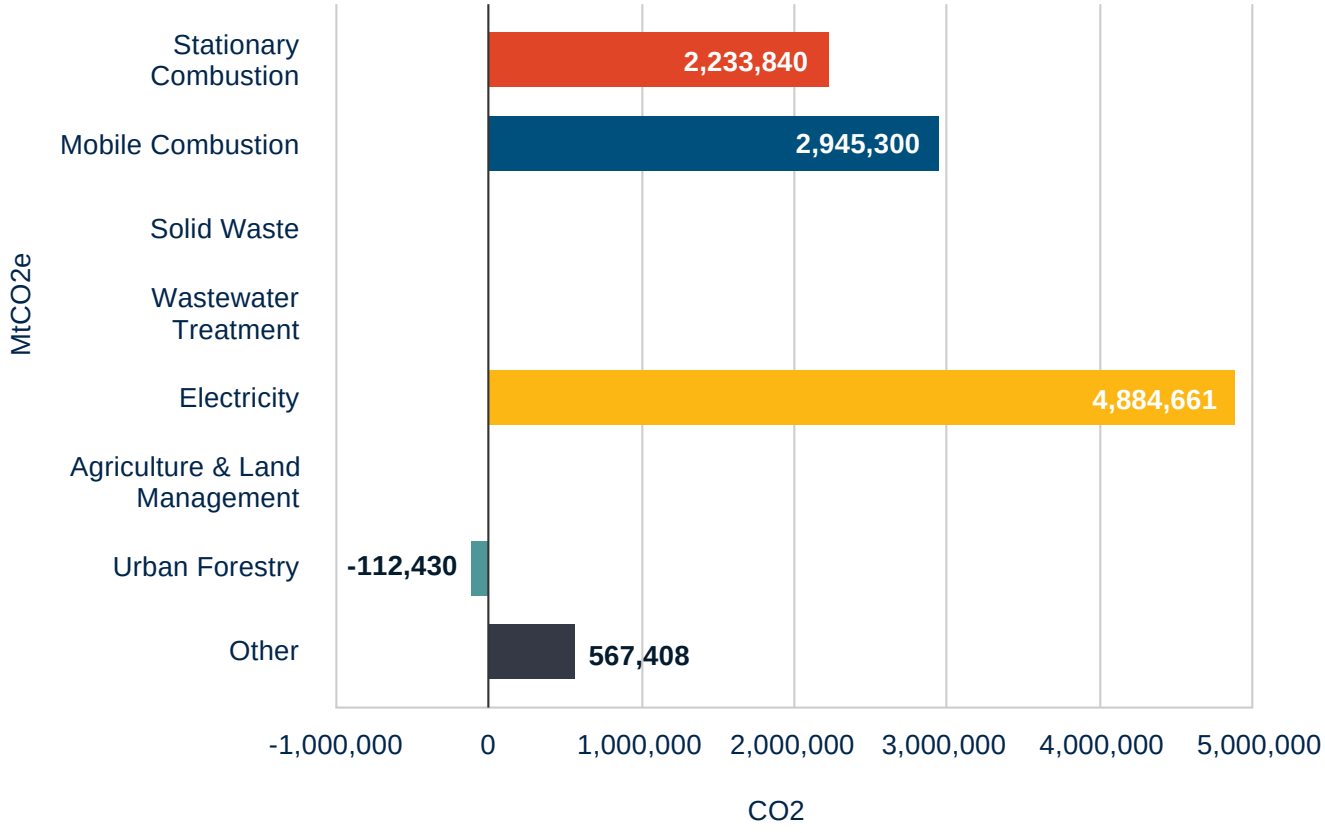


Figure 20. GHG Emissions, CO2, 2021. Source: SSG analysis.

The largest source of methane emissions is wastewater treatment, followed by solid waste. Note that if a twenty year GWP is used for methane (85 instead of 30), methane emissions would nearly triple (IPCC, 2021). A twenty year GWP reflects the importance of reducing GHG emissions in the near future, but it is not standard in GHG emissions reporting protocols (EPA, 2023d).

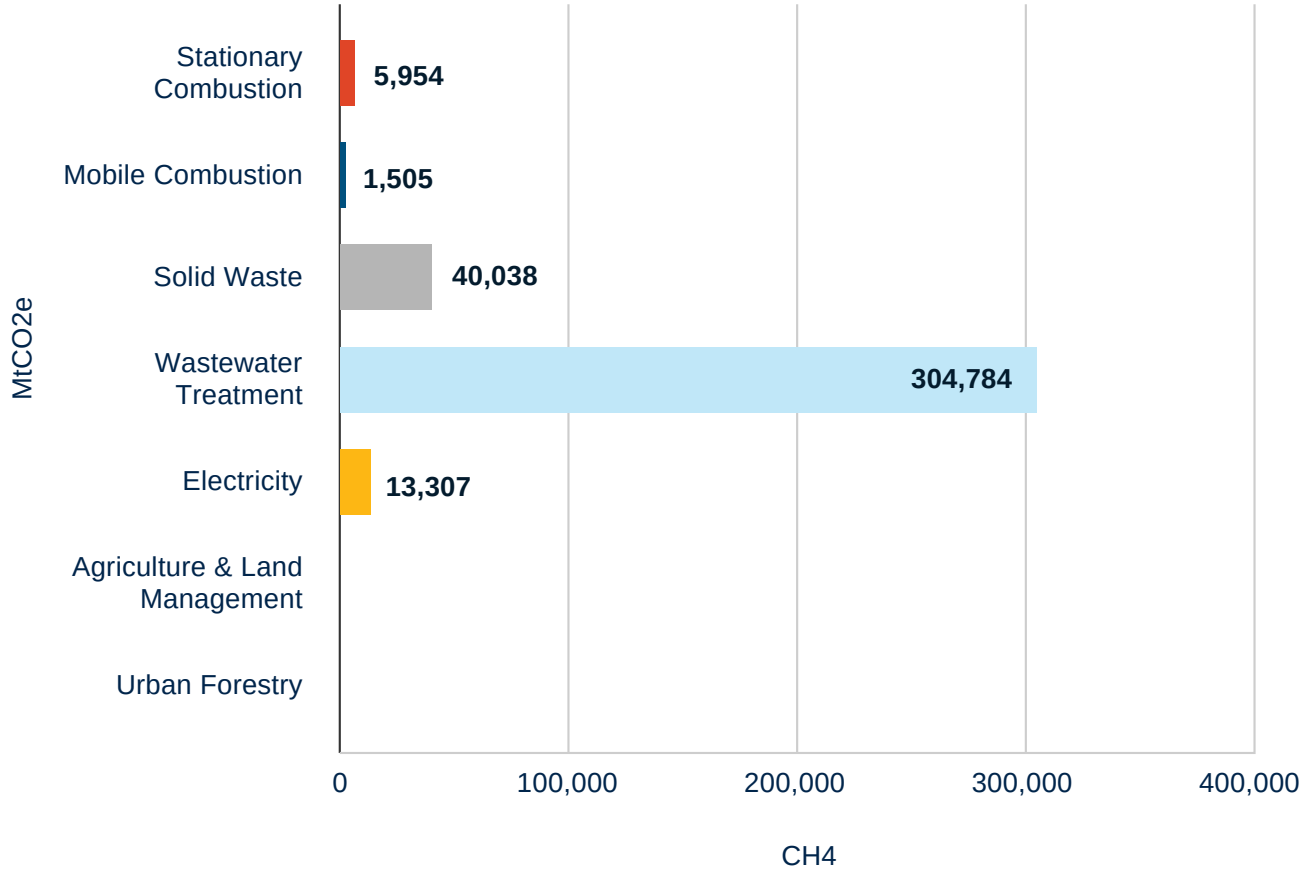


Figure 21. GHG Emissions, CH4, 2021. Source: SSG analysis.

Nitrous oxides are primarily from agricultural and land management.

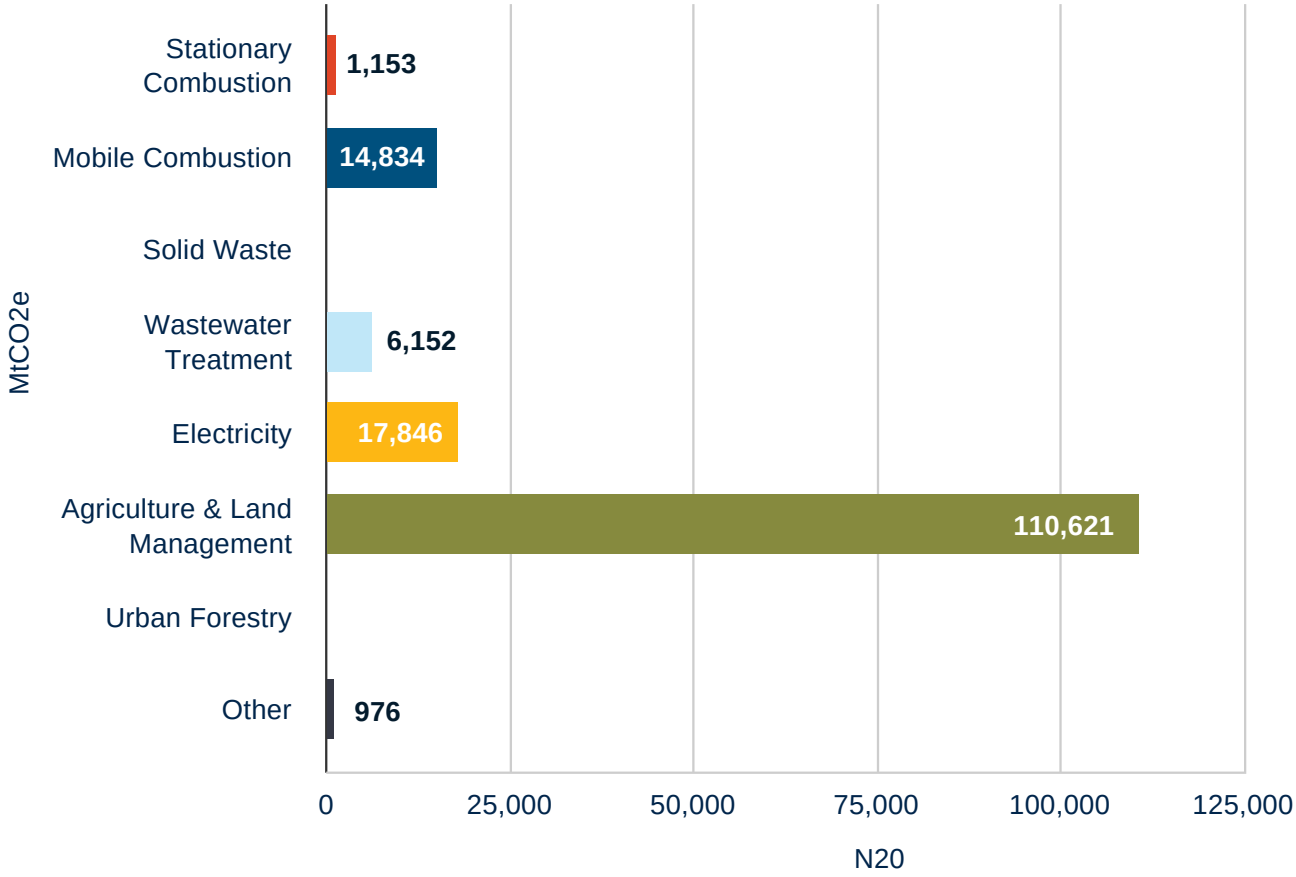


Figure 22. GHG Emissions, N2O, 2021. Source: SSG analysis.

4.5 Energy and emissions shares

Electricity accounts for 45% of the total energy but 69% of the total emissions, illustrating the potential for GHG emissions emissions reductions from this sector, particularly given the low cost of renewable electricity generation (IEA, 2022).

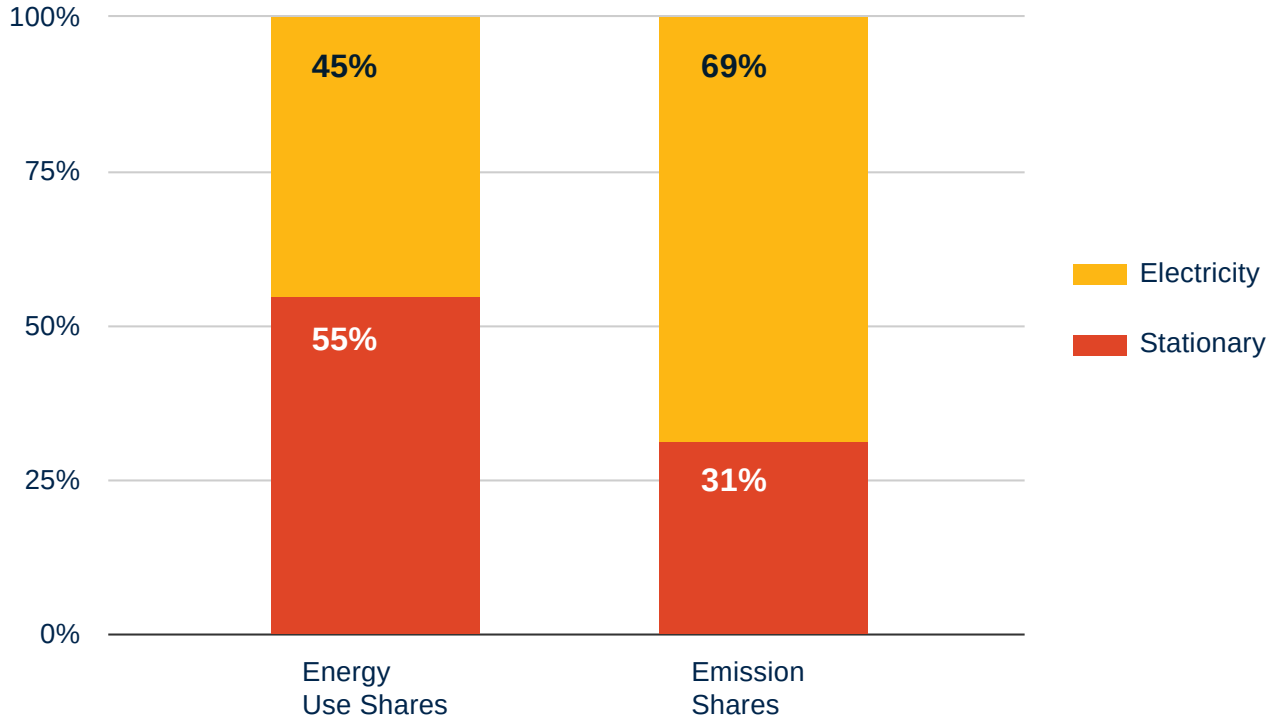


Figure 23. GHG Emissions by Scope, 2021. Source: SSG analysis.

An additional challenge for the electricity system is that the pathway to decarbonize the energy system requires electrifying most of the 55% of the energy demand that is currently powered by natural gas, gasoline and diesel.

4.6 Total energy use

The residential sector uses the most energy, as would be expected. Total energy consumption across all sectors is 42 million MMBTU.

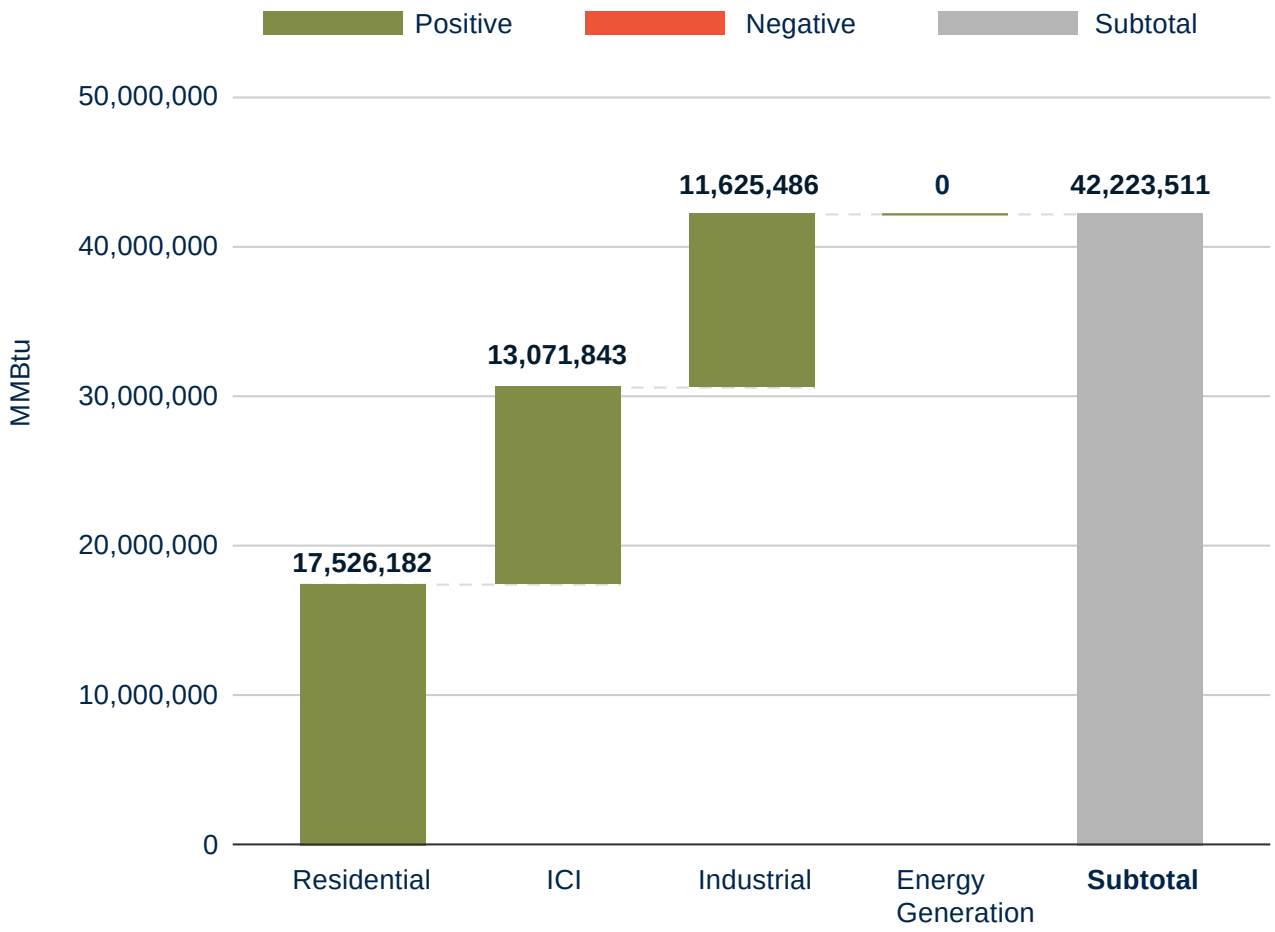


Figure 24. Energy Consumption by Sector, 2021. Source: SSG analysis.

4.7 Electricity consumption

Electricity's share of stationary energy for the residential, commercial/institutional and industrial sectors is 77%, 47% and 46% respectively.

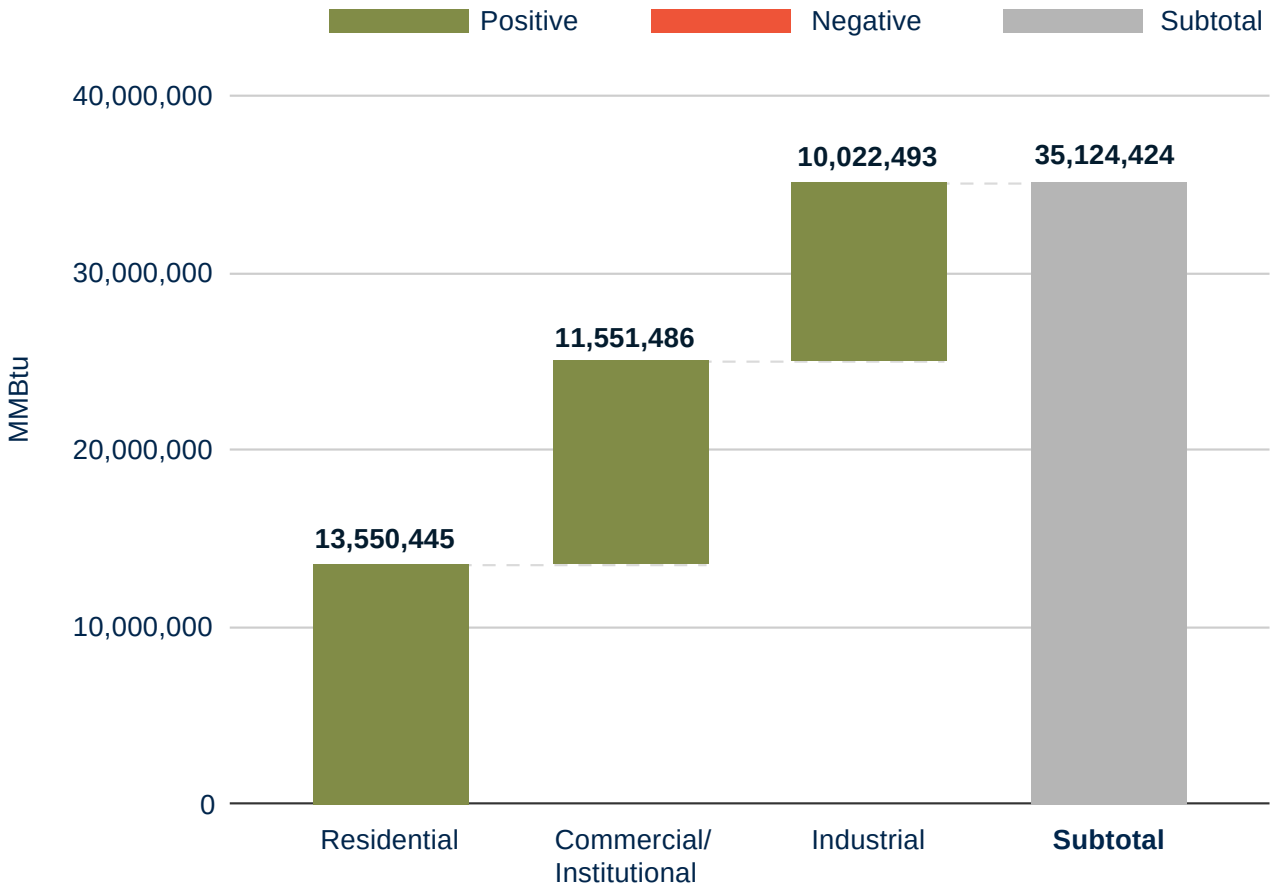


Figure 25. Electricity Consumption by Sector, 2021. Source: SSG analysis.

4.8 Comparison with Dayton's GHG inventory

The City of Dayton completed a GHG inventory in 2019, which is a narrower geographic scope than Dayton Kettering MSA. Figure 26 illustrates a share-based comparison of the two inventories. The two inventories show small variations by sector. In both cases, the largest share of emissions is from electricity, with a slightly higher share in Dayton. Dayton Kettering MSA has a slightly higher share of emissions from transportation (mobile combustion) and natural gas (stationary combustion).

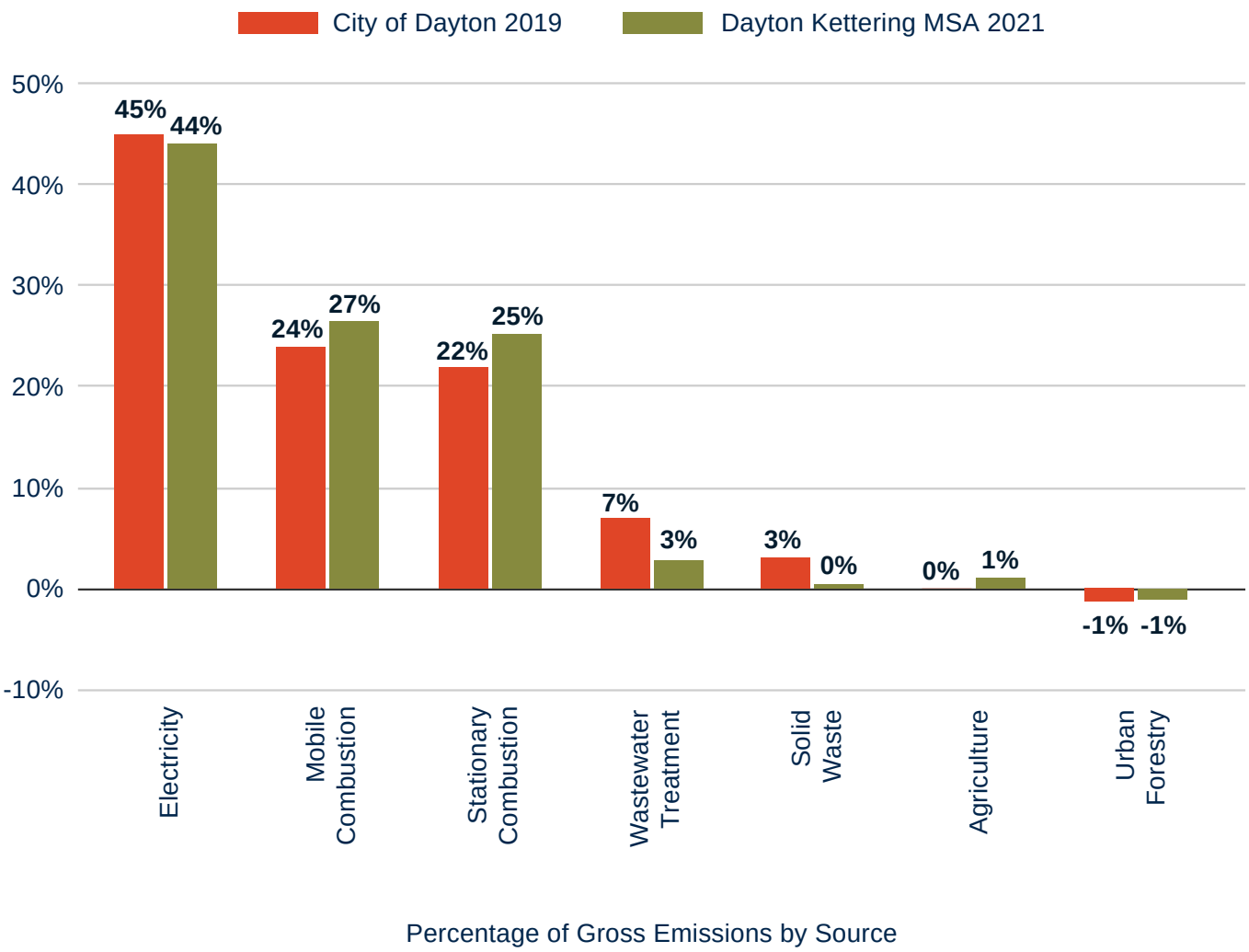


Figure 26. Comparison of inventories by sector by share for Dayton (2019) and Dayton Kettering MSA (2021). Source: SSG analysis.

