PRIORITY CLIMATE ACTION PLAN

March 2024

ThriveTogether

A Sustainability Playbook for Greater Cincinnati

GREATER CINCINNATI

PRIORITY CLIMATE ACTION PLAN

March 2024

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ACKNOWLEDGEMENTS

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INTRODUCTION

CPRG Overview

In 2022, the Inflation Reduction Act (IRA) was passed by the United States Congress and signed into law by President Biden. Within the IRA were the provisions for the US Environmental Protection Agency (EPA) to create the Climate Pollution Reduction Grants program (CPRG), in a larger effort to tackle climate pollution, advance environmental justice and deliver cleaner air to communities. The CPRG program provides states, metropolitan statistical areas, tribes and territories with grants to develop and implement local plans to ultimately reduce GHG emissions from their economies in six key sectors (electricity generation, industry, transportation, buildings, agricultural and working lands, and waste management).

This two phase program provided noncompetitive planning grants to applicants in summer 2023 to fund the creation of the Priority Climate Action Plan (PCAP). The purpose of the PCAP is to understand current and future GHG emissions, design policies and programs to reduce these emissions, and begin collaboration with other entities and communities which will benefit and be affected by implementation.

The PCAP also provides support to the Phase 2 Competitive Implementation Grants. Any project proposed within a metro region, state, or tribal area for inclusion in a Phase 2 Grant application must be supported by one or more Implementation Measures included in that area's PCAP.

The planning grant to develop the Priority Climate Action Plan for Cincinnati's Metropolitan Statistical Area was awarded to OKI Regional Council of Governments as the lead developer. OKI collaborated with Green Umbrella and other agencies in the Plan Working Group to develop the PCAP. The group invited community members across the region to form the Plan Steering Committee, consisting of representatives from a plethora of local governments, non-profit organizations and industry.

PCAP OVERVIEW

PRELIMINARY GHG INVENTORY:
The greenhouse gas inventory is a list of emissions sources and quantification of associated emissions using a standardized method. The inventory is necessary to identify reduction opportunities and prioritize options.

IMPLEMENTATION MEASURES:
The table of Implementation Measures is compiled from the direct input of stakeholders in the region gathered primarily through the plan's website on the Citizen Lab platform. Also, the Greater Cincinnati Region has experience planning for energy-efficiency, resilience, and climate action, as summarized in this document. These previous efforts also contributed to the foundation of the list of Implementation Measures in Table 1 of this plan.

DISADVANTAGED COMMUNITIES IMPACT ANALYSIS:
This analysis is to identify communities with residents that have low incomes, limited access to resources, and/or disproportionate exposure to environmental or climate burdens. Using the EPA's Climate and Economic Justice Screening Tool, along with census tract data, the analysis identifies LIDAC communities in the region and how they will be positively impacted by the implementation of the proposed projects.

REVIEW OF AUTHORITY TO IMPLEMENT:
This section explores the landscape of existing regulation, policies, and statutory authority that impacts the implementation of the various measures of this plan.

PUBLIC ENGAGEMENT:
With a diverse and varied region, robust public engagement is the central mechanism that formulates the planning process. This section identifies the various levels of engagement and the tools used to facilitate that engagement.

LOOKING FORWARD:
This section looks ahead to the steps to come as we transition into building the Comprehensive Climate Action Plan for the Cincinnati MSA.

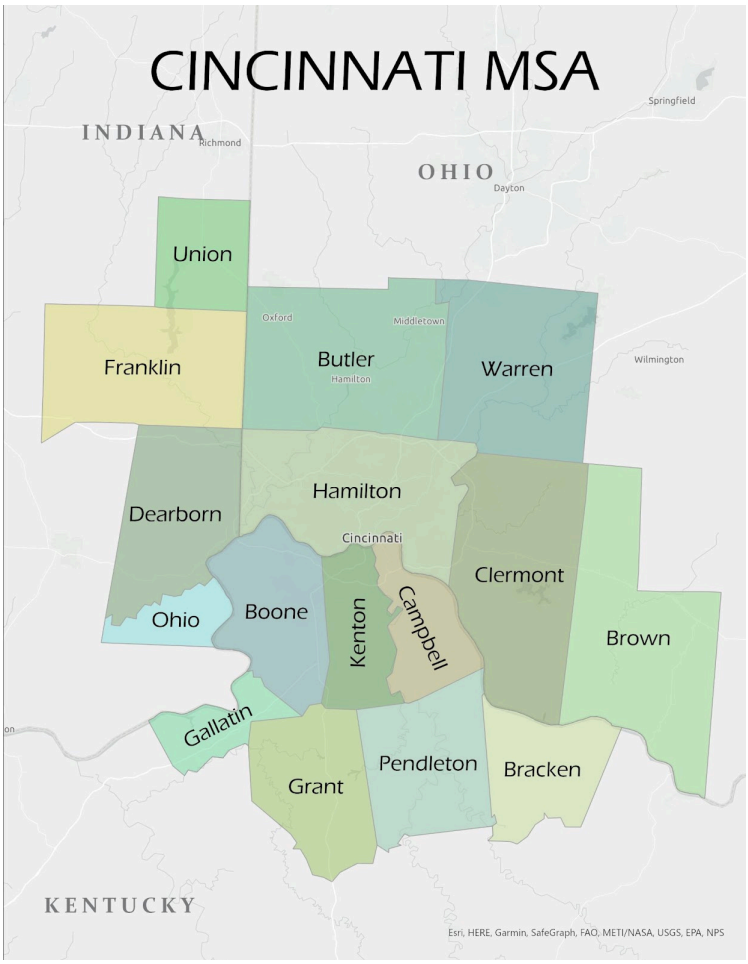
SCOPE OF THE PCAP

These plans encompass the Cincinnati Metropolitan Statistical Area (MSA), consisting of 16 counties in southwest Ohio, northern Kentucky and southeast Indiana: Union County, Franklin County, Butler County, Warren County, Franklin County, Dearborn County, Hamilton County, Boone County, Ohio County, Kenton County, Campbell County, Clermont County, Brown County, Gallatin County, Grant County, Pendleton County and Bracken County.

The region contains approximately 2.2 million residents within a diverse economy. The area was once dotted with coal burning power plants, all that have closed but one. Transportation is the key source of emissions in the region, both from local commuters and long distance freights passing through on the extensive interstate system.

Both rural, suburban and urban, the region contains a diverse collection of peoples, industry, and government entities, and therefore a multi-faceted, community engaging approach to combating the climate crisis is necessary.

Figure 1: Map of Cincinnati Metropolitan Statistical Area



ENERGY LANDSCAPE

OHIO --- In 2022, according to the US Energy Information Administration, 37% of electricity used by Ohioans was coal-fired and 51% from natural gas. Ohio also has 2 nuclear energy plants which provide 12% of the state's electricity generation. The residential sector uses almost 36% of the state's total electricity, followed by the industrial sector at 34% and the commercial sector making up 31% of Ohio's electricity consumption. Therefore it takes a combination of households, businesses and industry in targeting renewable electricity consumption.

The City of Cincinnati has made an ambitious goal to power their facilities using 100% renewable energy by 2035. Currently, more than 80% of City residents are powering their homes with 100% renewable energy.

KENTUCKY --- A majority of Kentucky's energy usage is in the industrial sector, accounting for 36% of total end-use energy consumption. This sector mainly consists of food, beverage and tobacco products, along with coal mining and petroleum refining. The transportation sector then makes up about 30% of energy consumption, followed by the residential sector at 20% and commercial at 14% of the state's energy use. Kentucky is the fifth largest coal producer among states and powers 68% of its electricity from coal. Natural gas powers 25% of Kentucky's electricity, followed by small scale hydroelectric, biomass, and solar energy productions.

The state of Kentucky does not have a renewable energy standard to require a specific amount of renewable electricity.

INDIANA --- Kentucky in 2022, Indiana was the nation's third largest coal consumer, mostly used for electric power generation and industry. Coal powered electricity has declined in recent years, and made up 52% of Indiana's power generation in 2022. 33% is from natural gas sources and renewables, primarily wind, supply 12% of electricity. Industry consumes 43% of Indiana's electricity consumption, followed by residential (34%) and commercial (23%).

PREVIOUS CLIMATE PLANNING EFFORTS

City of Cincinnati

The City of Cincinnati adopted its climate action plan, the Green Cincinnati Plan in 2008. It has since updated this plan twice – most recently in 2023. In the 2023 update, Cincinnati set the ambitious goal to reach carbon neutrality by 2050 and the plan establishes a roadmap of 30 goals, 40 strategies and 130 actions to reach this goal. One of the city's priorities with the plan is to inspire similar efforts from other local governments in the region. The City is a member of the Plan Working Group, and will be involved in the formulation of this regional Climate Pollution Reduction Plan. Their experience in producing, implementing, and updating a climate action plan will be valuable to our effort.

OKI Regional Council of Governments

In 2023, OKI Regional Council of Governments created the *How Do We Grow From Here? – Strategic Regional Policy Plan*, a vision for regional vitality sustainability and competitiveness across the 8-county OKI region. The plan encompasses transportation, public facilities, natural systems, housing, economic development and land use, with an overarching focus on sustainable, clean solutions. Additionally, in 2020 the OKI 2050 Metropolitan Transportation Plan was approved: a collection of innovative transportation solutions that support the goals and economy of the Greater Cincinnati area.

From 2017 through 2020, OKI Regional Council of Governments leveraged a grant to produce local Energy Efficiency Plans for eight local governments in southwest Ohio. The eight communities have all prepared energy plans in partnership with OKI. Although generally based on content from the US Department of Energy's guide on producing a local energy plan, OKI worked with each local government to tailor each plan to their situation. Each plan addressed a range of energy-related topics, including multiple avenues of public input, and included an energy audit of local government facilities. The project also dedicated over $130,000 toward sub-grants to the participating local governments to begin the implementation of their plans.

Green Umbrella

As Greater Cincinnati's Regional Climate Collaborative, Green Umbrella leads a network committed to taking decisive action in the face of climate change. Green Umbrella helps regional communities become more climate resilient and equitable, and work collectively to decrease our region's emissions. Green Umbrella serves a 10-county region in Greater Cincinnati, consisting of dozens of urban and rural communities spanning Southwest Ohio, Northern Kentucky, and Southeast Indiana. This segment of the Ohio River Valley has a population of over 2.2 million community members living across 188 individual jurisdictions, including cities, towns, townships, and villages.

Green Umbrella hosts five staffed programs including the Cincinnati 2030 District, which works to draw down commercial building emissions, the Greater Cincinnati Food Policy Council and which centers climate action in food systems, and several greenspace initiatives that prioritize carbon sequestration strategies. Green Umbrella also hosts three cohort programs: a Climate Action Fellowship for local governments, a Climate Research Incubator for researchers, and annual training and forums for local climate candidates.

Green Umbrella has also established the Climate Safe Neighborhoods Partnership with Groundwork Ohio River Valley, which explores the relationship between historically race-based housing segregation and the current and predicted impacts of climate change. The Partnership developed neighborhood Climate Advisory Groups to identify solutions to address extreme heat and flooding. Through intentional engagement with residents in priority communities, the effort honors community members as the subject matter experts in identifying local issues and co-creating community-based solutions. This partnership led the development of climate action plans for 10 disadvantaged urban neighborhoods in Cincinnati and Norwood, OH, and will be expanding into Northern Kentucky in 2024.

Green Umbrella is also a lead partner every five years in the development and finalization of the City of Cincinnati's Green Cincinnati Plan, including leading Climate Safe Neighborhoods engagement and a Climate Equity Benchmarking Analysis Report.

PRELIMINARY GHG INVENTORY

To complete the GHG Inventory for the Cincinnati Priority Climate Action Plan (PCAP), the Working Group hired UNPREDICTABLE City, an Ohio-based consulting firm. The GHG Inventory adhered to a Quality Assurance Project Plan (QAPP) filed with and approved by the US EPA. The information below is a preliminary report of this GHG Inventory, and will be updated for inclusion in the Comprehensive Climate Action Plan (CCAP).

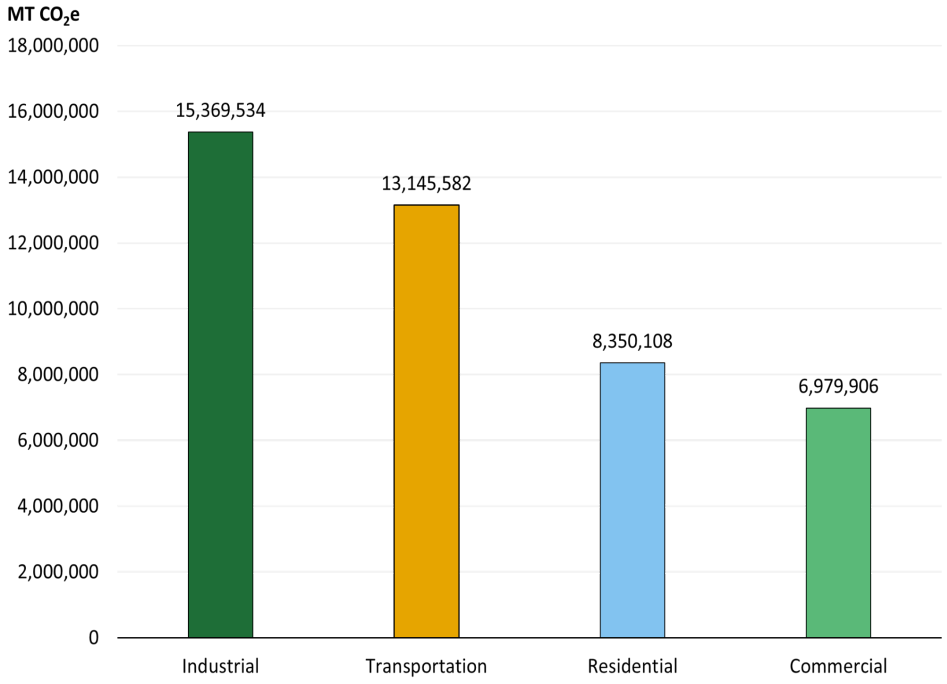
GHG Accounting Method

The processes to estimate and account for emissions in various sectors and among various sources adhere to guidelines set forth by the US EPA and utilize the LGGIT tool specifically developed to compile a regional GHG inventory. The full methodology is attached as Appendix A at the end of this document.

