PRIORITY CLIMATE ACTION PLAN

Philadelphia-Camden-Wilmington,
PA-NJ-DE-MD Metropolitan Statistical Area

March 2024

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

ICF

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Prepared For: Delaware Valley Regional Planning Commission (DVRPC) and Wilmington Area Planning Council (WILMAPCO)

Warming Stripes Image Credit: Professor Ed Hawkins
www.showyourstripes.info

DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION

The Delaware Valley Regional Planning Commission (DVRPC) is the federally designated Metropolitan Planning Organization for the Greater Philadelphia region, established by an Interstate Compact between the Commonwealth of Pennsylvania and the State of New Jersey. Members include Bucks, Chester, Delaware, Montgomery, and Philadelphia counties, plus the City of Chester, in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer counties, plus the cities of Camden and Trenton, in New Jersey.

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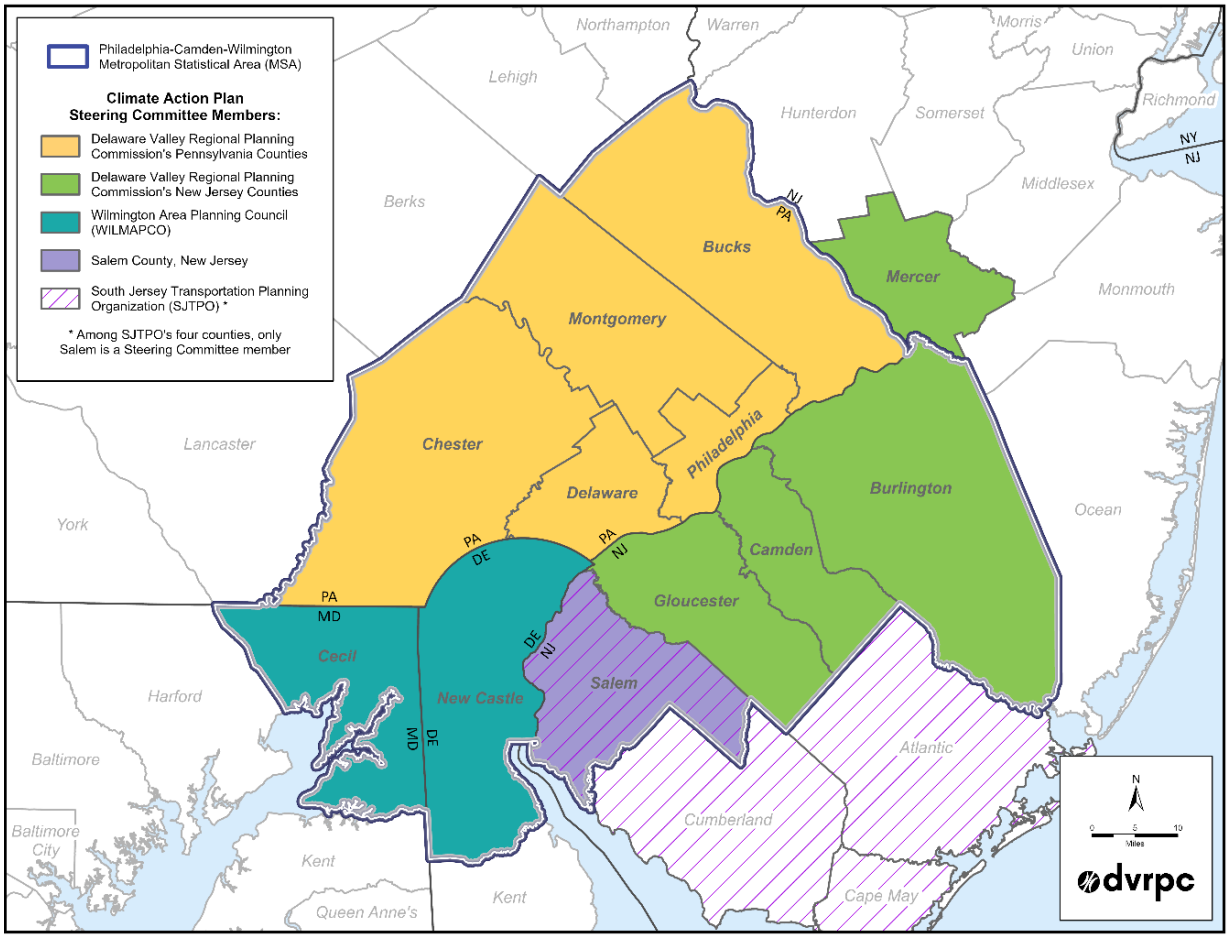
Introduction

The Delaware Valley Regional Planning Commission (DVRPC), in collaboration with the Wilmington Area Planning Council (WILMAPCO) and South Jersey Transportation Organization (SJTPO), has led the development of this Priority Climate Action Plan (PCAP) for the Philadelphia Metropolitan Statistical Area (MSA). It meets the requirements of the U.S. Environmental Protection Agency's (EPA's) Climate Pollution Reduction Grant (CPRG) program. The CPRG program provides funding to states, local governments, tribes, and territories to develop and implement plans for reducing greenhouse gas emissions and other harmful air pollution. DVRPC will also lead the other required CPRG planning deliverables for the Philadelphia MSA, including a Comprehensive Climate Action Plan (CCAP, due mid 2025) and Status Report (due 2027).

Within the limited eight-month timeline to coordinate across the MSA and produce the PCAP, DVRPC and partners strove to create an inclusive process from the beginning, and to center those most marginalized by the impacts of climate pollution in the planning process. Our stakeholder approach focused on building a foundation of relationships with community-based organizations to elevate the voices of low income and disadvantaged communities. Moving forward, we will continue this momentum through deeper engagement within our diverse and dynamic MSA in the CCAP process.

The Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA is geographically comprised of Bucks, Chester, Delaware, Montgomery, and Philadelphia counties in Pennsylvania; Burlington, Camden, Gloucester, and Salem counties in New Jersey; New Castle County in Delaware; and Cecil County in Maryland (see below for a map of the Philadelphia MSA). DVRPC added Mercer County, NJ, to the CPRG geographic area, as Mercer County is one of DVRPC's member governments.

Figure 1: Philadelphia Metropolitan Statistical Area



Source: DVRPC and US Census Bureau

CPRG Program Overview

The Inflation Reduction Act

The Inflation Reduction Act (IRA), signed into law on August 16, 2022, directs federal funding to reduce carbon emissions, lower healthcare costs, fund the IRS, and improve taxpayer compliance. IRA contains eight titles, each with some provisions that directly or indirectly address issues related to climate change, including reduction of U.S. greenhouse gas (GHG) emissions or promotion of adaptation and resilience to climate change impacts.[1] The law represents the largest investment toward addressing climate change in United States history, investing approximately $369 billion in energy security and climate change programs over the next ten years.[2]

Purpose and Intent of the CPRG

The CPRG program, authorized under Section 60114 of IRA, provides $5 billion in grants to states, MSAs, tribes, and territories to develop and implement plans for reducing GHG emissions and other harmful air pollution. The program consists of two phases: planning and implementation. The planning phase provides $250 million in noncompetitive planning grants for states and MSAs to develop a PCAP, CCAP, and Status Report. The implementation phase provides $4.6 billion for competitive implementation grants to eligible applicants to implement GHG reduction measures identified in a PCAP developed under a CPRG planning grant.

The PCAP is a document that identifies near-term activities that can be undertaken to achieve GHG reductions for the MSA. For this PCAP, climate action "measures" encompass relatively broad categories of potential GHG reduction actions, including expanding and/or creating projects, programs, and policies. The identification and selection of measures was informed by actions and goals outlined in state and local climate action plans, as well as input from community stakeholders from across the MSA, as described below in the Approach to PCAP Development section. Where possible, opportunities for regional collaboration have been identified to increase accessibility to collective resources and ensure that measures have widespread impact across the MSA. All measures described in this PCAP have the potential to positively impact climate actions in multiple states, counties, and cities across the MSA. Several actions within the measures can also be crosscut across the entire MSA to enhance efficiency and collaboration.

[1] *CRS. "Inflation Reduction Act of 2022 (IRA): Provisions Related to Climate Change," October 3, 2022. crsreports.congress.gov/product/pdf/R/R47262*

[2] *Senate Democrats. "Summary: The Inflation Reduction Act of 2022," July 27, 2022. www.democrats.senate.gov/imo/media/doc/inflation_reduction_act_one_page_summary.pdf*

See Table **1**, below, as a guide on where to find the required components of the PCAP.

Table 1: Crosswalk of PCAP Requirements and Document Locations

PCAP Requirement	**Requirement Notes and Document Location**
GHG Inventory	*Climate Work and Context for the Philadelphia MSA: GHG Inventory*
GHG Emissions Projections	*Climate Work and Context for the Philadelphia MSA: GHG Inventory*
GHG Reduction Targets	*Climate Work and Context for the Philadelphia MSA: GHG Inventory*
Priority Quantified GHG Reduction Measures	Priority GHG reduction measures, including the following for each (Priority Climate Actions: PCAP Measures): ● *GHG measure description* ● *Key actions and program elements* ● *Geographic coverage* ● *Key implementing agencies* ● *Authority to implement* ● *Intersection with other funding opportunities* ● *Quantified GHG reductions ($MTCO_2e$)* ● *GHGs and co-pollutants identification* ● *LIDAC benefits analysis* ● *Key metrics* Qualitative analysis of co-benefits achieved by implementing the measures and reducing GHG emissions: *Priority Climate Actions: Co-Benefits of PCAP Measures* Qualitative analysis of how implementing the measures will result in clean workforce development: *Priority Climate Actions: PCAP Measures and Workforce Development*
Benefits Analysis	Co-benefits of GHG reductions: *Priority Climate Actions: Co-Benefits of PCAP Measures* Benefits to LIDACs: See *Climate Actions: PCAP Measures* for information by measure
Review of Authority to Implement	See *Priority Climate Actions, PCAP Measures* for information by measure
Low Income and Disadvantaged Communities (LIDAC) Benefits Analysis	Identification of LIDACs and climate risks facing them: *Climate Work and Context for the Philadelphia MSA: Identification of Philadelphia MSA LIDACs* and *Appendix A* LIDACs that will be affected by the GHG reduction measures in the PCAP: *Climate Work and Context for the Philadelphia MSA: Identification of Philadelphia MSA LIDACs* and *Appendix A* Qualitative discussion of the expected benefits to LIDACs associated with PCAP GHG reduction measures: see measure-specific information for each measure in *Priority Climate Actions: PCAP Measures* and *Appendix E* Overview of planned and/or ongoing engagement with representatives and residents of LIDACs to inform PCAP and CCAP development and implementation: *Climate Work and Context for the Philadelphia MSA: Outreach to LIDACs*

PCAP Overview

This PCAP identifies high priority, ready-to-implement GHG reduction measures that will provide significant GHG reductions and other benefits to the Greater Philadelphia region and the communities within it. Inclusion in an MSA's PCAP is a prerequisite for a measure to be eligible for implementation grant funding in the second phase of the CPRG program. Accordingly, the measures identified in this PCAP are designed to be broad enough to encompass regional and local priorities for addressing climate pollution. The PCAP also serves as a starting point for a larger, more comprehensive region-wide climate planning effort to be conducted through 2024 and 2025 in the CCAP.

PCAP Definitions

Greenhouse Gas (GHG): The air pollutants carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.
GHG Inventory: A list of emission sources and sinks, and the associated emissions quantified using standard methods.
GHG Reduction Measure: Policies, programs, actions, or projects that reduce GHG emissions or enhance carbon sequestration in a certain sector, i.e., residential buildings, wastewater, electricity production, etc.
Co-Benefits: Positive effects beyond the reduction of GHGs (e.g., improved public health outcomes, economic benefits, increased climate resilience).
Low Income and Disadvantaged Community (LIDACs): Communities with residents that have low incomes, limited access to resources, and disproportionate exposure to environmental or climate burdens.

PCAP Limitations

EPA's extremely compressed timeline was the principal limitation in the development of the PCAP. As described in the next section, the identification of measures was primarily constrained to the recommendations contained in existing climate plans and publications as the PCAP timeline necessitated a significantly streamlined stakeholder engagement process, especially given the number of states (4), MPOs (3), and communities that fall within this MSA.

Approach to PCAP Development

Overview of Process

To develop the PCAP, DVRPC started by gathering existing climate planning materials from MSA partners and establishing a strategy for stakeholder engagement. The data gathered from these endeavors was analyzed and synthesized into the PCAP measures found later in this report.

The following graphics depict the PCAP development timeline, which spanned from early PCAP visioning in July 2023, to submission of the final PCAP to EPA by March 1, 2024. Figure 2 outlines the overall PCAP development process, including approaches to MSA collaboration, stakeholder engagement, and PCAP deliverables.

Figure 2: PCAP Development Schedule

Task	Year	2023						2024		
	Quarter	Q3			Q4			Q1		
	Month	J	A	S	O	N	D	J	F	M
DVRPC and WILMAPCO's early work on CPRG Coordination										
Steering Committee (SC) Kickoff Meeting + Information Gathering										
Consultant Contracted										
PCAP Goals and Visioning										
SC Mtg – Introduce Consultant, Review Initial Feeback from SC										
Monthly Regional Subcommittee Meetings										
SC Mtg - Review of PCAP Prioritization Process										
Review of Existing Plans, Sorting of Actions and Initial Measure Definitions										
PCAP Stakeholder Engagement										
Scoring of Priority GHG Reduction Measures										
SC Mtg - Review of Sorted Priority GHG Reduction Measures										
PCAP Writing and GHG Modeling										
LIDAC Analysis										
SC Mtg - Review Prioritized PCAP Measures, Implementation Grant Coord.										
SC Review of Draft PCAP										
PCAP Submission										

Source: ICF 2023

Steering Committee Engagement

A steering committee was formed to include state, regional, and county representatives from across the MSA. A list of state, MPO, and county entities represented in the steering committee are found in Appendix B. Steering committee engagement started in October 2023, with monthly meetings throughout the PCAP process through February 2024, resulting in a total of six steering committee meetings. Three subcommittees were formed consisting of members of the steering committee to focus discussions based on geographic areas: Pennsylvania, New Jersey, and Delaware/Maryland. These three subcommittees each met at least monthly.