4.9 Business as Usual Projection

GHG emissions are projected to decrease even though total energy consumption is projected to increase.[3]

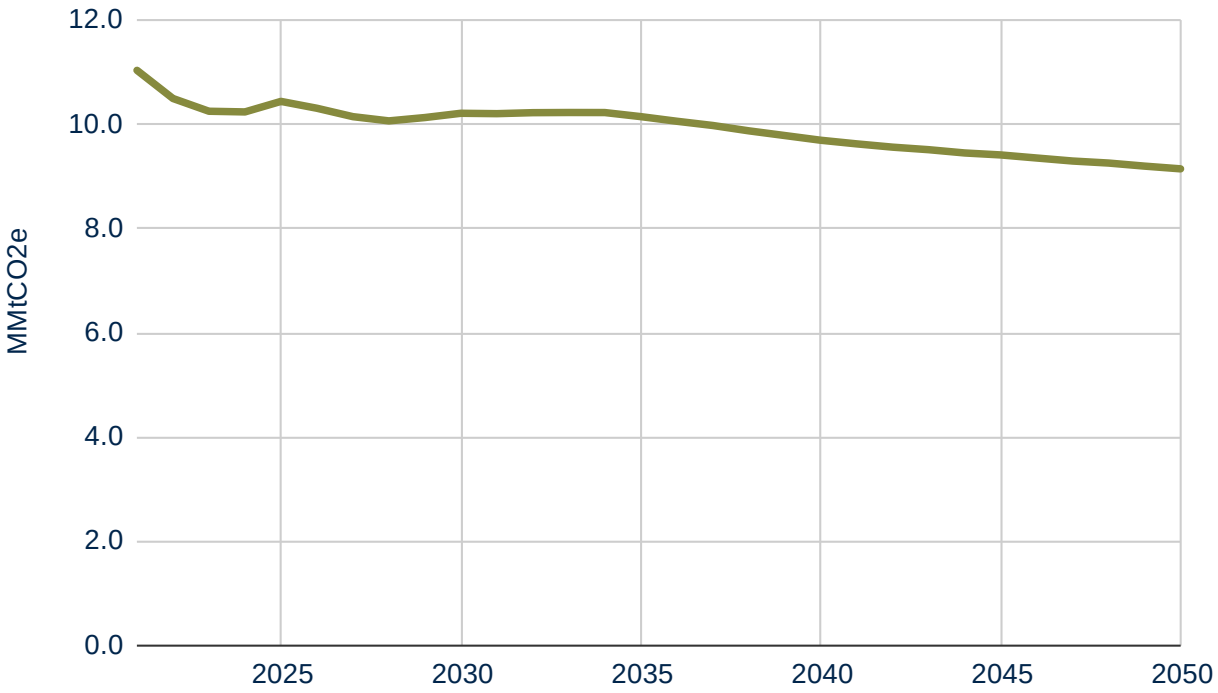


Figure 27. Total GHG emissions, 2019-2050. Source: SSG analysis.

[3] County population projections come from the Miami Valley Regional Planning Commission's 2050 Long Range Transportation Plan (LRTP).#

The decrease in emissions is the result of increasingly cleaner electricity driven by decreasing costs for wind and solar.

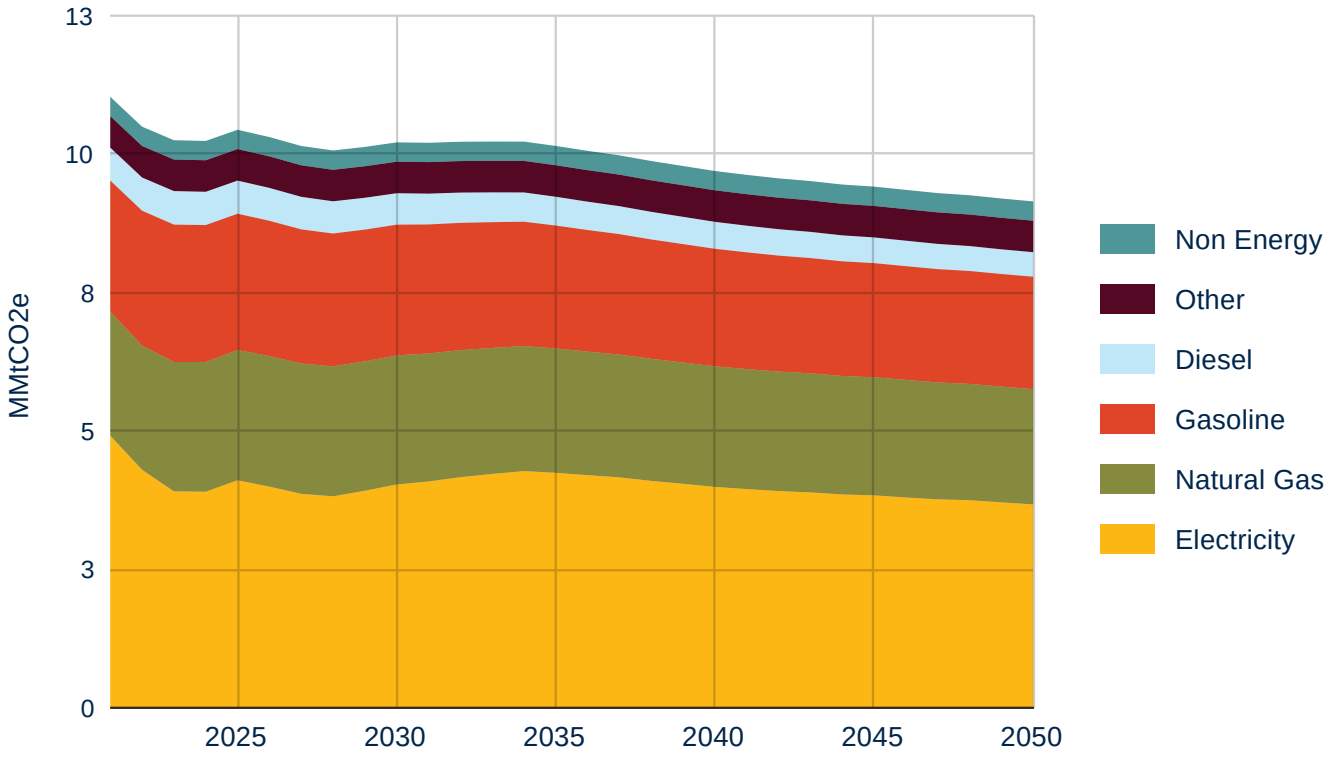


Figure 28. GHG emissions by fuel and non-fuel sources, 2019-2050. Source: SSG analysis.

There is a slight decrease in energy use in the transportation sector, based on a projection of increased vehicle efficiency from the EPA's state projection tool.

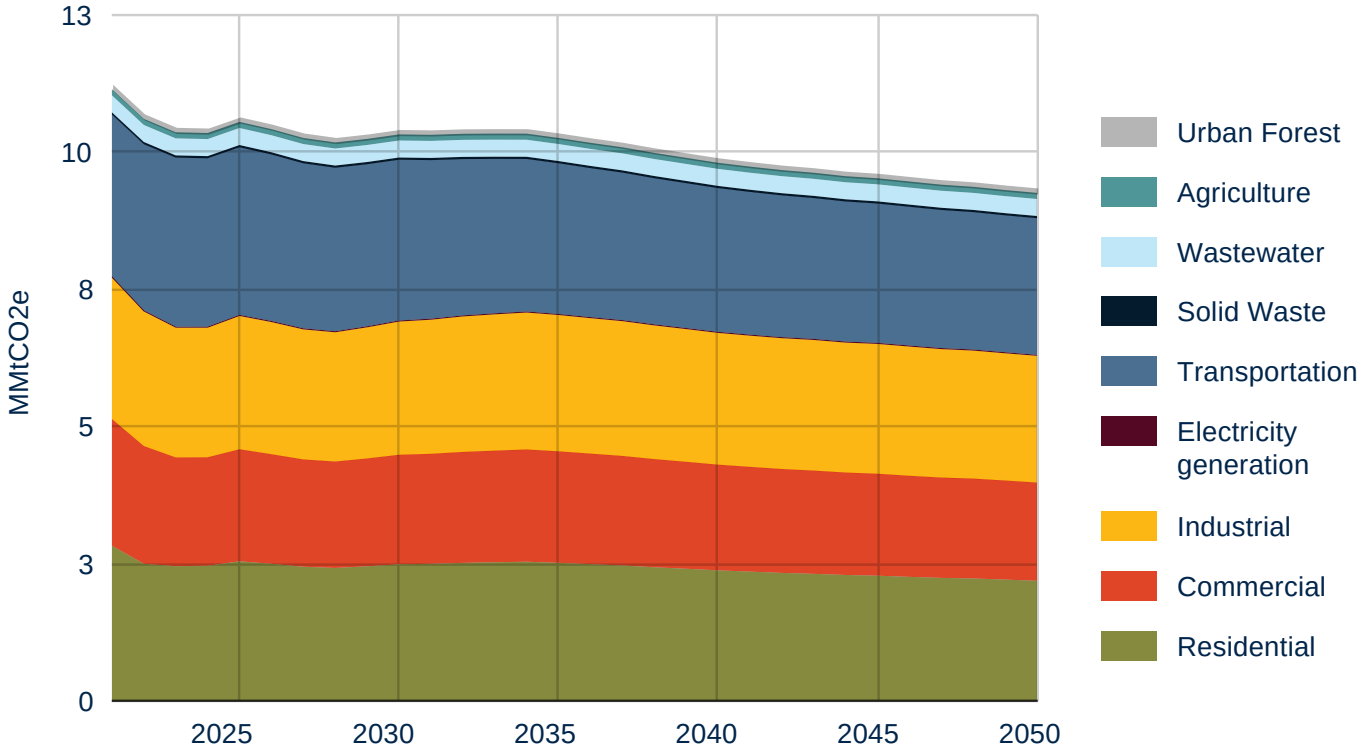


Figure 29. GHG emissions by sector, 2019-2050. Source: SSG analysis.

4.10 Observations

Like many regions, the Miami Valley has the twin challenges of electrifying heating and transportation and cleaning the electricity system in parallel, both of which will require major investments.

Cleaning the electricity system will cut total GHG emissions in half; the technologies required to enable this transition are already cost-effective (EIA, 2023).

Decarbonizing transportation and heating involves technologies that have an incremental upfront cost, but are lower cost to operate. These technologies are also readily available.

The residential sector is the largest source of GHG emissions; supporting measures in this sector will not only generate new employment opportunities, but also improve the quality of housing and affordability of housing across the region.

This transition will be aided by opportunities for efficiency including measures such as building retrofits, increasing the walking, cycling and transit mode shares, as well as the electrification equipment itself- electric vehicles and heat pumps are more efficient than the incumbent technologies. Maximizing efficiencies minimizes the need for additional electrical capacity, reducing the overall energy transition costs. There is an added benefit in that increased efficiency also reduces the operating costs for households and businesses, and provides a revenue stream to finance the investments required.

In addition to these broader transformational moves, there are also targeted actions in wastewater treatment and agriculture that can reduce methane and nitrous oxide emissions respectively.

5 Priority GHG Reduction Measures

5.1 Priority Measures

The following measures were identified from the engagement and technical analysis.

1.

5.1.1 Measure #1:
Clean Fleets

Clean Fleets	
Description	Electrification of the fleets for park authorities, including electric vehicles, UTVs and mowers and charging infrastructure. The project will also include building capacity amongst agency staff for electrification.
Estimate of the quantifiable GHG emissions reductions (e.g., through 2030 and 2050)	2024-2030: 375 MT CO_2e[4] 2024-2050: 1,546 MT CO_2e
Implementing agency or agencies	Centerville-Washington Park District, Five Rivers MetroParks
Milestones for obtaining implementing authority	No additional authority is required.

[4] Reductions from UTVs and mowers are not included in the reductions estimate as there were no offroad emissions included in the inventory.

Clean Fleets	
Implementation schedule and milestones	1. **Planning phase:** development of fleet electrification plan for each agency that identifies appropriate vehicles, charging requirements, workforce training requirements, efficiency measures and implementation schedule- 1 year 2. **Procurement strategy**: investigation of product availability, bulk procurement strategies, liaising with manufacturers- 6 months 3. **Fleet replacement and workforce training**: implementation of the fleet replacement training including procurement, training, financing strategies: 4 years
Geographic location	Centerville and Washington Township, Dayton metropolitan area
Funding sources	No additional external funding; agencies will leverage budgeted fleet replacement dollars.
Metrics for tracking progress	• Annual GHG emissions from fleet • Annual criteria air pollutants released • % of fleet vehicles electrified • % of VMT electrified • # of new positions created • Level of workforce satisfaction
Applicable sector	Transportation

Clean Fleets	
Quantitative cost estimates	**Centerville-Washington Park District** • 16 Electric trucks (F150 crew cab equivalent): $65,000/vehicle • 1 Electric van (Ford Transit equivalent) • 9 Electric UTVs (John Deere Gator equivalent): $40,000/vehicle • 22 Electric mowers: $5,000 per mower • 12 Charging stations located within maintenance facilities: $18,000/station • 2 Charging station located at Main Office parking lot: $18,000/station including upgrades and extension of electrical wiring **Five Rivers MetroParks** • 12 Electric trucks (F150 crew cab equivalent): $65,000/vehicle • 10 Electric passenger cars or SUVs (Ford Focus or Jeep equivalent): $45,000/vehicle • 18 Electric UTVs (John Deere Gator equivalent): $40,000/vehicle • 17 Charging stations located within maintenance facilities: $18,000/station • 1 Charging station located at Main Office parking lot: $18,000/station Estimated total cost: $4 million

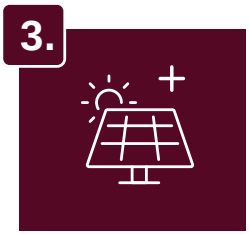
2.

5.1.2 Measure #2:

Virtual Power Plants

Virtual Power Plants	
Description	This project will involve the development of a regional virtual power plant (VPP) led by a regional aggregator, Sustainable Ohio Public Energy Council (SOPEC). The first projects will consist of solar installations by the City of Dayton at the Valleycrest Landfill, the Dayton International Airport, and other assets (such as city wellfields). These sites will be the initial sites to launch the VPP program regionally. The City will then enter a Power Purchase Agreement (PPA), alongside any other interested parties to procure the power for municipal supply and the residential aggregation program. As more solar assets are developed, additional parties can also procure the power. SOPEC will aggregate solar projects on municipalities, businesses and homes, with a specific focus on LIDAC in subsequent years of the project; some of these projects will involve building upgrades to support reduce energy use, and in some cases, the installation of the solar systems. An additional component is a workforce training program that will specifically target LIDAC. The program will serve as a model for other jurisdictions and residents/businesses within that jurisdiction to expand renewable energy.
Estimate of the quantifiable GHG emissions reductions (e.g., through 2030 and 2050)	2026-2030: 164,569 MT CO2e 2026-2050: 1,472,575 MT CO2e
Implementing agency or agencies	SOPEC is a council of governments that also has built out a 501c4 to develop and own solar assets for communities that are part of their program. Since SOPEC is run and governed by communities within Ohio, the assets would be governed by communities rather than investor owned generators or utilities.
Milestones for obtaining implementing authority	None required

Virtual Power Plants	
Implementation schedule and milestones	Year 1: 10 MW Year 2: 25 MW Year 3: 50 MW Year 4: 100 MW Year 5: 125 MW
Geographic location	Region-wide for members of SOPEC; additional municipalities can also join SOPEC
Funding sources	• The Solar4All program, assuming the State's application is successful • IRA tax credits including the Clean Electricity Production Tax Credit
Metrics for tracking progress	• MWh of clean electricity generated annually • GHG emissions avoided • Air pollution avoided • Direct jobs created • Indirect jobs created
Applicable sector	Electricity generation
Quantitative cost estimates	**Groundmount solar costs** Capital: $116,892,000 Fixed O&M: $6,205,000 Total: $123,097,000 **Rooftop solar costs** Capital: $28,613,250 Fixed O&M: $1,095,000 Total: $29,708,250



5.1.3 Measure #3:

Virtual Power Plant Plus

Virtual Power Plant Plus	
Description	The VPP+ project builds on the VPP project in Measure #2, with additional elements: **Revenue recycling/revolving loan fund**: Revenues from VPP+ projects will be directed to a revolving loan fund, which will be used to support additional solar, weatherization and transportation electrification projects. This mechanism will enable VPP+ to undertake five times or more the number of projects with the same investment. The revolving loan fund will be capitalized by CPRG phase 2, but can also incorporate funds from other federal and state grants, philanthropy, private investment and public sector investments. **Weatherization**: In addition to the solar projects, VPP+ will generate "negawatts" from weatherization or deep retrofits (energy savings of 50% or more) for both residential and small business sectors. Some of these projects will be undertaken in LIDAC communities and funded with a combination of grants and low interest loans. These retrofits can also include investments to improve the quality of homes or small businesses to enable solar installations. Some of these projects will return a share of the avoided costs to the revolving loan fund, with a share remaining with the building owner or occupant. A workforce training and development program is integral to the weatherization stream of activities. **Transportation:** Similar to the retrofit programs, VPP+ can finance green fleet programs, electric vehicle procurement and can split the savings between the vehicle owners and the revolving loans fund, generating GHG reductions and additional revenues for the revolving fund simultaneously. The program will also include education, tracking, and behavior change elements to maintain energy savings using the Bring Your Green Platform, and AI. VPP+ combines the strategies of aggregation and revenue recycling to scale clean electricity and building efficiency, reducing the consumption of and demand for electricity, and reducing household and small business energy costs in a transformational model.

Virtual Power Plant Plus	
Estimate of the quantifiable GHG emissions reductions (e.g., through 2030 and 2050)	**Solar Installations** 2026-2030: 164,569 MT CO2e 2026-2050: 1,472,575 MT CO2e **Weatherization** 2026-2030: 3,899 MT CO2e 2026-2050: 45,899 MT CO2e
Implementing agency or agencies	SOPEC is a council of governments that also has built out a 501c4 to develop and own solar assets for communities that are part of their program. Since SOPEC is run and governed by communities within Ohio, the assets would be governed by communities rather than investor owned generators or utilities.
Milestones for obtaining implementing authority	None required.
Implementation schedule and milestones	Year 1: Program and revolving fund design Solar capacity installed: Year 1: 10 MW Year 2: 25 MW Year 3: 50 MW Year 4: 100 MW Year 5: 125 MW Weatherization targets: Year 1: None Year 2: 100 homes; 10 small businesses Year 3: 250 homes: 20 small businesses Year 4: 500 homes; 50 small businesses Year 5: 1,000 homes; 100 small businesses
Geographic location	Region-wide for members of SOPEC

Virtual Power Plant Plus	
Funding sources	• Solar4All for residential solar installations, assuming the State application is successful • Additional funding can be leveraged from IRA Tax Credits including the New Energy Efficient Home Tax Credit, Residential Energy Efficiency Tax Credit, High Efficiency Electric Home Rebate Program, HOMES Program Rebate, Home Energy Efficiency Contractor Training, Residential Clean Energy Tax Credit, Energy Efficient Commercial Buildings Reduction, Clean Electricity Production Tax Credit
Metrics for tracking progress	• MWh of clean electricity generated annually • # of homes retrofit • # of small businesses retrofit • Average energy savings per retrofit • Direct jobs created • Indirect jobs created
Applicable sector	Electricity generation
Quantitative cost estimates	Home retrofits: $109,000,000 Small business retrofits: $12,000,000

4.

5.1.4 Measure #4:

Neighborhood Deep Retrofit Program

Neighborhood Deep Retrofit Program

Description

This project targets LIDAC neighborhoods for deep retrofits, building on the Energiesprong concept from the Netherlands, which has subsequently been developed in the US, including RetrofitNY in New York and REALIZE in California and Massachusetts.

Neighborhood deep retrofits: The deep retrofit model includes the following principles:

- Performance guarantees for thirty years
- Implementation possible in less than one week
- Affordability created through energy savings and reduced maintenance costs
- Attractive design with upgraded features
- Procuring is based on purchasing housing concepts instead of detailed specifications and drawings

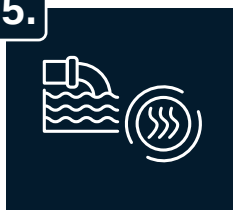
The project involves taking a laser scan of the building's exterior to create a building information model, which can then be used for computer-aided manufacturing. New panels are developed in a factory, and are then installed over the existing facade in less than one week. The project will target neighborhoods in Dayton with similar housing types and can be expanded beyond as required.

New buildings in LIDAC communities: A new building stream will support the construction of new net zero housing on vacant lots, providing an incentive for infill construction and the incremental capital costs of the net zero construction elements (design, insulation, heat pumps and solar systems). Resilience and peak management strategies such as batteries can also be included. Infill construction ensures that residents can walk, cycle or take transit to destinations, avoiding the cost, energy consumption and GHG emissions of vehicular travel.

Neighborhood Deep Retrofit Program	
Estimate of the quantifiable GHG emissions reductions (e.g., through 2030 and 2050)	2026-2030: 2,545 MT CO2e 2026-2050: 32,194 MT CO2e
Implementing agency or agencies	City of Dayton
Milestones for obtaining implementing authority	None required.
Implementation schedule and milestones	**Program design:** 1 year **Neighborhood retrofits:** Year 1: None Year 2: 10 homes Year 3: 50 homes Year 4: 100 homes Year 5: 300 homes **New construction** Year 1: None Year 2: 10 homes Year 3: 50 homes Year 4: 100 homes Year 5: 200 homes
Geographic location	City of Dayton
Funding sources	Additional funding can be leveraged from IRA Tax Credits including the New Energy Efficient Home Tax Credit, Residential Energy Efficiency Tax Credit, High Efficiency Electric Home Rebate Program, HOMES Program Rebate, Home Energy Efficiency Contractor Training, Residential Clean Energy Tax Credit

Neighborhood Deep Retrofit Program	
Metrics for tracking progress	• MWh of clean electricity generated annually • # of homes retrofit • Average energy savings per retrofit • Average energy cost savings per retrofit • # of new net zero homes developed in infill locations • Direct jobs created • Indirect jobs created
Applicable sector	Residential
Quantitative cost estimates	Deep retrofit costs: $38,050,435 Net zero construction costs: $19,972,796

5.



5.1.5 Measure #5:

Sugarcreek Waste Facility Upgrade (Greene County)

Sugarcreek Waste Facility Upgrade (Greene County)	
Description	Greene County (County) currently manages an average of 12,000 tons per year of sludge cake generated at their two largest water resource recovery facilities (WRRFs), Beavercreek and Sugarcreek. Prior to 2022, the County was able to direct this sludge to the Quasar solids processing facility in Zanesville, Ohio which digested the sludge to form a Class B biosolids product that could be land applied. With the sudden closing of this facility in early 2022, the County has been forced to direct the sludge cake to landfill as it is not classified for beneficial use, such as land application. Given the high cost to landfill and the significant risk presented by having only one solids disposal outlet, the County elected to evaluate the feasibility of processing solids at their WRRFs for beneficial use. Based on the findings from the 2020 Southwest Ohio regional solids management study, thermal drying of WRRF sludge was found to be the most reliable, sustainable, and cost-effective as compared to other solids processing approaches. In this project, the County will develop a thermal drying facility at Beavercreek and/or Sugarcreek WRRF to produce a beneficially usable, Class A dried product in lieu of landfilling. The project also avoided 600 sludge truck roundtrips per year. The thermal drying facility would be sized to accommodate processing the County WRRF sludge in one 8-hour weekday shift to match the County's current solids management operations. As such, the facility could be operated for longer periods to process additional sludge from other regional WRRFs, including those in Greene County, the Cities of Xenia and Fairborn and the Village of Yellow Springs.
Estimate of the quantifiable GHG emissions reductions (e.g., through 2030 and 2050)	This measure increases emissions (negative reductions). If the dryers use natural gas then the additional emissions from that combustion are greater than the emissions saved by not having sludge in the landfill and eliminating the truck trips to haul sludge from the WRRFs to the landfill. 2025-2030: -5,969 MT CO_2e[5] 2025-2050: -25,866 MT CO_2e

[5] Assumes paddle dryer as thermal dryer technology and natural gas as fuel source

Sugarcreek Waste Facility Upgrade (Greene County)	
Implementing agency or agencies	Greene County Sanitary Engineering
Milestones for obtaining implementing authority	None required
Implementation schedule and milestones	To be determined
Geographic location	2365 State Route 725, Spring Valley, Ohio
Funding sources	To be determined
Metrics for tracking progress	• Tons of class A biosolids produced • Annual avoided GHG emissions
Applicable sector	Waste, transportation
Quantitative cost estimates	Total project cost: $25 million

6.