Emissions by Sector

2022 emissions for the region total **43.8 million metric tons** of carbon dioxide equivalents (MT CO2e). This equates to roughly **19.5 MT CO2e per capita** for the region. As a reference, in 2021 the average per capita emissions for the entire US is 19.1 MT CO2e (although this varies widely by state).

Figure 2 Emissions by Analysis Sector



As a percent of total:

- Industrial = 35%
- Transportation = 30%
- Residential = 19%
- Commercial = 16%

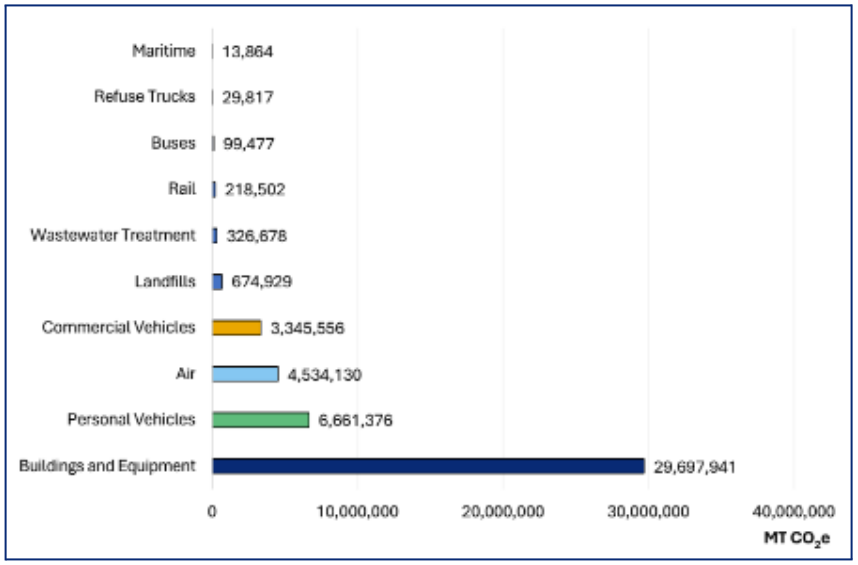
Points of Note

The transportation sector includes emissions from residential, commercial, and industrial sector activities. The commercial sector includes waste and wastewater treatment. These values are considered gross emissions and do not include any offsets or carbon credit mechanisms.

Emissions by Sub-Category

Buildings and equipment are the largest source of emissions based on their subcategory, primarily driven by electricity and natural gas consumption.

Figure 3 Emissions by Sub-Category



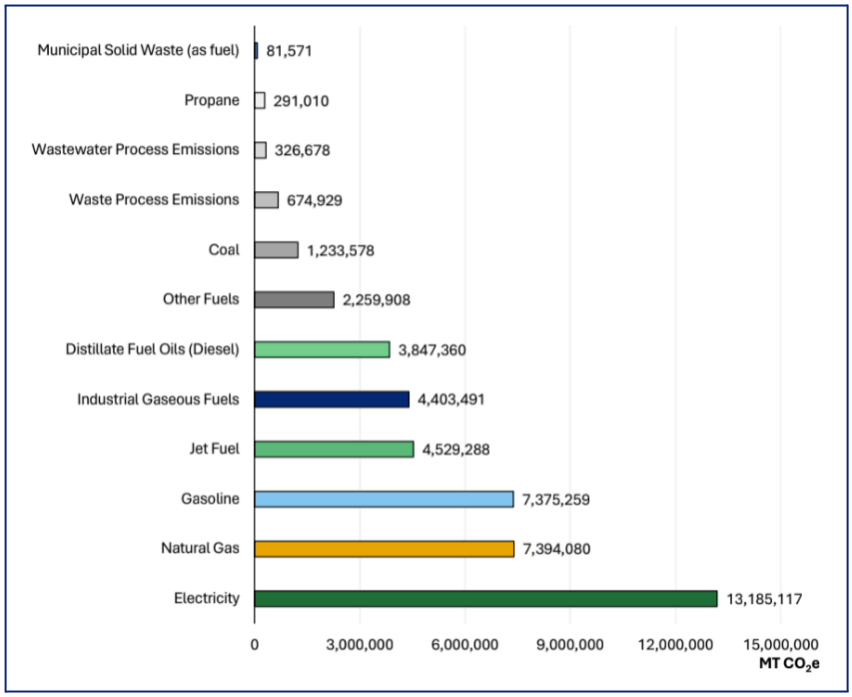
As a percent of total:

- Buildings and Equipment = 65%
- Personal Vehicles = 15%
- Air = 10%
- Commercial Vehicles = 7%
- Landfills = 1%
- Wastewater Treatment = 1%
- Rail = 0.5%
- Buses = 0.2%
- Refuse Trucks = 0.1%
- Maritime = 0.03%

Emissions by Source/Fuel

Buildings and equipment are the largest source of emissions based on their subcategory, primarily driven by electricity and natural gas consumption.

Figure 4 Emissions by Source/Fuel



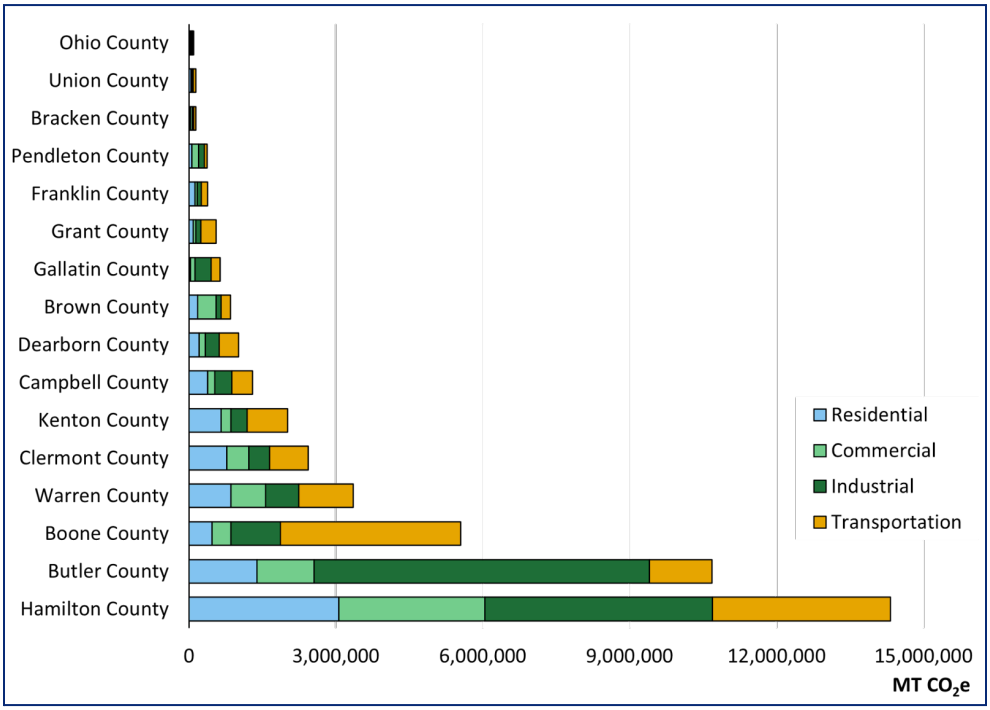
As a percent of total:

- Electricity = 29%
- Natural Gas = 16%
- Gasoline = 16%
- Jet Fuel = 10%
- Industrial Gaseous Fuels = 10%
- Diesel = 8%
- Other Fuels = 5%
- Coal = 3%
- Waste Process Emissions = 1%
- Wastewater Process Emissions = 1%
- Propane = 1%
- Municipal Solid Waste = 0.2%

Emissions by County and Sector

70% of the region's emissions are produced in 3 counties: Hamilton, Butler and Boone County. The graph presents the amount of emissions per county with indicators of sector.

Figure 5 - Emissions by County and Sector



The table below presents the percentage that each county contributes to the sector total, and for overall emissions.

Figure 6 - Percentage of Emissions by County and Sector

	Commercial	Industrial	Residential	Transportation	County Total
Hamilton County	43%	30%	37%	28%	33%
Butler County	17%	45%	17%	10%	24%
Boone County	6%	7%	6%	28%	13%
Warren County	10%	4%	10%	8%	8%
Clermont County	6%	3%	9%	6%	6%
Kenton County	3%	2%	8%	6%	5%
Campbell County	2%	2%	5%	3%	3%
Dearborn County	2%	2%	2%	3%	2%
Brown County	5%	1%	2%	2%	2%
Gallatin County	1%	2%	0%	1%	1%
Grant County	1%	1%	1%	2%	1%
Franklin County	1%	1%	1%	1%	1%
Pendleton County	2%	1%	1%	0%	1%
Bracken County	1%	0%	0%	0%	0%
Union County	0%	0%	0%	0%	0%
Ohio County	0%	0%	0%	0%	0%
OKI Total	100%	100%	100%	100%	**100%**

GREENHOUSE GAS REDUCTION MEASURES

Sector	Measure	Associated actions	Timeframe	Other Funding Sources	Regional GHG Benefits	LIDAC Benefits	Associated Metrics	Authority to Implement	Stakeholders
1. Transportation	1.A Buildout a robust EV charging network	1.A.1 Continue to track EV charging stations and EV registrations to reliably identify gaps and needs within the region's charging network	Short-term		335,176,050 kg CO2	EV charging in LIDAC communities can reduce air pollution in targeted areas, create job opportunities and increase resident mobility. https://www.smartcitiesdive.com/news/how-cities-can-center-equity-in-ev-charging/645120/https://www.smartcitiesdive.com/news/how-cities-can-center-equity-in-ev-charging/645120/		Currently being done under local authority	
		1.A.2 Continue to provide access to funding to help local governments provide EV charging points at public buildings, parks, airports, and other locations for public use.	Ongoing	Carbon Reduction Program (CRP) - the region receives $4 million annually from this program.		Homeownership can be a barrier for energy transition. Expanding access to EV charging ports for public use can fill the disparity in access. https://www.energy.gov/scep/blueprint-4b-ev-charging-infrastructure-community		OKI distributes Carbon Reduction Program (CRP) funding for publicly-accessible EV charging stations as a competitive grant program.	
		1.A.3 Develop EV hubs that support transit ridership and/or public or private fleet vehicle operations including infrastructure needed to support charging lots.	Mid-term	Carbon Reduction Program (CRP) - the region receives $4 million annually from this program.	628,232kg CO2	Communities dependent on public transportation and supporting infrastructure is necessary to ensure reliable access. https://greenlining.org/electric-vehicles-toolkit/making-evs-practical-accessible/		Can be done under local authority	
	1.B Convert public and private vehicle fleets to Electric Vehicles	1.B.1 Support fleet EV and alternative fuel vehicle purchases for local government, school districts, and transit.	Mid-term	Diesel Emissions Reduction Act (DERA) - US EPA distributed to states via block grant to fund the following: Diesel Emission Reduction Grants (DERG) - Ohio EPA; Clean Diesel Grant Program - Kentucky Transportation Cabinet; DieselWise - Indiana Dept of Enviornmental Management (IDEM)	742,500,000,000kg CO2	Shifting to electric vehicle fleets facilitates infrastructure improvements and upgrades, creating work opportunities. https://www.transportation.gov/urban-e-mobility-toolkit/e-mobility-benefits-and-challenges/community-benefits		Can be done under local authority	ODOT Cooperative Contracts Program
		1.B.2 Support use of battery electric locomotives in local rail freight operations.	Short-term		387kg CO2	Improved resiliency in communities facing challenges maintaining power generation in extreme weather events, job creation. https://newscenter.lbl.gov/2021/11/23/big-batteries-on-wheels-can-deliver-zero-emissions-rail-while-securing-the-grid/		Can be done under local authority	
		1.B.3 Provide case studies/examples to lower mystery and demonstrate effectiveness of low/zero emission vehicles to local governments.	Ongoing					Can be done under local authority	
		1.B.4 Support the use of electric Uncrewed Aerial Vehicles (UAVs) and Vertical Take-Off and Landing (e-VTOLs) to replace diesel truck trips within the region.	Long-term			Education and community engagement in LIDAC communities, workforce, and infrastructure training opportunities, and community-led research. https://www.law.berkeley.edu/wp-content/uploads/2022/11/CaseStudy_DeployingZeroEmissions.pdf		Need FAA authorization of aircraft and flight plans	