Early engagement resulted in a comprehensive list of climate action resources developed within the MSA, such as climate action plans or related documents as described in the Review of Existing Resources section. Committee members provided feedback on what their GHG reduction priorities were and if proposed GHG reduction measures for the PCAP would suit their own near-term implementation plans. Committee members provided additional stakeholder contacts for further engagement. Steering committee members also used these meetings to coordinate with each other on priorities and work out further details during subcommittee meetings.

Review of Existing Resources

Several climate action plans and other resources were reviewed from across the MSA (See Appendix C for a full list). Planning documents for the PCAP included state, regional, and local sustainability, energy, and climate action plans, including but not limited to:

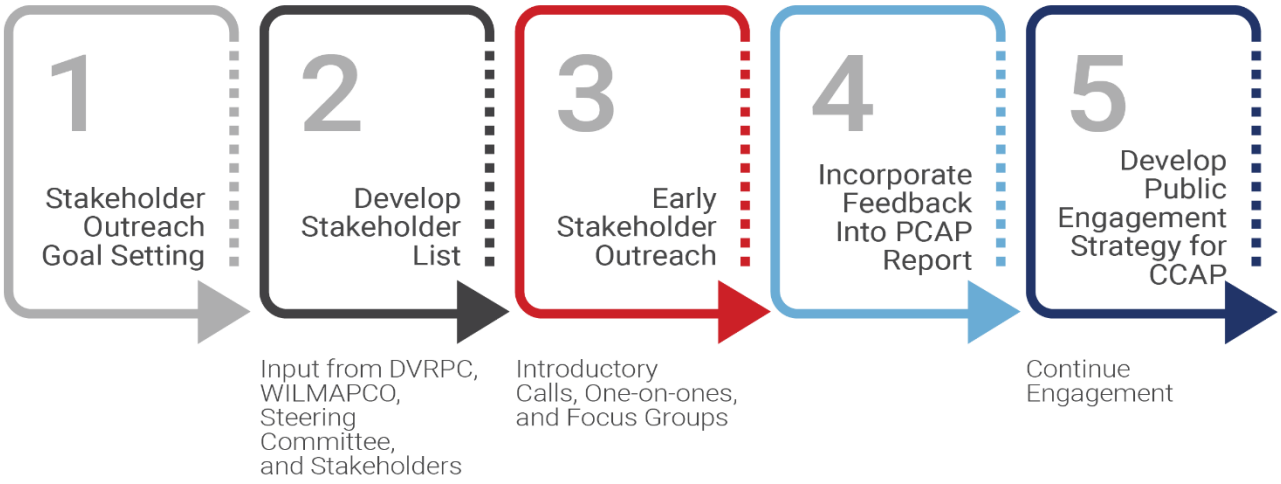
- Greenprint for Montgomery County: Climate Change Action Plan
- Sustain Delco
- Maryland's Climate Pathway
- Philadelphia Climate Action Playbook
- Chester County Climate Action Plan
- Pennsylvania Climate Action Plan
- New Jersey's Global Warming Response Act 80x50 Report
- Delaware's Climate Action Plan

Other foundational documents reviewed for PCAP development include climate-related state legislation, executive orders, regional studies, and an existing list of actions currently underway at the state, county, and municipal levels across the MSA. Collecting these necessary documents was a shared effort of representatives from all parts of the MSA.

Stakeholder Engagement Process

Stakeholder engagement is a key component of the Philadelphia MSA region's climate action planning efforts and informed the PCAP. Stakeholder input was collected through the project's steering committee and its subcommittees, through community and technical focus groups, a project website (www.dvrpc.org/cprg) including a short public feedback form, and one-on-one calls. Figure 3 outlines the stakeholder engagement process for the PCAP.

Figure 3: PCAP Stakeholder Engagement Process



Source: Connect the Dots 2023

Given the limited timeline provided to develop the PCAP, stakeholder engagement for this phase of climate action planning focused on the following objectives:

1. Facilitate awareness and understanding of the CPRG program among key organizations and community leaders.
2. Deepen established relationships and create new ones to support CCAP development and CPRG implementation.
3. Understand ongoing stakeholder efforts to reduce GHG emissions.
4. Utilize feedback from stakeholders (and the communities they represent) to inform the development of PCAP measures.
5. Determine how best to work collaboratively with stakeholders during the CCAP phase, when more robust public engagement will be conducted, including how to ensure an inclusive process that results in equitable outcomes.

Stakeholder engagement during the PCAP process informed the identification and development of PCAP measures and has made more robust public engagement possible for the CCAP phase. DVRPC, with support from the MSA steering committee, employed a grasstops approach that targeted community leaders and organizations to build strong relations and gain key insights in a short timeframe. Grasstops stakeholders can be defined as organizations, institutions, or individuals who are leaders within their respective field and hold topic expertise, relationships, and trust within their community of impact. DVRPC, WILMAPCO, and steering committee members compiled a list of more than 100 key stakeholders to engage. This listing included regional and local government agencies, advocacy organizations, research and educational institutions, community and nonprofit organizations, and utility companies whose work was known to align with the CPRG program.

Stakeholders engaged during the PCAP phase included those who were known to have technical expertise to inform PCAP measures, were already engaged in GHG reduction efforts, or could offer expertise on the needs of LIDACs in relation to climate change. These stakeholders were asked to participate in either a focus group meeting or a 1-on-1 phone call with DVRPC staff.

The focus groups were organized into the following groups:

- Program Implementers
- Technical Experts
- Utility Providers
- Local and Regional Government
- Community Based Organizations (CBOs)
- LIDAC-Focused CBOs

Focus group conversations were tailored to gather both general and specific input and feedback for each stakeholder group's area of expertise. For example, groups with more technical expertise provided detailed feedback on PCAP measures, while LIDAC focus group members shared community needs and preferred engagement practices. All groups provided key information on existing GHG reduction efforts and feedback on draft PCAP measures. DVRPC and WILMAPCO also engaged in virtual communication, conversations, and planning sessions with stakeholders and partners across the region. Specific to the WILMAPCO region, presentations about the PCAP were made to WILMAPCO's Council and Technical Advisory Committee (TAC) in January 2024, and to the Public Advisory Committee (PAC) in February 2024. A draft of the PCAP was shared with the TAC in mid-February. WILMAPCO coordinated around PCAP updates via one-on-one calls with DNREC's Division of Climate, Coastal, and Energy, DelDOT's Office of Sustainability, and New Castle County. WILMAPCO further organized a pair of discussions around potential active transportation PCAP submissions in New Castle County and Cecil County, with representatives from both counties and Delaware and Maryland DOTs.

Table 2, below, portrays the focus group engagement methodology utilized and the list of stakeholders who participated in these conversations.

Table 2: Summary of Stakeholder Engagement Activities

Date	Type of Engagement	Stakeholder(s)
January 8, 2024	Focus Group: Technical Stakeholders #1	Sierra Club New Jersey Chapter Sierra Club Delaware Chapter Drexel University Temple University
January 9, 2024	Focus Group: LIDAC CBOs & CBOs #1	The Latin American Community Center (Delaware) Energy Coordinating Agency Philadelphia Office of Community Empowerment & Opportunity Philadelphia Association of Community Development Corporations Isles of Trenton Ceiba Community Legal Services Regional Housing Legal Services Heart of Camden
January 9, 2024	Focus Group: Technical Stakeholders #2	Sierra Club of Pennsylvania Center for Environmental Transformation Earth Quaker Action Team Interfaith Power and Light Temple University Office of Sustainability
January 10, 2024	Focus Group: Utility Providers	Philadelphia Gas Works Pennsylvania Power & Light Borough of Lansdale (PA) Electric Department
January 11, 2024	Focus Group: Government Stakeholders	Haverford Township, Pennsylvania Bucks County Association of Township Officials Cecil County Council Upper Darby Township, Pennsylvania Chester County Planning Commission New Jersey Association of Counties Rutledge Borough (PA) Council
January 12, 2024	Focus Group: Program Implementers	Community First Fund Smart Energy Initiative of Southeast Pennsylvania DelVal Regional Finance Authority Pennsylvania Utility Law Project Southeastern Pennsylvania Transportation Authority (SEPTA) Delaware Authority for Regional Transit (DART) Cecil Transit Public Health Management Corporation Sustainable Jersey Fund for the School District of Philadelphia
January 25, 2024	Focus Group: LIDAC CBOs & CBOs #2	Healthy Communities Delaware Montgomery County Housing Authority Chester Residents Concerned for Quality Living Housing Equity Repair and Electrification 4 Climate Justice (HERE4CJ) PosiGen

A project logo and website, www.dvrpc.org/cprg, was developed to share information about CPRG and the PCAP. A general overview of the grant is provided on this page, along with meeting presentations and recordings, and a feedback form to collect public comments, ideas, and contact information for those interested in getting more involved.

The public feedback form on the project website generated 13 responses during the PCAP development. Twelve responses were from residents within the Philadelphia MSA and one response was from a resident outside of the MSA. Ten responses came from residents in Pennsylvania (six from Philadelphia, four from suburban southeast Pennsylvania counties), two responses from residents in New Jersey (one from Mercer County, one from outside of MSA), and one response from a resident in New Castle County, Delaware. Counties not represented in feedback form results included Bucks County (PA), Cecil County (MD), Burlington County (NJ), Camden County (NJ), Gloucester County (NJ), and Salem County (NJ). Form responses included a range of organizations with an emphasis in climate change and sustainability advocacy (three responses), local government entities (three responses), public health (two responses), housing, community, and/or economic development (one response), the private sector (one response), or unspecified (three responses). All respondents wanted to stay informed of future updates for the PCAP and the CCAP. Feedback received through the public form included the following:

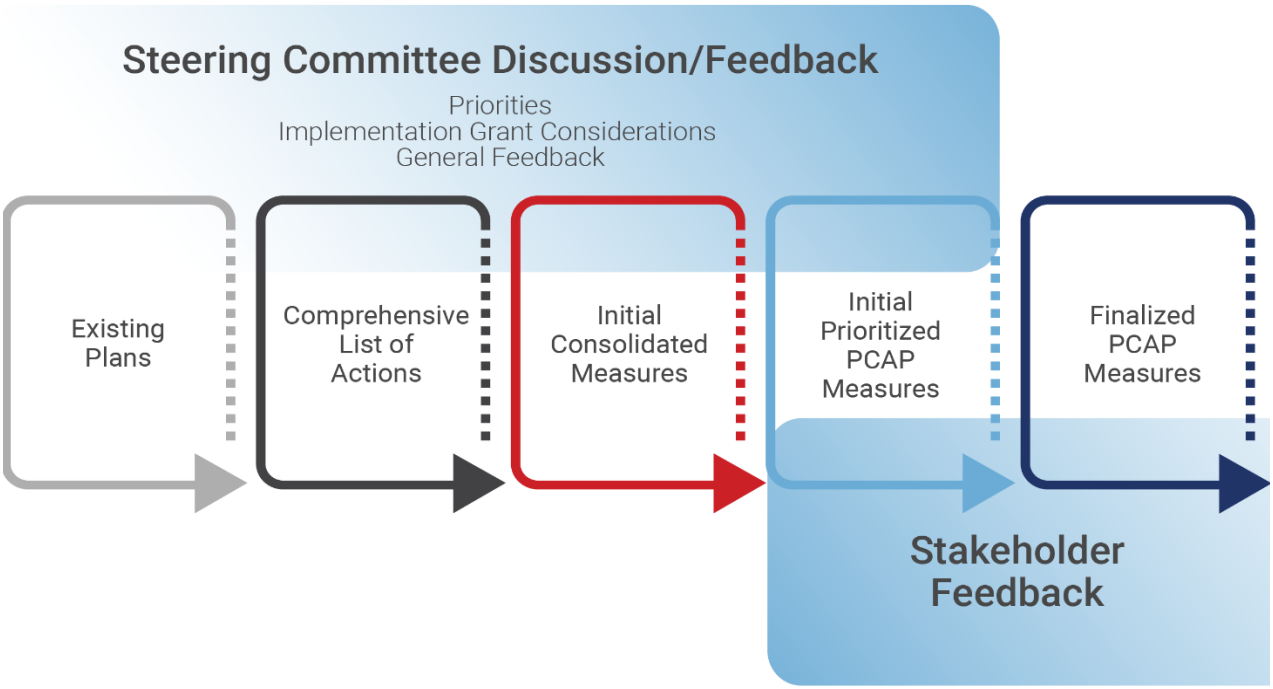
- Offering incentives for building decarbonization (commercial and residential) and clean electric grid actions (such as microgrids).
- Improving air quality and related impacts in environmental justice communities as part of greenhouse gas reduction measures.
- Changing the culture in the Philadelphia MSA and reaching consensus to reduce greenhouse gas emissions.
- Working with the public health community on greenhouse gas reduction measures to strengthen public health benefits to communities.
- Building a strong coalition of stakeholders such as utilities, labor organizations, and goods and movement organizations to develop greenhouse gas reduction measures.

Measure Prioritization

Once existing resources were reviewed and stakeholder ideas and feedback were gathered, data was synthesized to identify key measures for the PCAP. While almost two dozen potential measures were initially identified, only nine were finally selected to be included in the PCAP. The measure screening and prioritization process relied on a multi-methodology approach that included quantitative and qualitative methods. A scoring process was used to prioritize and screen potential measures based on the scope, applicability, measurability, potential impact, and other criteria. Measures were also subject to discussions at regular steering committee and subcommittee meetings, which further helped narrow down the list and fine tune the measures. Feedback from the stakeholder engagement process helped to inform the finalization of measures and ensure the final set of measures prioritized community needs. In the end, measures that scored highly and gained buy-in from multiple MSA stakeholders were selected for inclusion in the final PCAP (see

Figure **4**).

Figure 4: Measure Prioritization Process Overview



Source: ICF 2023

Climate Work and Context for the Philadelphia MSA

GHG Inventory

DVRPC compiles an inventory of GHG emissions and energy use for the nine-county Greater Philadelphia region every five years. The baseline inventory (published in 2008) developed emissions data for 2005. For its most recent inventory, which was in progress at the launch of the CRPG planning process, DVRPC chose to calculate emissions for 2019 as opposed to 2020 due to the impact of the COVID-19 pandemic on emissions patterns. Data collection and verification for the 2019 inventory was completed in late 2023.