5.1.6 Measure #6:

Transit Transformation

Transit Transformation	
Description	**Untethering the Electric Trolleys:** The Greater Dayton Regional Transit Authority (RTA) is one of a few transit agencies in the US with electric trolley buses. In this project RTA will add three charging stations so that these buses can go “off wire” to add range beyond their current routes into LIDAC areas, a novel and transformative approach for an electric trolley system. The infrastructure required for the bus chargers will be leveraged to include level 2 charging stations for the public use. **Electrifying the Flyer:** RTA currently operates a free to ride downtown circulator route called The Flyer. The Flyer is currently being operated as a diesel bus, however with a few strategic installations of some trolley infrastructure this route could be transitioned onto the Electric Trolleybus Infrastructure network and become an all-electric route. This project would require some intersection style infrastructure to be installed at 3rd and Main and a turnout and catch tray installation at Brown and Caldwell. Three buses would be replaced with electric models. **Route 35 – New Electric Trolley Route:** The historic trolley routes 3 & 5 had been removed from service while we started implementing our Transit System Redesign phase due to low ridership. After reviewing them as a combined route GDRTA feels this could provide a great service to the city by connecting areas along Wayne Ave and the Belmont District with Dayton Children’s Hospital Network and the businesses in Old North Dayton along Valley Street. This project is very easy to implement and by utilizing some of the existing trolley network the additions would be minimal, in comparison to building a brand-new electrified route. The project would require some reworking of the trolley infrastructure in the intersections downtown in order to allow buses to enter from the North/East and exit North/East where the current wire system downtown in/out of the hub requires inbound North/East buses to exit South/West and vice-versa. Also wire addition along Valley Street would increase the battery range and overall efficiency of the route. Three new electric buses would be purchased.

Transit Transformation	
Estimate of the quantifiable GHG emissions reductions (e.g., through 2030 and 2050)	2024-2030: 1,429 MT CO2e 2024-2050: 6,535 MT CO2e
Implementing agency or agencies	Greater Dayton Regional Transit Authority
Milestones for obtaining implementing authority	None required
Implementation schedule and milestones	Year 1: Design Year 2: Charger 1 installation Year 3: Charger 2 and 3 installation Electrify The Flyer: This route would launch in late 2024, early 2025 Route 35: This route would launch in late 2024, early 2025.
Geographic location	City of Dayton
Funding sources	Federal Transit Administration's Low or No Emission Vehicle Program
Metrics for tracking progress	• Annual # of new riders • Annual $ of new passenger trips • Annual # of vehicles charging at the public chargers • Annual avoided GHG emissions from passenger trips
Applicable sector	Transportation
Quantitative cost estimates	**The Flyer:** The estimated infrastructure cost of this project is approximately $300,000, and an annual route operating cost is $1,800,000. **Route 35:** The current project estimate is approximately $1.2 million, and the annual route operating cost is $1,800,000.

5.1.7 Measure #7:

Carbon Sequestration

Carbon Sequestration	
Description	This project involves three components: 1. **Ecological refuges**: Assemble and connect open space properties as identified in Miami Valley Open Space Plan and multimodal trails and promote ecological restoration with tree planting and native grasses. 2. **Green pathways:** Increase tree canopy and carbon sequestration potential of active transportation trails, with a focus on low-income and disadvantaged neighborhoods at highest risk of extreme heat. 3. **Urban forests:** Promote creative reuse of vacant lots and brownfields for ecological restoration and carbon sequestration in LIDAC neighborhoods.
Estimate of the quantifiable GHG emissions reductions (e.g., through 2030 and 2050)	2025-2030: 40 MT CO2e 2025-2050: 3,949 MT CO2e
Implementing agency or agencies	City of Dayton, MVRPC, Five Rivers Metroparks
Milestones for obtaining implementing authority	None required

Carbon Sequestration	
Implementation schedule and milestones	**Acres restored with native vegetation** Year 1: None Year 2: 5 Year 3: 10 Year 4: 100 Year 5: 300 **Trees planted** Year 1: 1,000 Year 2: 5,000 Year 3: 10,000 Year 4: 10,000 Year 5: 10,000
Geographic location	Miami Valley
Funding sources	Urban and Community Forest Assistance Program, American Climate Corps
Metrics for tracking progress	• Acres of greenspace restored with native plans • # of trees planted per year in LIDAC areas • # of trees planted per year along trails • Survival rate of trees by age class
Applicable sector	Forests, agriculture
Quantitative cost estimates	To be determined

8.

5.1.8 Measure #8:

Clean Cars for All

Clean Cars for All	
Description	Clean Cars 4 All provides incentives to help lower-income consumers living in priority populations to replace their old higher-polluting vehicles with newer and cleaner transportation, based on the program from the California Air Resources Board (CARB). Participants have the option of a purchase or lease of a new or used hybrid, PHEV, or ZEV replacement vehicle, or an alternative mobility option such as an e-bike, voucher for public transit or a combination of clean transportation options. Additionally, buyers of PHEVs and BEVs are also eligible for home charger incentives or prepaid charge cards if home charger installation is not an option. The program will include: • Lease-to-own programs, rebates, and low- or no-interest financing, bulk purchases and preferred parking spots for EVs • Incentives to help low-income people replace old polluting vehicles with a new or used hybrid or EV; purchase an e-bike; get a voucher for public transit; and benefitting from home charger incentives and prepaid charge cards. • Regional or statewide EV car-sharing cooperatives or services • EV-charging infrastructure in disadvantaged communities and areas without EV-charging at home (e.g. multifamily apartments), workplaces, and public spaces such as parks, RTA hubs, and parking lots (using solar PVs)
Estimate of the quantifiable GHG emissions reductions (e.g., through 2030 and 2050)	2027-2030: 9,733 MT CO2e 2027-2050: 98,056 MT CO2e
Implementing agency or agencies	To Be Determined
Milestones for obtaining implementing authority	None required

Clean Cars for All	
Implementation schedule and milestones	**EV deployment** Year 1: None (program design) Year 2: 200 Year 3: 500 Year 4: 500 Year 5: 500
Geographic location	Miami Valley
Funding sources	Additional funding is available from IRA tax incentives including the Clean Vehicle Tax Credit, Previously Owned Clean Vehicle Tax Credit
Metrics for tracking progress	• # of EVs purchased per year • Annual avoided GHG emissions • Annual avoided VMT
Applicable sector	Transportation
Quantitative cost estimates	To be determined

9.

5.1.9 Measure #9:

Active Transportation Infrastructure

Active Transportation Infrastructure	
Description	This project will support active transportation programming alongside investments in active transportation infrastructure across the Region, with a specific focus on LIDAC communities. Programming will target safe routes to school and workplace travel, helping people switch to walking, cycling and E-bikes, while supporting the development of the necessary infrastructure. The program will also test active transportation interventions such as funding car free days in neighborhoods.
Estimate of the quantifiable GHG emissions reductions (e.g., through 2030 and 2050)	2025-2030: 8,386 MT CO2e 2025-2050: 36,339 MT CO2e
Implementing agency or agencies	MVRPC
Milestones for obtaining implementing authority	None required
Implementation schedule and milestones	Year 1: Program development Year 2: School Travel Planning and Associated Infrastructure Year 3: Workplace Travel Planning and Associated Infrastructure Year 5: Targets 5% increase in biking mode shares for trips 8 miles or less 5% increase in walking mode shares for trips 2 miles or less
Geographic location	Dayton Kettering MSA

Active Transportation Infrastructure	
Funding sources	Infrastructure Investment & Jobs Act (IIJA) Section 11403 Carbon Reduction (CR) Program, Transportation Alternatives Program, Congestion Mitigation/Air Quality, Surface Transportation program, Safe Routes to School, Clean Ohio Trails Fund, Recreational Trails Program, Federal Transit Administration (FTA) Section 5310, Safe Streets For All, Rebuilding American Infrastructure & Sustainability & Equity
Metrics for tracking progress	• # of vehicular trips shifted to walking or cycling • Annual miles walked or cycled • # of miles of walking paths added • # of miles of protected bike lanes added
Applicable sector	Transportation
Quantitative cost estimates	Additional projected walking and cycling paths: $20 million Program implementation: $2 million per year

5.2 Project Prioritization

The Water and Environment Subcommittee used a pairwise comparison tool to weigh the criteria for prioritizing the PCAP projects.[6] An initial set of criteria was distilled from EPA's Phase 2 Notice of Funding Opportunity. The subcommittee added criteria on feasibility with stakeholders and the public.

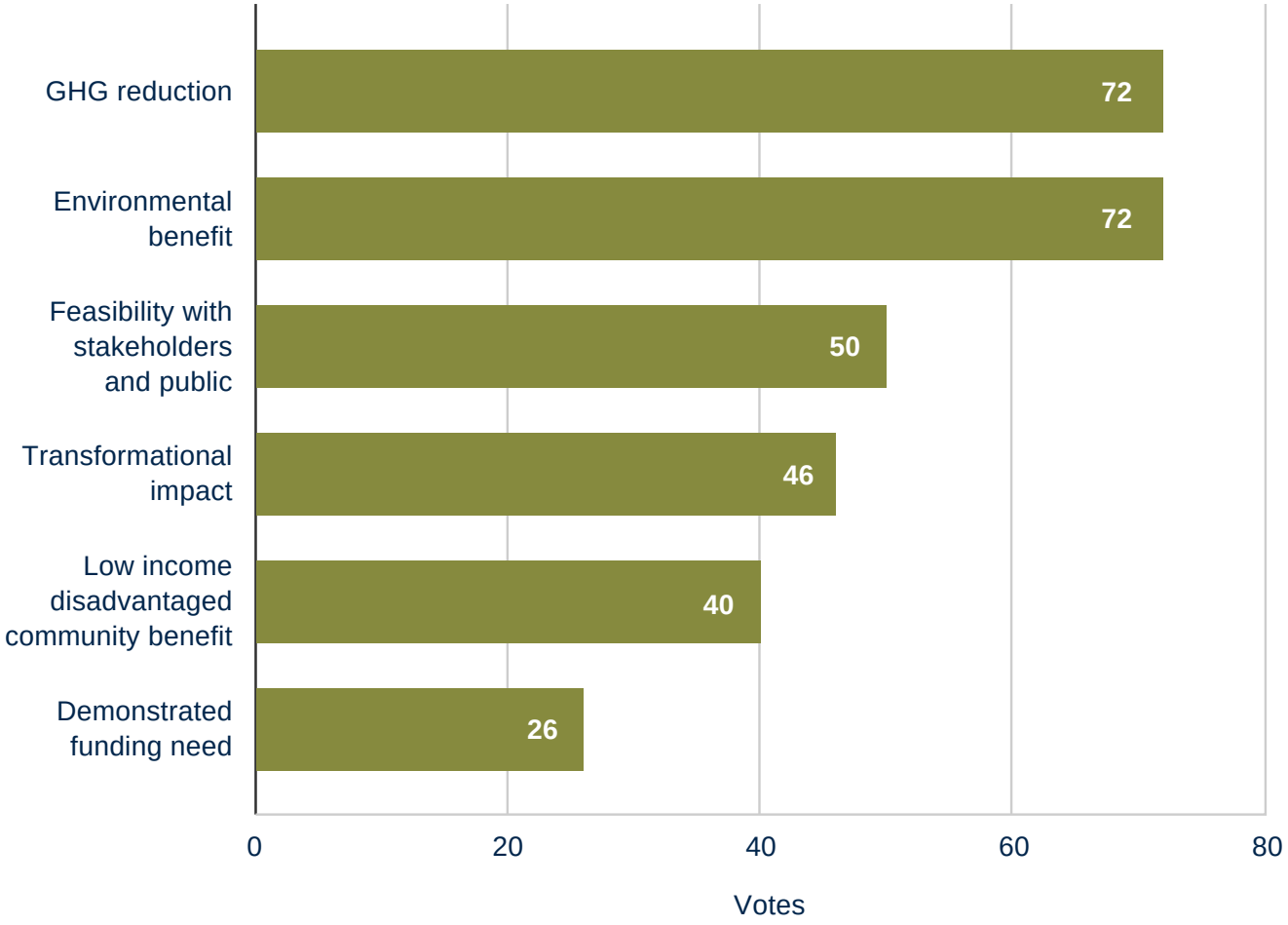


Figure 30. Voting results for weighing the priorities for the PCAP measures

[6] The tool used is available at: https://www.allourideas.org/

SSG undertook an assessment of the PCAP measure using these criteria. Each measure was scored relative to the other projects against the criteria identified, based on the analysis of GHG impacts and LIDAC findings. Other criteria were assessed subjectively based on the consulting team's expertise. The highest scoring measure was the Virtual Power Plus, followed by the Clean Cars for All and the Active Transportation measures.

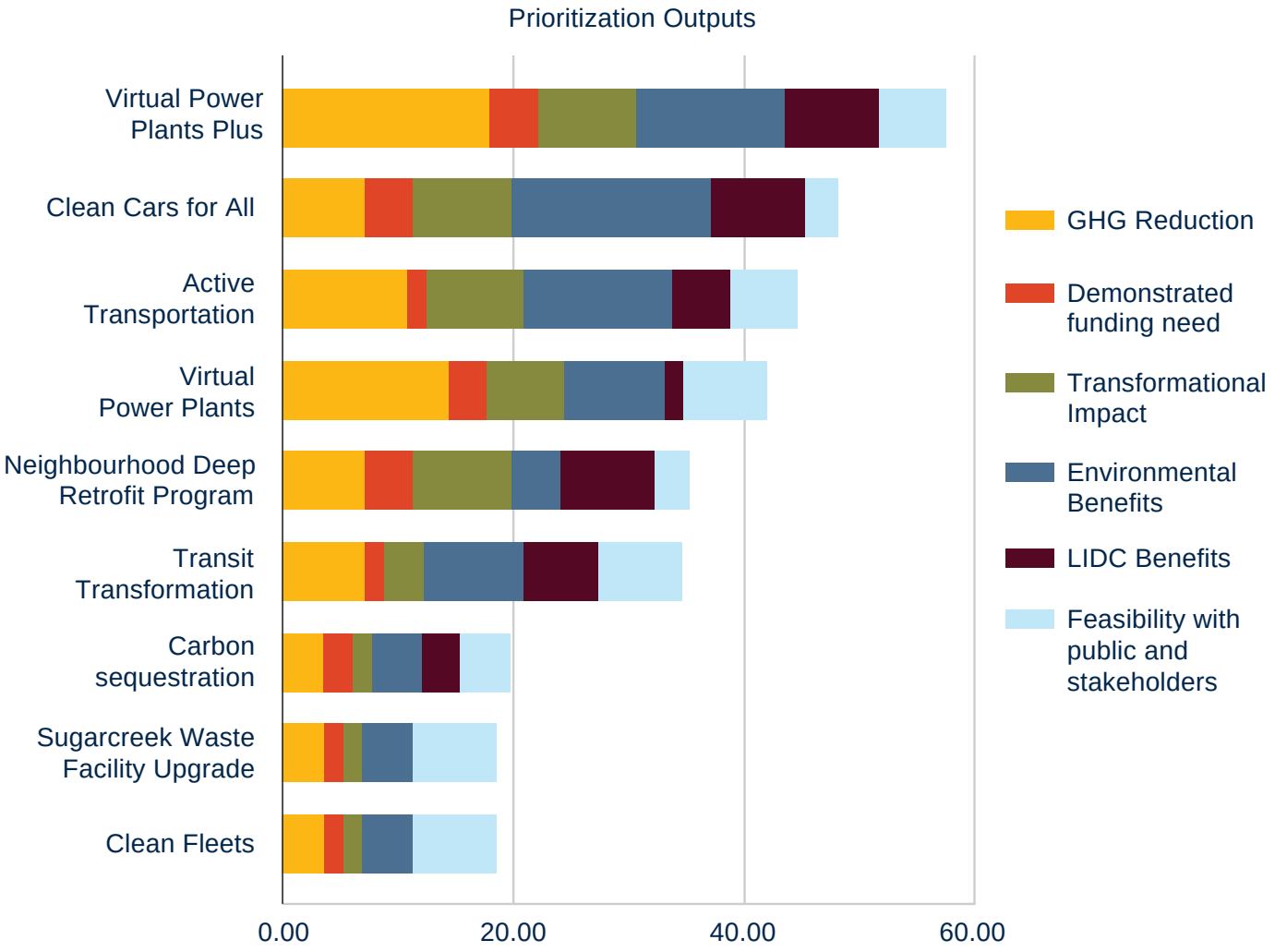


Figure 31. Scoring for the PCAP measures

6 Benefits Analysis for Low-income and Disadvantaged Communities (LIDAC)

The CPRG program requirements for the LIDAC Benefits Analysis are to undertake meaningful community engagement and to advance the goals of the Justice40 Initiative set forth in Executive Order 14008, which aims to deliver 40 percent of the overall benefits of relevant federal investments to disadvantaged communities.

6.1 Methodology

To identify disadvantaged communities within the counties in this PCAP, we undertook a review of the Environmental Justice Screening and Mapping Tool (EJScreen), and the Climate and Economic Justice Screening Tool (CEJST). These tools provide information at a census tract-level according to different categories and thresholds. The categories, thresholds and descriptions are provided below (Table 4 and Table 5).

Table 4. Categories and thresholds in the CEJST and their corresponding descriptions.

Categories	Type of burden	Description
Climate change	Expected agriculture loss rate	Expected agricultural value at risk from losses due to the following natural hazards: avalanche, coastal flooding, cold wave, drought, hail, heat wave, hurricane, ice storm, landslide, riverine flooding, strong wind, tornado, wildfire, and winter weather.
	Expected building loss rate	Expected building value at risk from losses due to the following natural hazards: avalanche, coastal flooding, cold wave, drought, hail, heat wave, hurricane, ice storm, landslide, riverine flooding, strong wind, tornado, wildfire, and winter weather.
	Expected population loss rate	Expected fatalities and injuries due to the following natural hazards: avalanche, coastal flooding, cold wave, drought, hail, heat wave, hurricane, ice storm, landslide, riverine flooding, strong wind, tornado, wildfire, and winter weather.

Categories	Type of burden	Description
Climate change	Projected flood risk	Number of properties at risk of floods occurring in the next thirty years (projected from a high-precision climate model) from tides, rain, riverine and storm surges, or a 26% risk total over the 30-year time horizon.
	Projected wildfire risk	A model projecting the wildfire exposure for any specific location in the contiguous U.S. today and with future climate change. The risk of wildfire is calculated from inputs associated with fire fuels, weather, human influence, and fire movement.
Energy	Energy cost	Average household annual energy cost in dollars divided by the average household income.
	PM2.5 in the air	Fine inhalable particles with 2.5 or smaller micrometer diameters. The percentile is the weight of the particles per cubic meter.
Health	Asthma	Share of people who answer “yes” to both of these questions: “Have you ever been told by a health professional that you have asthma?” and “Do you still have asthma?”
	Diabetes	Share of people ages 18 years and older who have been told by a health professional that they have diabetes other than diabetes during pregnancy.
	Heart disease	Share of people ages 18 years and older who have been told by a health professional that they had angina or coronary heart disease.
	Low life expectancy	Average number of years people have left in their lives.
Housing	Historic underinvestment	Census tracts that experienced historic underinvestment based on redlining maps between 1935 and 1940.
	Housing cost	Share of households that are both earning less than 80% of Housing and Urban Development’s Area Median Family Income and are spending more than 30% of their income on housing costs (Here onwards, also mentioned as housing burden).

Categories	Type of burden	Description
Housing	Lack of green space	Share of land with developed surfaces covered with artificial materials like concrete or pavement, excluding crop land used for agricultural purposes.
	Lack of indoor plumbing	Housing without indoor kitchen facilities or complete plumbing facilities.
	Lead paint	Share of homes built before 1960, which indicates potential lead paint exposure.
Legacy pollution	Abandoned mine land	Presence of an abandoned mine left by legacy coal mining operations.
	Formerly Used Defense Sites	Properties that were owned, leased, or possessed by the United States, under the jurisdiction of the Secretary of Defense prior to October 1986.
	Proximity to hazardous waste facilities	Number of hazardous waste facilities (Treatment, Storage, and Disposal Facilities and Large Quantity Generators) within 5 kilometers.
	Proximity to superfund sites	Number of proposed or listed Superfund or National Priorities list (NPL) sites within 5 kilometers
	Proximity to Risk Management Plan facilities	Count of Risk Management Plan (RMP) facilities within 5 kilometers.[7]
Transportation	Diesel particulate matter exposure	Mixture of particles in diesel exhaust in the air, measured as micrograms per cubic meter.
	Transportation barriers	Average relative cost and time spent on transportation relative to all other tracts.
	Traffic proximity and volume	Number of vehicles (average annual daily traffic) at major roads within 500 meters.
Water and wastewater	Underground storage tanks and releases	Weighted formula of the density of leaking underground storage tanks and the number of all active underground storage tanks within 1,500 feet of the census tract boundaries.

[7] These facilities are mandated by the Clean Air Act to file RMPs because they handle substances with significant environmental and public health risks.

Categories	Type of burden	Description
Water and wastewater	Wastewater discharge	Risk-Screening Environmental Indicators (RSEI) modeled toxic concentrations at stream segments within 500 meters.
Workforce development	Linguistic isolation	Share of households where no one over age 14 speaks English very well.
	Low median income	Low median income calculated as a share of the area's median income.
	Poverty	Share of people living at or below 100% of the Federal poverty level.
	Unemployment	Number of unemployed people as a share of the labor force.

Source: (Council on Environmental Quality, 2022)

Census tract IDs are classified as disadvantaged when they exceed one of these burdens and are at, or above, the 65th percentile for low income. These communities face socioeconomic disparities in addition to other environmental, climate, health, and other burdens. Census tracts are considered disadvantaged by the CEJST if they are at or above the 65th percentile for the number of low-income households, and at or above 90th percentile for one of the data indicators. Except in the categories of workforce development, for which a community is classified as disadvantaged when one of the described burdens is exceeded (90th percentile for each indicator) and more than 10% of people ages 25 years or older whose high school education is less than a high school diploma.

In addition to the CEJST, the EPA's Environmental Justice Screening and Mapping Tool (EJScreen Version 2.2) was used to complement our analysis. The EJScreen contains environmental and demographic indicators (EPA, 2023b). There are similarities to those described above in the CEJST (Table 4). A summary of the EJScreen's indicators is presented in the following table (Table 5, next page).

Table 5. Summary of the EPA's EJScreen indicators.

Environmental indicators	Socioeconomic indicators
Particulate matter 2.5	People of color
Ozone	Low income
Diesel particulate matter	Unemployment rate
Air toxics cancer risk	Limited english speaking
Air toxics respiratory hazard index	Less than high school education
Toxic releases to air	Under age 5
Traffic proximity and volume	Over age 64
Lead paint	
Superfund proximity	
Risk management plan facility proximity	
Hazardous waste proximity	
Underground storage tanks and releases	
Wastewater discharge	

The EJScreen is a computer mapping technology that provides a single, nationally consistent tool used by the EPA, government, partners, and the public for environmental and demographic characteristics of locations across the U.S. It includes two demographic indexes: 1) the Demographic Index based on the average of the two demographic indicators: percent low-income households and percent people of color; and the Supplemental Demographic Index based on the average of five indicators including percent of low-income, unemployed, limited English-speaking, less than high school education, and low life expectancy. The EJScreen uses the demographic indexes for two sets of overall indexes - 13 EJ indexes and 13 Supplemental EJ indexes. These indexes are a combination of the environmental indicators and the Demographic Index or the Supplemental Demographic Index.

In order to categorize communities as disadvantaged according to the EJScreen tool, the EPA defines them according to:

- Any census tract that is included as disadvantaged in CEJST;
- Any census block group at or above the 90th percentile for any of EJScreen's Supplemental Indexes when compared to the nation or state; and/or
- Any geographic area within Tribal lands, as included in EJScreen including:
  - Alaska Native Allotments
  - Alaska Native Villages
  - American Indian Reservations
  - American Indian Off-reservation Trust Lands
  - Oklahoma Tribal Statistical Areas.

Using these two sources of information to identify disadvantaged communities, the following section describes communities in Miami Valley according to the categories shown above in general terms, and identifies communities affected by the GHG reduction measures. For each mitigation measure, the section presents a map with identified locations and identification of potential benefits resulting from the implementation of each proposed GHG reduction measure.

6.2 Low-Income and Disadvantaged Communities (LIDAC)

This section identifies the low-income and disadvantaged communities within Montgomery, Miami, and Greene Counties. According to the CEJST, most of the multiple-burdened census tracts[8] are located in the City of Dayton (especially south of the Great Miami River) with communities exceeding 7 out of 8 the CEJST categories including: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development (Figure 32, next page).

[8] Census tracts that exceeded multiple categories and thresholds according to the Climate and Economic Justice Screening Tool (CEJST).