GREENHOUSE GAS REDUCTION MEASURES

Sector	Measure	Associated actions	Timeframe	Other Funding Sources	Regional GHG Benefits	LIDAC Benefits	Associated Metrics	Authority to Implement	Stakeholders
	1.C Encourage the use of transit, non-motorized vehicle, or walking for more trips within the region	1.C.1 Improve bike and pedestrian connectivity so that residents can safely access the places they need to go and transit for longer trips.	Ongoing	Transportation Alternatives Funding - US DOT via block grants to states / MPOs	62,784kg CO2	Improved bike and pedestrian connectivity in LIDAC residential areas improves resident accessibility to resources and needs https://www.urban.org/urban-wire/why-us-cities-are-investing-safer-more-connected-cycling-infrastructure		Can be done under local authority	Tri-State Trails
		1.C.2 Improve regional transit connectivity and service to provide an attractive, reliable, and efficient option for travel.	Ongoing			Increased access to essential services, jobs, education, and recreation while alleviating financial burdens for low-income individuals. https://nascsp.org/wp-content/uploads/2018/02/issuebrief-benefitsofruralpublictransportation.pdf		Can be done under local authority	METRO, SORTA, TANK
		1.C.3 Use incentives to grow transit ridership to improve efficiency and reduce emissions	Mid-term		835,526,857.25kg CO2	Giving incentives for desired behaviors is a method of getting first-time customers and increasing the user base, and encouraging participation. https://transweb.sjsu.edu/sites/default/files/1797-Ferrell-Loyalty-Rewards-Incentives-Increase-Transit-Ridershi.pdf		Can be done under local authority	METRO, SORTA, TANK
		1.C.4 Provide needed infrastructure support for Bus Rapid Transit, including transit centers and park & ride facilities.	Mid-term			Expansion of affordable public transit systems to connect low-income communities to new environments, education, resources and higher paying jobs. https://ssir.org/articles/entry/achieving_healthy_communities_through_transit_equity		Site developments subject to local zoning authority. ROW improvements subject to local authority or state DOT approval on state routes.	METRO, SORTA, TANK
		1.C.5 Provide improvements that make transit easier and more attractive to use, including language services for non-english speakers.	Ongoing			Assistance to those new to public transportation, materials to help familiarize people with the transit system in more many formats and languages. https://www.c40knowledgehub.org/s/article/		Can be done under local authority	METRO, SORTA, TANK
		1.C.6 Develop more affordable housing close to good transit service.	Long-term			Aids in the creation of a connected community. Building affordable housing on or near transit lines offers access to employment, healthy food, schools, and downtown areas. https://www.huduser.gov/portal/pdredge/pdr_edge_research_071414.html https://ternercenter.berkeley.edu/wp-content/uploads/2023/09/Housing-Abundance-Near-Transit-Freemark-2023-final.pdf		Subject to local zoning authority.	
	1.D Use technology, sound roadway network design, and policy to reduce areas of persistant traffic congestion	1.D.1 Continue to support the use of roundabouts at appropriate intersections to reduce delay and avoid unnecessary signals.	Ongoing			Less idling of cars in areas of high congestion and are shown to be safer for pedestrians and cyclists. In rural intersections roundabouts found significant reductions in crashes and injury related to crashes. https://wsdot.wa.gov/travel/traffic-safety-methods/roundabouts https://www.iihs.org/topics/roundabouts		ROW improvements subject to local authority or state DOT approval on state routes.	
		1.D.2 Provide jurisdictions studies of traffic lights to reduce wait time. Time traffic lights.	Mid-term			Delays and idling vehicles expel tons of carbon dioxide. Enhances safety as signal timing reduces abrupt stops. https://www.wired.com/story/googles-ai-traffic-lights-driving-annoying/		Can be done under local authority	

GREENHOUSE GAS REDUCTION MEASURES

Sector	Measure	Associated actions	Timeframe	Other Funding Sources	Regional GHG Benefits	LIDAC Benefits	Associated Metrics	Authority to Implement	Stakeholders
		1.D.3 Use data on trip origin/destination and traffic congestion to support reccomendations to large employers to adjust timing of shift changes.	Short-term			LIDAC rider data could show shorter trip times but they may spend a greater time accessing or waiting for transit and in moving vehicles, thus the entire trip's speed may be lower. https://www.sciencedirect.com/science/article/pii/S0965856423001763?via%3Dihub		Can be done under local authority	
	1.E Support local development of sustainable aviation fuel	1.E.1 Advance efforts to develop and utilize sustainable aviation fuel via feasibility studies and/or infrastructure.	Long-term			Creation of jobs, particularly in fields such as manufacturing, and research and development. https://www.energy.gov/sites/default/files/2020/09/f78/beto-sust-aviation-fuel-sep-2020.pdf		Need aircraft manufacturer and FAA approval?	Airlines and aircraft manufacturers
	1.F Support regional, intrastate, and interstate rail projects that move travellers more efficiently.	1.F.1 Support ongoing intra/interstate Amtrak projects. Develop proposal for regional system.	Long-term		10,055.25kg CO2	Expands options for rural and smaller urban community citizens with increased transfer points. Aids in airport and highway congestion. https://www.apta.com/research-technical-resources/high-speed-passenger-rail/benefits-of-high-speed-rail-for-the-united-states/		Plans driven at federal and state levels.	
		1.F.2 Implement programs to bridge the gap between rail travel and local destinations and movement while at the destination.	Long-term			More transfer points and connectibity between rail and local travel will allow LIDAC communities. According to the 2010 census, 41.8 million Americans age 18+ have disabilities, 40 million are age 65+, and 32 million are living below the poverty level. Many of these people have very few mobility options to meet their basic travel needs. https://nascsp.org/wp-content/uploads/2018/02/issuebrief-benefitsofruralpublictransportation.pdf https://www.transit.dot.gov/sites/fta.dot.gov/files/FTA_Report_No._0030.pdf		Can be done under local authority	METRO, SORTA, TANK, Tri-State Trails
2. Electric Power	2.A Replace the region's streetlights with LED fixtures	2.A.1 Provide funding support through loans and grants to local govenments to support the conversion of street lights to LED fixtures	Mid-term		70,557,607 CO2	LED fixtures reduce the energy used by local governments and lowers local governments' operating expenses. This, in turn, leads to lower tax burden on every resident of the community. https://www.aceee.org/toolkit/2015/01/reducing-energy-use-public-outdoor-lighting		Can be done under local authority	
	2.B Further develop renewable energy generation in the region	2.B.1 Develop community solar to support local non-profits and community-based groups.	Mid-term		2,459,037 CO2	Community solar projects are one way to help households without access to a rooftop to subscribe to solar. https://www.triplepundit.com/story/2023/buisness-support-community-solar/791521		Community solar not currently permitted in Ohio, Kentucky, or Indiana	Green Umbrella
		2.B.2 Support the implementation of municipal virtual power plants	Mid-term			Can provide energy in places of high demand, in extreme weather events and reduce overall energy costs https://neep.org/blog/virtual-power-plants-are-key-resilient-clean-energy-grid		Must partner with a licensed utility.	Green Umbrella

GREENHOUSE GAS REDUCTION MEASURES

Sector	Measure	Associated actions	Timeframe	Other Funding Sources	Regional GHG Benefits	LIDAC Benefits	Associated Metrics	Authority to Implement	Stakeholders
		2B.3 Support solar installations for local governments through financing options that are tailored for their situation	Mid-term			Solar deployment has increased rapidly, allowing more communities to access the benefits of solar PV and begin in local planning such as resilience planning, sustainability planning, and climate action planning. https://www.energy.gov/eere/solar/local-government-guide-solar-deployment		Net metering is not permitted in Kentucky. In Ohio, a maximum of 20% of the meter's usage can be sent to the grid under net-metering limits.	Green Umbrella
		2.B.4 Continue the development of hydropower along the Ohio and Great Miami Rivers.	Mid-term			Governments are starting to notice that, when done right, hydropower offers immense potential to electrify rural communities with clean energy and support the expansion of other renewables. https://h2oglobalnews.com/small-hydro-makes-big-splash-for-remote-communities/		Subject to approvals from Army Corp of Engineers. Similar projects have been approved on the Ohio and Great Miami Rivers.	
		2.B.5 Encourage the development of private solar installations, especially the utilization of large rooftops for solar or solar development on dormant landfills.	Mid-term			By installing solar on closed landfills, states and municipalities advance local solar energy while repurposing relatively large, vacant sites within communities with limited reuse potential. https://rmi.org/insight/the-future-of-landfills-is-bright/?utm_source=pocket_mylist		Subject to net metering restrictions currently in place in Ohio, Kentucky and Indinana.	Green Umbrella
		2.B.6 Increase adoption of SolSmart principles by area local governments to make the installation of solar easier and less costly in the region	Short-term			No cost technical assistance to communities to identify local energy priorities and strategies to make solar accessible and affordable. https://www.energy.gov/eere/articles/doe-funded-solsmart-program-expands-advance-equitable-solar-energy-adoption		Can be done under local authority	Green Umbrella, Local governments, Installers, Workforce development programs
	2.C Help Communities, businesses, and residents procure electricity generated using clean and renewable energy sources	2.C.1 Encourage community aggregation programs that include or are exclusively renewable energy.	Short-term		2,459,037 CO2	Aggregated buying groups purchase gas and electric generation on behalf of the community at competitive prices and pass savings along to residents. https://www.epa.gov/green-power-markets/community-choice-aggregation		Energy aggregation only available in Ohio.	Green Umbrella
		2.C.2 Increase the region's low and moderate income households' access to inexpensive renewable energy.	Mid-term			LIDAC communities have not historically been included in solar conversations. Savings on energy costs may be overlooked due to unfamiliarity. https://www.nrel.gov/state-local-tribal/lmi-solar.html		More avenues open in Ohio through consumer energy choice and aggregation.	
		2.C.3 Support the adoption of Renewable Portfolio Standards policies.	Mid-term			Low-Income Bonus Credit Program, allowing the transition to wind and solar energy to be more affordable for families and communities https://home.treasury.gov/news/featured-stories/the-low-income-communities-bonus-credit-program-our-approach-to-an-inclusive-clean-energy-economy			Green Umbrella
		2.C.4 Implement a carbon earnings tax and dividend to low-income and low polluters.	Mid-term			A carbon tax becomes affordable when the money collected from fossil fuel companies is given as a dividend to low-and-middle-income Americans who otherwise might not be able to afford the transition. https://citizensclimatelobby.org/remi-report/			Requires equitable outreach

GREENHOUSE GAS REDUCTION MEASURES

Sector	Measure	Associated actions	Timeframe	Other Funding Sources	Regional GHG Benefits	LIDAC Benefits	Associated Metrics	Authority to Implement	Stakeholders
		2.C.5 Streamline utility grid permitting.	Mid-term			Investment and good-paying jobs in communities otherwise excluded in economic development initiatives. https://www.energy.gov/gdo/articles/modernizing-our-grid-means-economic-development-disadvantaged-communities-across-us		Utility grid infrastructure permitting rests with federal and state regulators and law.	
3. Buildings	3.A Improve the Energy Efficiency of local governments, schools, and non-proffits in the region	3.A.1 Create a fiscally-positive revolving loan fund or grant opportunity to finance energy-efficient and/or solar improvements for local and county public entities (governments, schools, libraries, park districts, etc.) in the region.	Mid-term	National Clean Investment Fund - part of EPA GGRF; Also included in OEPA statewide Phase 2 application		Funds would be used to finance energy-efficient improvements in public resources and services benefitting the public directly. https://www.iea.org/commentaries/how-to-maximise-the-social-benefits-of-clean-energy-policies-for-low-income-households			
		3.A.2 Help connect non-profit organizations with funding for energy efficiency and solar.	Short-term			Connecting these frontline organizations to funding can allow for better distribution of funds throughout the community and community leadership in projects. https://www.energy.gov/communitysolar/community-power-acceleratortm			
		3.A.3 Conduct energy audits and make energy efficient building upgrades to public buildings	Short-term			Upgrading energy systems in public buildings can increase resilience to outages and extreme weather events. Low-income communities are often more vulnerable to the impacts of climate change and less equipped to deal with disruptions to essential services https://utilitiesone.com/improving-resilience-and-sustainability-in-facilities-through-energy-audits			
	3.B Improve the energy efficiency of commercial buildings	3.B.1 Adopt Energy Efficient Portfolio standards	Mid-term		435,176 CO2	Adopting standards influence practices. Regulators play a role in encouraging utilities to invest in equitable programs that reach low income communities. Comphension about how these programs fit into utility portfolios. https://www.aceee.org/toolkit/2021/04/supporting-low-income-energy-efficiency-guide-utility-regulators			
		3.B.2 Support foundational work, such as the regional 2030 District as they develop methods to achieving building efficiency goals.	Short-term		435,176 CO2	Foundational work focused on reducing energy consumption, lowering carbon emissions, and improving overall building performance, which can lead to several direct and indirect benefits for these communities. Actively involving communities in the implementation of phases of energy effiecincy projects ensures needs and input is heard. https://innovation.luskin.ucla.edu/transformative-climate-communities/#toggle-id-6-closed			
	3.C Improve the Energy Efficiency of residential dwellings in the region	3.C.1 Expand the number of households in the region served by the Home Weatherization Assistance Program	Mid-term			Expansion of HWAP would contribute significant savings in overall energy consumption and rduction in energy bills for residents. https://www.energy.gov/sites/default/files/2021/01/f82/WAP-fact-sheet_2021_0.pdf			Workforce development programs