For the CPRG program, the GHG inventory includes three counties outside of DVRPC's traditional jurisdiction, including Salem, NJ, New Castle, DE, and Cecil, MD. DVRPC calculated GHG emissions estimates for these counties by applying scaling factors, such as population, households, employment, vehicle miles traveled, agricultural land area, and household heating fuel types, to emissions and activity data in statewide inventories and in local inventories for counties within the DVRPC region.

DVRPC's inventory estimates emissions from the major GHGs, including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and Sulfur Hexafluoride (SF6). DVRPC uses a blend of "top-down" data (e.g., state fuel consumption estimates), "bottom-up" data (e.g., local consumption data gathered directly from utilities for electricity and natural gas consumption), and modeling (e.g., DVRPC's regional travel demand model and EPA's MOVES model) to develop estimates of energy use and GHG emissions. All of these data are processed and inputted into an Excel-based spreadsheet tool customized to DVRPC's needs.[3] DVRPC used the latest Global Warming Potential (GWP) values from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5), as did the state inventories used to obtain scaled emissions data for the three counties outside of the DVRPC region. The mix of data and other inputs used in DVRPC's nine-county inventory is dictated by data availability, existing protocols, and resource limitations.

Emissions Activities

DVRPC calculates GHG emissions associated with energy use in the residential, commercial, industrial, and transportation sectors (on-road transportation, passenger and freight rail, aviation, marine transportation, and off-road vehicles and equipment). DVRPC also calculates non-energy GHG emissions resulting from waste management (solid waste and wastewater), agriculture processes, industrial processes, fuel refining, transmission, and distribution, and emissions from ozone depleting substance substitutes. These categories are similar to those used in the U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks.

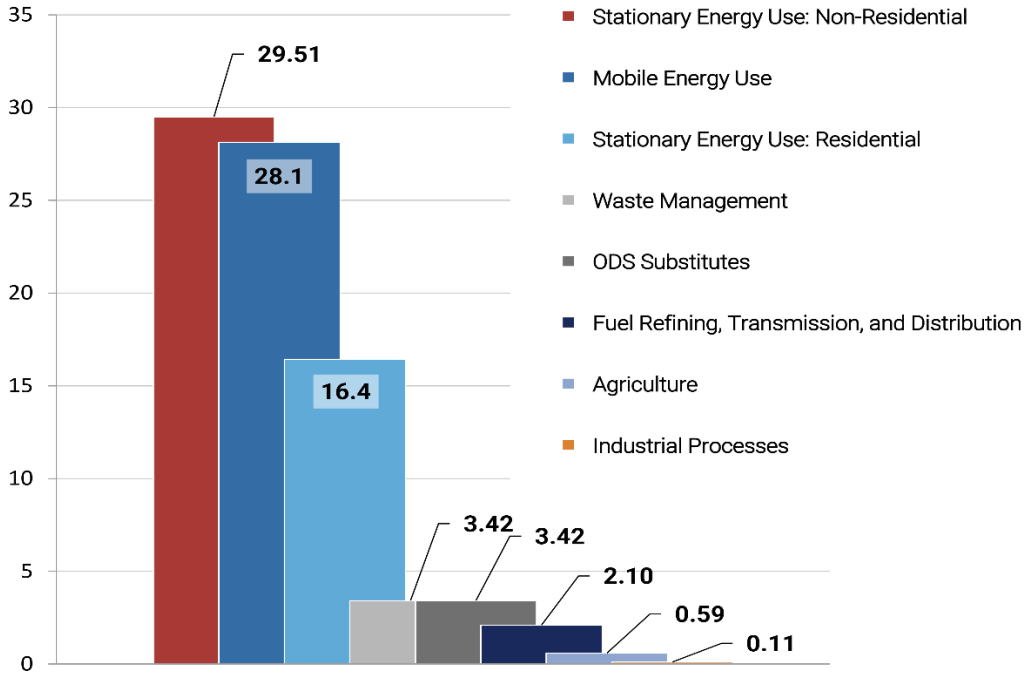
In 2019, emissions from all sectors in the nine-county Greater Philadelphia region were just over 72 $MMTCO_2e$ (million metric tons of carbon dioxide equivalent). This is a 4.4 percent decline from the 75.3 $MMTCO_2e$ emitted in 2015. Total estimated 2019 emissions for the three MSA counties located outside the DVRPC territory were 11.7 $MMTCO_2e$, bringing the total for the MSA to 83.7 $MMTCO_2e$. Of this total, almost 88.5 percent were associated with energy use, while the remaining 11.5 percent were associated with non-energy related emissions, such as the release of methane from agricultural operations and landfills. Approximately 24 percent of total emissions resulted from electricity consumption by the residential, commercial, and industrial sectors, while the direct burning of fuels in those same sectors accounted for an additional 30 percent. Transportation accounted for 33.6 percent of emissions, including 27 percent from on-road vehicles, 5.3 percent from aviation, 0.9 percent from off-road vehicles and equipment, and 0.5 percent from rail and marine activities apiece. Waste management accounted for four percent of emissions. Substitutes for ozone depleting substances (ODS) and fugitive and process emissions from fuel refining, transmission, and distribution accounted for four and two percent,

[3] *DVRPC. 2018. Energy Use and Greenhouse Gas Emissions Inventory for Greater Philadelphia: Methods and Sources. www.dvrpc.org/reports/tm18023.pdf*

respectively. Agricultural processes and industrial processes (except for fuel refining broken out above) each accounted for less than one percent of total emissions.

Traditionally, DVRPC also calculates net sequestration of greenhouse gases from land use, land use change, and forestry (LULUCF). However, the detailed land use file used for these calculations is not scheduled to be updated for the DVRPC region until later in 2024. Therefore, the 2019 inventory has yet to include this data for the Greater Philadelphia region. In 2015, LULUCF accounted for a net sequestration of 1.75 $MMTCO_2e$.

Figure 5: 2019 Greenhouse Gas Emissions (MMTCO2e) Philadelphia MSA



GHG Inventory Methodology

The inventories have been developed to be compliant with both the U.S. Communities Protocol for Accounting and Reporting Greenhouse SWSSWGas Emissions (USCP), Global Protocol for Community-Scale Greenhouse Gas Inventories (GPC), and Global Covenant of Mayors (GCoM) reporting framework.

The final 2019 Energy Use and Greenhouse Gas Emission Inventory for Greater Philadelphia is expected to be published by May 2024. DVRPC will also publish a detailed description of its methods and sources for the 2019 inventory. The methods and sources used are similar to those used for DVRPC's 2015 inventory, which are described in detail in *Energy Use and Greenhouse Gas Emissions in Greater Philadelphia, 2015: Methods and Sources* published in 2018.

Drivers of GHG Change

While a full GHG contribution analysis comparing DVRPC's 2019 nine-county inventory has yet to be prepared, a basic comparison of emissions and energy use shows that the largest source of emissions reductions in Greater Philadelphia between 2015 and 2019 was the result of a cleaner, less carbon-intensive grid due to the increasing use of natural gas and declining use of coal for electricity generation. While electricity consumption declined by just one percent regionally, emissions from electricity use declined by 13 percent due to a cleaner grid. Fuel switching from distillate fuel oil and other petroleum products to natural gas for direct consumption in the residential, commercial, and industrial sectors was the next largest driver of emissions reductions, followed by a decrease in direct energy use in the

residential and non-residential sectors. Together, these factors reduced emissions in the direct fuel use category by 5.5 percent.

Mobile sources, which include on-road transportation, rail, aviation, marine vehicles, and off-road vehicles and equipment, increased by 4.6 percent collectively. Approximately 75 percent of the emissions in this sector are accounted for by on-road vehicles, including light-duty cars and trucks and heavy-duty vehicles. On-road vehicles saw an increase of 4.9 percent due to a 6 percent increase in vehicle miles traveled (VMT), which was partially offset by small improvements in fleet fuel efficiency. While not captured in this inventory, it is worth noting that 2020 saw a dramatic dip in VMT due to the global pandemic, followed by a rebound in VMT to nearly pre-pandemic levels in subsequent years.

Emissions from petroleum refining saw a significant decrease of over 38 percent, or a drop of almost one $MMTCO_2e$, due largely to the closure of the Philadelphia Energy Solution refinery in south Philadelphia.

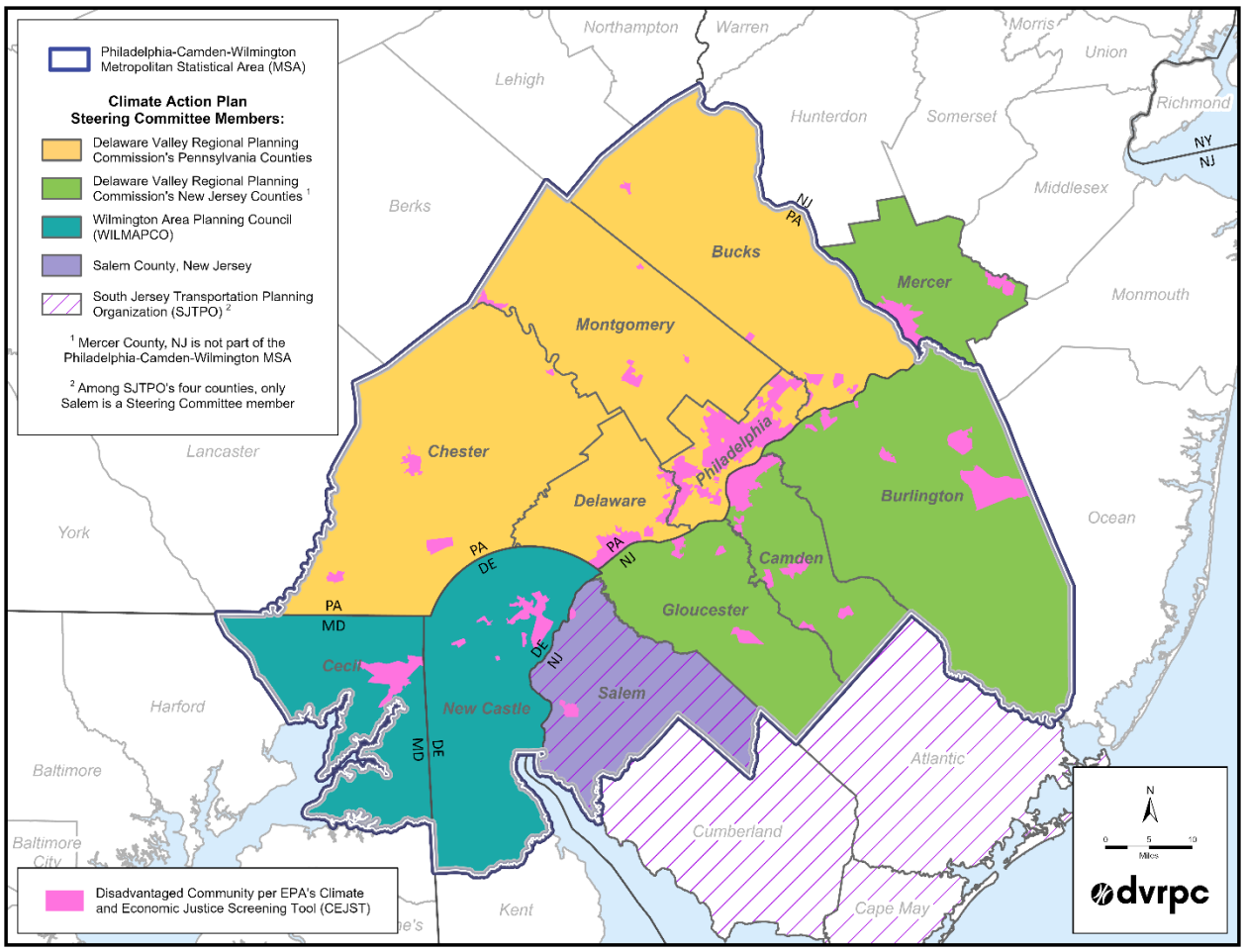
Identification of Philadelphia MSA LIDACs

The Philadelphia MSA region is composed of diverse cities and counties with varying economic, educational, and racial and ethnic demographics. Within this region, the median household income is $84,123, with 31 percent of households under the $50,000 annual income threshold, and 60 percent of households with an annual income between $50,000 and $200,000. The poverty rate in the region is 11.4 percent, with 15 percent of children and 10 percent of seniors living below the poverty line. Residents within the MSA tend to be formally educated, with 92.3 percent of people attaining a high school degree or higher and 42.3 percent achieving a bachelor's degree or higher. Of the MSA residents, 59 percent are non-Hispanic white, 20 percent are non-Hispanic Black, 11 percent are Hispanic, 6 percent are non-Hispanic Asian, and the remaining 4 percent are two or more races.[4] Please note that this demographic data does not account for Mercer County, NJ, which is involved in this PCAP but is geographically outside of the MSA. This compares to national United States data, which shows 75.5 percent of residents are non-Hispanic white, 13.6 percent are non-Hispanic Black, 19.1 percent are Hispanic, 6.3 percent are Asian, and 3 percent are two or more races.[5] The greatest concentration of low income and disadvantaged communities (LIDACs) in the region lies near the urban area in and around the City of Philadelphia, with other LIDACs scattered across other urban--and a few rural--areas throughout the MSA.

DVRPC used CEJST (a climate and environmental justice screening tool provided by the Council on Environmental Quality) to visualize and identify Census block groups that are designated as disadvantaged in the region per the 2020 U.S. Census (see Figure 6). Appendix A lists the Census tract IDs (containing block groups) of all LIDACs within the MSA (per the 2020 U.S. Census).