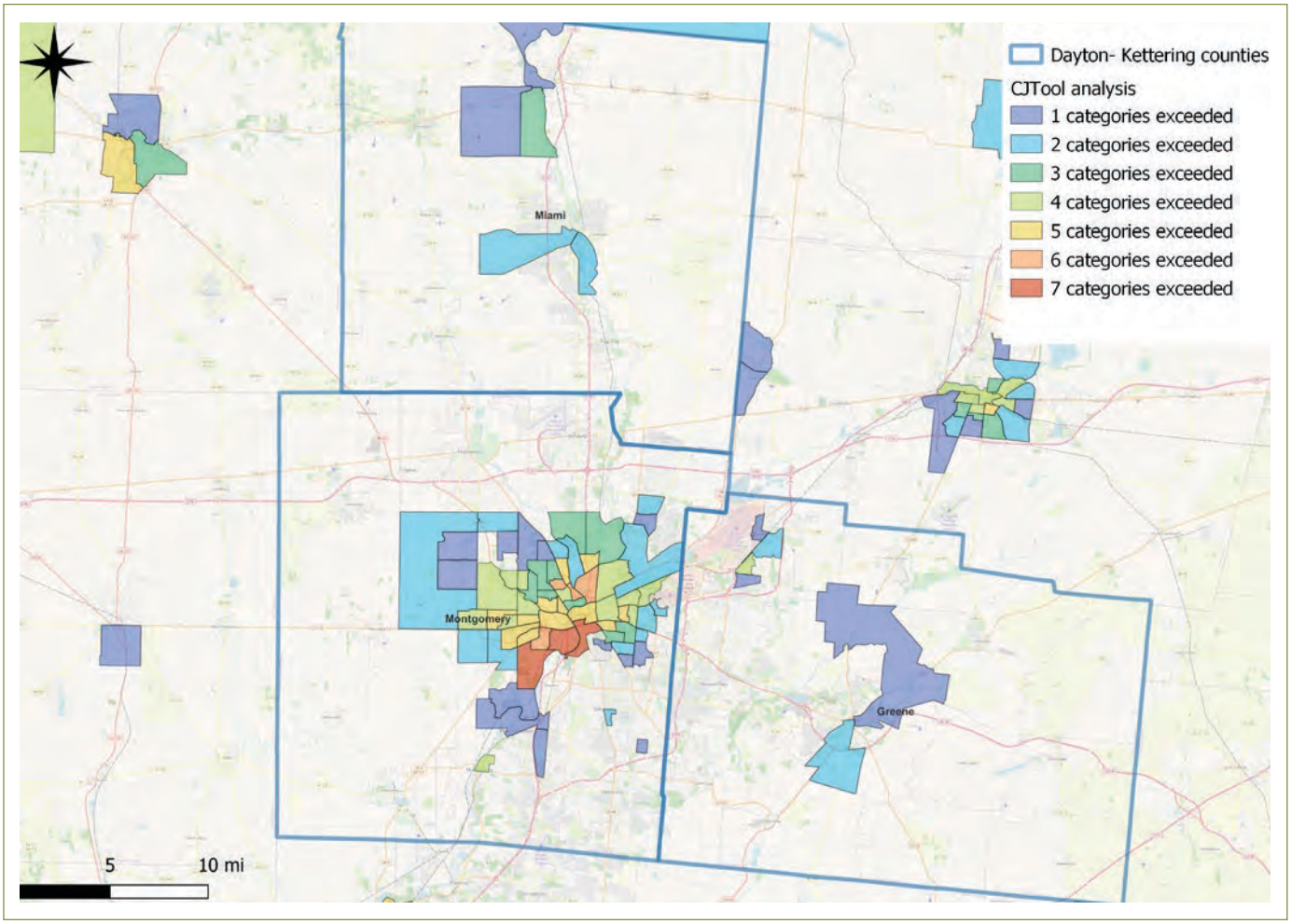


Figure 32. Mapping the disadvantaged communities in Miami Valley according to the CEJST and the number of categories exceeded. Source: Adapted from Council on Environmental Quality, 2022.

According to the 2020 Census, Montgomery County is 67.9% white, 21.2% Black, and 3.9% Hispanic; Miami County is 89.7% white, 2.4% Black, and 2% Hispanic; and Greene County is 81.7% White, 6.8% Black, and 3.1% Hispanic (MVRPC, 2021a). Montgomery County has the highest percentage of minorities, Hispanic residents, people in poverty, disabled residents, and households without access to cars, while Miami and Montgomery Counties have the highest percentage of elderly residents.

Major issues in Miami Valley include energy, transportation, housing (cost and stock), and proximity to Superfund sites. In Greene County, housing quality is a major issue in a few census tracts (lead paint; in Fairborn). Housing quality is also a major issue in a few census tracts and Superfund sites. Details on each of these categories are described in the following sections.

6.2.1 Socio-economic burdens

The Miami Valley communities that CEJST identifies as low-income and disadvantaged census tracts correspond to the 90th percentile of census tracts that are below the federal poverty level, and are matched with the 90th percentile for unemployment (Figure 33). In terms of poverty, Montgomery County presents the highest percentage of people living in poverty (14.3%), followed by Miami County (9.8%), and Greene County (9.4%) (Census Bureau, 2020). In Montgomery County, the City of Dayton has the highest concentration of communities facing socio-economic burdens. In Greene County, the communities with the highest unemployment population are in Xenia. Information is not available in CEJST for north of Montgomery Miami County, but according to the EJScreen Tool, west of Nottinghill (Woodlawn North) includes a few census tracts with an unemployment population over the 90th percentile in the state.

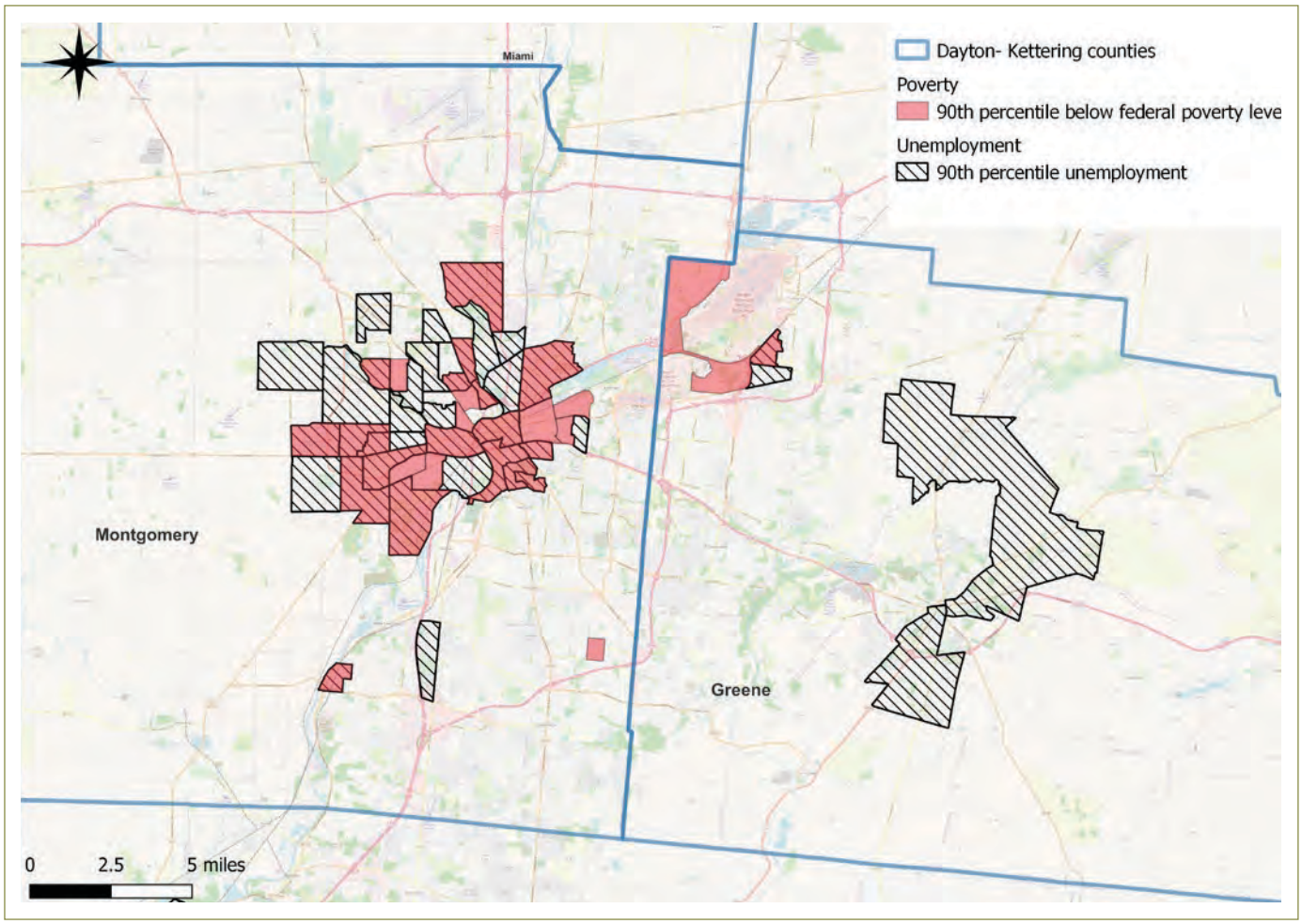


Figure 33. Poverty and unemployment in Miami Valley: Montgomery and Greene County. Source: Council on Environmental Quality, 2022.

These findings are consistent with an equity analysis completed by the MVRPC (MVRPC, 2014), which found that:

- 40 percent of the Region's population living in poverty live in areas with low to very low access to opportunity;
- The access to opportunity is much more limited in the older, urban communities compared to suburban communities (e.g. suburban communities along the I-675 corridor and northern I-75 corridor possess better access to opportunities); and
- Minorities are noticeably more isolated in the urban core and in areas with less access to opportunity (e.g. 64% of Black people live in areas with lower access to opportunity).

6.2.2 Housing

Across the three counties, the highest density of housing is in Dayton, Kettering, Xenia,Fairborn, and Troy (MVRPC, 2020). Home ownership rates are 57.6%, and there are 30,172 vacant housing units (8.2% of total housing). Home ownership rates and housing units available are shown in Table 6.

Table 6. Summary of housing characteristics for every county.

Category	Montgomery County	Miami County	Greene County
Homeownership rate (%)	54.7%	66.5%	62.2%
Number of vacant units	22,987 (9.1% of county total)	2,680 (5.7% of county total)	4,505 (6.3% of county total)

Source: Adapted from (MVRPC, 2020).

Severe housing challenges in the counties are illustrated in Figure 34.[9] The percentages reported in 2022 are lower than the state average of 13.4% and the national average of 15.77% (Data USA, 2022).

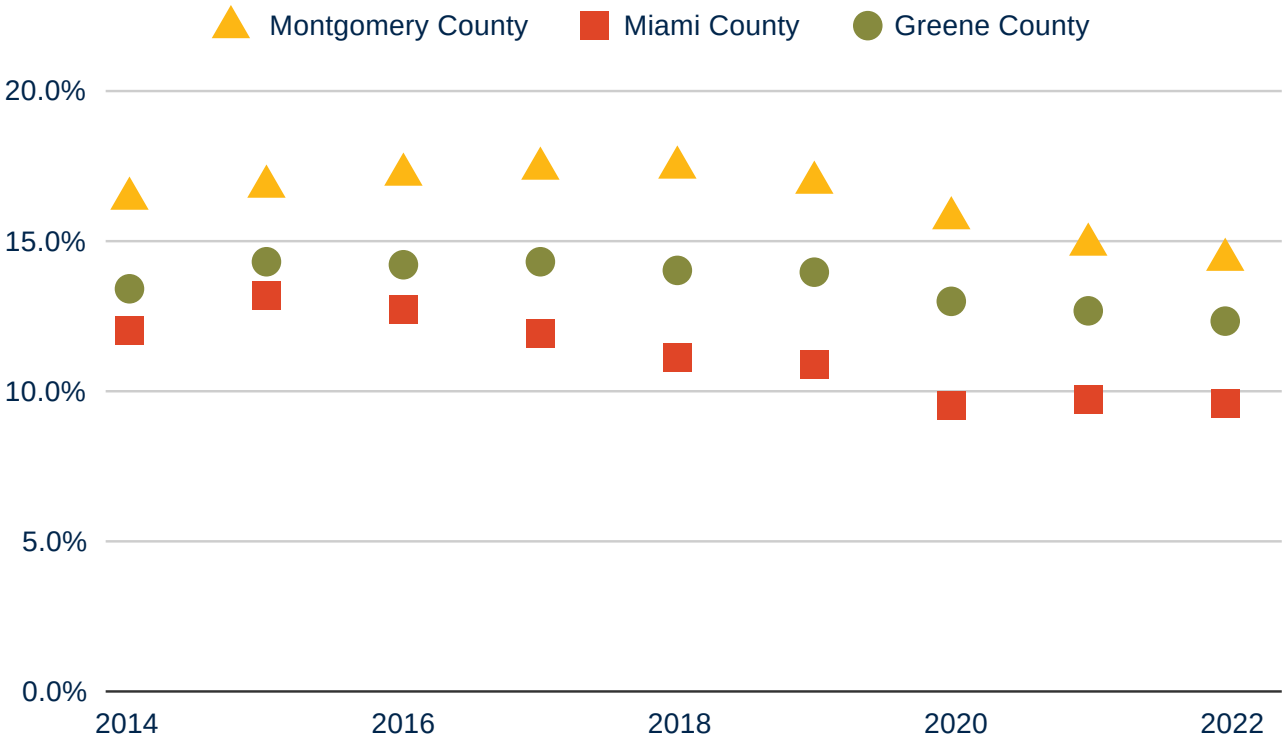


Figure 34. Percentage of households with severe housing problems (e.g. overcrowding, high costs, lack of facilities and plumbing) for the three counties for the period 2014-2022. Source: (Data USA, 2022).

[9] According to the County Health Rankings and Roadmaps the indicator "severe housing problems" refers to the percentage of households with at least one of the following problems: (i) overcrowding, (ii) high housing costs, (iii) lack of kitchen facilities, or (iv) lack of plumbing facilities. More information here: https://www.countyhealthrankings.org/explore-health-rankings/county-health-rankings-model/health-factors/physical-environment/housing-and-transit/severe-housing-problems?year=2023

Figure 35 shows the census tracts that face severe housing challenges, either high housing costs (housing burden) and/or quality issues (e.g., lack of facilities and plumbing, houses built before the 1960s to identify potential homes with lead paint exposure).

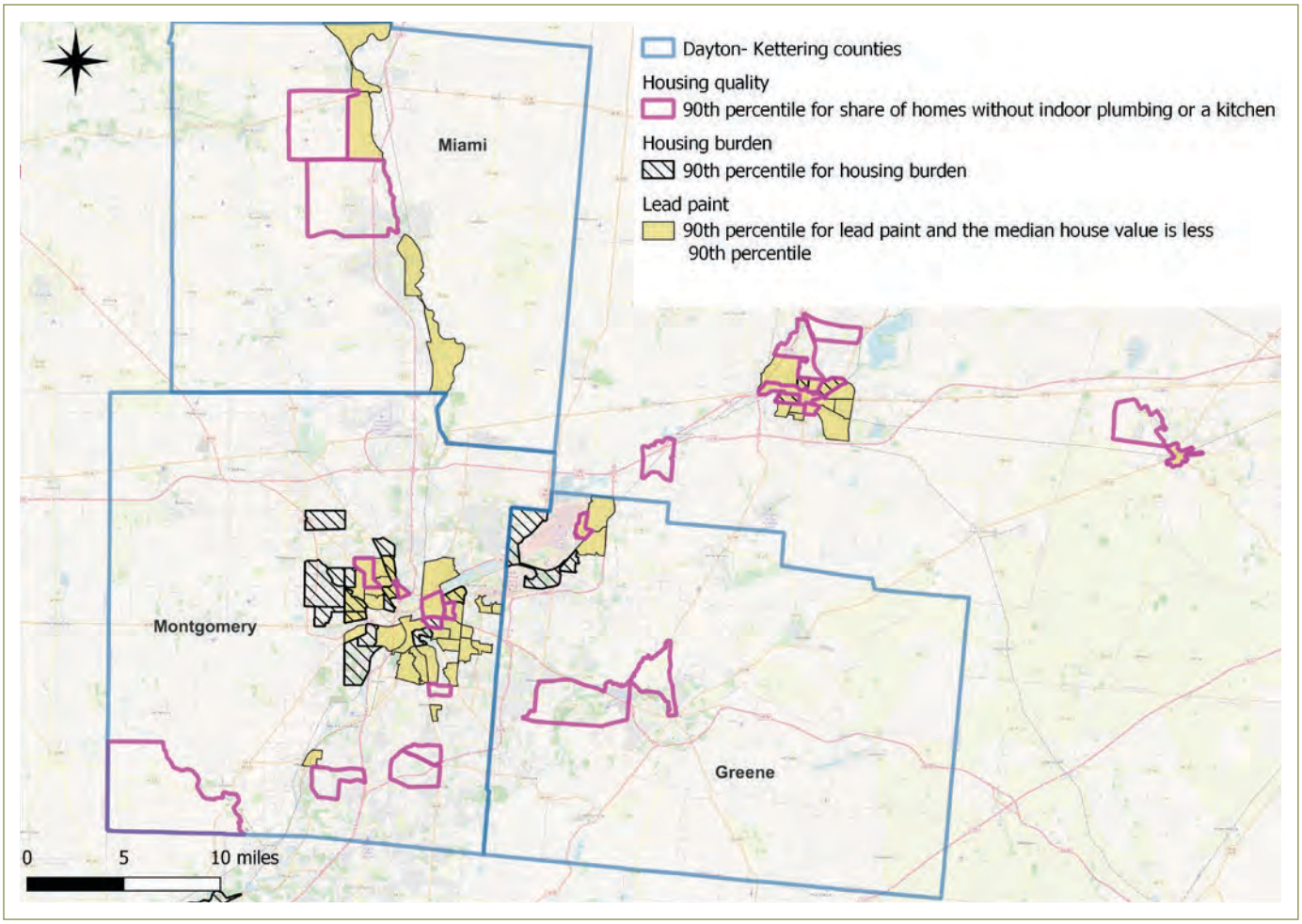


Figure 35. Housing burden in Miami Valley. Source: (Council on Environmental Quality, 2022).

Housing problems are to some extent related to the historic housing underinvestment in some areas of the region. This is specifically evidenced for black communities and low-income areas. Figure 36 shows the Redlining Map for Dayton, Ohio in the 1940s. The redlining mapping categorized residential areas for investment depending on the population living in the areas, where redlining identified areas populated mostly by "negro" and categorized as "hazardous residential area"; yellow spots meant that it was necessary to travel through colored (i.e. red) sections to reach there; and green and blue areas were identified as best and desirable residential sites. The redline mapping is identified in the CEJST[10] to demonstrate the neighborhoods that continue to be low-income communities and face barriers to access financing.

[10] CEJST accessed here: https://screeningtool.geoplatform.gov/en/#13.06/39.75451/-84.21525

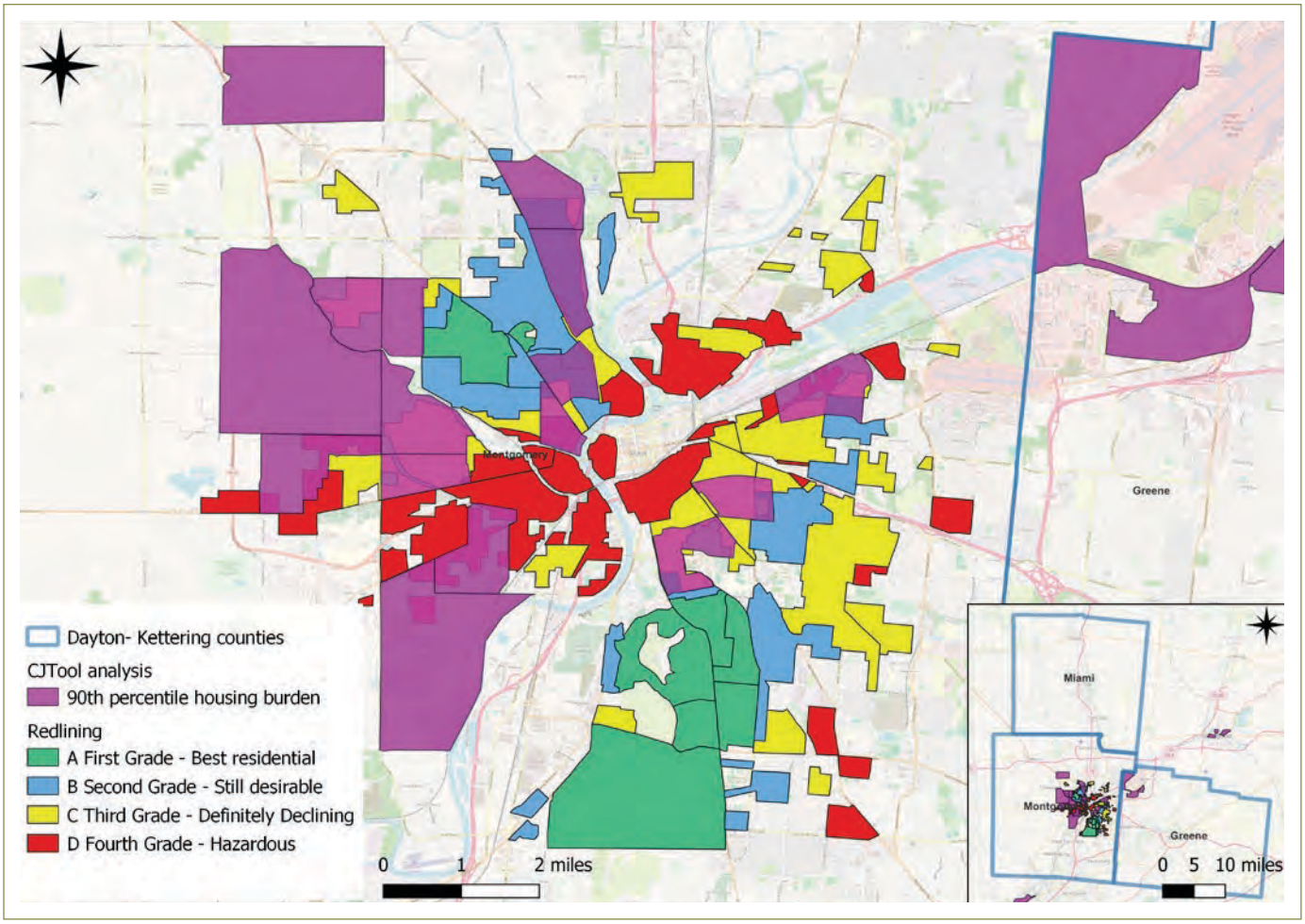


Figure 36. Redlining Map for Dayton, Ohio, mixed with housing burden according to the CEJST. Source: (Council on Environmental Quality, 2022; Nelson et al., 2023).

6.2.3 Energy burden and PM2.5 air pollution

High rates of energy burden (costs) and particulate matter (PM) 2.5 pollution levels are experienced by the City of Dayton in Montgomery County and northwest of the City of Troy in Miami County due to air pollution from industrial sources such as the asphalt industry and metal plating industry (Figure 37). The City of Dayton also has high rates of air pollution due to exposure to traffic.

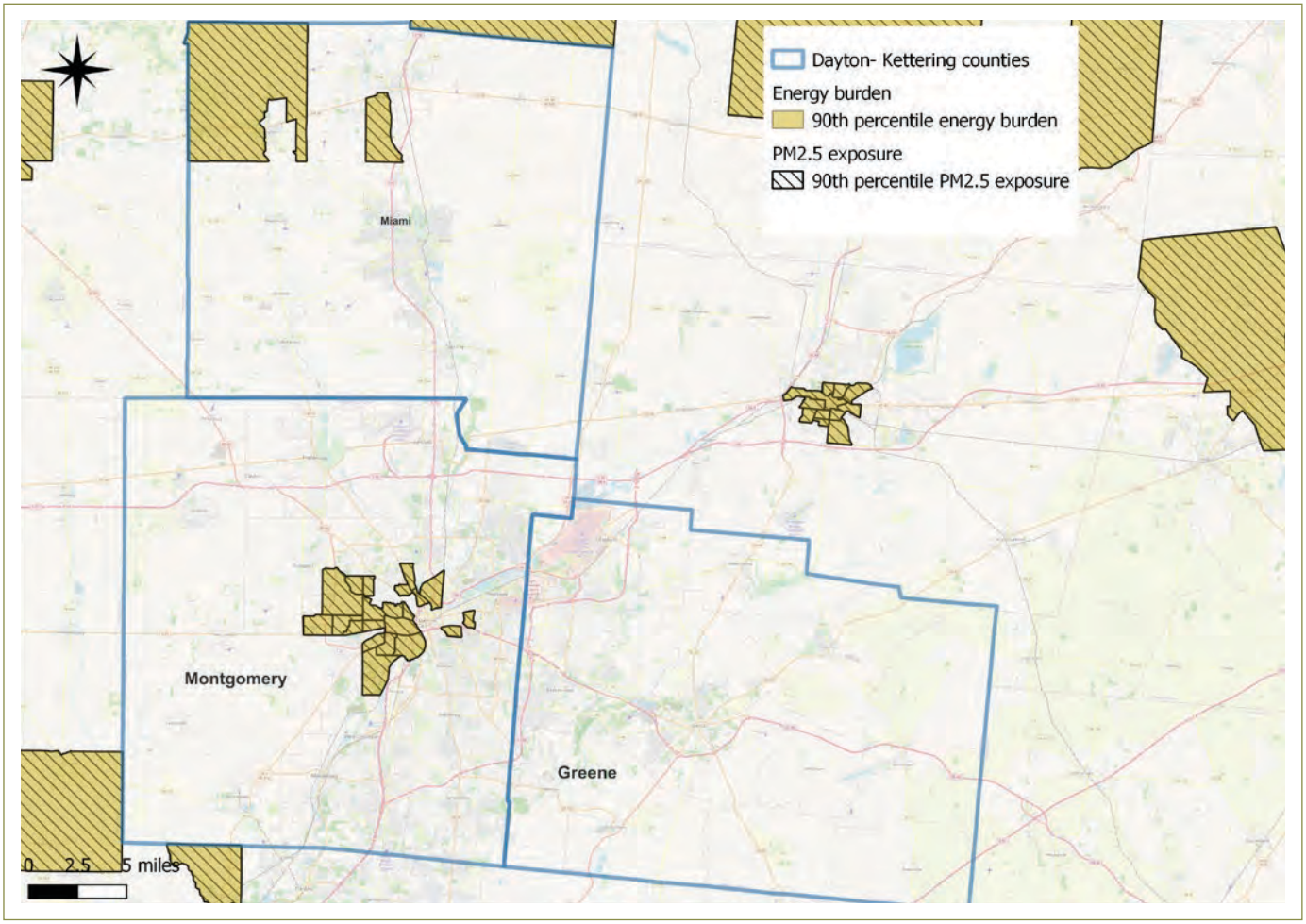


Figure 37. Energy burden and PM2.5 exposure in Miami Valley. Source: Council on Environmental Quality, 2022.