GREENHOUSE GAS REDUCTION MEASURES

Sector	Measure	Associated actions	Timeframe	Other Funding Sources	Regional GHG Benefits	LIDAC Benefits	Associated Metrics	Authority to Implement	Stakeholders
		3.C.2 Provide incentives to replace inefficient household appliances and HVAC equipment with new electric-based equipment	Short-term			Provides LIDAC communities access to modern, efficient technology that otherwise would be cost prohibited. https://www.americanprogress.org/article/how-states-can-equitably-deliver-home-electrification-rebates/			
		3.C.3 Encourage the development of residential units that are more energy efficient / adopt enhanced energy efficiency standards	Mid-term			97% of excess energy burdens for renting households could be eliminated by bring homes to median standards. https://localhousingsolutions.org/housing-policy-library/energy-efficiency-standards/			
		3.C.4 Incentivize energy-effiicent improvements through a property tax abatement program.	Mid-term		435,176 CO2	Assist LMI residents in paying for energy saving upgrades https://betterbuildingssolutioncenter.energy.gov/bca/residential-incentives			Green Umbrella
		3.C.5 Expand the MowGreener program in the region to electrify lawn care equipment	Short-term						
	3.D Adopt development patterns that are proven to be more energy-efficient and support energy efficient transportation	3.D.1 Conserve embodied carbon in existing buildings by avoiding demolition of existing buildings where possible.	Ongoing			"Prioritizing existing buildings, materials, and infrastructure, encouraging the use of low-carbon materials or the efficient use of materials, planning for deconstruction and reuse, reducing waste, and reducing the carbon impact of construction, are all ways that city officials are tackling embodied carbon." https://rmi.org/embodied-carbon-cities-policy-toolkit/			
		3.D.2 Promote Transit oriented development zoning and incentives for this type of development.	Short-term						
		3.D.3 Adopt cluster-style development in rural areas to reduce infrastructure and preserve agricultural and forrested lands.	Mid-term			Cluster development provides multiple benefits to small and rural towns. This development style can preserve existing natural characteristics, contribute to community character, and increase available housing. https://planning.org/blog/9227411/active-living-opportunities-through-cluster-housing/			
		3.D.4 Enhance energy standards for new construction to reduce the life-cycle carbon emmissions of new buildings. Do this through the promotion of model codes to be adopted by applicable jurisdictions.	Mid-term			Savings in energy costs for residents using new buildings and job opportunities associated industries. https://www.architecture2030.org/zero-code/			
	3.E Involve citizens in the effort to reduce GHG emissions	3.E.1 Hold events that build awareness and focus energy around reducing GHG emissions in the region	Short-term			Citizen involvement creates community investment in prohects around reducing GHG emissons. Events given individuals opportunities for education and participation. https://www.iea.org/commentaries/empowering-people-the-role-of-local-energy-communities-in-clean-energy-transitions			Green Umbrella
		3.E.2 Leverage existing coalitions (WeThrive, LiveWell) as community mobilizers (health in all policies).	Short-term			Existing coalitions have built trust in thier communities and can aid to education, faciliation, implementation and communication among local residents. https://publications.jsi.com/JSIInternet/Inc/Common/_download_pub.cfm?id=14333&lid=3			

GREENHOUSE GAS REDUCTION MEASURES

Sector	Measure	Associated actions	Timeframe	Other Funding Sources	Regional GHG Benefits	LIDAC Benefits	Associated Metrics	Authority to Implement	Stakeholders
4. Industrial	4.A Work to lower the GHG emissions from large-scale emitters	4.A.1 Advance industrial decarbonization through alternative fuel and energy-efficient equipment/infrastructure replacements/upgrades.	Mid-term			Industrial decarbonization will create cleaner air quality among communities dependent on these industries for jobs and economic opportunities. https://www.mckinsey.com/industries/oil-and-gas/our-insights/decarbonization-of-industrial-sectors-the-next-frontier			
	4.B Develop infrastructure to connect the region to the mega-regional clean hydrogen hubs (Appalachian and Midwest)	4.B.1 Identify transportation options for hydrogen.	Long-term						
		4.B.2 Explore opportunities to develop local production of hydogen, especially green hydrogen.	Long-term			Hydrogen and hydrogen-based fuels can transport energy from renewables over long distances – from regions with abundant solar and wind resources to energy disadvantaged areas. https://www.iea.org/reports/the-future-of-hydrogen			Workforce development programs
	4.C Work to improve industrial operations to be more energy efficient and use cleaner sources of energy.	4.C.1 Work to improve the energy-efficiency and reduce GHG emissions from buildings and industrial processes.	Mid-term			Innovations in efficiency and methods aimed at reducing GHG emissions in industrial processes can create employment opportunities in rural and disadvantaged communities. https://grist.org/energy/steel-built-the-rust-belt-green-steel-could-help-rebuild-it/			
		4.C.2 Electrify, improve the energy efficiency and operations of intermodal transition between barge and freight.	Mid-term			Benefits to LIDAC communities include improved enviromental conditions, health outcomes, economic opportunities and lower cost of goods. https://enotrans.org/wp-content/uploads/20			
5. Waste, Water, and Sustainable Materials Management	5.A Build an environment of collaboration among organizations involved in solid waste, recycling, composting, and food rescue to maximize efficiencies.	5.A.1 Create a local Green Hub to increase coordination and provide for more effective recycling, reuse, and organic waste diversion.	Mid-term			Creating a local Green Hub can ehnance waste reduction efforts in low income communities through education and resources about waste minimization strategies. https://greenlining.org/2024/whats-all-the-hub-about-how-community-resilience-hubs-can-bridge-gaps-in-social-connection-wellness-and-transportation/			R3source, landscaping & tree cutting businesses
		5.A.2 Partner with local schools, governments, and park districts to implement composting programs.	Short-term			Partnering with local schools, goverments, and parks can benefit LIDAC communities by increasing access to composting and fresh food, strengthening partnerships through collaborative programming and creating local work opportunities. https://www.usda.gov/topics/urban/coop-agreements			

GREENHOUSE GAS REDUCTION MEASURES

Sector	Measure	Associated actions	Timeframe	Other Funding Sources	Regional GHG Benefits	LIDAC Benefits	Associated Metrics	Authority to Implement	Stakeholders
		5.A.3 Develop infrastructure, incentives, tracking and reporting of food waste to reduce the amount of wasted food in the region.	Mid-term			Developing infratructure, incentives and systems of tracking and reporting to reduce food waste can translate to household savings, a reduction in food insecurity, and a significant reduction in GHG emissions. https://www.wri.org/insights/reducing-food-loss-and-food-waste			
	5.B Increase access to recycling for residents in multi-family buildings	5.B.1 Provide access to recycling service / containers at multi-family buildings	Mid-term			Providing access to recycling services and containers in LIDAC communities contirbutes to reduced waste management costs, reduced landfill use, improved public health, support of longer term sustainablity goals and equitable development. https://www.naahq.org/recycling-programs-best-practice			
		5.B.2 Counties should continue to provide regular household recyling events	Short-term			Community engagement, involvement and investement in waste and reuse practices. https://archive.epa.gov/region4/rcra/mgtoolkit/web/pdf/community_fact_sheet.pdf			
	5.C Work to reduce methane released in the region	5.C.1 Capture methane from wastewater treatment facilities and use it to generate electricity to help offset the power needs of the facility	Mid-term			Capturing methane from wastewater can create econmic and social benefits in disavantaged communities in the form of energy cost savings, improved air quality, job creation, energy security and infrastructure resiliency. https://www.energy.gov/eere/energy-independence-and-security			
		5.C.2 Work to divert organic waste from the region's landfills	Mid-term			Diverting organic waste from landfills improves air quality, lowers the volume of toxic wastes in the soil and waterways, aids in job creation, lowers waste management costs and improves the health of LIDAC communities. https://rmi.org/wp-content/uploads/dlm_uploads/2023/10/landfill_monitoring_memo_3.pdf			
		5.C.3 Continue to work to reduce methane emissions at landfills	Short-term			Minority and low-income areas are more likely to find themselves home to landfills and hazardous waste sites. placement than higher income areas. https://www.colorado.edu/ecenter/2021/04/15/hidden-damage-landfills			
		5.C.4 Use an anerobic digester to turn organic waste into compost on a large scale	Mid-term			Composting organic waste on larger scales provide natural resource that can be recycled back into the soil and used to feed crops. https://solanacenter.org/2023/05/12/the-benefits-of-diverting-organic-waste-from-landfills/			
		5.C.5 Process organic waste into biofuels and biochar	Mid-term			Rural and agricultural communities can benefit from soil improvement, habitat management, and renewable energy. Employment and educational opportunites will also emerge in research, development and engineering. https://news.osu.edu/researchers-want-to-use-biochar-to-combat-climate-change/			

GREENHOUSE GAS REDUCTION MEASURES

Sector	Measure	Associated actions	Timeframe	Other Funding Sources	Regional GHG Benefits	LIDAC Benefits	Associated Metrics	Authority to Implement	Stakeholders
6. Agricultural	6.A Reduce fertilizer use in agricultural production	6.A.1 Establish a program or business to produce and source compost for use in agricultural production	Mid-term			Programs would reduce fertilizer dependency while improving soil health, and contibuting to healthier environment for residents. https://www.usda.gov/media/press-releases/2023/03/16/usda-announces-cooperative-agreements-compost-and-food-waste			
		6.A.2 Cover Crop Use	Mid-term						
	6.B Increase local food production and markets	6.B.1 Develop region-specific marketing and low GHG certification for local food products to allow farmers to monetize best practices	Short-term			Support to local farmers, agricultural industry during transition, GHG reduction in food distribution. Increase resident access to food. https://www3.weforum.org/docs/WEF_Incentivizing_Food_Systems_Transformation.pdf			
		6.B.2 Explicitly label food options' energy intensity	Mid-term						
	6.C Increase use of farming methods that reduce GHG emissions	6.C.1 Provide incentives to farmers to reduce carbon on equipment	Short-term			Rural and agricultural communities will recieve, support, funding and education during transition to farming methods that reduce GHG emissions. https://www.americanprogress.org/article/quitting-fossil-fuels-and-reviving-rural-america/			
		6.C.2 Incentives to lessen the risk of trying something new	Mid-term			Farmers do not have the resources or incentives for the intial costs of energy transiton, this is a key barrier to adopting regenreative practices. https://agamerica.com/blog/financial-barriers-of-regenerative-agriculture/			
		6.C.3 Support education and workforce development to implement low emission AG and food servece / rescue	Mid-term						
7. Carbon Removal	7.A Expand protections of the region's forrested lands	7.A.1 Increase the amount of trees and tree canopy in the region through well-designed afforestation efforts. The development and sale of Carbon Credits could be a vehicle to drive efforts.	Mid-term			To mitigate these environmental issues in disadvantaged communities is to design green parking lots with plenty of large tree canopy cover that provides shade along with stormwater interception and infiltration. https://extension.psu.edu/green-parking-lots-mitigating-climate-change-and-the-urban-heat-island			Green Umbrella
	7.B Promote urban forestry as an important measure against the urban heat island effect	7.B.1 Encourage trees along roadway networks, sidewalks, and paths.	Mid-term		247 acres forest will be preserved 1.4 acres forest will be preserved 3,429 tree seedlings are set to be	More tree cover would lower disproportionately high levels of heat and pollution. Communities of color have 33% less tree canopy on average than majority white communities, the analysis revealed. And neighborhoods with 90% or more of their residents living in poverty have 41% less tree canopy than communities with only 10% or less of the population in poverty https://www.scientificamerican.com/article/trees-are-missing-in-low-income-neighborhoods/			Green Umbrella
		7.B.2 require trees and landscaping in and around parking lots to reduce urban heat island impacts.	Short-term			Heat reductions in urban areas and air quality improvements will promote community well being. https://capitaltrees.org/increasing-urban-green-spaces-to-reduce-urban-heat-island-effect-in-richmond/			

GREENHOUSE GAS REDUCTION MEASURES

Sector	Measure	Associated actions	Timeframe	Other Funding Sources	Regional GHG Benefits	LIDAC Benefits	Associated Metrics	Authority to Implement	Stakeholders
	7.C Increase wetland protection and restoration	7.C.1 Work with local soil and water untilies to create landscapes that manage increased rain events	Long-term			Support underserved landowners who face significant barriers in accessing USDA conservation assistance programs https://www.nrcs.usda.gov/news/usda-invests-17-million-in-partnerships-to-restore-wetlands-support-underserved-producers			
		7.C.2 Increase wetland protection and restoration	Mid-term			Wetland protections safegaurd water quality, mitigates the effects of extreme weather and flooding, and provides recreation opportunities. https://www.ers.usda.gov/webdocs/publications/45347/51895_err183.pdf?v=0			
	7.D Support biochar research, development , and implementation	7.D.1 use biochar in tree plantings / soil improvement	Mid-term			CO2 reduction, waste management, soil fertility, water retention, bioremediation, stormwater treatment, and carbon sequestration https://static1.squarespace.com/static/5d1e51dd2a98da000183bc20/t/6318fe3485ee5f0db22e166b/1662582334987/%28Once+_+Future+Green%29+Biochar+Siting+for+Environmental+Justice.pdf https://carbonneutralcities.org/wp-content/uploads/2023/02/BiocharPlaybook.pdf			

LOW INCOME DISADVANTAGED COMMUNITIES BENEFIT ANALYSIS

LIDAC and Climate Risk Identification

To identify Low Income and Disadvantaged Communities, the plan utilized the EPA's Climate and Economic Justice Screening Tool. To be classified as a Low-Income Disadvantaged Tract, one or more variables must exceed the defined percentile AND be designated as Low Income. Variables include environmental factors such as risk of Asthma, Heart Disease, Particulate Matter, Traffic Proximity and Lack of Greenspace. The tool and a full list of environmental factors can be found on EPA's CEJST website.