[4] *U.S. Census Bureau. 2022. American Community Survey 1-year Data (2005-2022).*
[5] *U.S. Census Bureau. 2023. Quick Facts: United States. www.census.gov/quickfacts/fact/table/US/PST045223*

Figure 6: LIDAC Areas Within the Philadelphia Metropolitan Statistical Area



Source: EPA Climate and Economic Justice Screening Tool (CEJST), DVRPC and US Census Bureau

Climate Impacts and Risks Facing Philadelphia MSA's LIDACs

The climate risks most prevalent in the U.S. include extreme weather events (hurricanes, extreme rainfall, etc.), extreme heat and urban heat island effects, flooding, sea level rise, drought, and wildfires. Social systems inequitably distribute negative impacts from climate risks on Black, Indigenous, and People of Color (BIPOC) individuals and communities, low-income households, unhoused individuals, rural communities, and agricultural workers.[6] Not only do these communities experience the most severe impacts of climate change, but they are also the least able to prepare for and respond to these impacts due to a lack of resources and socio-political power. According to a 2021 EPA analysis, racial and ethnic minorities are particularly vulnerable to climate change impacts, especially Black and African American individuals.[7]

[6] *Marino, E.K., K. Maxwell, E. Eisenhauer, A. Zycherman, C. Callison, E. Fussell, M.D. Hendricks, F.H. Jacobs, A. Jerolleman, A.K. Jorgenson, E.M. Markowitz, S.T. Marquart-Pyatt, M. Schutten, R.L. Shwom, and K. Whyte, 2023: Ch. 20. Social systems and justice. In: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. doi.org/10.7930/NCA5.2023.CH20*

[7] *EPA. 2021. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency, EPA 430-R-21-003. www.epa.gov/cira/social-vulnerability-report*

Minority and low-income communities are more likely to suffer the consequences of climate change due to heightened exposure to climate risks and inaccessibility to resources, such as adequate infrastructure and proper insurance.[8] Many factors contribute to this inequality, including historical discriminatory practices in housing, education, and employment. Pre-existing health status and living conditions are two key components of climate vulnerability, which are often determined by economic power, social policies, political influence, and structural racism.[9]

Within the Philadelphia MSA, the most prevalent climate risks are extreme heat, extreme precipitation events, and sea level rise:

- **Extreme Heat.** Since the early 20th century, the Greater Philadelphia region has seen annual average temperature increase at an average rate of about 0.4 degrees Fahrenheit per decade. Looking to the future, mean annual temperatures are projected to increase by up to 5 degrees Fahrenheit over the 2000 baseline by 2050. As the region grows hotter, extreme heat events are also expected to become more common and severe;[10] already, 8 of the 10 hottest years on record have occurred since 2000. Historically, the average hottest day of the year was 97.4˚F; by 2080, the average hottest day of the year could reach up to 106.6˚F under a high emissions scenario. The number of days per year with maximum temperature above 100˚F will likely increase, as well.[11] Across the historical baseline, Philadelphia only experiences an average of 0.3 days per year with temperatures exceeding 100˚F. Under a high emissions scenario, there may be as many as 17 days by the end of the century. Exposure to extreme heat can cause heat exhaustion, heat stroke, and can contribute to deaths from a range of cardiovascular diseases such as heart attacks and strokes. Older adults, young children, people of color, outdoor workers, those with poorer health, and low-income individuals are more at risk of heat-related death. Additionally, higher temperatures will lead to increased energy demand and higher energy costs.[12] Individuals belonging to LIDACs will be less able to afford these increased costs, thus exacerbating heat-related health risks.
- **Extreme Precipitation.** The Greater Philadelphia region is expected to see an up to 12 percent increase in mean annual precipitation by 2050, especially in winter months.[13] To date, 6 of the 10 wettest years on record have occurred since 1990. Extreme rain events overall will likely increase in frequency and intensity throughout the century.[14] This will cause more intense flooding, disproportionately harming households without homeowners' or renters' insurance or that cannot afford the necessary home repairs. In addition to flooding, heavy precipitation can cause landslides, which can further damage infrastructure.[15] Flooding can also impact human health by increasing mold production and exposure to waterborne diseases, particularly affecting those in poor living conditions and lacking access to safe and reliable drinking water.[16]

[8] *Patnaik, A., Son, J., Feng, A., Ade, C., 2020. Racial Disparities and Climate Change. Princeton Climate Action. psci.princeton.edu/tips/2020/8/15/racial-disparities-and-climate-change*

[9] *Patnaik, A., Son, J., Feng, A., Ade, C., 2020. Racial Disparities and Climate Change. Princeton Climate Action. psci.princeton.edu/tips/2020/8/15/racial-disparities-and-climate-change*

[10] *Pearl, N. and Montalto, F. 2023. A Climate Resilience Research Agenda for the Greater Philadelphia Area. Drexel University. drexel.edu/~/media/Files/sustainability/pdf/CRRA_Executive_Summary.ashx*

[11] *Pierce, D. W., D. R. Cayan, D. R. Feldman, and M. D. Risser, 2023: Future Increases in North American Extreme Precipitation in CMIP6 downscaled with LOCA. J. Hydrometeor., doi.org/10.1175/JHM-D-22-0194.1, in press.*

[12] *EPA, 2023. Climate Change and Heat Islands. www.epa.gov/heatislands/climate-change-and-heat-islands#:~:text=When percent20people percent20are percent20exposed percent20to percent20extreme percent20heat percent2C percent20they,attacks percent2C percent20strokes percent2C percent20and percent20other percent20forms percent20of percent20cardiovascular percent20disease*

[13] *Pearl, N. and Montalto, F. 2023. A Climate Resilience Research Agenda for the Greater Philadelphia Area. Drexel University. drexel.edu/~/media/Files/sustainability/pdf/CRRA_Executive_Summary.ashx*

[14] *Ibid.*

[15] *EPA. 2021. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency, EPA 430-R-21-003. www.epa.gov/cira/social-vulnerability-report*

[16] *EPA. 2021. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency, EPA 430-R-21-003. www.epa.gov/cira/social-vulnerability-report*

- **Sea Level Rise.** According to an ICF study conducted in 2015, sea level in the Greater Philadelphia region is expected to rise by 7 to 11 inches by the 2030s, and up to 45 inches by the 2080s compared to a 2000 baseline.[17] As sea level rises, so do tidal rivers, such as the tidal Delaware River, which rose at a rate of 1.0 inches per decade in the 20th century. Sea level rise increases "sunny day" tidal flooding and, combined with stronger storms, increases the impact of storm surge-induced flooding, damaging infrastructure and coastal property.[18] As with riverine flooding, LIDACs may be less able to afford the costs of repairing damages or relocating if their homes become completely inundated. Additionally, saltwater intrusion from sea level rise can make drinking water unsafe for coastal communities, leading to dangerous impacts on health. Sea level rise worsens when compounded by other factors facing the Philadelphia MSA, including extreme precipitation and land subsidence. The latter plays a particular role in coastal wetlands, agricultural areas, and developed regions, where land subsides at an average rate of 3 mm per year.[19] As land sinks and seas rise, the Greater Philadelphia region becomes more vulnerable to damaging flooding and its associated health and economic risks.

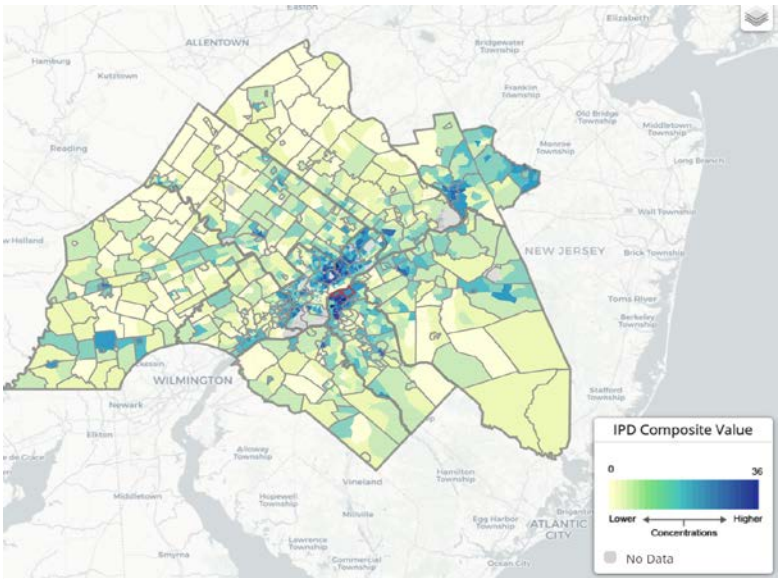


Figure 7: Concentrations of Populations Identified for Equity Analyses in the Greater Philadelphia Region

Source: www.dvrpc.org/webmaps/ipd/#map

The City of Philadelphia's 2021 Climate Action Playbook, created by the Office of Sustainability, outlines the City's actions towards meeting the goals of the Paris Agreement. As noted in this report, systemic racism has contributed to vast inequities between Philadelphia neighborhoods. Pollution and industrial areas are most likely to be in neighborhoods with greater minority and/or low-income communities. These areas are also less likely to have green land cover, which has benefits for health and wellbeing. These frontline communities will face the brunt of the climate impacts listed above.

DVRPC created the Indicators of Potential Disadvantage (IPD) analysis to identify low-income and minority populations in the Greater Philadelphia region. The following population groups were "indicators" of potential disadvantage: youth, older adults, females, racial minorities, ethnic minorities, foreign-born, limited English proficiency, disabled, and low-income. Using these indicators, each census tract was given an IPD score determined by standard deviations relative to an indicator's regional average. A higher IPD score indicates a greater concentration of disadvantaged communities. The map in Figure **7**igure 7 shows concentrations of census tracts with higher IPD scores, as represented by the darker blue shading.

[17] *Mayor's Office of Sustainability. 2015. Growing Stronger: Toward a Climate Ready Philadelphia. ICF. www.phila.gov/media/20160504162056/Growing-Stronger-Toward-a-Climate-Ready-Philadelphia.pdf*

[18] *Pearl, N. and Montalto, F. 2023. A Climate Resilience Research Agenda for the Greater Philadelphia Area. drexel.edu/~/media/Files/sustainability/pdf/CRRA_Executive_Summary.ashx*

[19] *Ohenhen, L.O., Shirzaei, M., Ojha, C. et al. Hidden vulnerability of US Atlantic coast to sea-level rise due to vertical land motion. Nat Commun 14, 2038 (2023). doi.org/10.1038/s41467-023-37853-7*

Outreach to LIDACs

Because LIDACs are more likely to suffer greater consequences of climate change, the stakeholder engagement process for the PCAP sought out the perspectives of LIDAC-serving organizations and leaders. LIDACs have historically carried the burdens of the energy systems without receiving proportionate benefits. It is essential that regional climate action efforts identified in this plan prioritize LIDAC communities as main receivers of the benefits of these actions, including wealth building, job creation, and improvements to the environment, public health, and quality of life, while also mitigating any negative impacts that these actions may pose.

DVRPC and PCAP partners convened two focus groups in January 2024, specifically focused on collecting the knowledge and feedback from LIDAC-serving CBOs. These organizations were identified by DVRPC, WILMAPCO, and the CPRG steering committee, concentrating on existing relationships in the region, while ensuring representation from a diversity of organizations from across the Philadelphia MSA. LIDAC organizations from across the Philadelphia MSA attended these meetings and provided specific feedback on the draft PCAP measures, shared the work that their organizations and other LIDAC-focused organizations were implementing, and gave guidance on how best to engage the LIDAC communities they serve. During this engagement, project staff also collected referrals from these LIDAC-serving organizations and community leaders for further outreach and engagement that can be carried out during the CCAP.

Key takeaways from LIDAC-serving organizations:

- There is a robust landscape of programs and organizations in urbanized areas where LIDAC members are already engaged in climate mitigation activities, though they would benefit from greater funding and/or coordination, with a particular focus on the following:
    - Residential energy conservation and home repairs
    - Gardening and green spaces
    - Supporting contractors and workforce development focused on GHG reduction measures
- There are geographic areas of the MSA region, particularly outside of urbanized areas, where the landscape of programming and LIDAC-serving organizations is weak or very segmented.
- Existing engagement with LIDACs is at times also focused on particular issues or agendas, therefore only engaged with residents interested in those topics rather than the community as a whole.
- Outreach and education with LIDACs need to address their short-term needs and concerns.
- To be accessible, outreach must consider the languages spoken, literacy levels, and levels of technical knowledge.
- Communities are more likely to be reached through trusted sources such as elected officials or organizations with strong relationships within the community.
- LIDAC-serving organizations face the challenge of accessing funding to scale up existing efforts or pilot new programs.

Findings from these focus groups added nuance to the PCAP measures, in particular highlighting that much of the existing PCAP measure-aligned regional work targets homeowners and not renters or landlords. The findings also provided essential guidance for how best to collaborate with LIDACs during the CCAP and support existing GHG reduction programming in the near and long term in these geographies.

Finally, a consistent recommendation from this focus group outreach is to engage LIDACs in the MSA early on and throughout both the implementation processes of the priority measures identified in this plan and in the development of the CCAP. Additional group and individual discussions with LIDAC-focused CBOs will be held to ensure that LIDAC engagement in the CCAP is timely and meaningful.

Existing Targets, Goals, Plans, Policies, and Programs

While there is no official existing MSA-wide GHG reduction target or goal, there are numerous state, regional, and local GHG reduction targets and goals that this PCAP will help to achieve.

To mitigate catastrophic climate change impacts across the Philadelphia region and around the world, DVRPC's Long Range Plan, Connections 2050, calls for achieving net-zero GHG emissions by 2050 through renewable energy, energy efficiency, energy management, the electrification of buildings and vehicles, and through reducing vehicle miles traveled by improving transit and non-motorized travel options. Additionally, Connections 2050 establishes a goal to increase the installed capacity of solar.

DVRPC provides numerous planning tools and programs that provide ongoing GHG mitigation support to the region. For example, DVRPC compiles a regional detailed GHG inventory at 5-year intervals allocating emissions to each of its nine counties and 352 municipalities. DVRPC also has several programs and tools focused on the reduction of greenhouse gasses, focusing primarily on the southeast PA collar counties (Bucks, Chester, Delaware, and Montgomery) as this is where the strongest demand for GHG mitigation support is found. These planning tools and programs can be found on DVRPC's Web page here: www.dvrpc.org/energyclimate/

While WILMAPCO does not have a formal GHG reduction target, they have a policy objective to "Reduce Carbon Emissions and Promote Climate Resilience" within their *2050 Regional Transportation Plan: 2023 Update* (www.wilmapco.org/rtp). Policy actions to realize that objective include reducing vehicle miles traveled, supporting clean vehicle infrastructure, fuels, and technology, and adapting to sea level rise, storm flooding, and other environmental challenges. Performance measures have been identified to track the progress of these actions, including a 10 percent VMT reduction target between 2020 and 2030.