6.2.4 Transportation

Communities living in the downtown area of Dayton experience traffic, noise, pollution and safety issues. Rural areas face different travel barriers, including high transportation costs (energy burden) and other travel barriers (Figure 38).

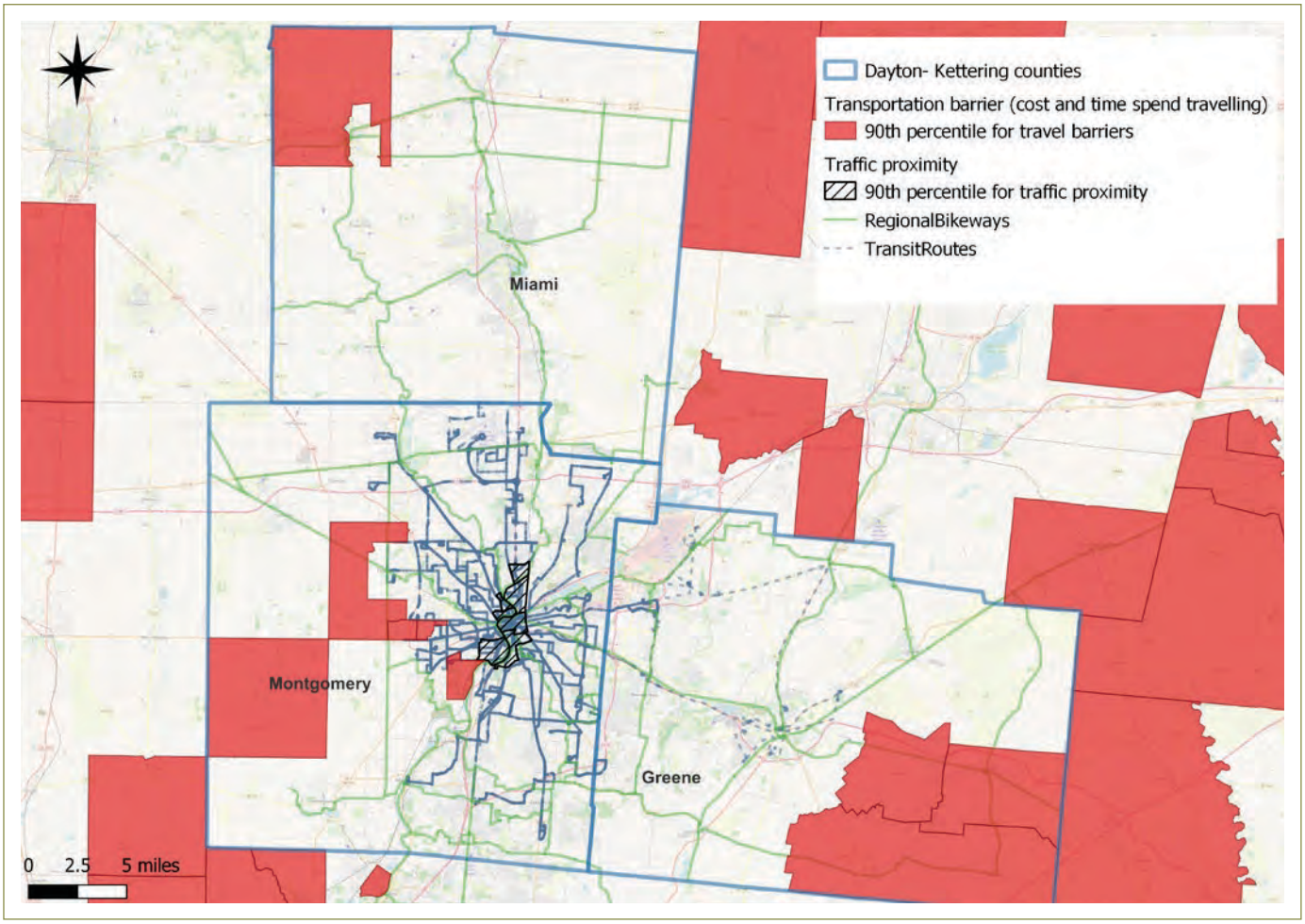


Figure 38. Transportation burdens in Miami Valley. Source: (Council on Environmental Quality, 2022).

6.2.5 Legacy pollution, water, and wastewater

Legacy pollution sites, defined as sites that have been historically polluted and remain contaminated (controlled or not) with hazardous waste or other contamination, are widespread across the counties. Disadvantaged communities were identified using indicators provided by the CEJST for proximity to the following:

- Abandoned mine land;
- Formerly Used Defense Sites (FUDS);
- Proximity to hazardous waste facilities;
- Proximity to superfund sites (NPL);
- Proximity to Risk Management Plan (RMP) facilities;
- Underground storage tanks (UST) and releases; and
- Wastewater discharge.

One of the major indicators is the proximity to Superfund sites (NPL or National Priorities List sites). The Superfund proximity indicator was high in Montgomery County including Dayton and in Miami County, including in Troy. There are multiple pollution burdens for a few communities in proximity to polluted underground storage tanks, water discharge facilities, and abandoned mine sites.

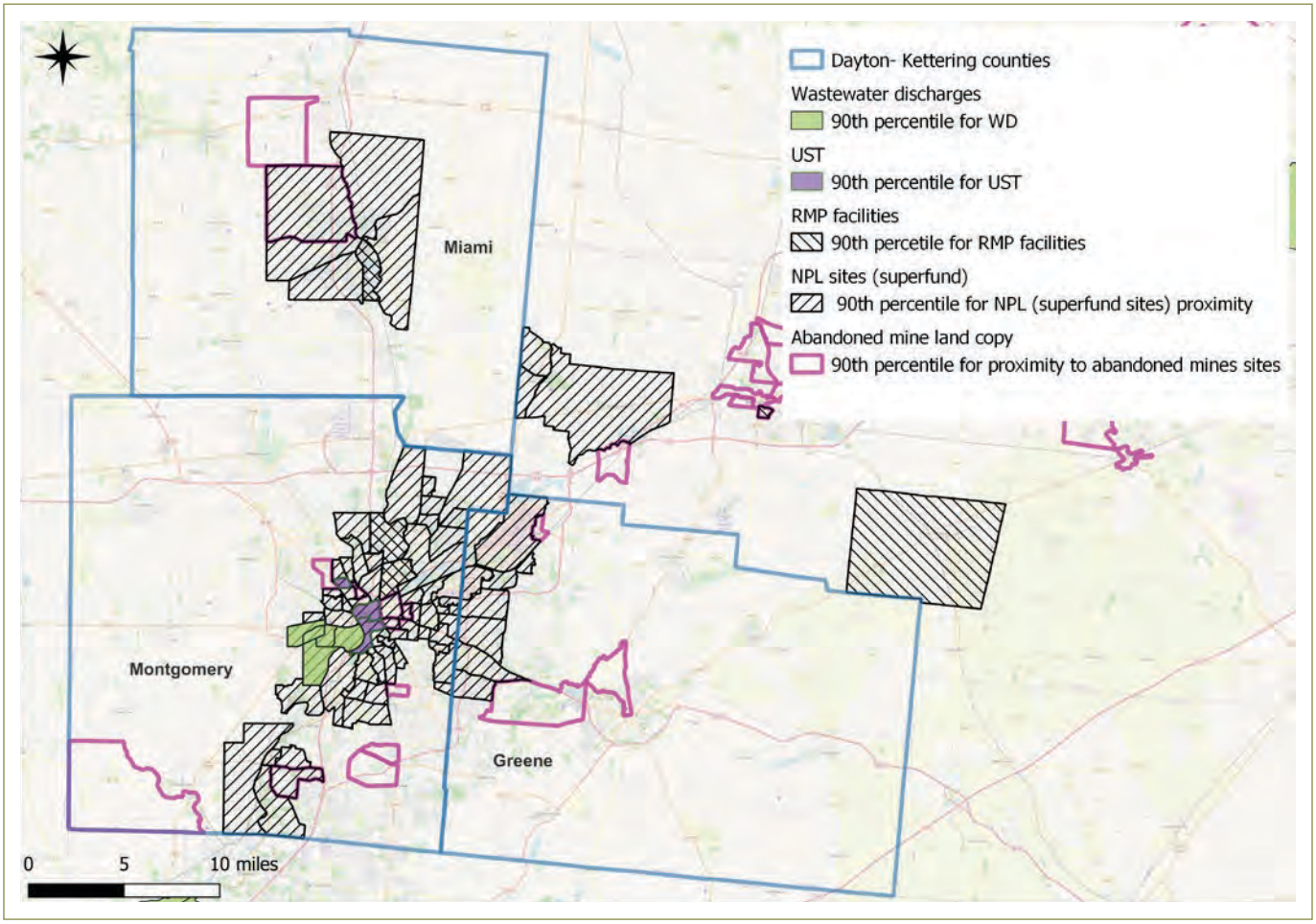


Figure 39. Legacy pollution in Miami Valley. Source: (Council on Environmental Quality, 2022).

6.2.6 Impacts on Cities

The EJ Screening and Mapping Tool (EPA, 2023b) provides the following insights on disadvantaged communities within cities in the Miami Valley MSA:

- **Dayton (Montgomery County)** is the most populous city in the MSA (population 138,525) with 54% of the people qualifying as low income, 49% of the population are people of color (primarily Black), an unemployment rate of 11%, and a per capita income of $23,247. The city contains both a "Justice40 (CEJST)" disadvantaged community and an EPA IRA disadvantaged community. It has 2 Superfund sites; 8 hazardous waste, treatment, storage, and disposal facilities; 28 water dischargers; 157 air pollution sites; 27 brownfields; and 71 sites on a toxic release inventory. The city has critical service gaps including barriers to broadband internet access, housing burden, transportation access, and access to food (i.e. is a food desert). The city is rated in the top 90th percentile for PM 2.5 pollution levels in the state and 91st percentile in the country; 95th percentile for toxic releases to air in the country; and 96th percentile in the country for proximity to Superfund sites.
- **Kettering (Montgomery County)** has a population of 57,496 with a primarily white population (86%), and 24% of the population considered low-income. The city has a per capita income of $38,238, a low unemployment rate of 4%, and 63% of housing is owner-occupied. Kettering contains both a "Justice40 (CEJST)" disadvantaged community and an EPA IRA disadvantaged community. The city has 2 hazardous waste, treatment, storage, and disposal facilities; 3 water dischargers, 28 air pollution sites, 1 brownfield, and 8 sites on a toxic release inventory. The only critical service gap is a food desert. LIke Dayton, Kettering ranks high for particulate matter (PM2.5) (92nd percentile in the state and 91st percentile in the country), and ranks high for Superfund proximity (95th percentile in the state and 91st percentile in the country).
- **Fairborn (Greene County)** has a population of 34,728 with a predominantly white population (79%) and 39% of the population considered low-income. The city has a per capita income of $33,286 and 51% of housing is owner-occupied. Fairborn contains both a "Justice40 (CEJST)" disadvantaged community and an EPA IRA disadvantaged community. The city has an unemployment rate of 5%. Fairborn, has 2 water dischargers, 24 air pollution sites, 2 brownfields, and 6 sites on a toxic release inventory. The city’s only notable environmental indicator is higher than average particulate matter (87th percentile in the state and 90th percentile in the country). Fairborn has critical service gaps including access to broadband internet, housing burden, transportation access, and access to food (i.e. is a food desert).

- **Troy (Miami County)** has a population of 26,229 that is 86% white and 26% of the population is considered low-income. The city has a per capita income of $32,536 and 66% of housing is owner-occupied. Fairborn contains both a "Justice40 (CEJST)" disadvantaged community and an EPA IRA disadvantaged community. The city has a low unemployment rate of 4%. Troy has 2 Superfund sites, 6 hazardous waste, treatment, storage, and disposal facilities, 2 water dischargers, 47 air pollution sites, and 21 sites on a toxic release inventory. Proximity to Superfund sites is 99th percentile in the country, and proximity to RMP (Risk Management Plan) facilities is 92nd percentile in the country. Troy's critical service gaps are transportation access and access to food (i.e. food desert).
- **Huber Heights (Montgomery and Miami County)** has a population of 42,835 with 76% white population, 27% percent considered low-income, and an unemployment rate of 5%. The city has a per capita income of $31,758 and a majority of homes are owner-occupied housing (75%). Huber Heights contains both a "Justice40 (CEJST)" disadvantaged community and an EPA IRA disadvantaged community. Huber Heights has a Superfund site; 1 hazardous waste, treatment, storage, and disposal facility; 5 water dischargers; 25 air pollution sites; and 6 sites on a toxic release inventory. Huber Heights' critical service gaps include housing burden, transportation access, and is a food desert.
- **Piqua (Miami County)** has a population of 20,258, is majority white (92%), 36% of the population is considered low-income, and has an unemployment rate of 4%. The city has a per capita income of $27,186 and a majority of owner-occupied housing (65%). Piqua contains both a "Justice40 (CEJST)" disadvantaged community and an EPA IRA disadvantaged community. Piqua has 2 superfund sites; 2 hazardous waste, treatment, storage, and disposal facilities; 3 water dischargers; 40 air pollution sites; 15 brownfields; and 11 sites on a toxic release inventory. Piqua has a relatively high flood risk (11%, 80th percentile in the state). The critical service gap is transportation access.
- **Xenia (Greene County)** has a population of 25,563 that is majority white (82%) with 40% of the population considered low-income, and a 7% unemployment rate. The city has a per capita income of $27,099 and a majority of owner-occupied housing (60%). Xenia contains both a "Justice40 (CEJST)" disadvantaged community and an EPA IRA disadvantaged community. Xenia has 2 hazardous waste, treatment, storage, and disposal facilities; 2 water discharger; 25 air pollution sites; 3 brownfields; and 5 sites on a toxic release inventory. The critical service gap is transportation access, and access to food (i.e. is a food desert).

One community within the region does not have any Justice40 or EPA IRA disadvantaged tracts:

- **Beavercreek (Greene County)** has a population of 45,849, is majority white (83%), 14% of the population is considered low-income, and has an unemployment rate of 2%. The city has a per capita income of $47,719 and a majority of owner-occupied housing (73%). Beavercreek does not have any Justice40 or EPA IRA disadvantaged tracts. Beavercreek has high particulate matter levels (88th percentile in the state and 90th percentile in the country). Beavercreek has a Superfund site; 1 hazardous waste, treatment, storage, and disposal facility; 13 air pollution sites; and 3 sites on a toxic release inventory. Beavercreek's critical service gaps include housing burden and transportation access.

6.3 Climate Impacts and Risks

This section describes the climate impacts and risks associated with climate change in Miami Valley. The main impacts considered are extreme weather events, such as extreme rainfalls, hurricanes and tornadoes; extreme heat and urban heat island effects; flooding; drought; and wildfires.

6.3.1 Extreme weather events

The region will face extreme weather events such as increases in the number of hot days and heat waves with a greater risk of heat-related illness and death (GLAAC, 2013). According to the U.S. Vulnerability index, census tracts from Troy to the north in Miami County are highly vulnerable and census tracts in the remaining areas are medium-high risk to extreme heat; both Miami County and Montgomery County are highly vulnerable to extreme rainfall, precipitation, and storms (Environmental Defense Fund, 2022). These potential risks and vulnerabilities are identified as disproportionately impacting minorities (Black and African Americans) and low-income communities because they are more likely to live in high risk areas. particularly the census tracts on the west side of the Great Miami River in the City of Dayton (EPA, 2023b).

According to a recent study developed by the First Street Foundation on heat extremes, Miami and Montgomery county are part of the heat belt across the U.S. that will experience an increase in the number of days with temperatures over 125°F in the following 30 years (Freedman, 2022). In addition, Miami, Montgomery, and Greene county are projected to experience an increase on 11, 12 and 13 days with temperatures over 100°F for the same period (Buchanan, 2022).

6.3.2 Flooding

Most communities along the Great Miami River are offered a high degree of protection from riverine flooding by the flood protection system of the Miami Conservancy District (MCD). However, impervious surfaces combined with poor drainage in some areas may lead to urban flood problems from heavy rain events. Furthermore, the MCD

flood protection system is not designed to protect properties located along small tributary streams from flooding. These areas may be particularly vulnerable to climate change induced flood events (projected flood risk in the next 30 years). (Council on Environmental Quality, 2022)

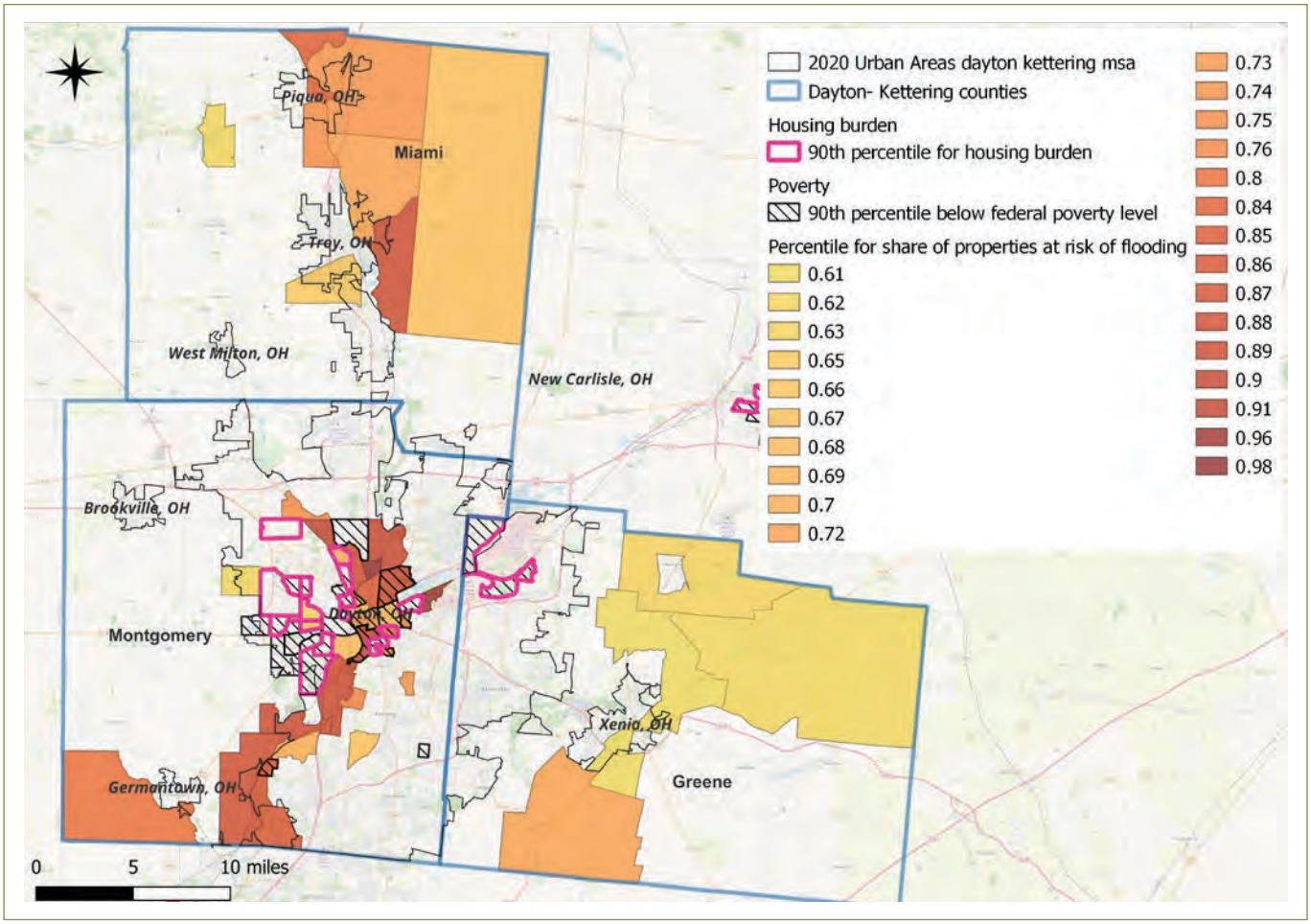


Figure 40. Flood risk, intersecting with poverty and housing burdens in Miami Valley. Source: (Council on Environmental Quality, 2022).

6.3.3 Drought

According to the U.S. Vulnerability index, all three counties in Miami Valley have low vulnerability to drought (Environmental Defense Fund, 2022). Currently, according to the Ohio Drought Monitor, the west and northern counties are experiencing moderate drought (NOAA & NIDIS, 2023).

6.3.4 Wildfires

The region has a low risk of wildfires.

6.4 Benefits Analysis

This section analyzes qualitatively the potential benefits to the Miami Valley's communities resulting from the PCAP projects.

6.4.1 Measure #1: Clean Fleets

This measure involves electrification of the fleets for park authorities, including electric vehicles (EVs) and charging infrastructure in the Centerville-Washington Park District area and Five Rivers MetroParks. While the measure's impacts are relatively small, it may directly benefit the surrounding communities.

Possible direct benefits to the communities include local reductions in PM2.5 resulting from combustion in vehicles, reduced exposure to diesel particulate emissions, ozone, and noise. The introduction of electric vehicles also leads to capacity building in terms of training drivers and park employees on electric vehicle use and maintenance. Infrastructure construction for EV charging stations will create new or improved local jobs and build capacity through training; new jobs will be created in EV manufacturing and other technology sectors. Reduced maintenance for EVs may reduce the requirement for mechanics. Figure 41 provides an overview of the census tracts that SSG has identified as potentially benefiting from the mitigating actions of the PCAP/CCAP.