The required list of identified LIDACs with Census Tract ID numbers are provided in Appendix C.

Figure 7 - LIDAC Map

LIDACs by Geography

Understanding the makeup of the population on a geographical scale is important when choosing implementation measures to benefit LIDAC communities across the region. To understand the geographic distribution of identified Low Income and Disadvantaged Communities, a simple analysis was conducted. The population of the county was compared with the population residing in LIDAC tracts as well as the number of tracts in the county being compared with the number of tracts identified as LIDAC.

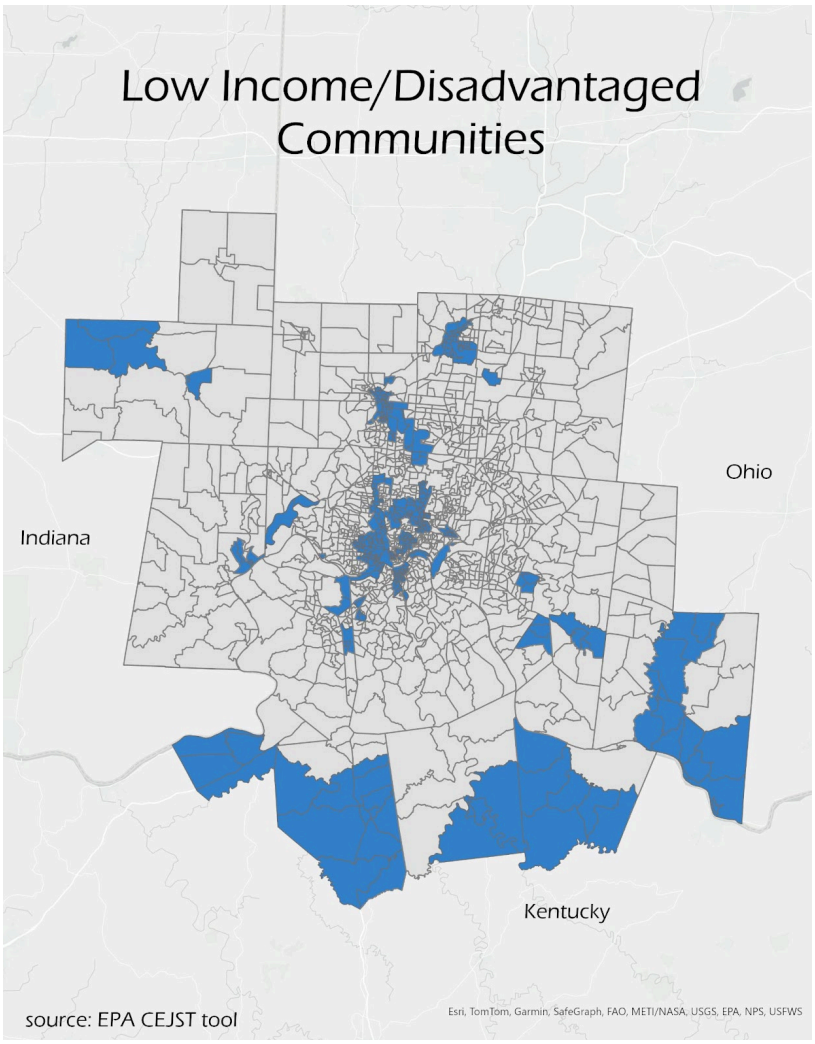


Table 2 - LIDAC Populations by County

County Name	Total Tracts	Total Pop	# LIDAC Tracts	% Tracts LIDAC	Pop in LIDAC Tract	% Pop in LiDAC Tract
Hamilton	222	813,589	78	35.14	222,995	27.41
Butler	80	380,019	27	33.75	97,761	25.73
Kenton	41	165,668	13	31.71	41,348	24.96
Grant	4	24,951	3	75	16,153	64.74
Brown	9	43,572	4	44.44	15,603	35.81
Clermont	40	204,275	3	7.5	13,337	6.53
Campbell	25	92,861	6	24	12,180	13.12
Boone	22	130,820	2	9.09	8,697	6.65
Franklin	5	22,774	2	40	6,759	29.68
Gallatin	2	8,737	1	50	6,218	71.17
Warren	33	229,132	1	3.03	5,952	2.6
Bracken	3	8,305	2	66.67	5,613	67.59
Dearborn	10	49,479	1	10	5,121	10.35
Pendleton	3	14,572	1	33.33	4,758	32.65
Ohio	2	5,874	0	0	0	0
Union	2	7,113	0	0	0	0

Significant LIDAC Geographical Findings:

- Hamilton County, Ohio has the largest amount of population living in designated LIDAC census tracts, yet making up only 27% of the population.
- Butler County, Ohio has the second highest population of persons living in LIDAC tracts, making up 25% of the population.
- Although in the bottom half of counties by total population, 71% of Gallatin County, Kentucky's residents reside in a LIDAC tract.
- 67% of Bracken County, Kentucky's population is designated as living in a LIDAC tract, 2 out of 3 of their census tracts.

LIDAC Demographics: The preliminary analysis includes demographic information to understand the characteristics of the population living in LIDAC tracts.

Table 3 - LIDAC Demographic Characteristics

LIDAC	Total	% of Regional Total
TOTAL POPULATION	**458,220**	**21%**
Age Under 10 Years Old	**68,480**	**24%**
Age 10 to 17 Years Old	50,691	21%
Age 18 to 64 Years Old	280,903	21%
Age 65+ Years Old	58,146	18%
Hispanic All Races	**27,753**	**39%**
Not Hispanic White	265,935	15%
Not Hispanic Black	**142,049**	**54%**
Not Hispanic Asian	4,434	8%
Not Hispanic Other	18,049	30%

Significant LIDAC Demographic Findings:

- The **Non-Hispanic Black population are 3.6 times more likely** (54% vs 15%) to live in a Low-Income Disadvantaged tract compared to Non-Hispanic Whites
- **Hispanics of any race are 2.6 times more likely** (39% vs 15%) to live in a Low-Income Disadvantaged tract compared to Non-Hispanic Whites
- Other Non-Hispanic populations are 2.0 times more likely (30% vs 15%) to live in a Low-Income Disadvantaged tract compared to Non-Hispanic Whites.
- Only Non-Hispanic Asians are half as likely (8% vs 15%) to live in a Low-Income Disadvantaged tract compared to Non-Hispanic Whites.
- There were minor Age disparities, but Age 10 & Under are slightly more likely to live in a Low-Income Disadvantaged tract compared to the general population (24% vs 21%).
- Only those 65 & Older were slightly less likely to live in a Low-Income Disadvantaged tract compared to the general population (18% vs 21%)

Environmental Identification

In addition to communities designated as Low Income or Disadvantaged, an analysis was conducted on tracts with environmental and workforce development indicators.

Environmental Indicators

- *Asthma*
- *Heart Disease*
- *Energy*
- *Particulate Matter 2.5*
- *Traffic Proximity*
- *Diesel*
- *Lack of Greenspace*

Workforce Development Indicators

- *Linguistic Isolation*
- *Low Median Household Income*
- *Unemployment*
- *Poverty*
- *High School Equivalency*

Of the selected environmental indicators, the Particulate Matter 2.5 indicator was below the threshold for the entire region. The other six environmental indicators were analyzed, and, in several cases, more than one environmental variable threshold was exceeded. Tables 5 and 6 in Appendix B shows the demographics of where there were no environmental variable thresholds exceeded and up to six variables exceeded at once for all census tracts and specifically low income tracts.

Significant Environmental Findings:

- 89% of the Region's total population had no thresholds exceeded, but only 59% of the Non-Hispanic Black population resides in tracts that have no environmental variable thresholds exceeded
- 4% of the Region's population lives in an area with 3 or more environmental variable thresholds exceeded compared to 14% of the Non-Hispanic Black population regionally

Significant Findings for Environmental Indicators in Low Income/Exceeds Threshold Populations:

- There were no Census tracts that exceeded the Particulate Matter 2.5 variable within the Cincinnati Metro Region
- The Non-Hispanic Black population consistently are more likely to live in areas that exceed the environmental threshold **and** live in a low-income area. The **greatest disparity is with Asthma (39% vs 9% - a difference of 30%)**. Other

environmental indicators exceed the general population more substantially than other racial and ethnic groups.

- The Hispanic population also consistently are more likely to live in areas that exceed the environmental threshold and live in a low-income area. **The greatest disparity is also with Asthma (19% vs 9% - a difference of 10%)**.
- The population under 10 years of age are more likely to live in low-income areas that **exceed the threshold for Asthma**. The rest of the environmental indicators are more similar to the general population.

Workforce Indications

The EPA's CEJST tool also provides indicators for workforce development, which can be used to identify populations and tracts. When analyzed for selected workforce development indicators the analysis found:

- There were no Census tracts that exceeded the Linguistic Isolation variable within the Cincinnati Metro Region
- The Non-Hispanic Black population are at least 3 times as likely to exceed the percentile threshold across **all** workforce development indicators compared to the general population
- Hispanics of any race are at least 2 times as likely to exceed the percentile threshold across **all** workforce development indicators compared to the general population

Discussion of LIDAC Benefits

LIDAC benefits that are specific to each implementation Measure and Action are included in Table 1. As the specifics of these measures are developed in the CCAP phase, additional information and analysis will be added to the table. Below, we have summarized many of the more common benefits and co-benefits that will be realized through measures to reduce greenhouse gas emissions in the region.

- **Cleaner Air:** The reduction of localized emissions targeted areas will improve air quality directly in communities that need it most. LIDAC communities and other minority populations face higher exposure to pollutants and spend more time working outside with limited access to affordable healthcare.

- **Improved Transportation Access:** Implementing upgrades in transit options near residential areas and improving traffic flow, safety and overall walkability in neighborhoods will enable communities dependent on public transportation a wider network of transfer points and an optimized service. This will allow LIDAC communities to have access to resources, employment, education and recreation once inaccessible due to distance.

- **Reduce Energy Burden:** Transition to clean energy and facilitation through support of municipal programs and individual incentives will provide LIDAC communities with an opportunity to drastically reduce household energy costs. Historically, these have been excluded from the conversations around solar and renewable energy, and renters. Hence their accessibility to clean energy, savings and familiarity with energy efficient technologies. Moreover, building a system of collaboration among organizations involved in solid waste, recycling, composting, and food rescue to maximize efficiencies will bring benefits.

- **Green Jobs and Training Opportunities:** As clean energy needs grow and new needs emerge, there will be an ongoing demand for an array of green roles in nearly every industry. According to the Department of Energy, clean energy jobs grew 3.9%, adding 114,000 jobs nationally, and increased to over 40% of total energy jobs in 2022 alone. Job creation for LIDAC communities including occupations in agriculture, forestry, regenerative methods and other green jobs will continue to increase local capacity and create demand in the workforce and higher educational sector.

Public Engagement

There is a concerted effort to engage representatives of the region's LIDAC communities during the PCAP. These efforts will continue in an expanded way during the CCAP phase. The Planning Team reached out directly to organizations and representatives with deep connections in the identified LIDAC communities. These organizations are also included on the Plan Steering Committee. More details of LIDAC public engagement can be found in the chapter on Public Engagement.

REVIEW OF AUTHORITY TO IMPLEMENT

This section explores various regulatory policies, authority, and agencies that apply in the realization of the Implementation Measures and Actions listed in Table 1. The list below is a selection of measures with corresponding analysis of controlling entities, policies, or law, along with a discussion of potential hurdles to be overcome in the realization of the measure. This list is not comprehensive, but highlights some of the more significant obstacles to the Implementation Measures.