WILMAPCO also developed a hot spot analysis for the placement of public electric vehicle charging stations. This work supported successful grant funding to install stations in the Wilmington region. In addition, WILMAPCO has supported state and locally driven climate mitigation planning efforts, including Delaware's climate and electric vehicle planning efforts, and the City of Newark's Sustainability Plan.

SJTPO's Long Range Plan has a goal to "Improve the Resiliency and Reliability of the Transportation Infrastructure ", which, while not listed explicitly, includes climate mitigation strategies. The agency does not have a formal GHG reduction target. The four states encompassing the Philadelphia MSA have all set GHG reduction goals: an 80 percent reduction in 2005/2006 GHG emissions by 2050 in Pennsylvania and New Jersey; a 28 percent reduction in 2005 emissions by 2025 in Delaware; and a 50 percent reduction in 2006 emissions by 2030 in Maryland. All four states are also part of the Regional Greenhouse Gas Initiative (RGGI), the 12-state cap-and-trade program for carbon dioxide emissions from power generation facilities. Pennsylvania, however, which joined in 2022, is not yet an active participant due to two pending court injunctions that prevent the state from participating in the quarterly RGGI auctions.

Of the MSA's 12 counties, there are many plans, such as comprehensive and sustainability plans, that address or touch on issues of buildings, energy generation, transportation, agriculture, waste, and their accompanying GHG pollution in varying levels of depth. For example, New Castle County's Comprehensive Plan, NCC 2050, addresses these issues. Three of the region's twelve counties currently have published climate action or energy master plans focused specifically on GHG reductions. These include the Chester County Climate Action Plan[20], the Philadelphia Energy Master Plan[21], and Sustain Delco, Delaware County's sustainability and climate action plan.[22] Chester County, PA's plan calls for an 80 percent reduction in both County government and countywide GHG emissions by 2050 from 2005

[20] *Chester County Planning Commission. 2021. Chester County Climate Action Plan. www.chescoplanning.org/Environmental/pdf/ClimateActionPlan.pdf*
[21] *City of Philadelphia. 2017. Municipal Energy Master Plan. www.phila.gov/media/20170927092513/MunicipalEnergyMasterPlan.pdf*
[22] *Delaware County. 2023. Sustain Delco: A Sustainability Plan for Delaware County. www.delcopa.gov/sustainability/pdf/SustainDelcoPlan.pdf*

levels. Sustain Delco calls for a 20 percent reduction in 2019 county-wide emissions by 2028. The City of Philadelphia's plan, meanwhile, sets three GHG reduction goals for City government owned facilities and operations:

- Reduce greenhouse gas emissions by 50 percent by 2030
- Reduce energy use by 20 percent by 2030
- Generate or buy 100 percent of all electricity from renewable resources by 2030

In addition to these published plans, Bucks County, PA and Montgomery County, PA are actively working on countywide Climate Action Plans. All these plans, both published and under development, include detailed actions, programs, and policies to reduce GHG emissions across a full spectrum of sectors.

Numerous municipal governments, which include cities, townships, and boroughs, have also published climate action or energy transition plans. While an accurate accounting of all plans is not complete, DVRPC estimates that approximately 15 to 25 municipal governments across the MSA have completed plans. Examples include the Middletown Township, Bucks County, PA Climate Action Plan[23] and the Radnor Township, Delaware County, PA Renewable Energy and Conservation Plan.[24] The former sets a goal of an 80 percent reduction in 2018 emissions levels by 2050 and the latter calls for 100 percent clean electricity by 2035 and 100 percent clean energy by 2050.

DVPRC, WILMAPCO, and all our state, regional and local partners are committed to the collaborative implementation of PCAP measures to reduce GHG emission to achieve our collective energy and climate justice goals.

Available Public Climate Funding Sources

The following are available public funding sources for climate-related programs. Some may not be available to the whole region or apply to all measures. Please follow the links below for specific information and guidance regarding each funding source. Additionally, refer to DVRPC's Municipal Funding Guide for federal, state, county, and private sources of funding for locally initiated planning and development projects.

Table 3: Federal Climate Funding Sources

Federal Program/Grant Name	**Funding Source**
Alternative Fuel Vehicle Refueling Property Tax Credit	Federal – Formula
Assistance for Latest and Zero Building Energy Code Adoption	Federal – Formula
Capital Investment Grants Program	Federal – Competitive
Carbon Reduction Program	Federal – Formula
Charging and Fueling Infrastructure Grants	Federal – Competitive
Clean Commercial Vehicle Tax Credit	Federal – Formula
Clean Diesel Grant Program/Diesel Emissions Reduction Act	Federal – Competitive
Clean Heavy-Duty Vehicle Program	Federal – Formula

[23] *Middletown Township Environmental Advisory Council. 2021. Climate Action Plan: Local Actions and Policies to Reduce Middletown Township's Greenhouse Gas Emissions. www.middletownbucks.org/cap*

[24] *Practical Energy Solutions. 2021. Radnor Township Renewable Energy and Conservation Plan. www.radnor.com/home/showpublisheddocument/10/637693886528900000*

Federal Program/Grant Name	Funding Source
Clean School Bus Program	Federal – Competitive
Clean Vehicle Tax Credit	Federal – Formula
Clean Water State Revolving Fund	Federal – Formula
Congestion Mitigation and Air Quality (CMAQ) Improvement Program	Federal – Formula
Consumer Recycling Education and Outreach Grant Program	Federal – Competitive
Empowering Rural America Program	Federal – Competitive
Energy Efficiency and Conservation Block Grant	Federal – Formula
Energy Efficiency Revolving Loan Fund Capitalization Grant Program	Federal – Formula
Grants for Bus and Bus Facility Programs	Federal – Competitive
Green and Resilient Retrofit Program	Federal – Competitive
Greenhouse Gas Reduction Fund	Federal – Competitive
Home Efficiency Rebates Program	Federal – Formula Rebates Administered by States
Home Electrification and Appliance Rebates Program	Federal – Formula Rebates Administered by States
Low or No Emission Grant Program	Federal – Competitive
National Electric Vehicle Infrastructure (NEVI) Program	Federal – Formula
Powering Affordable Clean Energy	Federal – Competitive
Previously Owned Vehicle Tax Credit	Federal – Formula
Renew America's Schools Program	Federal – Competitive
Ride and Drive Electric	Federal – Competitive
Rural Energy for America Program	Federal – Competitive
Solid Waste Infrastructure for Recycling Grant Program	Federal – Competitive
State Energy Program	Federal – Formula
State of Good Repair Formula Program	Federal – Formula
Surface Transportation Block Grant Program	Federal – Formula
Urban and Community Forestry Grants	Federal – Competitive
Urbanized Area Formula Program	Federal – Formula
Weatherization Assistance Program	Federal – Formula
Zero Emission Technologies Grant Program	Federal – Competitive

In addition to federal funding opportunities, a range of different state funding opportunities exist to support the implementation of different decarbonization measures, technologies, and associated climate opportunities. Source funding for these programs comes from a variety of places including state budget lines, and the Regional Greenhouse Gas Initiative (RGGI), which is active in New Jersey, Maryland and Delaware, while Pennsylvania's participation in the program is on hold due to a court order. A range of the larger state and local opportunities for funding and clean energy financing are outlined in

Table 4.

Table 4: State and Local Opportunities for Clean Energy Financing

Opportunities	Pennsylvania	New Jersey	Delaware	Maryland
Utility Equipment Rebate and Energy Efficiency Programs for New and Existing Buildings	Pennsylvania's Energy Efficiency and Conservation (EE&C) Program, as part of Act 129 Administered by PECO, PPL, and MetEd in the Phila MSA	New Jersey's Utility Energy Efficiency Programs, as Directed from the Clean Energy Act of 2018 Administered by PSE&G and Atlantic City Electric in the Phila MSA	Delaware Energy Programs, from the Energy Efficiency Resource Standards Act of 2009 Administered by Delmarva and the Delaware SEU in the Phila MSA	EmPOWER Maryland Program, as part of the Maryland Energy Efficiency Act of 2008 Administered by Delmarva in the Phila MSA
State and Local Energy Accelerator and Lending Programs	Pennsylvania DEP Green Energy Loan Fund Philadelphia Green Capital Corporation Green Bank Philadelphia Energy Authority Programs		Delaware Sustainable Energy Utility (Energize Delaware)'s Programs	Maryland's Clean Energy Center Programs
Electric and Alternative Vehicle Programs	Pennsylvania's Alternative Fuels Incentive Grants	Charge Up New Jersey Programs	Delaware Clean Vehicle Rebate Programs	Maryland Electric Vehicle Tax Credits
Commercial Property Assessed Clean Energy Programs (C-PACE)	Active C-PACE Programs Exist in Pennsylvania, Delaware, and Maryland with a Range of Different Program Administrators. A C-PACE Program is in Development for New Jersey			

Measure-specific federal, regional, state, and utility funding opportunities are listed in the PCAP Measures section below, under the Intersection with Other Funding subsections included in each PCAP measure description.

Priority Climate Actions

PCAP Measure Overview

Through the development of this PCAP, nine measures were identified by DVRPC and the Philadelphia MSA steering committee, with input from stakeholder engagement, as measurable, impactful initiatives that local governments and agencies across the Philadelphia MSA can enact to reduce GHG emissions in the near-term. While several additional measures were also initially considered, the following measures were prioritized due to the presence of key actions that can be taken within these measures that have the potential for significant, near term GHG emissions reductions, benefits to LIDACs and the greater community, trackable metrics, and adaptability for counties, municipalities, and other actors across the MSA. The PCAP measures are as follows:

Measure 1: Actions to Support Decarbonization of Local Governments Operations

Measure 2: Actions to Implement Energy Efficiency, Electrification, and Clean Energy for Residential Buildings

Measure 3: Actions to Implement Energy Efficiency, Electrification, and Clean Energy for Commercial Buildings

Measure 4: Actions to Transition Light Duty Vehicles to Low- or No-Carbon Emission Vehicles

Measure 5: Actions to Expand and Improve Transit

Measure 6: Actions to Implement Bicycle, Pedestrian and Active Transportation Improvements

Measure 7: Actions to Implement a Clean Electricity Grid and Ensure Grid Reliability

Measure 8: Actions to Reduce Waste and Better Manage Waste Generated

Measure 9: Actions to Reduce Emissions at Wastewater Treatment Plants and to Increase Generation of Biomethane

The following sections further detail the PCAP measures. Sections outline the CPRG schedule, including the timeline for taking action under these measures; the co-benefits that these measures provide to the MSA region; the overall benefits that LIDACs can gain from these measures; the impacts of the measures on workforce development; and a detailed description of each PCAP measure. The PCAP Measures section dives deep into each individual measure, highlighting the key actions, GHG impacts, funding opportunities, LIDAC impacts, metrics, and other specific elements of the measures and what stakeholders need to know to take relevant climate action.

CPRG Implementation Schedule and Milestones

Table 5 depicts a proposed timeline for implementation of the CPRG, including the PCAP measures outlined in the following section.

Table 5: Proposed CPRG Implementation Timeline

Milestone	Timeframe
2024	
Deliver final PCAP to EPA, which includes stakeholder input on measures	March 1, 2024
Counties, municipalities, and other actors identify key actions they could take under the PCAP measures	December 2024
2025	
Coordinate resources across jurisdictions and take initial actions across the PCAP measures	Early 2025
Estimate GHG emissions reductions from measure actions	Early 2025
Estimate LIDAC benefits from measure actions	Early 2025
Identify funding sources to support implementation (outside of CPRG Implementation Grant funding)	Early 2025
Develop the CCAP	Early 2025
Deliver final CCAP to EPA	June 30, 2025
2026	
Continue implementing CPRG measure actions at the county and municipal level	Early 2026
Implement pilot programs and short-term strategies for GHG reductions	Mid 2026
Secure local government approval and budget for ongoing GHG reductions	Mid-late 2026
2027	
Deliver Status Report to EPA	Mid-2027
Continue to implement measures and reduce GHGs at the county and municipal level; Track progress across the Philadelphia MSA	2027 onward, with goals met by 2050

Co-Benefits of PCAP Measures

The measures outlined in the PCAP will not only contribute towards meeting local, state, and national climate goals, but will also provide several co-benefits across the Philadelphia MSA region. Examples of co-benefits from the priority GHG reduction measures outlined in this plan include but are not limited to co-pollutant emission reductions (e.g., criteria air pollutants and air toxics), increased climate resilience, improved access to services and amenities, jobs created and workforce development, and decreased energy costs from energy efficiency improvements. This section outlines the co-pollutant reductions that are expected to result from these measures, as well as the socioeconomic and public health benefits expected because of the implementation of the priority measures identified in this plan.

Co-pollutant Emission Reductions

Co-pollutant emission reductions include criteria air pollutants and air toxics (See **Table** 6 below), which will have near- and long-term public health and socioeconomic co-benefits for the region. In the near term, benefits include improving indoor and outdoor air quality and reducing hazardous air pollutants, toxins, and other pollutants. Reducing these types of pollutants can immediately benefit the physical and economic wellbeing of communities. These co-pollutants are also described per measure in the PCAP Measures section.