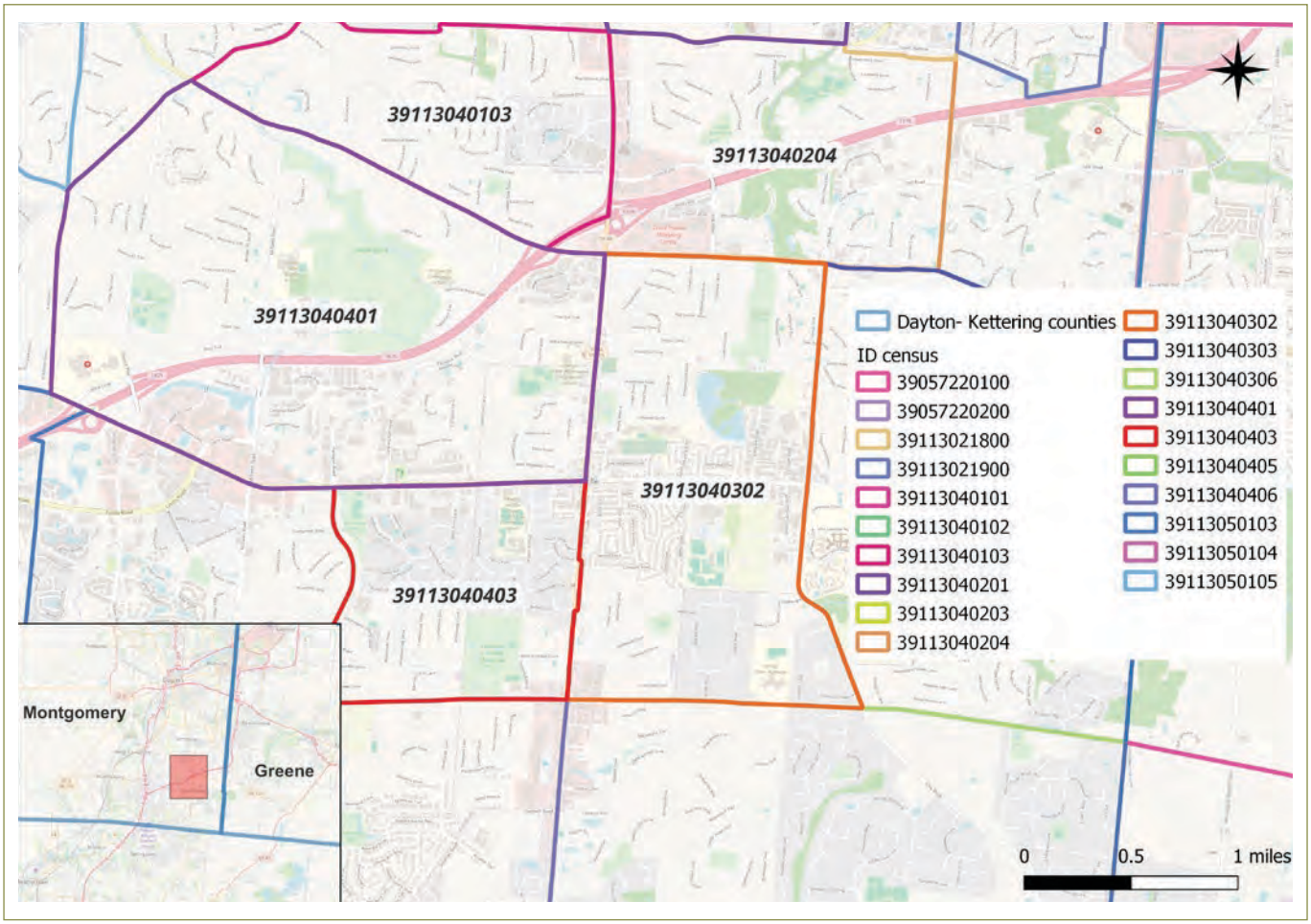


Figure 41. Census tract IDs that may directly benefit from the implementation in terms of reduced air pollution and new employment opportunities due to the clean fleet projects in the Centerville-Washington Park District area. Source: SSG analysis

Indirect benefits to LIDAC communities (Figure 42) will include:

- Reducing the air pollution from mobile sources moving southeast to northwest due to wind flows, thereby reducing PM2.5 exposure. Potential benefitted LIDAC communities census tract IDs include:

  39113070201 39113004300

- Capacity building such as training sessions will target communities that face low median incomes, improving their access to opportunities and reducing their unemployment rates. LIDAC communities census tract IDs facing socio-economic burdens are adjacent to the census tracts where the mitigation measure will be implemented and therefore stand to benefit. These census tracts include:

  39113050402 39113021800

  39113050101

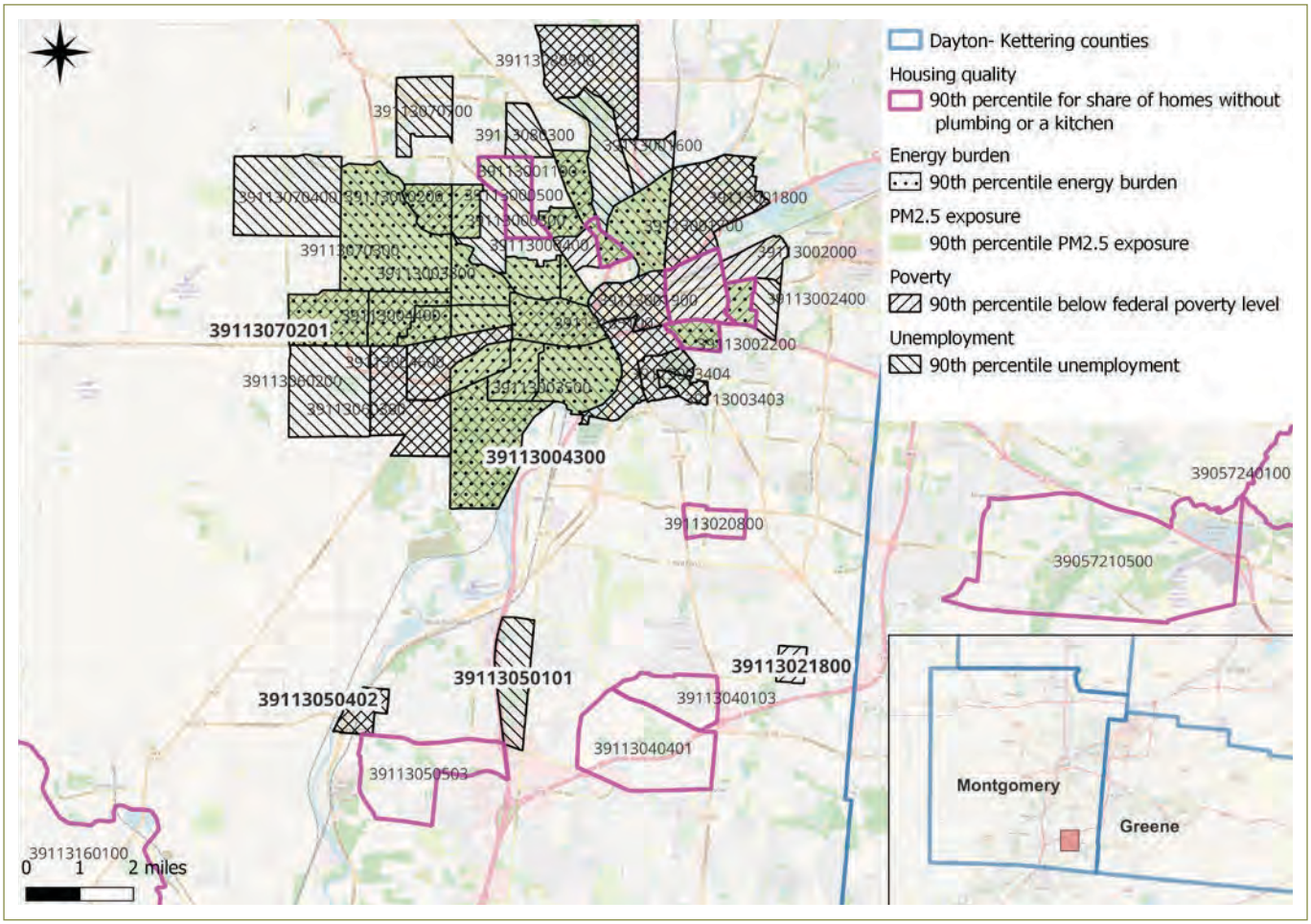


Figure 42. LIDAC communities that may benefit from the implementation of the clean fleet project.

6.4.2 Measures #2 and #3: Virtual Power Plants (VPP) and VPP+

The City of Dayton is planning to add solar generation plants at different places in the county (Figure 43). The City would be an initial investor of the program, purchasing the power for municipal supply and residential aggregation programs. The following map shows these pilot locations, and additional potential location sites in Superfund sites or brownfields.

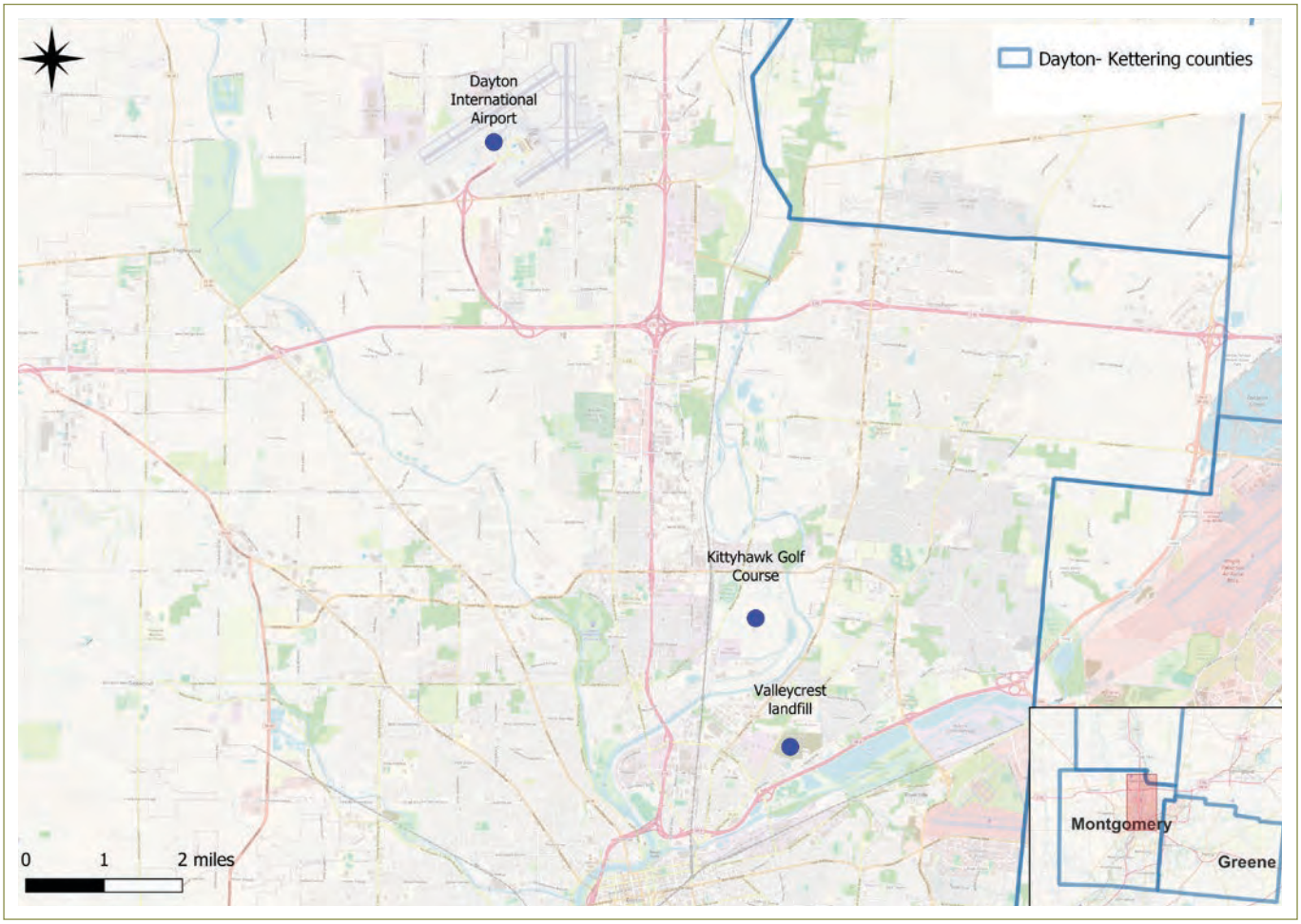


Figure 43. Possible sites for initial ground mount solar generation plants. Source: SSG analysis.

Virtual Power Plants (VPP)

Local benefits from the implementation of this program would include the repurposing of historically contaminated sites for solar farms, which would require preparation of the site (e.g. clearance, remediation, and cleaning) and would reduce the pollution burdens on the nearby populations exposed to these contaminated sites.

In terms of direct benefits, new renewable energy generation inside the county's boundaries would decrease the need for new electricity development beyond the counties' boundaries, and would stimulate the broader deployment of new technologies. Other direct benefits for the municipalities investing in the programs include generating financial returns and if complemented with energy aggregation programs benefits would also include relief in terms of costs for communities with energy burdens.

Indirect benefits for LIDACs include (Figure 44):

- Energy aggregation programs would provide positive impacts for communities with energy burdens including options to negotiate for energy prices and rates. The list of LIDACs benefiting include:

  39113001100 39113001200

  39113000802 39113001700

- In addition, if these measures are led by SOPEC and are community owned, the program could also translate into financial opportunities for low-income households facing poverty burdens. In this context, LIDACs benefiting from solar generation could include:

  39113080500 39113000900

  39113001100 39113001200

  39113000802 39113001800

- Direct benefits for LIDACs close to landfills and superfund sites will include improvements from the clean-up and redevelopment of polluted sites resulting in decreases in contamination loads and overall contaminated sites; the creation of new local jobs; and improvements in neighborhood quality of life, health, and reputation. The LIDACs that could directly benefit are:

  39113080700 39113001800

  39113080500 39113001700

  39113080600 39113090302

- Finally, similar to the implementation of clean fleets, deployment of solar power plants could translate into opportunities for local innovation and capacity, training programs and capacity building and the creation of jobs targeting low-income and unemployed people and communities. The LIDACs that could benefit include:

  39113080500 39113001700

  39113001800 39113001100

  39113001600 39113080300

  39113080600

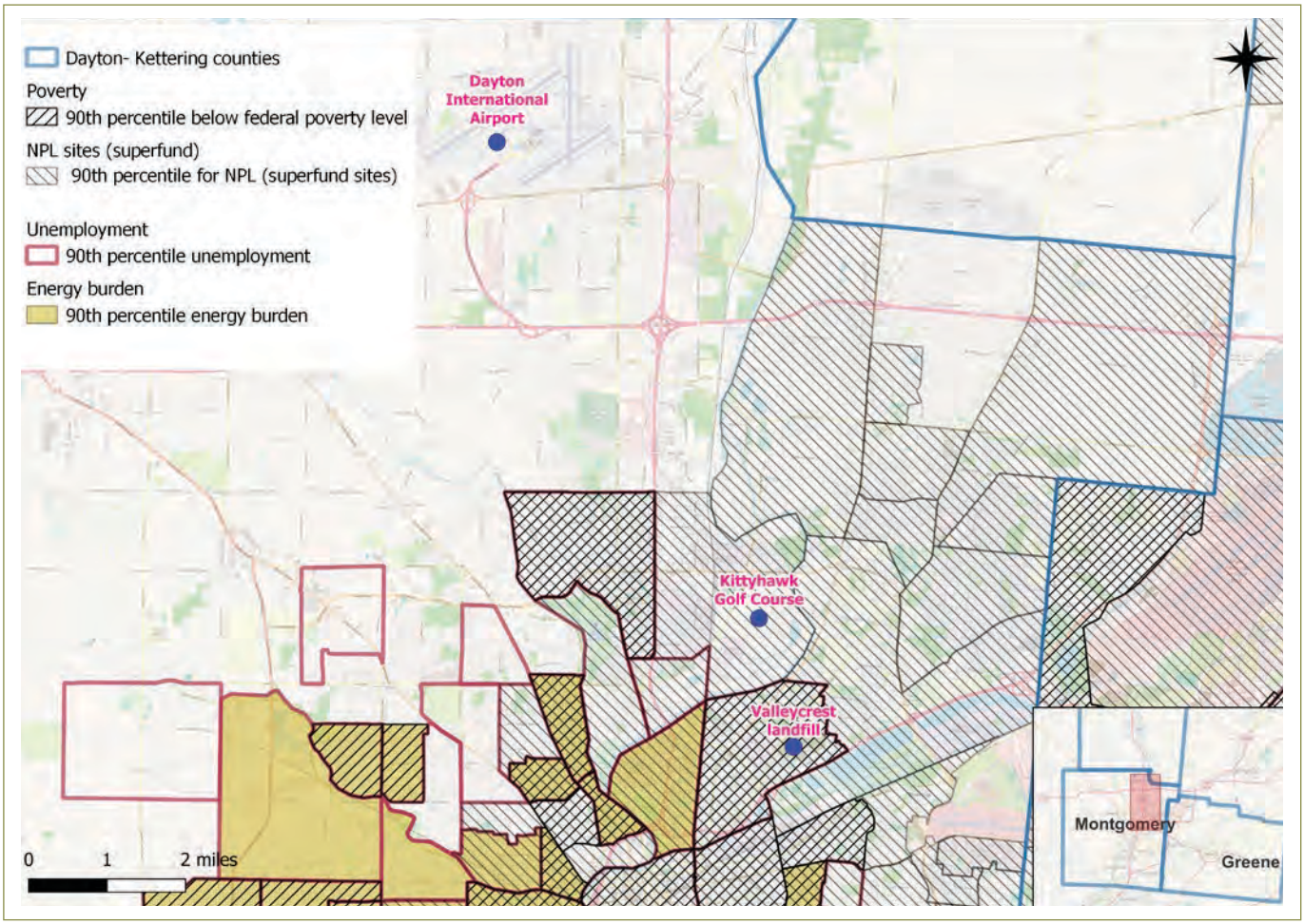


Figure 44. LIDAC communities possibly benefiting from the implementation of the Virtual Power Plant.

Virtual Power Plant Plus

This measure adds to the VPP program to aggregate residential solar projects with revenues directed to a revolving loan fund, which would be used to support weatherization and electrification projects in LIDAC communities (e.g. grants or low interest loans).

In addition to the direct benefits described above for measure #2 in Section 6.5.2, there will be indirect benefits. The measure aims to implement solar generation with revenues directed to a revolving fund that would finance retrofit programs and residential solar energy installations. LIDACs participating in the aggregation program could opt for retrofits that would reduce their energy burden by increasing energy efficiency and reducing their energy costs, which at the same time would reduce overall demand for energy.[11] The LIDACs that would benefit from this measure will be the same as the ones listed in Section 6.5.2

[11] Note that the Counties of Montgomery, Greene, and Miami are in the 67th, 70th and 78th percentile for the U.S. climate vulnerability index regarding extreme temperatures and among the 80th percentile regarding the Urban Heat Island index (Environmental Defense Fund, 2022).

6.4.3 Measure #4: Neighborhood Deep Retrofit Program

Retrofitting Existing Buildings

A deep retrofit program will be implemented in the city of Dayton, targeting the low-income and disadvantaged communities.

This program will provide LIDACs with direct benefits including reduced energy costs from energy efficiency measures and from the installation of solar PV panels. The switch from fossil fuels to renewable energy would also provide benefits due to improvements in indoor air quality and local air quality.

The direct and indirect benefits for LIDACs would include:

- Reductions in energy burden due to lower energy bills resulting from energy efficiency measures and the switch to renewable energy. The following LIDACs that could benefit include:

  Montgomery County:

39113040103	39113020800
39113002200	39113000500
39113002300	39113040401
39113050503	39113001200
39113160100	39113001900

- Increases in resilience to cope with temperature extremes by incorporating and/or upgrading heating, ventilation and air conditioning systems (HVAC), installing off the grid solar energy capacity, and upgrading home building envelope (insulation) (Figure 45, next page).

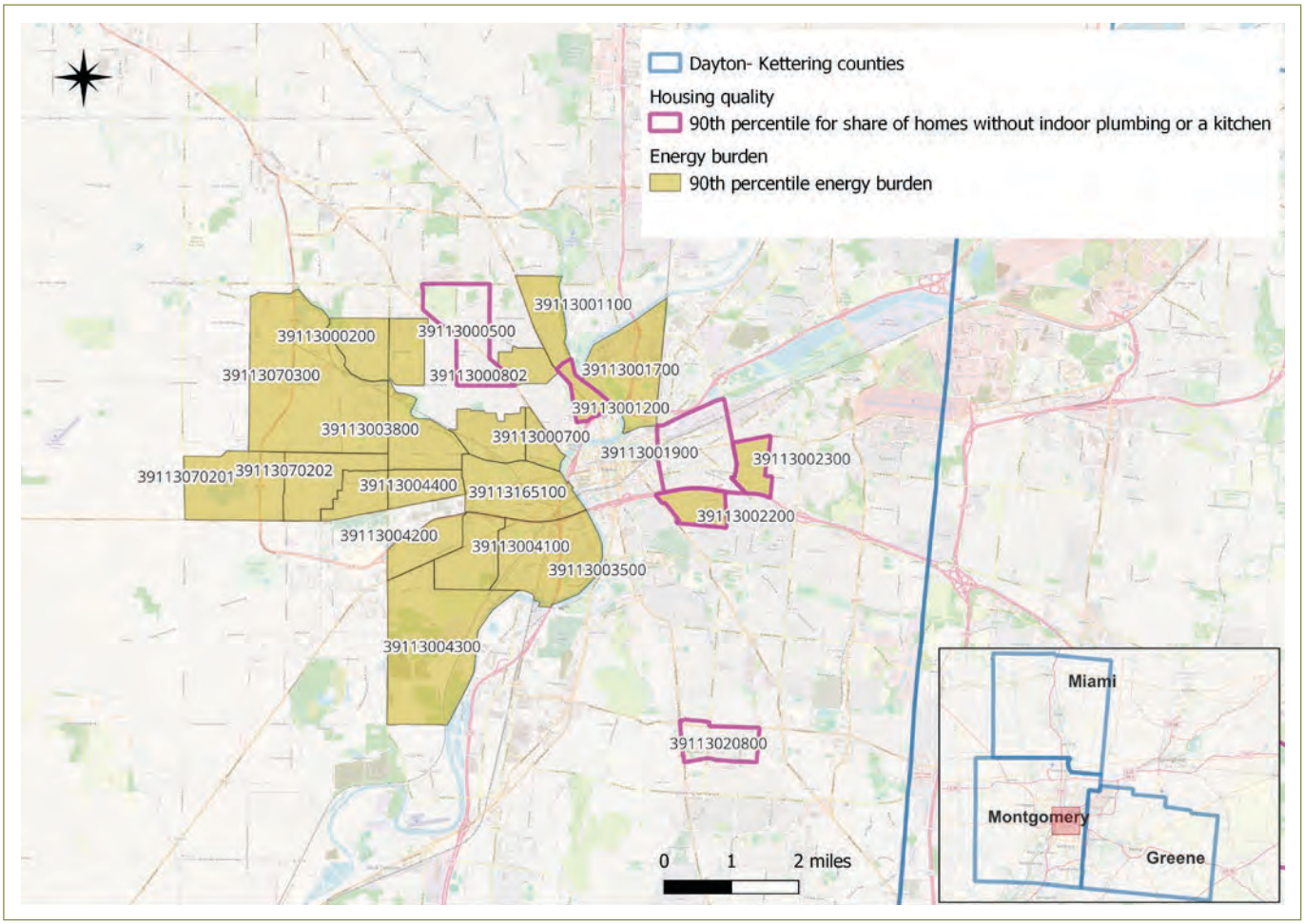


Figure 45. Possible LIDAC benefits from a Deep Retrofit Program in Dayton. Source: SSG analysis.

Indirect benefits such as the creation of new jobs to implement and undertake retrofits, and complementary community capacity building through training sessions. Targeting training efforts to communities with low median income, below poverty level, and high unemployment rates would contribute to reducing these socio-economic burdens.

Net Zero new Buildings

The stimulation of the construction of new net zero housing on vacant lots will provide access to housing options with low energy and transportation costs. In addition to low heating and cooling costs, the geographic location is located in walkable and cyclable areas, and therefore reduces transportation costs..

Indirect impacts on economic development are, on the one hand, positive impacts due to creation of new jobs, and on the other hand, potential risks of gentrification, due to the development of high quality housing.

6.4.4 Measure #5: Sugarcreek Waste Facility Upgrade (Greene County)

This measure would upgrade the thermal drying facility at the Sugarcreek location to a Water Resource Recovery Facility (WRRF) that would process the sludge generated at the same facility replacing the current practice of disposing it in landfill. Figure 46 shows the location of the facility.

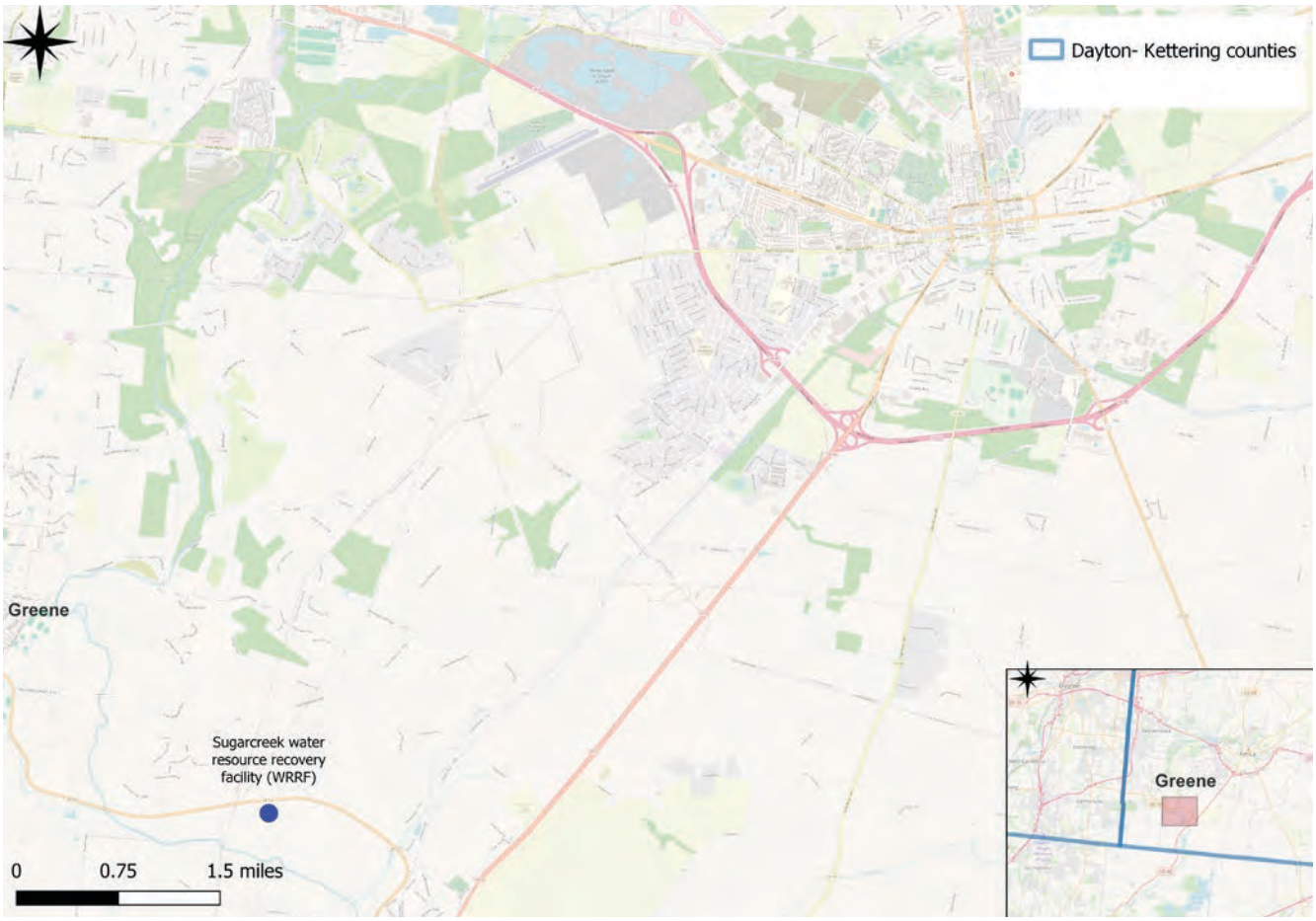


Figure 46. The Sugarcreek Water Resource Recovery Facility (WRRF) in Greene County. Source: SSG analysis.

Direct benefits from treating the sludge and avoiding disposal in landfill would result in GHG emission reductions from the resource recovery and an extended life of the landfill due to reduced waste input. The facility would benefit from reduced costs for landfilling the sludge and a possible increase in revenues from waste recovery (e.g. fertilizer, compost).