Table 4 - Authority to Implement Analysis

Policy Proposal	Controlling Entity	Hurdles
Transit ridership incentives	Transit Authority (SORTA, TANK, etc.)	Equitable program design. Ability to implement through transit app and for non-app riders.
Provide needed infrastructure support for Bus Rapid Transit, including transit centers and park & ride facilities.	Site developments subject to local zoning authority. ROW improvements subject to local authority or state DOT approval on state routes.	
Afforestation / Land Trusts	- Private landowners - Local jurisdiction for street trees and public lands	Finding significant land mass, PORT Authority
Revolving Loan Fund and/or grants to finance Energy-efficient Improvements or Green Energy to Local Government Buildings and Facilities (including LED conversions)	Lenders and/or grant programs	It will require ongoing management. Each project will require some review and vetting. Loan payments will need to be properly accounted.
Utility Solar; Community Solar; Virtual Power Plants	None of the states have passed legislation that meets the EPA standard for "shared renewables legislation." Ohio: There is currently no authority to develop Community Solar in Ohio. HB 197 has been introduced to create a Community Solar Pilot Program. More info on the bill can be found here.	Would have to work with local energy provider to connect with energy grid and either setup net-metering or a purchased power arrangement.

	Indiana: Indiana recently passed laws mandating local zoning allow individual solar under 1MW in size. Kentucky: Solar plants of 10MW or more require approval from the siting board. State and/or local regulations on setbacks also apply. Here is a map of Kentucky counties with local solar regulations and solar projects in process or approved.	
Support Expansion of Home Weatherization Assistance Programs (HWAP)	Income eligibility requirements apply to the HWAP program. However, an expansion could serve households not served by the program or could be used for improvements not covered, like pre-weatherization.	Finding the additional skilled workforce needed to significantly expand the program.
Anaerobic Digester for organic waste composting	The facility would be subject to local zoning. OH EPA, KY EEC, or IDEM would likely have to approve and permit the design of the facility.	Finding a suitable site and obtaining entitlements for development from all related regulatory agencies.
Methane capture from WW treatment facilities with the ability to use captured methane to produce energy to run plant operations	Local jurisdiction would need to approve the project. OH EPA, KY EEC, or IDEM would likely have to approve modifications to treatment plant.	
Support the use of electric Uncrewed Aerial Vehicles (UAVs) and Vertical Take-Off and Landing (e-VTOLs) to replace diesel truck trips within the region.	The Federal Aviation Administration (FAA) regulates aircraft and flight plans. The aircraft must be certified and flight plans must be approved.	

PUBLIC ENGAGEMENT

Community feedback helps better understand the values, hopes, concerns, and perspectives of Greater Cincinnati's communities. Currently, the Greater Cincinnati region is facing multiple challenges – repairing a legacy and ongoing reality of racial injustice, mitigating and adapting to climate change, tackling housing affordability and homelessness, and more. For all these reasons, the engagement process is crucial to the successful completion of the Regional Sustainability Playbook.

The ThriveTogether team employs a collaborative governance approach in the development of the Playbook and idea sourcing for implementation projects. The University Network for Collaborative Governance defines collaborative governance as follows:

> *Collaborative governance refers to community and public policy decision making processes and structures that enable participants to work together to enhance their communities and shape sustainable public policy decisions. Collaborative governance does this by engaging participants collectively and constructively across the boundaries of the public, private, and civic sectors to leverage the unique attributes and resources of each for the greater impact.*

ThriveTogether's engagement is guided by the following:

Forms of Equity and Justice (Source: Green Umbrella's 2022 Climate Equity Benchmarking Analysis)

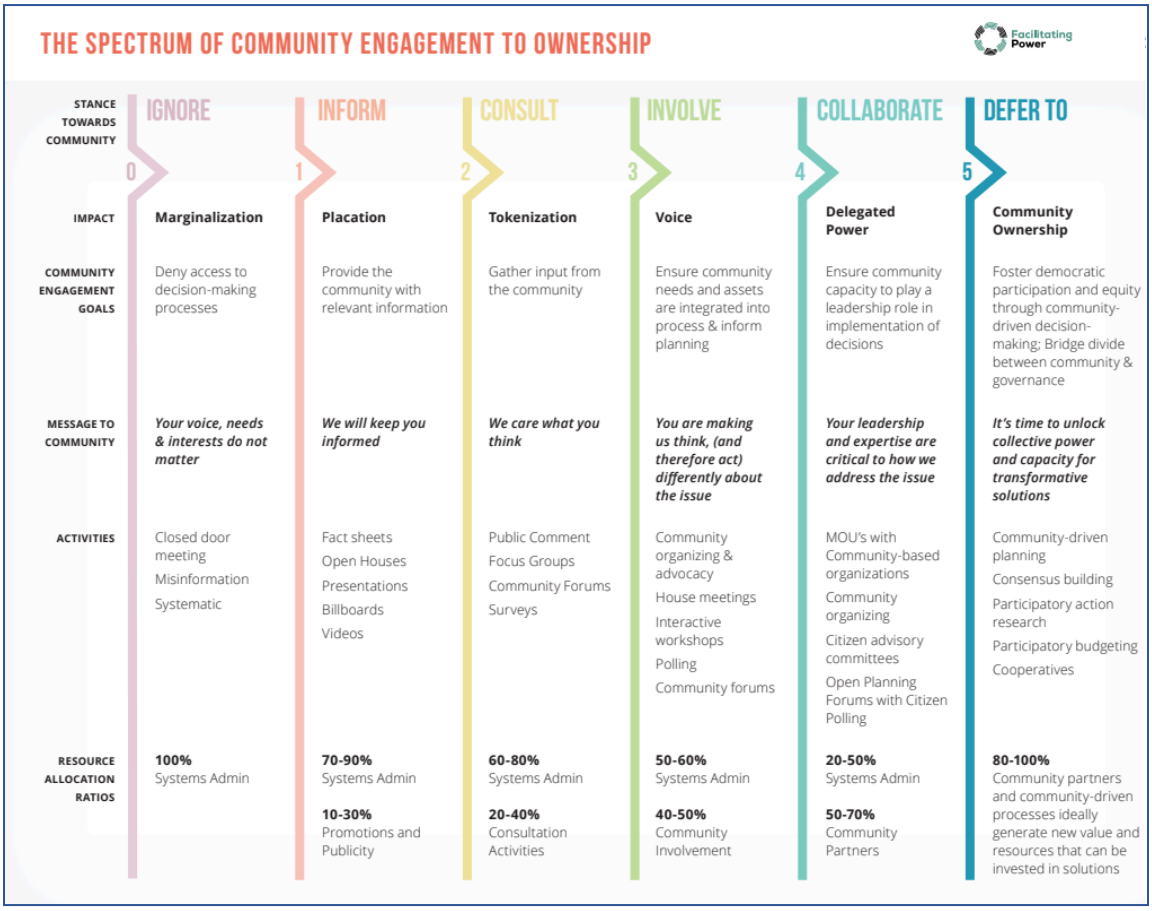
- Recognition: identifying and acknowledging injustices affecting specific populations.
- Procedural: addressing power structures and access to participation in decision-making. A key to this is ensuring equitable, inclusive, and meaningful engagement and asking how our engagement shifts power, builds trust, and ensures accountability, both structurally and intergenerationally.
- Distributional: addressing the distribution of burdens and benefits across different populations.
- Restorative: making commitments to correct past harms and facilitate repair.

- Transformative: addressing underlying structural conditions that are the root cause of social and racial injustices while cultivating accountability, reducing harm, and preventing future unintended consequences.

Forms of Accountability (Source: Institute for Sustainable Communities' Urban Equity Climate Compact)

- Individual Accountability: individuals take responsibility for their actions and any consequences associated with them.
- Mutual Accountability: Members of a group unite in pursuit of core objectives. The group's duties and actions align with those objectives to ensure positive change takes place simultaneously throughout the group, instead of in a top-down way.
- Community Accountability: A community works together to establish safe environments for its members. These safe spaces provide community members support and avenues to examine community systems and leadership. After these examinations, the community can develop strategies to eliminate negative behavior and systems that perpetuate oppression.

Figure 8 Spectrum of Community Engagement to Ownership (Source: Facilitating Power)



ThriveTogether Engagement Approaches

The ThriveTogether engagement process is driven by three central strategies:

- Greater Cincinnati Climate Action Hub
- Steering Committee and Subcommittees
- In-person and Virtual Engagement Sessions

Greater Cincinnati Climate Action Hub

The ThriveTogether team is using Citizen Lab to host a virtual hub for public engagement for the Regional Sustainability Playbook for Greater Cincinnati. The ThriveTogether team uses the site to share information about Playbook, as well as collecting, organizing, and analyzing public feedback about the issues and areas of policy that the Playbook addresses. Over the course of our engagement process, the platform will offer a variety of information and virtual engagement activities that will allow members of the public to learn about and contribute their ideas to shape the Playbook. The pandemic has demonstrated that virtual alternatives to in-person communication can present both challenges and opportunities. The site can't replicate or replace in-person engagement—nor should it. However, it can offer a lower barrier to entry for some communities to participate in the engagement process. Accessing the information and contributing feedback on this Hub is free.

Most importantly, the site was designed to make the engagement process as transparent as possible. For example, the ThriveTogether team reports out on results of surveys taken, offers recordings of steering committee meetings, and publishes engagement updates contributing to the plan. The hub also hosts an anonymous and optional Equity and Representation Survey to capture as much demographic information on users as possible. The site is used to explain how public feedback has been analyzed and incorporated into the policies of the Draft Playbook, and ultimately, the Final Playbook.

Steering Committee and Subcommittees

To ensure a regional and diverse perspective throughout the planning process, ThriveTogether is convening a Steering Committee to provide guidance and input at key moments in the plan development process, as well as a regional submission for implementation funds. The first Steering Committee meeting was held in December 2023 and will be followed by six additional meetings through spring 2027.

Figure 9 Climate Action Hub Launch Oct 18, 2023

The Equity and Engagement Subcommittee ensures ThriveTogether engagement is equitable, transparent, and accountable, and centers underserved and disproportionately impacted communities such as our region's BIPOC (Black, Indigenous, People of Color), disabled, immigrants and refugees, linguistically-isolated, low-wealth, rural, senior, and youth populations. The Subcommittee meets quarterly and the co-chairs of the subcommittee are Rico Blackman of (Director of Community Organizing at Greater Cincinnati Homeless Coalition & Executive Director at Black Power Initiative) and Reena Murphy (Sustainability Coordinator at City of Oxford OH).

In-person and Virtual Engagement Sessions

The ThriveTogether Planning team is committed to hosting in-person and virtual events to create new climate action engagement spaces in Greater Cincinnati, as well as activating existing networks to support the development of the preliminary and comprehensive climate action plans.

Engagement for the Preliminary Climate Action Plan

The ThriveTogether process was publicly launched on October 18, 2023 at the Green Umbrella Annual Meeting in Cincinnati, Ohio. Since then, the ThriveTogether Planning Team has coordinated significant participation in the preliminary climate action planning process through the three primary engagement pathways.

Greater Cincinnati Climate Action Hub

The Greater Cincinnati Climate Action Hub was publicly launched on October 18, 2023. Through the hub, ThriveTogether has hosted an Equity and Representation Survey, collected project proposals, published all findings and next steps related to the regional greenhouse gas inventory, and shared the recordings and materials from all steering committee meetings. See below for the quick stats on hub engagement since the launch:

- 1,099 site visits from 496 unique visitors

- 396 users registered, with a 76% registration rate from all site visits
- 310 active users, with a 63% participation rate from all site visits
- 105 project and policy proposals submitted to inform the PCAP implementation strategies
- 52% of users are from Hamilton Co. OH, 8% from Kenton Co. KY, 7% from Butler Co. OH, 6% from Boone Co. KY, 4% from Campbell Co. KY, 4% from Warren Co. OH, 2 from Clermont Co. OH
- 78% of users identify as White/Caucasian, 9% identify as Black/African American, 4.5% identify as Hispanic/Latino, 3% identify as Multi-racial/Multi-ethnic, 1.5% Asian American/Pacific Islander/Asian, 1.5% identify as Native American/American Indian/Indigenous
- 48% of users were born between 1980-1999, 25% were born between 1965-1979, 19% were born between 1946-1964, 4% were born between 2000-2020
- 60% of users identify as a woman, 32% identify as a man, 1.5% identify as Gender nonbinary/Genderqueer/Gender non-conforming
- 67% of users identify as straight, 10% identify as bisexual, 3% identify as aromantic/asexual, 3% identify as queer, 3% identify as lesbian, 3% identify as fluid

Steering Committee and Subcommittees

The ThriveTogether Planning Team actively recruited a diverse set of regional stakeholders to participate in the Steering Committee. Since launching ThriveTogether in Fall 2023, the Steering Committee has met twice. The Steering Committee is composed of the following:

- 3 states
- 16 counties
- 21 cities/towns/townships (11 of which are considered environmental justice communities)
- 15 nonprofit organizations
- 4 chambers of commerce
- 4 educational institutions
- 4 utilities

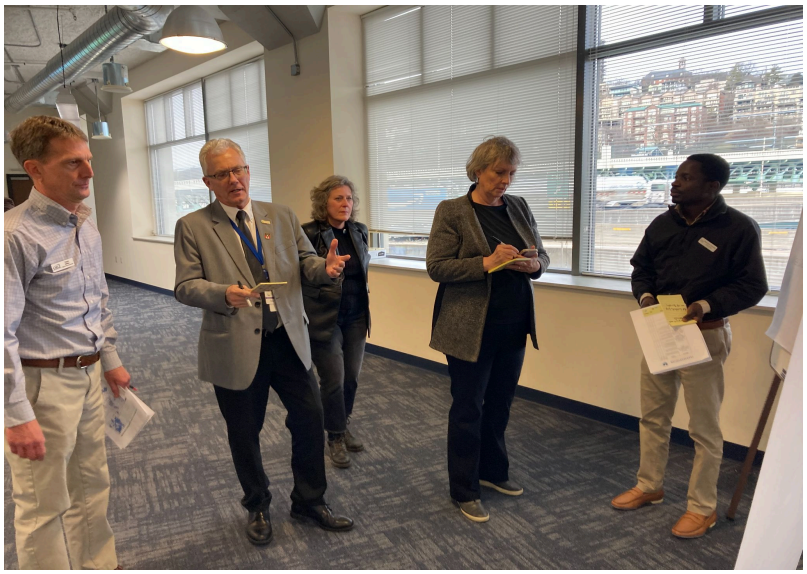


Figure 10. Plan Steering Committee Meeting Feb 7. 2024

At the first Steering Committee meeting in December 2023, ThriveTogether collected insights from 22 steering committee members on seven key topics related to engagement. Some of the high-level feedback included innovative or unique ways to connect with regional communities (public transit surveys, canvassing, short online videos, social print media; outreach via agriculture, faith-based, schools, training, land owners, parks, recreation centers; peer-to-peer education, community meetings, civil and professional associations, workshops; in-person seasonal community activities like neighborhood festivals, block parties, and faith community gatherings). Another example includes, members shared thoughts on how the contributions of community members should be recognized and what steps should be taken to maintain opportunities for future collaboration or engagement (storytelling, media coverage, and skill sharing; professional and development opportunities, public engagement, recognition, gratitude, letters of appreciation, and follow-up; platforming success stories; offering monetary stipends, snacks, childcare, transportation).