Table 6: GHGs and Co-pollutants that will be reduced through implementation of PCAP Measures

Pollutant	Air Pollutant Type	Impacted Measure Category
Carbon Dioxide (CO2)	GHG	All
Hydrofluorocarbons (HFCs)	GHG	Buildings, Transportation
Methane (CH4)	GHG	All
Nitrous Oxide (N2O)	GHG	Buildings, Transportation, Grid, Wastewater
Perfluorocarbons (PFCs)	GHG	None
Sulfur Hexafluoride (SF6)	GHG	Grid
Carbon Monoxide (CO)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Lead	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Nitrogen Oxides (NOx)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Particulate Matter (e.g., PM2.5)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Sulfur dioxide (SO2)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Ozone	Co-pollutant: Criteria Air Pollutant Air Pollutant	All
Volatile Organic Compounds (VOCs)	Co-pollutant: VOCs	Buildings, Transportation, Grid, Waste, Wastewater
Other hazardous air pollutants (HAPs)	Co-pollutant: Air Toxics	Buildings, Transportation, Grid, Waste

Public Health
Improved public health is a significant and direct co-benefit of reducing GHG and co-pollutant emissions in the region. Health risks arise from both outdoor and indoor air pollution caused by the combustion of fossil fuels, like coal, natural gas, and petroleum, and consequent release of GHGs, hazardous air pollutants (HAPs), toxins, and other pollutants. In the United States roughly 87 percent of people's lives are spent indoors, so indoor exposure to combustion pollutants, such as natural gas for cooktops or heating, has the potential for substantial health effects.[25]

Exposure to co-pollutants from the combustion of coal, natural gas, and petroleum are linked to a litany of physical health concerns, including illness and premature mortality. A large body of research on the detrimental health effects of exposure to air pollution provides strong evidence that long-term exposure to ambient particulate matter (i.e., PM2.5), ambient ozone, and household air pollution contributes to premature mortality and increased risk of illness. Evidence is also growing on the association between long-term exposure to air pollution and adverse birth outcomes, cognitive declines, and gastrointestinal inflammatory diseases. Short-term exposure to high levels of air pollution can also exacerbate asthma and cardiopulmonary symptoms.[26] Air pollution impacts have historically been concentrated in LIDACs, where community members may also have reduced access to medical care and other health resources due to poverty, lack of transportation, etc.[27]

The measures in this PCAP also improve public health by making active transportation options, such as biking and walking and first- and last-mile connections to public transportation safer and more accessible.

Extreme heat is another health risk resulting from GHG emissions. In the U.S., nearly two-thirds of the population live in areas vulnerable to health risks, including heat exhaustion, heat stroke, respiratory, and cardiovascular conditions caused or exacerbated by extreme heat. From 2004 to 2018, an average of 702 deaths occurred annually in the U.S. due to extreme heat. GHGs are linked to global warming and hotter average temperatures, so reducing GHG emissions can result in more favorable temperatures and lower health risks for communities.[28] The measures in this PCAP include actions that will improve access to energy efficient residential air conditioning to address extreme heat vulnerability.

These public health co-benefits particularly support LIDACs, which have been shown to face the highest risk of air pollution, extreme climate events, and poor transportation resources.[29]

Socioeconomic
Implementing these PCAP measures and actions will also have several social and economic, or socioeconomic, benefits for the MSA population, particularly for LIDACs.

As described further in the next section, PCAP Measures and Workforce Development, efforts to reduce GHGs should intentionally prioritize expansion of the workforce within the clean economy and seek to reskill and upskill the existing workforce, while creating new access to high-quality, family-sustaining jobs. The growth of clean energy technologies, such as solar installations and EV charging infrastructure, requires trained individuals who understand how to source, manufacture, install, and maintain this hardware. Clean energy jobs training, especially for individuals in LIDACs, supports the supply chain of climate infrastructure and technology while also generating jobs and economic opportunities for communities. It also creates a new opportunity for the regional economy to produce the inputs needed for

[25] *U.S. EPA. 1989. Report to Congress on indoor air quality: Volume 2. EPA/400/1-89/001C. Washington, DC.*
[26] *Health Effects Institute. 2020. Health Effects Institute Annual Report 2020: Valuing Science Informing Decisions. www.healtheffects.org/system/files/hei-annual-report-2020.pdf*
[27] *American Lung Association. 2023. Driving to Clean Air: Health Benefits of Zero-Emission Cars and Electricity. www.lung.org/getmedia/9e9947ea-d4a6-476c-9c78-cccf7d49ffe2/ala-driving-to-clean-air-report.pdf*
[28] *Vaidyanathan, A. Malilay, J., Schramm, P., and Saha, S. Heat-Related Deaths — United States, 2004–2018. MMWR Morb Mortal Wkly Rep 2020; 69:729-734.*
[29] *Ebi, K. L., and Hess, J. J. (2020). Health Risks Due to Climate Change: Inequity In Causes And Consequences. Health Affairs. 39(12). doi.org/10.1377/hlthaff.2020.01125*

these technologies itself, if the right economic development investments and policies are made. Installation of clean energy technologies, including distributed resources (e.g., rooftop solar PV installations) and grid investments, creates more redundancy in the grid and lessens the likelihood of blackouts.[30] Therefore, these investments and clean energy workforce trainings enhance climate resilience and curb the economic impact of extreme weather events.

The PCAP measures also address energy use, including in public, residential, and commercial buildings and in vehicles in the transportation sector. In most circumstances, electrifying these fossil fuel-driven sectors and enhancing efficiencies reduces the percentage of budget or income that goes toward energy costs, thereby reducing energy burden, which is particularly high in the region's LIDACs, according to a 2021 study by Greenlink Analytics[31]. Reducing the energy cost burden, particularly for LIDAC residents, reduces financial stress for households and businesses, and allows funds to be used elsewhere to stimulate the economy.[32]EVs also have lower maintenance and fuel costs than internal combustion engine (ICE) vehicles.[33]

Additionally, the measures include actions to expand public transit, better manage waste, and improve pedestrian and bicycle routes. These factors, as well as reduced air pollution and a healthier environment, are key to promoting social inclusion and community gathering, such as opportunities to use green spaces and gather communally outside. Therefore, these measures improve social capital, encourage residents and businesses to engage with their community and local economy, and benefit the overall socioeconomic wellbeing of the Philadelphia MSA.

Finally, climate change causing GHG emissions drive the increased frequency and severity of extreme weather and heat events, which have high financial costs and economic impact.[34] In the longer term, reducing GHG emissions can help curb these events, such as extreme precipitation and storms. This would avoid costs associated with damage caused by extreme weather, including increased insurance premiums and costs to repair structural damage to buildings and roadways. These events also damage crops and natural resources, including waterways and forests, which results in realized costs and economic impacts. Costs associated with medical bills and premature deaths can also be avoided by limiting extreme weather events. In 2022 alone, the U.S. experienced 18 extreme weather and climate events that cost over $1 billion. Reducing these costs is beneficial for individuals, communities, and the overall economy.[35]

Benefits to LIDACs

As mentioned throughout this section, there is the potential for significant co-benefits to LIDACs as a result of the priority actions identified in this PCAP, such as wealth building, job creation, and improvements to the environment, public health and quality of life. However, many of these benefits will not just happen on their own, and given the disproportionate burden and high risk that these communities experience, it is essential that regional climate action efforts identified in this plan take intentional steps to prioritize LIDAC communities as main receivers of the co-benefits of these actions. Appendix E gives a table of general co-benefits that LIDACs can achieve due to these PCAP measures. Steps that local

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[30] *Stout, S., Hotchkiss, E., Lee, N., Holm, A., & Day, M. (2018). Distributed Energy Planning for Climate Resilience. NREL. www.nrel.gov/docs/fy18osti/71310.pdf*

[31] *Greenlink Analytics. 2021. Energy Burden Focus Groups with the City of Philadelphia.* www.greenlinkanalytics.org/post/energy-burden-focus-groups-with-the-city-of-philadelphia

[32] *U.S. DOE. 2019. Low-Income Household Energy Burden Varies Among States — Efficiency Can Help In All of Them. Energy.gov. www.energy.gov/sites/prod/files/2019/01/f58/WIP-Energy-Burden_final.pdf*

[33] *U.S. DOE. 2022. Saving Money with Electric Vehicles. www.energy.gov/energysaver/articles/saving-money-electric-vehicles*

[34] *Seneviratne, S.I., X. Zhang, M. Adnan, W. Badi, C. Dereczynski, A. Di Luca, S. Ghosh, I. Iskandar, J. Kossin, S. Lewis, F. Otto, I. Pinto, M. Satoh, S.M. Vicente-Serrano, M. Wehner, and B. Zhou, 2021: Weather and Climate Extreme Events in a Changing Climate. In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1513–1766, doi: 10.1017/9781009157896.013.*

[35] *Smith, A. 2023. 2022 U.S. billion-dollar weather and climate disasters in historical context. NOAA. www.climate.gov/news-features/blogs/beyond-data/2022-us-billion-dollar-weather-and-climate-disasters-historical*

governments and other key actors can initially take to ensure that these benefits are felt by LIDACs, include:

- Engaging early and consistently with LIDAC communities in the planning and implementation of measures.
- Targeting funding to ensure that climate solutions are low- and no-cost for LIDACs.
- Ensuring that climate action steps that LIDAC communities must take in their homes and businesses are as streamlined and simple to access and implement as possible.
- Centering the structure of programs, policies, and projects around LIDAC needs first to ensure long term affordability, quality of life, and opportunity for these communities.
- Prioritizing LIDACs and LIDACs' needs into workforce development practices.

The forthcoming CCAP will provide additional recommendations for local governments to help ensure that benefits are felt by LIDACs as informed by stakeholder and public outreach, conversation with LIDACs, and additional research on best practices.

For more analysis of LIDAC benefits from this PCAP, please see the Summary LIDAC Benefit Table in Appendix E.

PCAP Measures and Workforce Development

The measures outlined in this PCAP create significant opportunities for expansion of the clean economy, including its workforce. Meeting the demand for new job opportunities with qualified and trained workers will require partnerships with and learning from stakeholders. Workforce development will receive a larger emphasis in the CCAP, but some preliminary work based on available information has been completed.

A range of occupations will be needed to support priority measures identified in the PCAP, including electricians, HVAC mechanics, construction laborers, maintenance workers, carpenters, manufacturing workers, vehicle and construction equipment operators, professional services in engineering, construction and finance, and public employees with a range of different operational departments. Based on the existing attributes of these jobs (such as wages, and benefits), these present significant opportunities for family sustaining jobs within the region. While these opportunities exist, there are a range of barriers to realizing these employment benefits. When exploring this work further in the CCAP, regional leaders should consider findings from a Pennsylvania study on the clean energy workforce which found:

- Employers reported hiring difficulties related to a small applicant pool.
- Lack of experience or qualified applicants with industry-specific knowledge is a significant barrier.
- Programs that provide on-the-job training were pivotal to landing clean energy jobs.
- The state's clean energy training landscape is mostly focused on the energy efficiency sector.
- Clean energy wages for the seven occupations reviewed in the study (using 2021 data) were between $17-$33 per hour, a considerable improvement over food preparation and retail wages.[36]

[36] *Pennsylvania Department of Environmental Protection. 2021. 2021 Pennsylvania Clean Energy Industry Workforce Development needs Assessment & Gap Analysis. https://files.dep.state.pa.us/Energy/Office percent20of percent20Energy percent20and percent20Technology/OETDPortalFiles/2021CleanEnergyGapAnalysis/PA_2021_Clean_Energy_Gap_Analysis_Report.pdf*

As the region considers expanding its workforce to support measures, training and job development programs should target LIDACs and the existing workforce, since it will need to pivot as the economy itself moves away from reliance on fossil fuels. Foundational on-the-job training in climate-related and clean energy roles can broaden workforce access for those in need of employment, including those without college degrees, while also accelerating decarbonization actions across the MSA. To support PCAP measures and workforce development, local governments, organizations, and companies will need to offer job trainings related to building and maintaining future measures including facility energy systems, solar photovoltaic systems, compost management, EV charging infrastructure, aerobic digestive system operations, public transit services, and more. Clean energy workforce development can reach many economic sectors, including construction, agricultural, energy, government, manufacturing, and transportation. Additionally, new opportunities may correspond with loss of opportunities in other sectors of the economy. Where possible, workforce programs should seek to identify industries impacted and connect with individuals affected by these changes.

For example, investments in residential efficiency programs intended to reduce energy burdens, like Philadelphia's Built to Last program, create demand for jobs with average wages that range roughly from $45,000 to $55,000. These single positions provide income that nearly matches the median household income across the city. The top growing occupations are in manufacturing, construction, transportation, and administrative support roles, positions that LIDAC residents may rapidly fill. Anticipated job and income growth from these investments is more labor-intensive than continued investments in alternative means of meeting the same energy demand; the result is net job and income growth for the region that scales with the investments.

Currently in the MSA, the City of Philadelphia has taken steps to expand solar PV (photovoltaic) installer jobs, to the benefit of minority, female, and/or young residents ready to enter the workforce. In a study conducted for the Philadelphia Energy Authority, it was determined that 15 living wage jobs are created for every 100 solar installations. As Pennsylvania is home to more than 550 solar companies and ranks highly in the U.S. for clean energy employment, there are many opportunities in the region to create jobs and increase employment in LIDACs.[37] New Jersey is also committed to an inclusive green economy and workforce, and the state anticipates adding tens of thousands of green jobs to implement GHG reduction programs and policies.[38]

As demand for clean energy technologies and programs continues to grow in the Greater Philadelphia region and across the U.S., the supply of workers in the clean energy sector will need to increase. To foster this growth in an equitable way that promotes a diverse workforce and accessibility to LIDACs, wraparound services can also be offered, such as transportation support, childcare, a stipend for training participation, and more. By offering accessible training, the MSA can develop the clean energy workforce, support economic development in LIDACs, and take significant steps toward regional and national climate goals.

[37] *Practical Energy Solutions. 2019. Solar Potential in Philadelphia: Labor Market Data. philaenergy.org/wp-content/uploads/2019/11/PEA_SolarPVInstaller_LaborMarketData_11.1.19.pdf*

[38] *New Jersey Council on the Green Economy. 2022. Green Jobs for a Sustainable Future. The State of New Jersey. www.nj.gov/governor/climateaction/documents/CGE percent20Roadmap.pdf*

PCAP Measures

The following section provides a comprehensive overview of each of the nine PCAP measures. It delves into each measure's description, key actions, geographic coverage, and reasons for its prioritization. Individual measures are further explored for implementation considerations, including the key implementing agencies, their authority, and potential intersections with other funding. It concludes with an analysis of the measure's effect on GHG reductions, a LIDAC engagement summary, the co-pollutants targeted by the measure, and potential metrics for tracking the measure's impact. This section serves as a guide to understanding each PCAP measure's role in mitigating GHG emissions and its applicability and implications for the MSA. Additional key actions within these nine measures will be addressed through the forthcoming CCAP that will outline all actions that the region can take within these measures to achieve net zero greenhouse gas emissions by 2050.