Possible co-harms related to this solution include:

- Negative impacts on health due to dust release as part of the drying process;
- safety issues related to dust releases (fires and explosions);
- an energy-intensive process; and
- nuisance odors.

This measure will require high-skilled workers and capacity building in the area. The upgrade and new waste recovery facility will create new jobs for local people (Figure 47). The following LIDACs could benefit from this measure:

39057240600

39057240302

39113021800

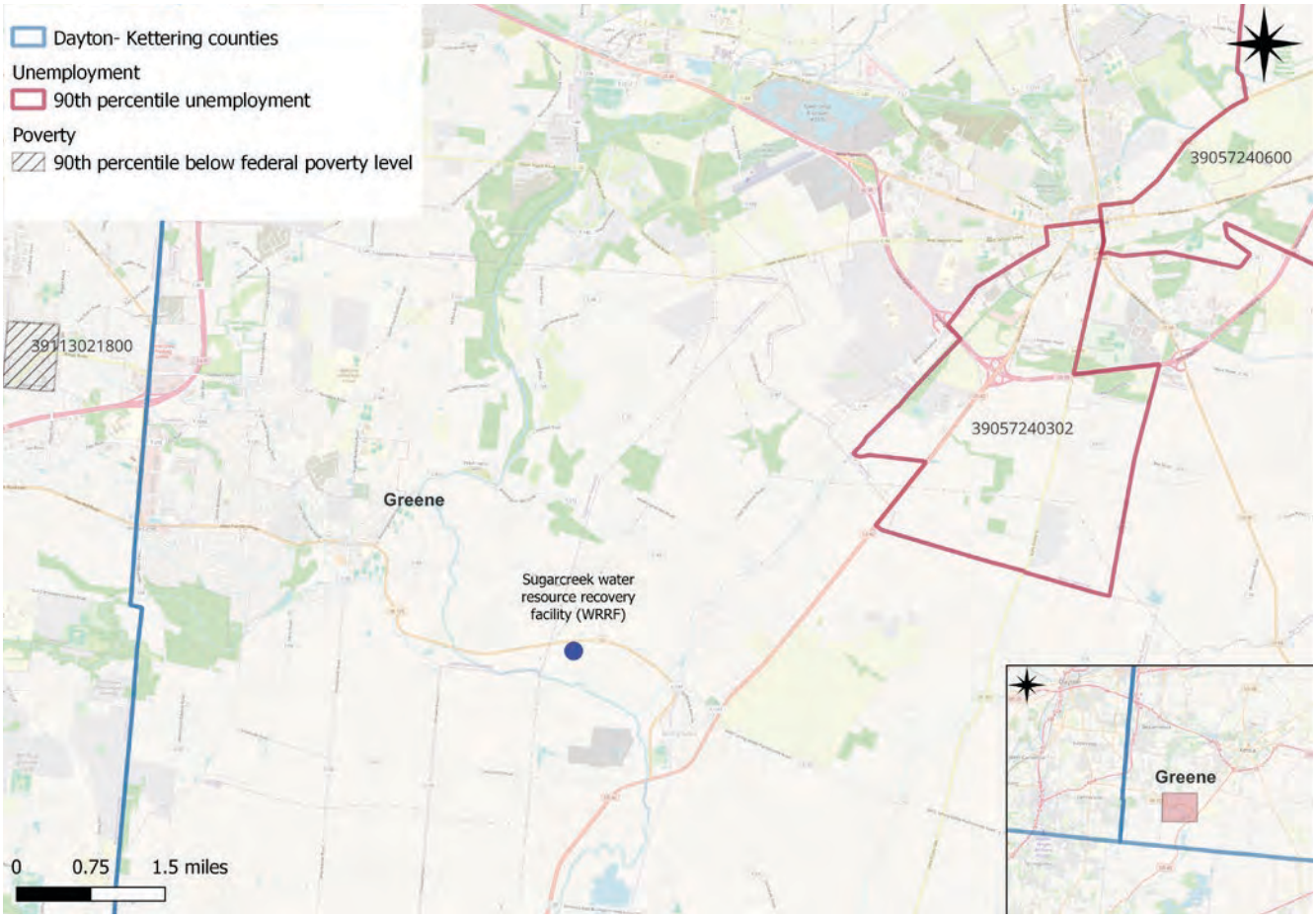


Figure 47. Possible LIDAC benefits from the Sugarcreek Waste Facility Upgrade. Source: SSG analysis.

6.4.5 Measure #6: Transit Transformation

This measure aims to expand and upgrade transit routes within low income and disadvantaged neighborhoods. The transformation would include electrification of the transit fleet especially within the City of Dayton; the development of charging sub-stations for the Regional Transit Authority's (RTA) trolley buses and private EVs; a transition from overhead wire routes to wireless systems in order to expand routes; and an extension of the RTA services. The measure includes the expansion of transit and the Flyer[12] on-demand services, service hours, frequency, and routes to better serve LIDAC areas (Figure 48).

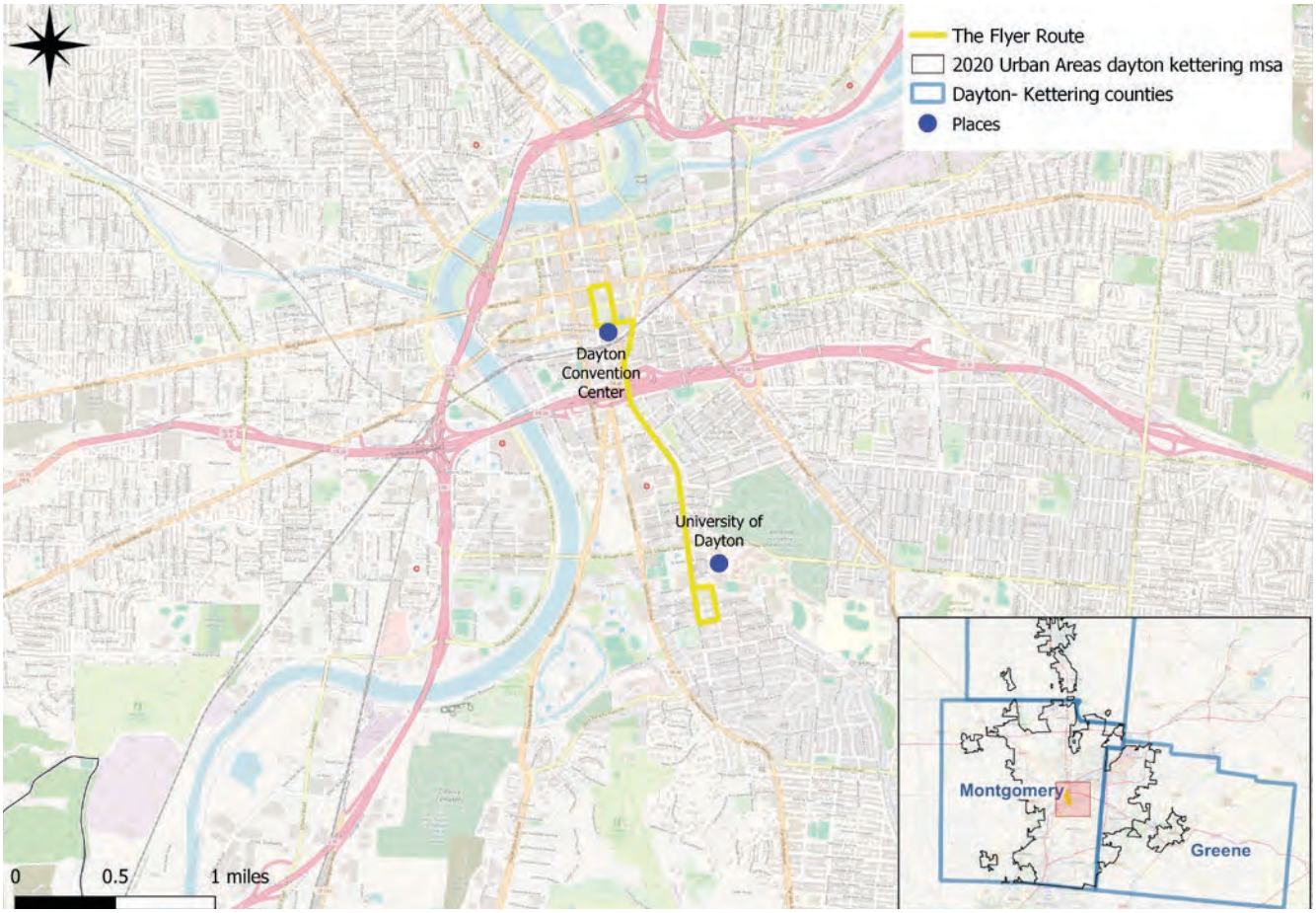


Figure 48. The Flyer's starting and ending points route. Source: SSG analysis

Direct benefits from the transit transformation include the switch from fossil fuels to electricity, reduction in vehicles with combustion engines, reduced air pollution emissions (specifically PM 2.5) and other electrification co-benefits such as reduction of noise in streets previously from car engines. The expansion of transit routes will reduce barriers to travel for low-income households that depend on public transit,

[12] Free transit route from University of Dayton up to the Dayton Convention Center.

and improve connectivity to the rest of the city including access to services, education, jobs, parks, and green spaces. In addition, improvements in access to public transit may reduce poverty burdens due to reduced transportation costs.

Increasing service times, routes, and transit vehicle trip frequencies will result in the creation of new jobs, (e.g. transit drivers and maintenance operators), however, there would be declines in some other jobs such as taxis and private sharing vehicles.

The benefits to LIDACs (Figure 49) could include:

- Electrification of transit would enhance local environments by reducing noise and air pollution emissions (PM2.5). Electrification would benefit LIDACs with a high proximity to traffic index, The following communities could be positively impacted by the electrification of fleets:

  39113000200
  39113000300
  39113070300
  39113003800
  39113000700
  39113000802
  39113001200
  39113001100
  39113001700
  39113001000
  39113002300
  39113002200
  39113003500
  39113004100
  39113004300
  39113004200
  39113004400
  39113003900
  39113070202

- In addition, combining electrification strategies with the expansion of the service routes and frequencies by expanding the fleet (trolley and buses) to LIDAC communities would improve access to clean transportation and reduce transportation barriers. These improvements would especially benefit LIDAC census tracts with limited transit route access. These LIDACs could include:

  39113004300
  39113070201
  39113070202

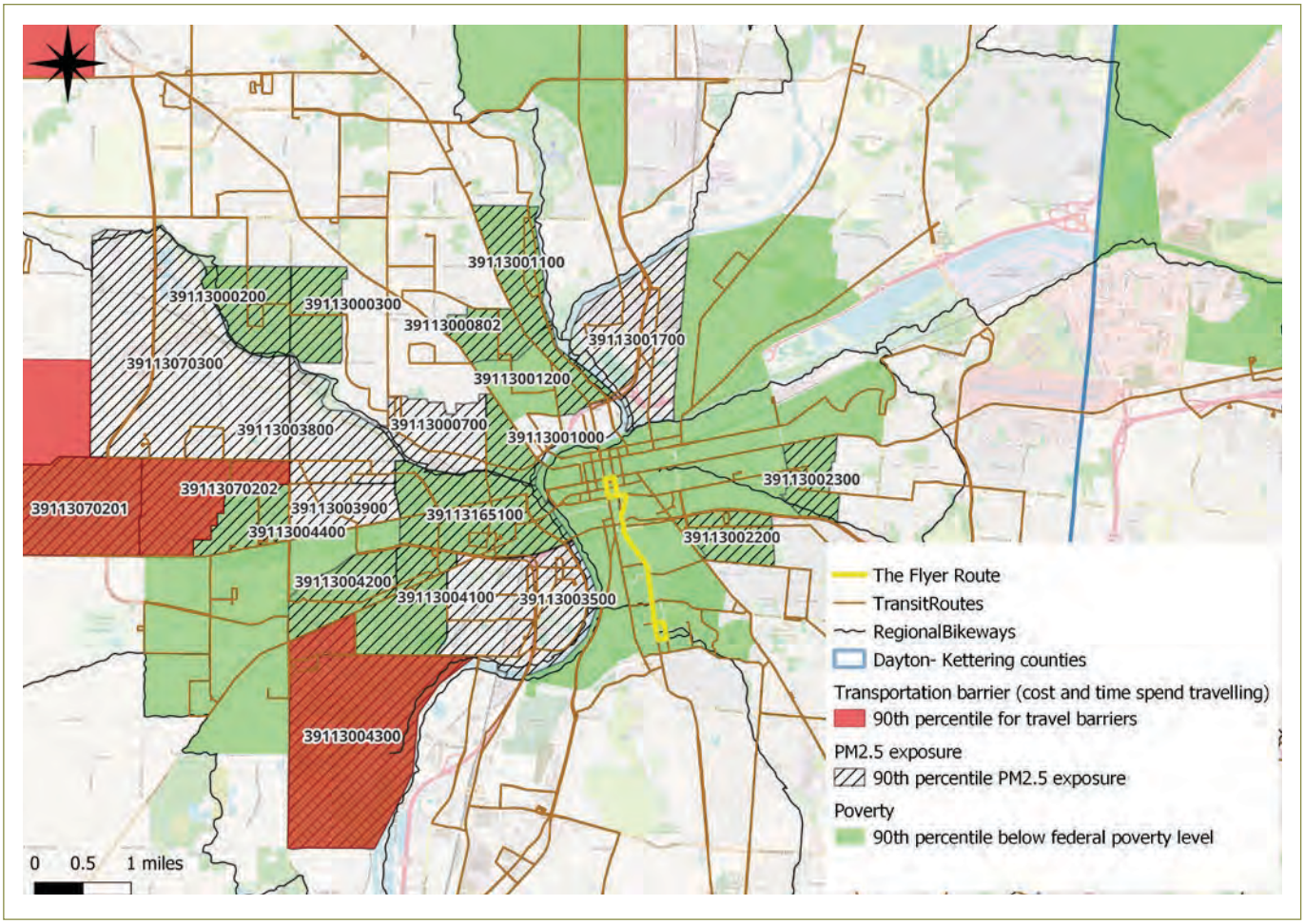


Figure 49. LIDAC census tracts possibly impacted by the expansion of the transit fleets and electrification in the City of Dayton. Source: SSG analysis.

6.4.6 Measure #7: Carbon Sequestration

Tree cover has a positive impact on neighborhoods especially in areas that are at high risk from climate impacts such as extreme heat and extreme temperature increases. In addition, tree cover and green spaces enhance mental and physical health as well as quality of life for communities, providing access to recreational activities, sports, and enjoyment of nature. This measure will have a positive impact for neighborhoods (census tracts) on the east side of the Great Miami River in the City of Dayton (EPA, 2023b) which are more likely to experience flooding during extreme rain events; and for the County of Montgomery and the County of Miami, which are projected to experience an increase in the number of days with temperatures over 100°F and 125°F.

The expansion of tree cover in the City of Dayton could have an impact on the following LIDAC communities (Figure 50):

39113001000	39113001800
39113001200	39113165100
39113001501	39113003404

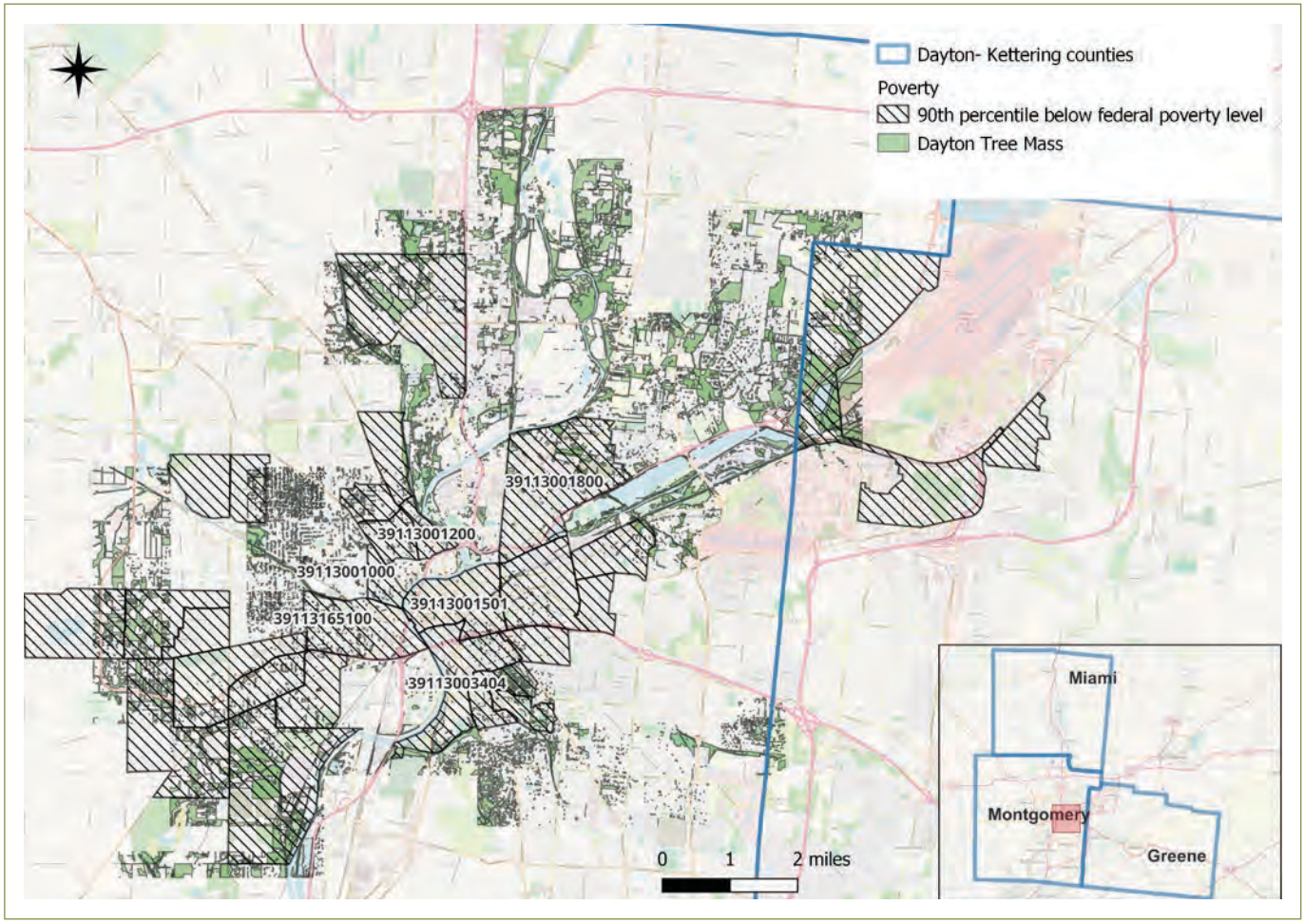


Figure 50. Census tract IDs possibly benefiting from the expansion of tree cover next to the Great Miami River. Source: SSG analysis.

6.4.7 Measure #8: Clean Cars for All

Measure #8 will provide incentives to help low-income consumers living in priority populations to replace their older higher-polluting vehicles with cleaner vehicles/ transportation by purchasing or leasing-to-own new or used hybrid, PHEV, or ZEV replacement vehicles, or an alternative mobility option (e-bike, voucher for public transit or a combination of clean transportation options). PHEV and BEV buyers are also eligible for home charger incentives or prepaid charge cards if a home charger installation is not an option.

Since this action will be implemented region-wide, it would directly target LIDACs and reduce their transportation barriers, their household costs for transportation, and diesel consumption. The impacts of this measure will intersect and complement the electrification of transit fleets, which plans to develop more public charging stations and promote charging spaces in the workplace. The following LIDAC census tracts in particular could be positively impacted by access to cleaner transportation options as they are areas that face poverty burdens and transportation barriers (Figure 51):

39113070201

39113070202

39113004300

Increasing coverage of the program to low-income households could have a positive impact on census tracts close to the City of Dayton's downtown. In addition to a reduction in household transportation cost, the measure could also improve accessibility to primary services, businesses, jobs, and green spaces.

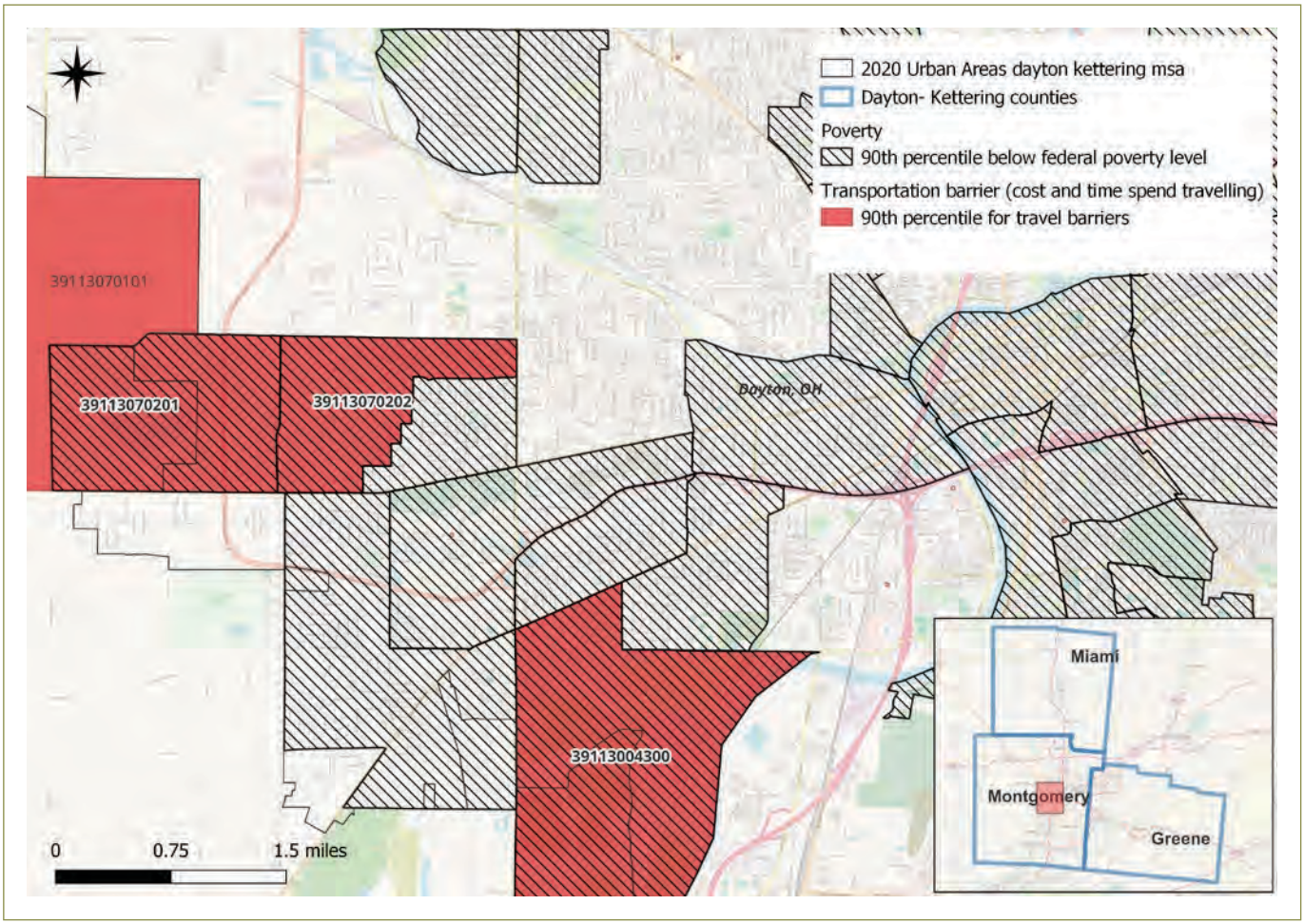


Figure 51. Census tract IDs that could directly benefit by the Clean Cars 4 All program and that currently face poverty burdens and transportation barriers.