The Equity and Engagement Subcommittee had its first quarterly meeting and set the purpose, goals, strategies, logistics, and next steps. The key goals and example strategies of the subcommittee include:

- Understand Our Communities: meet communities where they are
    - Example strategy: host listening sessions and complete surveys
- Build Trust: leverage partnerships with trusted community leaders and organizations
    - Example strategy: engage existing formal and informal networks early on
- Advance Equity and Justice: attend to all forms – recognition, procedural, distributional, restorative, transformative
    - Example strategy: create an Equity and Justice Framework
- Engage With Care: foster accessible approaches that move communities along the engagement ladder
    - Example strategy: host events with bilingual, sign language, and transcription services
- Evaluate Success: develop metrics and benchmarking approaches
    - Example strategy: co-create metrics of success with frontline communities

In-person and Virtual Engagement Sessions

Through various presentations and engagements the ThriveTogether Planning Team introduced ThriveTogether to over 1,400 individuals and over 400 organizations/jurisdictions across our 16 county region. These engagements included committee meetings, workshops, social events, partner meetings, and regional board meetings. See below for examples of these intentional engagement activities:

Activation of Greater Cincinnati's Metropolitan Planning Organization Board

The OKI Regional Council of Governments also serves as the region's metropolitan planning organization. Through in-person sessions, OKI staff introduced the CPRG process and coordinated participation via the OKI Intermodal Coordinating Committee, Executive Committee and Board of Directors meetings. This activity reached over 75 participants that represent over 50 jurisdictions across Greater Cincinnati.

Collaborative Engagement with Frontline Communities

ThriveTogether partnered with the Climate Safe Neighborhoods Partnership led by Green Umbrella and Groundwork Ohio River Valley, which is dedicated to exploring the relationship between historically race-based housing segregation and the current and predicted impacts of climate change. The Partnership works directly with frontline community members to identify solutions to address climate impacts and pollution. Through intentional engagement with residents in priority communities, the effort honors community members as the subject matter experts in identifying local issues and co-creating community-based solutions. In Fall 2023, Climate Safe Neighborhoods hosted two Climate Advisory Groups in disadvantaged neighborhoods in Southwestern Ohio (the Avondale neighborhood in Cincinnati, and Wards 1 and 4 in Norwood). These groups were introduced to the ThriveTogether process and were activated to participate in the hub. This activity included 12 events with 70 unique participants from frontline neighborhoods.

Regional Food Systems Planning Events

The Greater Cincinnati Regional Food Policy Council (FPC), a program of Green Umbrella, led a regional food systems planning series with a focus on climate action for jurisdictions across Greater Cincinnati. Phase 1 of this project was done in Fall 2023 in collaboration with the RE-AMP Food Policy Action Council's Activating Food Policy Councils to Lead on Climate Change in the Midwest project via the West Michigan Sustainable Business Forum. Phase 2 will launch in 2024 through the ThriveTogether planning process in support of the Comprehensive Climate Action Plan. The FPC activated its four food systems area committees (Farms and Land Use, Access and Education, Infrastructure, and Institutions) to provide input and guidance for the planned actions that cities, counties, towns, townships, and other jurisdictions can take to make our regional food system more resilient to climate change. This activity reached the FPC's 80 active participating members and generated 130 unique concepts for food related regional climate action to be considered for preliminary and comprehensive planning.

Preparing Engagement for the Comprehensive Climate Action Plan

Greater Cincinnati Climate Action Hub

The ThriveTogether team will leverage Citizen Lab's features to support deep engagement across all 16 counties. The following are some of the approaches the team will use in order to ensure our digital engagement supports the "Spectrum of Community Engagement to Ownership" referenced above:

- Inform
    - Messaging: reach out with integrated messaging tools.
    - Information: keep communities up-to-date using project timelines, information pages, rich media & interactive options.
    - Official Updates: provide official updates using the input management tool to keep communities informed.
- Consult
    - Surveys: ask community tailored questions to better understand their needs and expectations.
    - Polls: gather feedback on a specific topic to quickly understand community priorities.
- Involve
    - Option Analysis: share information about different possible scenarios to help community members give more informed input.
    - Mapping: allow communities to provide feedback and ideas visually on a map and interact with their neighborhood.
- Collaborate
    - Ideation: co-create solutions with community members by giving them a platform to give new ideas.
    - Online Workshops: organize live discussions and facilitate online, real-time deliberation.
- Empower
    - Citizen Proposals: enable community members to suggest projects on any given topic and gather support.
    - Participatory Budgeting: let community members allocate a budget using a tool to get insights into what they think should be invested in.

Steering Committee and Subcommittees

The Steering Committee next meetings are as follows:

Schedule of Steering Committee Meetings

December 2023	Introductions, Community Engagement
February 2024	Priority Plan
August 2024	GHG Reduction Targets
February 2025	Comprehensive Plan
September 2025	Plan Implementation
September 2026	Update of Benefits Analysis, Workforce Analysis, and Implementation Status
April 2027	Summary Report

The Equity and Engagement Subcommittee's next steps include:

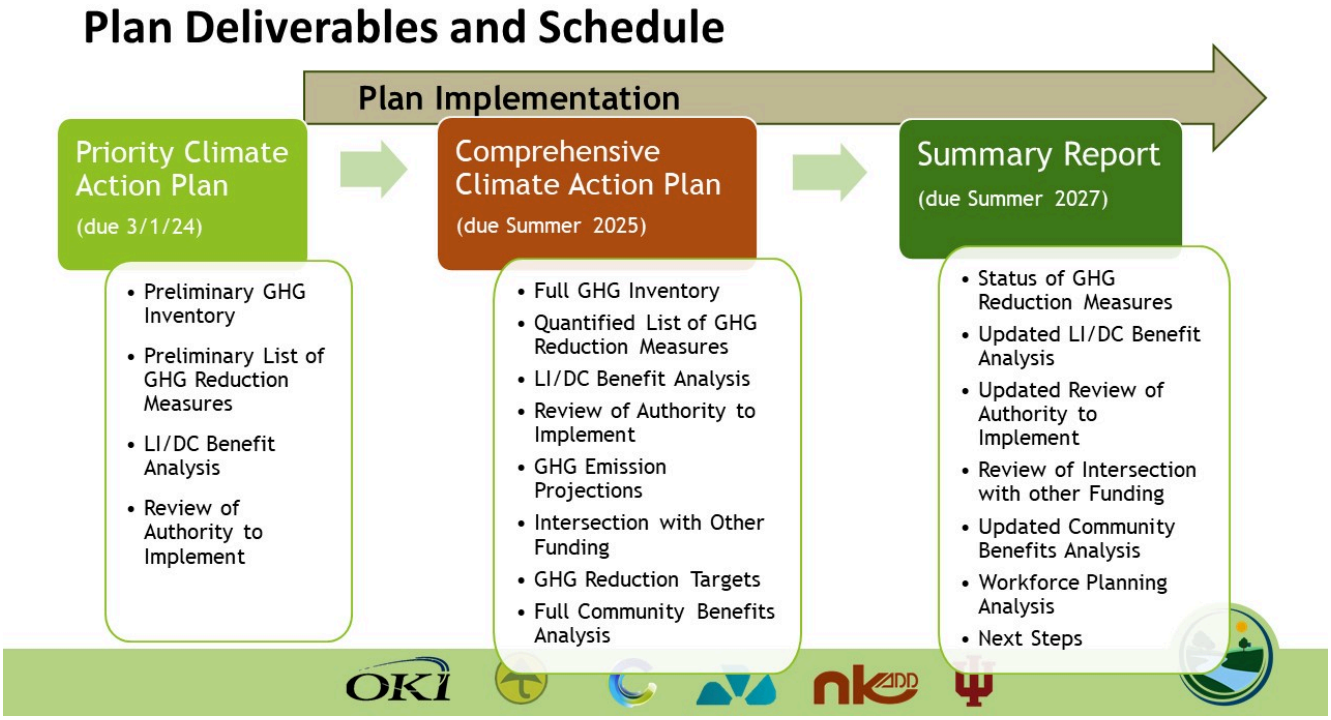
- March 15, 2024: Draft Equitable Engagement Plan for Steering Committee review
- April 15, 2024: Next Equity and Engagement Subcommittee Meeting
- Earth Week 2024: Announce the Comprehensive Climate Action Plan engagement process

In-person and Virtual Engagement Sessions

While the in-person and virtual sessions have not yet been set (see above for finalization schedule), there are many ideas being considered for how to approach engagement for comprehensive planning. See below for some of the ideas to date:

- Identify Community Climate Ambassadors/Liaisons in each county
- Establish mechanisms that can help counties stay abreast available technical assistance
- Plan workshops on different topics of climate change and its impacts
- Identify how to engage best with Green Umbrella Working Groups
- Lead Rural Dialogues
- Collaborate with the Climate Safe Neighborhoods Partnership in upcoming EPA and NOAA workshops
- Identify mini teams that can support each county (community lead, equity liaison, staff support)

LOOKING FORWARD



The Comprehensive Climate Action Plan will build upon the Priority Climate Action Plan. This will include continuous public engagement and collaboration with Steering Committee and subcommittee members which will be blended with in-person and virtual meetings. The public will also be engaged through the CitizenLab platform as highlighted in our Regional Sustainability Playbook for Greater Cincinnati. Our collaboration and engagement will be community-voice centered, built on trust, equity, justice, care and goal oriented.

The greenhouse gasses inventory for the region will be refined and comprehensively reported. Mobile combustion on road which includes estimation for energy consumption, vehicle miles travel and vehicle type will be estimated using the US EPA's Motor Vehicle Emissions Simulator (MOVES) model. Estimations for electric consumption will be improved using the US EPA's most recent line loss value for 2022 which is 5.1%. Meanwhile, more landfills will be included in the waste emission value estimations in the GHGRP by ensuring reliable and accurate estimations for emissions are conducted. On wastewater emission, refined data from the facility information will be aggregated to the county level to ensure accurate estimations for wastewater emissions data. In the CCAP, an extensive analysis on tree canopy benefits, agriculture emissions, fugitive emissions, renewable energy certificates and other carbon credit mechanisms will be analyzed and reported accordingly.

Further development of LIDAC Benefits Analysis will be conducted in CCAP. As shown in the *Figure 5* - LIDAC Map, *Table 1*- LIDAC Populations by County, *Table 2* - LIDAC Demographic Characteristics, *Table 3* - Selected Environmental Variables for all Populations and *Table 4* - Selected Environmental Variables for Low Income & Exceeds Threshold Populations of this PCAP document, LIDAC communities in the region have been identified using the EPA's Climate and Economic Justice Screening Tool, along with census tract data.
LIDAC communities will be engaged and prioritized in the CCAP. Specifically, a quantitative assessment and/or qualitative discussion of the implementation measure benefits including but not limited to cleaner air, reduction of household spending on energy, improvement in walkability and transit service, additional job opportunities and job training, that are associated with the GHG reduction measures will be conducted. The LIDAC communities will be positively impacted by the implementation of the projects. The proposed projects will be implemented based on the population and geographical scale of the LIDAC communities. An advance analysis will be conducted and reported on the ratio of population residing in LIDAC tracts, numbers of identified tracts in LIDAC communities and population of the county. There will be periodical stakeholder engagement of the LIDAC communities which will include the qualitative or quantitative analysis to measure and evaluate benefits associated with GHG reduction measures and any changes and input will be reported and incorporated respectively.