Measure 1: Actions to Support Decarbonization of Local Government Operations

GHG Measure Description

This GHG reduction measure includes key actions to implement projects and policies to decarbonize the operations of local governments, including counties, municipalities, authorities, and school districts across the Philadelphia MSA, particularly in the building, transportation, and energy sectors. Local governments within the MSA will lead the development of this measure within their jurisdiction, while leveraging regional partnerships, project development support, and joint procurement of resources as appropriate. Collectively, the goal for this measure across the MSA will be to decarbonize operations, improve indoor and outdoor air quality, and reduce energy costs for local governments and associated agencies. The indirect co-benefits of these actions, including improved public health and the creation of clean energy jobs, will spread throughout communities. Regional support and resources will prioritize municipalities with significant populations of historically underserved LIDACs. Local governments that take these climate-focused actions will lead by example, enhancing their ability to influence decarbonization in the electric grid, transportation, commercial and residential sectors within the region.

This measure was also identified as a priority in all state, subregional, and local climate action plans that were reviewed across the MSA for this PCAP (see Appendix C). Several existing state and regional programs provide technical assistance, project development support, and funding to support local governments with implementing this action. This measure aligns with the FY 2022-2026 EPA Strategic Plan, particularly Goal #1: Tackle the Climate Crisis and Strategic Goal #4: Ensure Clean and Healthy Air for All Communities.[39]

Case Study: Solar for City of Philadelphia (Adams Solar)
The City of Philadelphia has leveraged its purchasing power to spur the development of an 80-megawatt solar array in Adams County, which will generate 22% of the city's predicted electricity demand. This will produce electricity for buildings such as City Hall, Philadelphia International Airport, and the water department operations.

Case Study: Sustainable Energy Partnership
Founded in 2020, the Partnership is working together to pool resources and work across jurisdictions to procure renewable energy. The Sustainable Energy Partnership is a cooperative effort between four counties in the Southeast Pennsylvania region to aggregate and leverage purchasing power towards new renewable projects. The goal is to meet counties' renewable energy targets, lower local government energy costs, and utilize economies of scale to work together.

[39] *U.S. EPA. 2022. FY 2022-2026 EPA Strategic Plan Overview. www.epa.gov/system/files/documents/2022-03/fy-2022-2026-epa-strategic-plan-overview.pdf*

Key Actions/Program Elements

To lead by example to reduce GHGs emissions across the Philadelphia MSA, local governments will take actions under this measure to decarbonize local government operations. Sectors targeted by these actions include buildings and facilities, transportation, and energy. Actions to reduce emissions in the solid waste and wastewater treatment sectors are identified in Measures 8 and 9 respectively. By reducing GHG emissions in operations, local governments within the Philadelphia MSA will benefit from lower energy costs, while the greater community will benefit from improved air quality and the creation of clean energy jobs.

This action-oriented measure focuses on project development and implementation steps rather than technical assistance or report writing, and it can be tailored to the needs of each participating local government. For additional guidance on taking the following actions, local governments may participate in an energy manager circuit rider program, like the one that DVRPC is launching for municipalities in southeast Pennsylvania, or they may hire their own local government energy manager or other decarbonization-focused roles. Additional resources, tools, and funding support are available through several federal and state sources noted in Table 7 below.

Buildings and Facilities
In the building and facilities sector, local governments can implement energy efficiency and conservation, electrification, and onsite distributed energy resources (DERs) such as renewables and battery storage. These actions can be implemented in existing local government buildings and facilities and in the construction of new buildings and facilities. Example actions include, but are not limited to:

- Benchmark local government facilities each year to identify and track energy and GHG reduction opportunities.
- Adopt a local government-wide requirement that local government buildings and facilities are benchmarked each year.
- Conduct building energy improvements and retrofits, often initiated through an audit to identify opportunities, including:
    - Development and implementation of low-cost operation and maintenance strategies for buildings to reduce wasted energy use and improve occupant comfort.
    - Installation of energy efficient windows and building envelope updates, such as insulation and air sealing.
    - Electrification of building heating, air conditioning and water heating systems through heat pump installation, especially in buildings using delivered fuels or electric resistance heating.
    - High-efficiency HVAC upgrades, lighting retrofits and building control systems.
- Adopt building energy efficiency standards for appliances, and uniform stretch codes for new municipal construction or major retrofits.
- Design and install infrastructure in buildings and facilities, such as new electrical systems or other equipment to support building efficiency and electrification, transportation electrification or new renewable energy and battery storage systems.
- Design and install energy efficient landscaping, such as planting trees with high, spreading crowns that provide ample shade, to reduce the demand for summertime air conditioning.
- Convert outdoor lighting such as traffic signals, area lighting, and streetlights to LED (light-emitting diode).
- Install on-site renewable energy, battery storage, and other distributed energy resources to offset the amount of conventional energy purchased from the grid and improve resiliency.
- Develop integrated distributed energy resources, microgrids, and district heating and cooling facilities to support decarbonization and resilience of existing and new public facilities.

Transportation
Transportation emissions can be reduced in local government operations by converting county, municipal, and school fleets to electric vehicles or low carbon intensity fuels, installing alternative vehicle charging or fueling infrastructure, and reducing local government employees' commuter vehicle miles traveled (VMT). Example actions include:

- Convert local government and school fleets to electric vehicles (EVs), hybrid vehicles or other alternative fuel vehicles that use low- or no-carbon fuels. When converting the fleet local governments should right-size vehicles so that vehicle size meets the need (e.g., procuring compact cars instead of SUVs where appropriate).
- Install EV chargers and other supporting infrastructure for alternative fuel vehicles on public property.
- Require that EV charging is enabled in all local government new construction projects (e.g., conduit, parking).
- Reduce government employee VMT. Strategies include:
    - Offer commuter benefit options to off-set the cost of transit or the use of bikes for commuting.
    - Offer rebates for electric bike purchases.
    - Offer telework options to employees that can work remotely.
    - Promote bike-to-work days, carpools, and other social initiatives.
    - Offer secure storage areas where employees can lock up bikes, e-bikes, or scooters while at work, and changing/shower facilities for employees to clean up after a bike commute.
    - Consider employee VMT when siting new facilities.

Energy
Energy decarbonization can be achieved through the adoption of clean and renewable energy systems and procurement that power local government operations. Example actions include:

- Purchase renewable electricity or fuels from utilities, energy suppliers or through offsite clean energy projects such as power purchase agreements.
- Conduct site feasibility assessment and pre-construction planning for the identification of behind the meter renewable energy projects at public buildings and facilities.
- Install distributed energy resources on local government property, such as rooftop solar panels, solar parking canopies, geothermal energy systems, and battery storage systems.
- Use renewable energy certificates (RECs) or other clean energy financing tools to offset the GHG emissions of remaining conventional energy sourced from the electric grid.

Geographic Coverage

This measure will cover all local governments across the entire Philadelphia MSA. This includes 12 counties, 388 municipalities, and an unknown number of schools.

Implementation Considerations

Key Implementing Agencies

- **Counties, municipalities, and authorities.** Local government entities such as counties, cities, boroughs, townships, as well as their respective agencies (such as the Philadelphia Energy Authority and other similar entities) will play a critical role in leading, managing, and implementing actions for local government operations.
- **Schools, school districts, and intermediate units.** These entities will play a critical role in leading, managing, and implementing these actions within schools and school districts.

- **Regional planning organizations.** In collaboration with state and local governments, DVRPC can provide support and best practices to enable electrification and decarbonization of buildings, energy, and transportation. WILMAPCO and the South Jersey Transportation Planning Organization (SJTPO) can provide support and best practices to enable decarbonization of local government transportation.
- **State governments and agencies.** Including the Commonwealth of Pennsylvania, State of Delaware, State of New Jersey, State of Maryland, and their respective public agencies will play a role in providing technical assistance, coordination, and funding to local governments.
- **Utilities.** Local utilities will also need to be involved to provide relevant data, interconnection agreements, and to ensure the electricity grid can support electrification of government operations and the expansion of renewable energy and energy efficiency. Utilities also provide rebates to support project funding.

Authority to Implement

Local governments within the MSA have the authority to implement decarbonization projects in their own operations, per this measure, within their respective jurisdictions. In Pennsylvania, local governments, schools, regional planning organizations, states, and other public entities are authorized to work and procure cooperatively, which may help overcome common decarbonization implementation barriers faced by small and medium-sized local governments. This measure falls under the local governments' regulatory authority to protect public health and welfare. To enact specific decarbonization projects, policies, and/or pilot programs, local governments may need to gain approval from a legislative body or other administrative authority that oversees budgets and/or regulations.

Intersection with Other Funding

In addition to the federal, state, local, and other funding opportunities listed in Table 7 below, municipal and county governments, community groups, and nonprofit organizations can refer to DVRPC's Municipal Funding Guide for federal, state, county, and private sources of funding for locally initiated planning and development projects.

Table 7: Funding Opportunities for Measure 1

Program/Grant Name	Funding Source
Energy Efficiency and Conservation Block Grant	Federal – Formula
State Energy Program	Federal – Formula
Greenhouse Gas Reduction Fund	Federal – Competitive
National Electric Vehicle Infrastructure (NEVI) Program	Federal – Formula
Green and Resilient Retrofit Program	Federal – Competitive
Clean School Bus Program	Federal – Competitive
Renew America's Schools Program	Federal – Competitive
Electric School Bus Grant Program	State (NJ)
Community Energy Plan Grant (CEPG) Program	State (NJ)
Community Energy Plan Implementation Grant (CEPI)	State (NJ)
Higher Education Decarbonization Pilot	State (NJ)
Clean Fleet EV Incentive Program	State (NJ)
New Jersey Utility Energy Efficiency Programs	Utility (PSE&G, Atlantic City Electric)
EmPOWER Maryland	Utility (Delmarva)
Pennsylvania's Energy Efficiency and Conservation (EE&C) Program	Utility (PECO, PPL, MetEd)
Delaware Energy Programs (Energy Efficiency Resource Standards Act of 2009)	Utility (Delmarva, Delaware SEU)
Maryland Clean Energy Capital Program	Private (Maryland Clean Energy Center)

Quantified GHG Reductions ($MTCO_2e$)

This measure will lead to broad GHG reductions in the building, energy, and transportation sectors.

Table 8: GHGs reductions from Actions to Decarbonize Local Government Operations

Cumulative Reductions from 2025-2030 ($MTCO_2e$)	Cumulative Reductions from 2025-2050 ($MTCO_2e$)
1,716,983	20,613,568

This measure quantifies resulting GHG emissions reduced if the Philadelphia MSA's local governments (including counties, cities, towns and other forms of local government) implemented a broad set of building, fleet and renewable energy projects within their own facilities. It scales existing plans on greenhouse gas reductions from the City of Philadelphia on a per capita basis and provides a trajectory of 90 percent reduction in emissions by 2050 for most local government operations. A detailed description of the methodologies can be found in Appendix D. Note this measure is expressed in metric tons (MT), while the GHG inventory is expressed in million metric tons (MMT).

GHGs and Co-Pollutants Identification

This measure targets reductions of the following GHGs and co-pollutants listed in Table 9 associated with energy used at local government buildings and tailpipe emissions from fleet vehicles running on gasoline or diesel. Natural gas is widely used for heating and cooking needs, while natural gas and other fossil fuels, such as coal, are combusted to generate electricity for use in government buildings. Gasoline and diesel are widely used to fuel local government fleets.

Table 9: GHGs and Co-pollutants associated with Actions to Decarbonize Local Government Operations

Pollutant	Air Pollutant Type	Impacted Measure Category
Carbon Dioxide (CO2)	GHG	All
Hydrofluorocarbons (HFCs)	GHG	Buildings, Transportation
Methane (CH4)	GHG	All
Nitrous Oxide (N2O)	GHG	Buildings, Transportation, Grid, Wastewater
Carbon Monoxide (CO)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Lead	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Nitrogen Oxides (NOx)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Particulate Matter (e.g., PM2.5)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Sulfur dioxide (SO2)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Ozone	Co-pollutant: Criteria Air Pollutant Air Pollutant	All
Volatile Organic Compounds (VOCs)	Co-pollutant: VOCs	Buildings, Transportation, Grid, Waste, Wastewater
Other hazardous air pollutants (HAPs)	Co-pollutant: Air Toxics	Buildings, Transportation, Grid, Waste

LIDAC Benefits Analysis

This analysis of LIDAC benefits provides a preliminary overview of the potential LIDAC benefits expected to result from Measure 1. It includes ways the measures may benefit specific LIDAC populations, and how local governments can support the impact of these benefits. Additional analysis will be conducted moving forward for the CCAP.

Local governments, especially schools, can center LIDAC communities in the development and implementation of these actions to ensure they are prioritized and receive the maximum benefits possible from these actions. When planning for local government facilities that most impact LIDACs, such as community centers, critical facilities, and schools, local governments should prioritize actions in LIDAC communities first, and engage these communities in the planning and development process.

Table 10 summarizes LIDAC benefits that may result from this measure. Important highlights include:

- Reducing indoor air pollution in public schools serving LIDAC communities will particularly benefit Black children who have disproportionate rates of asthma.[40]
- Local governments will largely be funding clean transition projects, such as building rehabilitation, renewable energy installations and related infrastructure. These projects need a local workforce to construct, implement, and deliver clean energy solutions. Local governments have the authority to prioritize hiring minority, women, and other historically marginalized business owners for these projects, ensuring they reap the economic benefits.

Table 10: LIDAC Benefits Associated with Actions to Decarbonize Local Government Operations

LIDAC Benefits	Achieved by this Measure
Public Health Benefits	
Improved Air Quality	✔
Improved Protection from Climate-Related Disasters	✔
Safe and Healthy Buildings	✔
Safer Streets	
Reduced Noise Pollution	
Socioeconomic Benefits	
Local Job Creation and Economic Growth	✔
Reduced Household Costs	
Preserved and Improved Affordable Housing	
Improved Access to Clean Energy Technologies	
Increased Reliable and Clean Energy Sources	✔
Expanded Access to Public Transportation and Micromobility	✔

[40] *Office of Minority Health. (2022). Asthma and African Americans. U.S. Department of Health and Human Services. www.minorityhealth.hhs.gov/asthma-and-african-americans*

LIDAC Engagement Summary

While this measure mainly impacts energy use and decarbonization within local government operations, impacts will include co-benefits for LIDACs including health, job, and environmental benefits. Local governments should focus on LIDAC engagement for proposed actions where communities stand to be directly impacted to ensure that LIDACs are priority beneficiaries of these actions. For example, when siting EV charging stations, local governments can investigate sites for these stations in public facilities located in LIDAC communities, while educating neighboring residents on their availability and how they can be used.