Co-benefits from the implementation of this measure will result from the adoption of low-emissions vehicles reducing air pollution and community exposure to PM2.5 and noise reduction, especially in census tracts with a high traffic proximity index, because fewer combustion engine vehicles will be on the streets. Census tracts facing these burdens are concentrated in the City of Dayton (Figure 52). LIDAC census tracts that potentially could benefit from this measure include:

90th percentile for PM2.5 exposure:

39113003800	39113165100
39113004200	39113003500
39113002300	39113003900
39113004400	39113070201
39113002200	39113000300
39113001100	39113000700

90th percentile for PM2.5 exposure *(continuation)*:

39113004100	39113004300
39113001200	39113001700
39113070202	39113000200
39113001000	

90th percentile for traffic proximity:

39113080600	39113165200
39113001501	39113001700
39113003404	39113003500
39113001200	

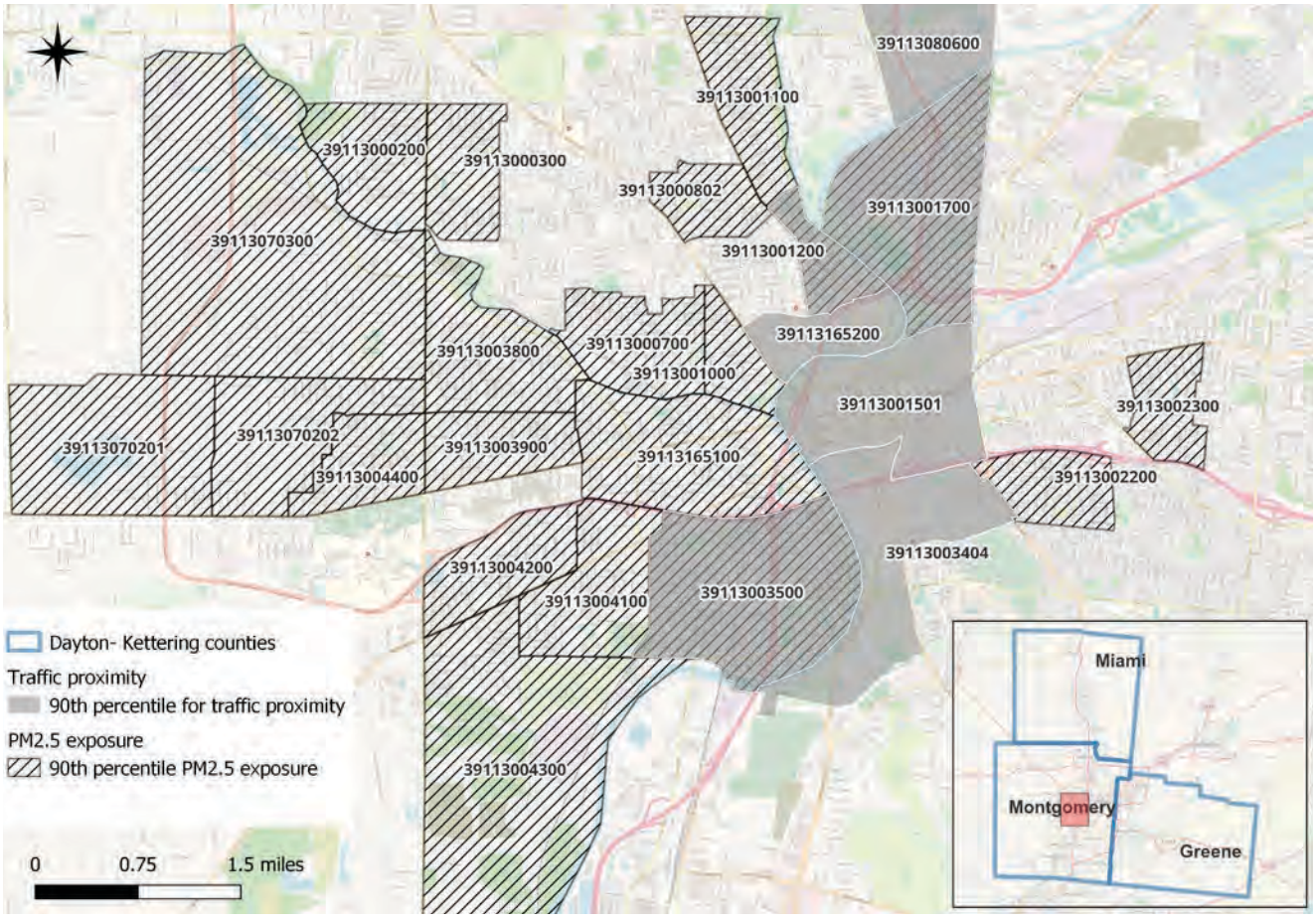


Figure 52. Census tract IDs with high PM2.5 exposure and traffic proximity. Source: SSG analysis.

6.4.8 Measure #9: Active Transportation Infrastructure

This measure will promote a higher share of active transportation modes (e.g. biking and walking) and support reductions in car trips that will reduce PM2.5 emissions, reduce traffic congestion in high concentration areas, and improve health and life expectancy (e.g. lower air pollution, increase in physical activities). The following LIDAC census tracts, in particular those facing air pollution and lower life expectancy burdens, could benefit from this action (Figure 53):

LIDACs in the 90th percentile for low life expectancy:

39113080600	39113002000	39113021501	39113080700	39113001800	39113090600
39113090302	39113002400	39113003800	39113000802	39113001900	39113001700
39113001000	39113050301	39113004200	39113000300	39113002600	39113000801
39113004300	39113070201	39113002300	39113000100	39113060200	39113003500
39113080400	39113070300	39113004400	39113000400	39113165100	39113003900
39113000900	39113070700	39113003100	39113003300	39113002800	39113021000
39113030100	39113003404	39113070600	39113001100	39113003000	39113004100
39113002500	39113070202	39113080100	39113080500	39113080300	

LIDACs in the 90th percentile for PM2.5 exposure

39113001000	39113070300	39113004400	39113001200	39113001700	39113004100
39113004300	39113003800	39113000802	39113002200	39113000200	
39113070202	39113004200	39113000300	39113001100	39113003500	
39113070201	39113002300	39113000700	39113165100	39113003900	

LIDACs in the 90th percentile for coronary heart diseases

39113001000	39113060100	39113004200	39113000700	39113060300	39113003500
39113004300	39113070201	39113002300	39113002200	39113070400	39113003900
39113000900	39113070300	39113004400	39113001800	39113070102	39113004100
39113070202	39113070700	39113003100	39113001900	39113020500	39113080500
39113080100	39113004600	39113070600	39113060200	39113001700	
39113002000	39113003800	39113080700	39113165100	39113000200	

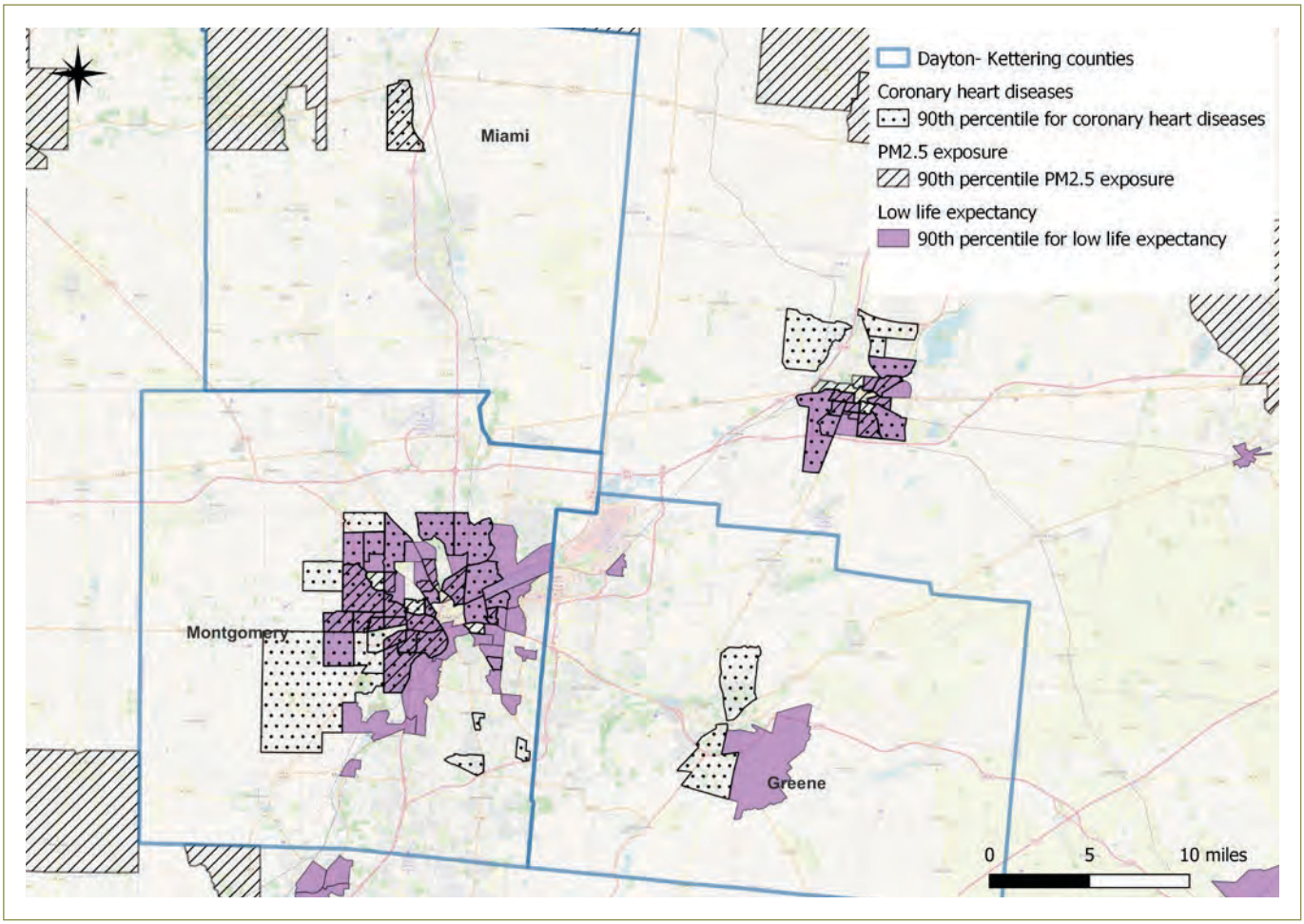


Figure 53. LIDAC census tract IDs with high percentiles for coronary heart disease, low life expectancy, and PM2.5 exposure in Miami Valley. Source: SSG analysis.

Accessible and safe active transportation options can positively impact households financially by reducing the costs of transportation (e.g. public transit, and/or private vehicle fuels and maintenance costs). They also improve access to primary services, businesses, jobs, and education. In addition, there are the co-benefits related to social interactions with more people walking and cycling. Conversely, a co-harm of autonomous transportation is a loss of jobs, especially those related to private vehicle sharing and taxis.

7 CCAP Recommendations and Next steps

The PCAP provides a foundation for more detailed analysis in the CCAP, including on projected energy and emissions across the region and within specific geographies. It highlights how specific actions can benefit LIDAC neighborhoods both directly and indirectly.

7.1 Technical Analysis

While the PCAP evaluated the impact of specific measures, the CCAP will construct a model of the Miami Valley and systematically evaluate actions and policies and their GHG impacts, financial impacts and implementation mechanisms, supported by an extensive engagement process.

Based on the technical analysis in the PCAP, recommendations for the CCAP include the following:

1. Evaluate the compounding and integrated benefit of electrification combined with clean energy on GHG reductions for key measures;
2. Identify mechanisms to specifically target LIDAC neighborhoods through policies, incentives and investments;
3. Directly involve LIDAC representatives in designing policies and mechanisms;
4. Identify transportation options for rural areas, given the relatively heavy reliance on vehicles;
5. Evaluate mechanisms to scale building weatherization or retrofits across the region;
6. Leverage the opportunity of SOPEC, a unique mechanism for aggregating renewable energy and building retrofits.
7. Evaluate a scenario for concentrated development across the region as a strategy to systematically transform transportation in Miami Valley.

7.2 Engagement Recommendations

The following recommendations are suggested as a result of the pre-engagement process for the community engagement plans and activities for the CCAP. These recommendations can be used in conjunction with the communication plans and protocols of MVRPC and its regional partners to assist with project development, increase awareness, and ensure successful implementation.

Table 7. Recommendations from the pre-engagement process

Theme	Recommendations
Stakeholder Engagement and Goal Alignment	**1.** Stakeholder-Centric Listening: Implement a structured process for listening to and understanding the unique needs of different stakeholder groups. **2.** Inclusive Goal Development**:** Facilitate workshops or focus groups to involve the community actively in setting climate action goals, ensuring their priorities are at the forefront. **3.** Transparency in Communication: Develop a clear, transparent communication plan to keep stakeholders informed about engagement processes and decisions.
Overcoming Financial and Resource Barriers	**1.** Sustainable Resource Strategies**:** Identify and propose resource optimization strategies to mitigate financial and staffing challenges in climate action. **2.** Incentive Programs: Develop incentive programs that support individuals and businesses in adopting eco-friendly practices within their budget constraints.
Prioritizing Marginalized Communities	**1.** Environmental Justice Advocacy: Advocate for and develop policies focused on addressing the challenges faced by marginalized communities, including predominantly Black neighborhoods. **2.** Technology and Accessibility Solutions: Design initiatives to improve access to eco-friendly technologies, with a focus on increasing electric vehicle usage and charging infrastructure in underserved areas. **3.** Targeted Pollution Monitoring: Create a targeted plan for monitoring and addressing climate pollution in marginalized areas, emphasizing schools and residential zones.

Targeted Outreach and Community Engagement	1. Targeted Group Engagement: Engage with specific groups such as outdoor enthusiasts and naturalists through tailored programs and events. 2. Rural and Immigrant Outreach: Implement grassroots engagement strategies in rural and immigrant communities, emphasizing education on climate change's local impact. 3. Community-Specific Messaging: Craft messages and solutions that resonate with the unique experiences of different community segments.
Educational and Communication Initiatives	1. Reimagining Public Forums: Transform public forums into more interactive and solution-focused sessions, moving beyond complaint-centric formats. 2. Climate Education Programs: Develop comprehensive education programs focusing on the impacts of climate change on local environments, health, and children. 3. Strategic Partnerships: Leverage existing partnerships and form new collaborations for broader outreach and impact.
Leveraging Technology and Media for Engagement	1. Dynamic Social Media Campaigns: Create engaging, informative social media campaigns to promote events and disseminate information. 2. Clear and Concise Messaging: Ensure all communications are straightforward, avoiding overly complex language. 3. Diverse Digital Platforms: Utilize a mix of digital platforms, including webinars, podcasts, and local events, complemented by feedback mechanisms like surveys. 4. Innovative Technology Use: Integrate various technologies like Zoom, WhatsApp, and live streaming for real-time engagement. 5. Video Content Creation: Produce short, impactful video content to convey key messages effectively and quickly.

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9 Appendices

9.1 Appendix A. GHG Inventory Method

9.1.1 Accounting Protocol

The accounting protocol for this GHG inventory is the Global Protocol for Community-Scale Greenhouse Gas Inventories (GPC).[13]

9.1.2 Background Information

Table 8. Background information

Name of jurisdiction	Dayton Kettering MSA
State	Ohio
Inventory year	2021
Geographic boundary	Greene, Miami and Montgomery Counties
Land area (km2)	4,440
Resident population	811, 078
GDP	$49.5 billion (2021)[14]
Composition of economy	483,000 jobs: Health care- 16%; Government- 16%; Retail- 11%; Manufacturing- 10%; Professional, scientific and technical services- 9%; Accommodation and food services- 8%; Other- 30%.[15]
Climate	Dayton's climate features hot, humid summers and cold, dry winters.[16]

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[15] U.S. Bureau of Economic Analysis (2023). CAEMP25N Total full-time and part-time employment by NAICS industry 1. Retrieved from: https://apps.bea.goviTable/?reqid=70&step=1&isuri=1&acrdn=5#eyJhcHBpZCI6NzAsInN0ZXBzIjpbMSwyOSwyNSwzMSwyNiwyNywzMF0sImRhdGEiOltbIlRhYmxlSWQiLCIzMyJdLFsiTWFqb3JfQXJlYSIsIjUiXSxbIlN0YXRlIixbIjUiXV0sWyJBcmVhIixbIjE5NDMwIl1dLFsiU3RhdGlzdGljIixbIi0xIl1dLFsiVW5pdF9vZl9tZWFzdXJlIiwiTGV2ZWxzIl0sWyJZZWFyIixbIjIwMjEiXV0sWyJZZWFyQmVnaW4iLCItMSJdLFsiWWVhcl9FbmQiLCItMSJdXX0=

[16] Great Lakes Integrated Sciences + Assessments (2013). Historical Climatology: Dayton, Ohio. Retrieved from: /https://graham.umich.edu/media/files/GLAA-C/Dayton/DaytonOH_Climatology.pdf

9.1.3 Reporting Sectors

Table 2 describes the sectors included and the rationale for exclusions according to the requirements of GPC.

Table 9. Reporting Sectors

Sector	Inclusion	Rationale
Stationary Energy		
Residential buildings	Yes	
Commercial and institutional buildings and facilities	Yes	
Manufacturing industries and construction	Yes	
Energy industries	Yes	
Agriculture, forestry, and fishing activities	No	IE
Non-specified sources	No	NO
Fugitive emissions from mining, processing, storage, and transportation of coal	No	NO
Fugitive emissions from oil and natural gas systems	No	NE
Transportation		
On-road	Yes	
Railways	No	NO
Waterborne navigation	No	NO
Aviation	No	NE
Off-road	No	NE
Waste		
Solid waste disposal	Yes	
Biological treatment of waste	No	NO
Incineration and open burning	No	NO
Wastewater treatment and discharge	Yes	
Industrial Processes and Product Use		
Industrial processes	Yes	
Product use	No	NO
Agriculture, Forestry and Other Land-Use (AFOLU)		
Livestock	No	NE
Land	No	NE
Aggregate sources and non-CO2 emission sources on land	Yes	

Table 10. Exclusion Rationale Notations

Notation	Definition	Description
IE	Included Elsewhere	GHG emissions for this activity are estimated and presented in another category of the inventory.
NE	Not Estimated	Emissions occur but have not been estimated or reported; justification for exclusion shall be noted in the explanation.
NO	Not Occurring	An activity or process does not occur or exist within the city.
C	Confidential	GHG emissions which could lead to the disclosure of confidential information and can therefore not be reported.

9.1.4 Inventory Tool

EPA's Local Greenhouse Gas Inventory Tool ("Inventory Tool") was used to develop the GHG Inventory. The Inventory Tool is attached as Appendix 2.

9.1.5 Data Sources

Table 11. GHG Inventory Data Sources

Inventory Tool Sector	Data Source
Stationary	U.S. Energy Information Administration Natural Gas Consumption by End Use Form EIA-176: Annual Report of Natural and Supplemental Gas Supply and Disposition, 2021
Electricity	U.S. Energy Information Administration Electricity Sales to Ultimate Customers Form EIA-861: Annual Electric Power Industry Report, 2021
Mobile	U.S. Federal Highway Administration Highway Statistics, 2021 Table VM-2 Vehicle-miles of travel, by functional system
Mobile	U.S. Federal Highway Administration Highway Statistics, 2021 Table VM-4 Distribution of Annual Vehicle Distance Traveled

Inventory Tool Sector	Data Source
Stationary, Electricity, Mobile	National Renewable Energy Laboratory Net Electricity and Natural Gas Consumption, Reference Case[17] State and Local Planning for Energy
Additional Emissions Sources	U.S. Environmental Protection Agency, Office of Atmospheric Protection Greenhouse Gas Reporting Program, 2021 Emissions by Unit and Fuel Type
Additional Emissions Sources	U.S. Environmental Protection Agency, Office of Atmospheric Protection Greenhouse Gas Reporting Program, 2021 Facility Level Information on GHGs Tool
Additional Emissions Sources	U.S. Environmental Protection Agency, Office of Atmospheric Protection Greenhouse Gas Reporting Program, 2021 Facility Report: Fairborn Cement Company LLC
Additional Emissions Sources	U.S. Environmental Protection Agency, Office of Atmospheric Protection Greenhouse Gas Reporting Program, 2021 Facility Report: Cargill Incorporated
Agriculture	U.S. Department of Agriculture National Agricultural Statistics Service, Quick Stats, 2020-2021 Commodity: Corn, Soybeans Data Item: Acres Planted, Fertilizer (Nitrogen) Applications
Urban Forestry	U.S. Forestry Service National Land Cover Database Tree Cover Canopy maps, 2021

[17] Data used to allocate Ohio energy consumption to the Dayton Kettering MSA counties.

Inventory Tool Sector	Data Source
Urban Forestry	Miami Valley Regional Planning Commission
	Miami Valley Geo-Spark
	2020 Urban Area for the Miami Valley, Ohio
Solid Waste	U.S. Environmental Protection Agency, Office of Atmospheric Protection
	Greenhouse Gas Reporting Program, 2021
	Facility Report: Stony Hollow Landfill, Inc.
Wastewater	Miami Valley Regional Planning Commission
	Miami Valley Geo-Spark
	Areawide 208/201 Facilities Planning Area (FPA) information
Wastewater	Miami Valley Regional Planning Commission
	Miami Valley Geo-Spark
	Population - Block Group

9.1.6 Global warming potential

Table 12. Global Warming Potentials (100-yr)[18]

CO2 to CO2e	1
CH4 to CO2e	30
N2O to CO2e	273

[18] Arias, P.A., N. Bellouin, E. Coppola, R.G. Jones, G. Krinner, J. Marotzke, V. Naik, M.D. Palmer, G.-K. Plattner, J. Rogelj, M. Rojas, J. Sillmann, T. Storelvmo, P.W. Thorne, B. Trewin, K. Achuta Rao, B. Adhikary, R.P. Allan, K. Armour, G. Bala, R. Barimalala, S. Berger, J.G. Canadell, C. Cassou, A. Cherchi, W. Collins, W.D. Collins, S.L. Connors, S. Corti, F. Cruz, F.J. Dentener, C. Dereczynski, A. Di Luca, A. Diongue Niang, F.J. Doblas-Reyes, A. Dosio, H. Douville, F. Engelbrecht, V. Eyring, E. Fischer, P. Forster, B. Fox-Kemper, J.S. Fuglestvedt, J.C. Fyfe, N.P. Gillett, L. Goldfarb, I. Gorodetskaya, J.M. Gutierrez, R. Hamdi, E. Hawkins, H.T. Hewitt, P. Hope, A.S. Islam, C. Jones, D.S. Kaufman, R.E. Kopp, Y. Kosaka, J. Kossin, S. Krakovska, J.-Y. Lee, J. Li, T. Mauritsen, T.K. Maycock, M. Meinshausen, S.-K. Min, P.M.S. Monteiro, T. Ngo-Duc, F. Otto, I. Pinto, A. Pirani, K. Raghavan, R. Ranasinghe, A.C. Ruane, L. Ruiz, J.-B. Sallée, B.H. Samset, S. Sathyendranath, S.I. Seneviratne, A.A. Sörensson, S. Szopa, I. Takayabu, A.-M. Tréguier, B. van den Hurk, R. Vautard, K. von Schuckmann, S. Zaehle, X. Zhang, and K. Zickfeld, 2021: Technical Summary. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 33−144. doi: 10.1017/9781009157896.002.

9.1.7 Emissions Factors

Table 13. Fuel Emissions Factors[19]

Fuel	kg CO2	kg CH4	kg N2O	Heat Content (MMBtu/ unit)	Unit
Natural Gas	54.863	0.0049	0.0001	1.0370	mcf
Digester Gas	34.106	0.0021	0.0004	0.6550	mcf
Diesel	10.21	0.0004	0.00008	0.1381	gal
LPG	6.02	0.0003	0.00006	0.0920	gal
Gasoline	8.50	0.0004	0.00007	0.1202	gal
Residual Fuel Oil No. 5	10.21	0.0004	0.00008	0.1400	gal
Residual Fuel Oil No. 6	11.27	0.0005	0.00009	0.1500	gal
Propane	5.72	0.0003	0.00005	0.0910	gal
Butane	6.67	0.0003	0.00006	0.1030	gal
Jet Fuel	9.75	0.0004	0.00008	0.1350	gal
Residential Coal	2390.90	0.2742	0.03989	24.9300	short tons
Commercial Coal	2051.40	0.2353	0.03422	21.3900	short tons
Industrial Coal	2138.58	0.2459	0.03576	22.3500	short tons
Electric Power Coal	1890.52	0.2170	0.03157	19.7300	short tons
Distillate Fuel Oil	10.281	0.0004	0.00008	0.1387	gal
Kerosene	10.150	0.0004	0.00008	0.1350	gal

[19] The Climate Registry 2021 Default Emission Factors and Emissions Factors for Greenhouse Gas Inventories, U.S EPA April 2022

Table 14. Emission Factors Per MMBtu[20]

Fuel	kg CO2	kg CH4	kg N2O	MMBtu/ Unit	
Natural Gas	52.91	0.0047	0.0001	0.001037	MMBtu/scf
Digester Gas	52.07	0.0032	0.00063	0.000655	MMBtu/scf
Jet Fuel	72.22	0.003	0.0006	0.135	MMBtu/gal
Residential Coal	95.90	0.011	0.0016	24.93	MMBtu/short ton
Commercial Coal	95.90	0.011	0.0016	21.39	MMBtu/short ton
Industrial Coal	95.69	0.011	0.0016	22.35	MMBtu/short ton
Electric Power Coal	95.82	0.011	0.0016	19.73	MMBtu/short ton

Table 15. eGRID Electricity Emission Factors for RFC West Subregion[21]

Fuel	lbs CO2/MWh	lbs CH4/MWh	lbs N2O/MWh
Electricity	1,046.13	0.095	0.014

9.1.8 Business as Usual (BAU) projection

The BAU projection is an extrapolation of GHG emissions from 2022 to 2050 using EPA's State Inventory and Projection Tool.[22] The primary input into this tool is a population projection, which is derived from state projections from the U.S. Census Bureau[23] through 2030 and national projections[24] through 2050 apportioned to states based on the 2030 population. The tool uses the population projection to calculate future fuel use by sector and fuel type. Emissions factors are applied to the fuel use to determine emissions. The emissions factors for non-electricity fuels are shown in Table 7. The projected emissions factor for grid electricity is based on the trend in Ohio electricity sector emissions and demand from the Energy Policy Simulator (EPS) by the Rocky Mountain Institute (RMI).[25] In the EPS model, fuel use for electricity generation is forecasted based on existing capacity, estimated demand, electricity generation costs, and policy assumptions such as state renewable portfolio standards.

Solid waste and wastewater emissions are scaled based on projected population. Agriculture and urban forestry emissions are held constraint from 2021 through 2050.

[20] Ibid.

[21] Emissions & Generation Resource Integrated Database (eGRID). https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid

[22] EPA (2023). State Inventory and Projection Tool. Retrieved from: https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool

[23] U.S. Census Bureau. "Current Population Reports, 1995-2030"

[24] U.S. Census Bureau. "The Baby Boom Cohort in the United States: 2012 to 2060"

[25] https://rmi.org/energy-policy-simulator/

9.2 Appendix B. Priority Actions Details

External document

9.3 Appendix C. Validation Approach

External document

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