Greenhouse gasses emission reductions targets will be set via the Steering Committee and Subcommittees. Priorities will be given to highly emitted sectors including transportation, electric power, buildings, agriculture, industrial, waste, water, and sustainable materials management, and carbon removal. Specifically emissions from industrial and transportation sectors, buildings and equipment, air, personal and commercial vehicles sub-categories, while emissions from electricity, natural gas, gasoline, jet fuel, industrial gaseous fuels sources will be drilled down significantly. The results will be shared with the stakeholders and public.

APPENDIX A

Greenhouse Gas Inventory Methodology

The development of the greenhouse gas (GHG) inventory required several different approaches in order to build a full picture of emissions within the region. Whenever available, actual energy consumption values or reported emissions values were used. When these data were not available, consumption estimates were developed in order to provide a foundation for creating emissions estimates. These processes are detailed below.

Mobile Combustion

On Road

Energy consumption, vehicle type, and vehicle miles traveled (VMT) are the main drivers of on road emissions. Due to the difficulty in acquiring consistent on-road data across counties within Indiana, Kentucky, and Ohio, on-road emissions for the PCAP were developed by projecting 2020 National Emissions Inventory (NEI) values using the growth in statewide energy consumption for each particular fuel. The growth rate was calculated using 2020 and 2022 transportation fuels data found in the US Energy Information Administration's State Energy Data System (US EIA SEDS). When 2022 data were not available, they were projected based on the average annual growth rate for 2015-2021 for each individual fuel.

As possible, the US EPA's Motor Vehicle Emissions Simulator (MOVES) model will be used to improve the GHG inventory for the CCAP.

Off Road

Energy consumption and type of transportation are the main drivers of off road emissions. Off road emissions estimates employ energy consumption values developed by UNPREDICTABLEcity at the county level. Generally, state-level energy consumption values provided by the US EIA are downscaled to the local-level based on known local data. When possible, actual local energy consumption values replace estimates. This methodology was developed as part of the 2015 Franklin County (Ohio) Energy Study, and has since been used to develop emissions estimates for the Ohio Air Quality Development Authority, Power a Clean Future Ohio, the Energy Foundation, and fifteen greenhouse gas inventories for local governments throughout Ohio.

Air

Attribution of kerosene-type jet fuel is based on departures from individual airports as reported by the Federal Aviation Administration (FAA) and the US Bureau of Transportation Statistics (US BTS). Aviation gasoline, primarily used in small propeller planes, is attributed based on registered single-engine aircraft.

Energy consumption values are then multiplied by the corresponding emission factor as presented on the US EPA's Emission Factor Hub.

Rail

Trains are assumed to use diesel fuel or electricity. Electricity consumption for trains is often captured in US EIA Form-861 under the "Transportation" sector. No transportation electricity consumption was reported for the region.

Diesel consumption is based on rail-miles traveled for passenger and freight rail, fuel tables 4-25 and 4-18 from the US BTS, and local rail line information. Energy consumption values are then multiplied by the corresponding emission factor as presented on the US EPA's Emission Factor Hub.

Maritime

The maritime industry is assumed to be the primary source of residual fuel consumption in the transportation sector. Fuel consumption estimates are developed by taking the state level total for residual fuel (as found in US EIA SEDS) and attributing consumption based on the number of docks and their use, as noted in the US BTS's Citizen Connect database and local information. Energy consumption values are then multiplied by the corresponding emission factor as presented on the US EPA's Emission Factor Hub.

Electric Power Consumption

Actual county-level electricity consumption values were made available by Duke in counties where they operate. US EIA Form-861 provides electricity consumption values for municipal utilities. When these data encompassed the entirety of a county's electricity consumption, they were then multiplied by the US EPA eGRID factor provided for the corresponding subregion. All counties in Ohio and Indiana are within the Reliability First Corporation West (RFCW) subregion. All Kentucky counties are within the Southeast Reliability Corporation Tennessee Valley (SRTV) subregion. At the time of analysis, US EPA's most recent line loss value was for 2021; 4.5% for the Eastern United States. The value for 2022 has since been released (5.1%) and will be incorporated into the CCAP.

When an entire county's electricity consumption could not be aggregated with available data, estimates were produced for the residential, commercial, and industrial sectors using downscaled state-level data provided by US EIA SEDS database. Residential energy consumption estimates were developed based on housing type, fuel use, and average energy consumption values provided by US EIA in the Residential Energy Consumption Survey. Energy consumption values are then multiplied by the corresponding emission factor as presented on the US EPA's Emission Factor Hub.

Commercial and Industrial estimates were developed based on square footage, building use, and information provided in US EIA's Commercial and Manufacturing Energy Surveys. Energy consumption values are then multiplied by the corresponding emission factor as presented on the

US EPA's Emission Factor Hub. When emissions values were reported to US EPA through the GHGRP, they replaced estimates for individual buildings.

Stationary Combustion

Natural Gas

Actual county-level natural gas consumption values were made available by Duke in counties where they operate. When these data encompassed the entirety of a county's electricity consumption, they were then multiplied by the corresponding emission factor as presented on the US EPA's Emission Factor Hub.

When an entire county's natural gas consumption could not be aggregated with available data, estimates were produced for the residential, commercial, and industrial sectors using downscaled state-level data provided by US EIA SEDS database. Residential energy consumption estimates were developed based on housing type, fuel use, and average energy consumption values provided by US EIA in the Residential Energy Consumption Survey. Energy consumption values are then multiplied by the corresponding emission factor as presented on the US EPA's Emission Factor Hub.

Commercial and Industrial estimates were developed based on square footage, building use, and information provided in US EIA's Commercial and Manufacturing Energy Surveys. Energy consumption values are then multiplied by the corresponding emission factor as presented on the US EPA's Emission Factor Hub. When emissions values were reported to US EPA through the GHGRP, they replaced estimates for individual buildings.

Other Fuels

Estimates were produced for the residential, commercial, and industrial sectors using downscaled state-level data provided by US EIA SEDS database. Residential energy consumption estimates were developed based on housing type, fuel use, and average energy consumption values provided by US EIA in the Residential Energy Consumption Survey. Energy consumption values are then multiplied by the corresponding emission factor as presented on the US EPA's Emission Factor Hub.

Commercial and Industrial estimates were developed based on square footage, building use, and information provided in US EIA's Commercial and Manufacturing Energy Surveys. Energy consumption values are then multiplied by the corresponding emission factor as presented on the US EPA's Emission Factor Hub. When emissions values were reported to US EPA through the GHGRP, they replaced estimates for individual buildings.

Waste

Waste emission values were taken directly from the US EPA's GHGRP. Additional landfills not included in the GHGRP exist, but may not be in operation. If reliable estimates of their emissions can be developed, they will be included in the CCAP.

Wastewater

Wastewater emission estimates were developed using the US EPA's Local Greenhouse Gas Inventory Tool, Wastewater module. All known wastewater treatment facilities were assessed to have aerobic or anaerobic digestion capacity. Estimates on their population served were developed. Default data are used for other required data inputs. Facility information is aggregated to the county level and processed in LGGIT.

If it is believed that more refined data will lead to a significantly different outcome, they will be gathered and assessed for the CCAP.

Not Included

Not included in the PCAP analysis are:

- Tree canopy benefits;
- Agricultural emissions;
- Fugitive emissions; or
- Renewable Energy Certificates or other carbon credit mechanisms.

These values are planned for inclusion in the CCAP where data exists or can be estimated.

APPENDIX B

Table 5 - Selected Environmental Variables for all Populations

Jurisdiction	No Environ. Indicators	1	2	3	4	5	6	Total
Total Population	1,949,384 (89%)	116,731 (5%)	67,145 (3%)	46,074 (2%)	8,472 (<1%)	11,626 (1%)	2,309 (<1%)	2,201,741
Population Under 10 Years Old	**241,450 (86%)**	**18,015 (6%)**	**10,261 (4%)**	**7,654 (3%)**	1,377 (<1%)	1,789 (1%)	180 (<1%)	280,726
Population 10 to 17 Years Old	**209,743 (88%)**	**14,217 (6%)**	7,820 (3%)	5,325 (2%)	849 (<1%)	1,200 (1%)	222 (<1%)	239,376
Population 18 to 64 Years Old	1,203,372 (89%)	68,705 (5%)	41,810 (3%)	27,713 (2%)	5,092 (<1%)	6,899 (1%)	1,617 (<1%)	1,355,208
Population 65+ Years Old	294,819 (90%)	15,794 (5%)	7,254 (2%)	5,382 (2%)	1,154 (<1%)	1,738 (1%)	290 (<1%)	326,431
Hispanic All Races	**56,053 (79%)**	**4,964 (7%)**	**6,397 (9%)**	**2,744 (4%)**	84 (<1%)	458 (1%)	72 (<1%)	70,772
Not Hispanic White	1,632,698 (93%)	58,333 (3%)	36,585 (2%)	16,498 (1%)	2,793 (<1%)	4,088 (<1%)	557 (<1%)	1,751,552
Not Hispanic Black	**156,124 (59%)**	**47,787 (18%)**	**20,942 (8%)**	**24,546 (9%)**	**5,407 (2%)**	**6,551 (2%)**	**1,649 (1%)**	**263,006**
Not Hispanic Asian	54,769 (96%)	1,052 (2%)	651 (1%)	200 (<1%)	42 (<1%)	39 (1%)	20 (<1%)	56,773
Not Hispanic Other	**49,740 (83%)**	**4,595 (8%)**	**2,570 (4%)**	**2,086 (3%)**	146 (<1%)	490 (1%)	11 (<1%)	59,638

Table 6 - Selected Environmental Variables for Low Income & Exceeds Threshold Populations

Low Income & Exceeds Threshold	**Asthma**	**Heart Disease**	**Energy**	**PM 2.5**	**Traffic Proximity**	**Diesel**	**Lack of Greenspace**
Total Population	196,616 (9%)	91,970 (4%)	69,909 (3%)	0	49,355 (2%)	63,267 (3%)	23,998 (1%)
Under 10 Years Old	**32,865 (12%)**	13,328 (5%)	11,398 (4%)	0	7,051 (3%)	9,085 (3%)	3,305 (1%)
10 to 17 Years Old	24,431 (10%)	10,05 (4%)	8,592 (4%)	0	5,309 (2%)	5,656 (2%)	2,513 (1%)
18 to 64 Years Old	116,877 (9%)	53,985 (4%)	41,867 (3%)	0	30,801 (2%)	40,695 (3%)	15,804 (1%)
65+ Years Old	22,443 (7%)	14,598 (4%)	8,052 (2%)	0	6,194 (2%)	7,831 (2%)	2,376 (1%)
Hispanic All Races	**13,187 (19%)**	**4,291 (6%)**	**3,273 (5%)**	**0**	**3,126 (4%)**	**3,192 (5%)**	**1,979 (3%)**
Not Hispanic White	71,523 (4%)	45,685(3%)	36,289 (2%)	0	22,077 (1%)	27,672 (2%)	12,705 (1%)
Not Hispanic Black	**101,949 (39%)**	**38,607 (15%)**	**26,887 (10%)**	**0**	**21,803 (8%)**	**29,78 (11%)**	**8,557 (3%)**
Not Hispanic Asian	1,513 (3%)	514 (1%)	350 (1%)	0	430 (1%)	505 (1%)	125 (<1%)
Not Hispanic Other	**8,444 (14%)**	2,873 (5%)	3,110 (5%)	0	1,919 (3%)	2,115 (4%)	632 (1%)

APPENDIX C

IDENTIFIED LIDAC CENSUS TRACTS

Table 7 - LIDAC Census Tracts source: EJ Screen

18029080300	39017011123	39061008300
18047969700	39017012200	39061008400
18047969900	39017012300	39061008501
21015070301	39017012700	39061008502
21015070311	39017013000	39061008601
21023950200	39017013100	39061008800
21023950300	39017013200	39061009200
21037050100	39017013400	39061009300
21037050500	39017013500	39061009400
21037050600	39017013600	39061009500
21037051101	39017013900	39061009600
21037051200	39017014000	39061009700
21037053200	39017014100	39061009800
21077960101	39017014400	39061009902
21081920200	39017014600	39061010002
21081920300	39017014700	39061010003
21081920400	39025041102	39061010004
21117060300	39025041701	39061010005
21117060700	39025041800	39061010202
21117060900	39061000200	39061010300
21117061000	39061000900	39061010500
21117061200	39061001100	39061010700
21117061400	39061001600	39061010900
21117064400	39061001700	39061011000
21117065000	39061002200	39061021602
21117065100	39061002300	39061021603
21117065600	39061002800	39061021604
21117066900	39061003600	39061021802
21117067000	39061003700	39061021900
21117067100	39061003800	39061022200
21191930300	39061003900	39061022301
39015951400	39061004702	39061022700
39015951600	39061005500	39061023201
39015951700	39061005600	39061023400
39015951800	39061006000	39061025200
39017000100	39061006100	39061025300

39017000200	39061006300	39061025401
39017000300	39061006400	39061025500
39017000400	39061006600	39061025700
39017000500	39061006800	39061026200
39017000600	39061006900	39061026300
39017001100	39061007300	39061026400
39017010500	39061007700	39061026700
39017010906	39061007800	39061026900
39017010909	39061007900	39061027000
39017011004	39061008000	39061027100
39061027400	39061008100	39061027200
		39165031700