For this measure, initial LIDAC engagement was conducted in January 2024 via focus groups and one-on-one discussions with LIDAC-focused CBOs.

Key Metrics

Possible key outputs and outcomes to track performance of this measure over time include the following:

- Buildings
    - Number of buildings benchmarked and changes in their energy and GHG intensities over time
    - Number of buildings audited
    - Number of buildings retrofitted
    - Number of clean energy trainings held for government employees
    - Dollar amount of energy savings
- Transportation
    - Number of EV chargers installed
    - Number of EV and low/no carbon fuel vehicles in the fleet
    - Percent of employee VMT reduced
- Energy
    - kW of rooftop solar panels installed on government property
    - kWh of battery energy storage installed for government use
    - Amount of renewable energy purchased and/or generated
- Number of clean energy jobs created in the community
- Number of MWDBE firms hired, MWDBE hours worked, MWDBE contract dollar amount for government projects

Measure 2: Actions to Implement Energy Efficiency, Electrification, and Clean Energy for Residential Buildings

GHG Measure Description

Energy used in residential buildings for heating, cooling, cooking, and electricity accounts for approximately 19 percent of GHG emissions in the Philadelphia MSA. Significant action is needed in the residential building sector to implement energy efficiency, electrification, and clean energy measures. This will require a coordinated ecosystem of partners to engage communities, conduct planning, develop programmatic tools and implementation support, and adopt supportive policy to ensure that this transition is centered on LIDAC communities first. This coordination will provide the resources needed for all residential properties to achieve decarbonization. Importantly, this measure provides an opportunity to invest in better housing quality, and if done correctly, will also improve the affordability of housing within the region, resulting in immediate and direct community health and socioeconomic community benefits.

Further, residential decarbonization will result in improved air quality due to reduced energy consumption, decreased on-site combustion of fossil fuels and a concomitant decrease in local criteria and hazardous air pollutants including greenhouse gas emissions. There will be a particular emphasis on beneficial implementation of this measure in LIDACs, by targeting residential properties in LIDAC communities, including affordable housing and public housing properties, and through outreach to low-income qualifying households.

This measure aims to highlight key priority actions that will enable equitable residential building decarbonization in the near term for renter- and owner-occupied single-family and multi-family households. Decarbonization actions include programs and projects that increase building energy efficiency, reduce energy consumption, increase building electrification, and deploy renewable energy systems and storage in residential buildings.

Each local government within the MSA could lead the development of actions to implement this measure within their jurisdiction, or local governments could work together in partnership with local non-profits, state, or regional agencies on implementation.

This measure was also identified as a priority in nearly all state, subregional, and local climate action plans that were reviewed across the MSA for this PCAP (see Appendix C). Several existing state and regional programs provide technical assistance, project development support, and funding to support residential buildings with implementing this action. This measure aligns with the FY 2022-2026 EPA Strategic Plan, particularly Goal #1: Tackle the Climate Crisis and Strategic Goal #4: Ensure Clean and Healthy Air for All Communities.[41]

Case Study: Built to Last
Built to Last is an initiative of the Philadelphia Energy Authority as a “one stop shop” for homeowners to improve energy conservation & efficiency, healthy homes, and general home repair. Built to Last streamlines applications and coordination for a variety of home repair programs, reducing administrative burden for applicants and ensuring repairs and renovations produce maximum value, energy efficiency, and health for its occupants. The program has managed 100 homes.

Case Study: Energize Delaware Affordable Multi-Family Housing Program
Energize Delaware provides assistance to multifamily building owners with energy efficiency and renewable upgrades, for both existing and new construction buildings. A “one stop shop” for building owners streamlines financial and technical assistance, such as project scoping, construction oversight, or low-interest loans.

[41] *U.S. EPA. 2022. FY 2022-2026 EPA Strategic Plan Overview. www.epa.gov/system/files/documents/2022-03/fy-2022-2026-epa-strategic-plan-overview.pdf*

Key Actions/Program Elements

The key actions and programs identified for this measure will enable equitable residential building decarbonization in the near term for both single family and multi-family renter- and owner-occupied homes. These actions will, together, support equitable, scaled, and simplified action to increase building energy efficiency, reduce energy consumption, increase building electrification, and deploy renewable energy systems and storage in residential buildings.

Local governments and other key implementing agencies will take actions under this measure to promote clean energy, electrification, and energy efficiency for residential buildings. Sample actions include:

- Conduct a comprehensive planning effort to identify the state of the residential housing stock and model the potential investment needed to achieve building decarbonization across the residential sector, including owner-occupied and rental, single family, and multifamily households. This planning effort should prioritize the design of solutions and programs that center on the needs of LIDAC communities.
- Provide funding for low- to no-cost home energy audits to allow building owners and renters to identify opportunities to decarbonize homes and improve indoor air quality and comfort.
- Support and provide incentives for the project development and implementation of residential decarbonization solutions. This support will prioritize energy burdened communities by supporting the implementation of home-repair and safety measures needed before decarbonization work can begin, and all measures should be provided at low- to no-cost for these communities. Decarbonization solutions needed across all homes include:
    - Installation of energy efficient windows and building envelope updates.
    - High efficiency HVAC upgrades or, preferably, the electrification of heating, cooling and water heating systems. The expanded access to energy-efficient air conditioning (e.g., heat pumps) is particularly crucial for LIDACs where heat-related health concerns are prevalent. Heat pump heating and cooling systems can reduce energy costs compared to oil furnaces, electric resistance heating, and in some cases, natural gas.
    - Installation of thermostats and smart controls that support the efficient use of heating and cooling technologies and may enable the future incorporation of these homes into Distributed Energy Resource Aggregation programs, also known as Virtual Power Plants.
    - Installation of energy efficient lighting and appliances.
    - Electrification of household cooking appliances.
    - On-site renewable energy and battery storage systems.
- Support community-scale aggregation programs, such as Solarize, that support the streamlined and scaled implementation of distributed energy resources and EV chargers for all residential communities. Program design should ensure that these solutions are low- to no-cost for energy-burdened communities.
- Support clean energy lending programs to help deploy clean energy solutions such as energy efficiency, electrification, and renewable energy systems. The lending ecosystem should include both large and small community lenders and CDFIs.
- Support the utilization of state and federal tax incentives to support residential retrofits that include energy efficiency and renewable energy.
- Provide specific decarbonization solutions and support to renters and rental property owners that preserve housing affordability, such as outreach programs to promote energy efficient lighting, home electronics, heating and cooling, and behaviors.[42] Outreach programs can be conducted in partnership with utilities, who are familiar in communities and can make door-to-door visits to promote the program, conduct energy assessments, and install energy efficient hardware. Incentive programs can also be employed to encourage renters and rental property owners to install energy efficient upgrades.

[42] *U.S. DOE. (n.d.). Tips for Renters and Rental Property Owners. energy.gov. www.energy.gov/energysaver/tips-renters-and-rental-property-owners*

- Identify, amplify, and support programs that provide technical and workforce assistance for residential building decarbonization efforts. Support can include education for building trades and building owners (e.g., educational resources, networking opportunities, concierge and accelerator support); and workforce development assistance (e.g., workforce training, incentives for training participation, and job placement). As applicable, workforce development efforts should focus on creating additional clean jobs and economic opportunities in LIDACs.
- Evaluate and revises codes, ordinances and permitting structures to support:
    - The introduction of stretch codes and provision of resources to strengthen the enforcement of current building and energy codes and appliance standards in residential buildings to increase energy efficiency and better enable decarbonization of housing.
    - Energy efficient and green building practices in new construction and major renovations such as solar-readiness, solar PV panels, LEED, Energy Star, electrification, solar orientation, EV charging stations, stormwater best management practices, etc. Support regulations that ensure that these solutions are low- to no-cost for energy-burdened communities as possible.
    - Incentives and educational resources for homeowners and the builder community on completing electrification-ready upgrades when doing other work (e.g., panel upgrades to be prepared for a future heat pump or electric appliance) and steps to make buildings ready for charging infrastructure.
    - Zoning ordinances that enable behind the meter solar PV systems as by-right in all major districts, including residential. and provide reasonable pathways for medium and large-scale solar PV installations as well.
- Support the use of renewable energy certificates (RECs) or other clean energy financing tools to expand onsite clean energy. Philadelphia, New Jersey, Maryland, and Delaware all have solar REC (SREC) programs that homeowners with residential solar systems can participate in to sell SRECs earned from solar energy generation back to utilities.[43]

Geographic Coverage

As this measure will cover all residential buildings within the MSA, all areas within the MSA and in neighboring regions will benefit from steps to decarbonize residential buildings across the MSA.

Implementation Considerations

The ecosystem of partners required to achieve the key actions below includes local governments, community-based organizations, residential building owners and renters, utilities, private consultants and contractors, nonprofits and advocacy organizations, amongst others.

Key Implementing Agencies

- **Counties, municipalities, and authorities.** Including all local government entities such as counties, cities, boroughs, townships, and other forms of local government as well as their respective public agencies (such as the Philadelphia Energy Authority and other similar entities).
- **Regional housing authorities.** These local governmental or quasi-governmental organizations are responsible for managing and overseeing public housing programs and services within a specific geographic area, typically spanning multiple municipalities or counties. Housing authorities play a role in climate and energy efficiency endeavors by implementing policies and initiatives aimed at improving the energy performance of public housing units through collaborations with utility companies, government agencies, and CBOs.
- **Regional planning organizations.** In collaboration with state and local governments, DVRPC can provide support and best practices to enable decarbonization of buildings.

[43] *DSIRE. N.d. Programs. NC Clean Energy Technology Center. programs.dsireusa.org/system/program?type=85&*

- **State governments and agencies.** Including the Commonwealth of Pennsylvania, State of Delaware, State of New Jersey, State of Maryland and their respective public agencies.
- **Utilities.** Local utilities will also need to be involved to provide relevant data, interconnection agreements, and to ensure the electricity grid can support electrification of government operations and the expansion of renewable energy and energy efficiency. Utilities also provide rebates to support project funding.
- **Local energy, climate, and community development nonprofits.** These organizations are key to supporting robust and inclusive community engagement in the design and implementation of equitable residential decarbonization programs and solutions. Trusted organizations can share knowledge and resources or support implementation of energy efficiency, electrification, and clean energy throughout the MSA with an emphasis on LIDACs.
- **Contractors.** Partnership with contractors will be needed to ensure adequate resources, workforce, knowledge and capacity is available to implement and maintain best practice retrofits to the residential building stock.
- **Property owners, developers, renters.** As end users, homeowners, property owners, developers, and renters are crucial actors in this measure. While property owners and developers generally have more decision-making control over changes to and within buildings, renters can also make changes that will result in GHG reductions, within the confines of their housing agreements and available resources. All end users can make behavior changes and decisions that improve building comfort and energy affordability.
- **Small and large financial institutions.** Small financial institutions, like community development financial institutions (CDFIs), community banks and credit unions, provide localized funding and support for small-scale energy efficiency projects, fostering community-level sustainability. Meanwhile, large financial institutions, such as national banks and investment firms, offer substantial capital and expertise for larger-scale regional initiatives, driving the adoption of renewable technologies and advancing energy efficiency goals on a broader scale within the region.
- **Labor and trade organizations.** These groups (e.g., unions) can advocate for workforce development programs tailored to the renewable energy and energy efficiency sectors, ensuring that workers are equipped with the necessary skills and training. They also collaborate with industry stakeholders to establish standards, certifications, and apprenticeship programs, promoting quality craftsmanship and safety standards in the installation and maintenance of energy-efficient technologies, thus driving the adoption of sustainable practices within the region.

Authority to Implement

Local governments and regional agencies within the MSA have the authority to support the implementation of decarbonization projects in residential buildings either through programs, policies, or projects within their respective jurisdictions. This measure falls under the local governments' policing power, or the regulatory authority to protect public health and welfare. To enact specific energy efficiency programs, policies, and/or projects, local governments may need to gain approval from the local elected officials or other administrative authority that oversees budgets and/or regulations. In implementing this measure, local governments may need to partner with existing non-profits, utilities, CBOs, lending institutions, contractors, or regional agencies to support project development and installation of residential building decarbonization actions.

Intersection with Other Funding

In addition to the federal, state, local, and other funding opportunities listed in Table 11, municipal and county governments, community groups, and nonprofit organizations can refer to DVRPC's Municipal Funding Guide for federal, state, county, and private sources of funding for locally initiated planning and development projects.

Table 11: Funding Opportunities for Measure 2

Program/Grant Name	Funding Source
State Energy Program	Federal – Formula
Energy Efficiency Revolving Loan Fund Capitalization Grant Program	Federal – Formula
Weatherization Assistance Program	Federal – Formula
Assistance for Latest and Zero Building Energy Code Adoption	Federal – Formula
Energy Efficiency and Conservation Block Grant	Federal – Competitive
Green and Resilient Retrofit Program	Federal – Competitive
Home Efficiency Rebates Program	Federal – Formula Rebates Administered by States
Home Electrification and Appliance Rebates Program	Federal – Formula Rebates Administered by States
New Jersey Utility Energy Efficiency Programs	Utility (PSE&G, Atlantic City Electric)
EmPOWER Maryland	Utility (Delmarva)
Pennsylvania's Energy Efficiency and Conservation (EE&C) Program	Utility (PECO, PPL, MetEd)
Delaware Energy Programs (Energy Efficiency Resource Standards Act of 2009)	Utility (Delmarva, Delaware SEU)
Delaware Sustainable Energy Utility (Energize Delaware)'s Programs	Utility (Delaware SEU)
Maryland Clean Energy Advantage Loan	Private (Maryland Clean Energy Center)

Quantified GHG Reductions (MTCO2e)

This measure will lead to broad GHG reductions in the building and energy sectors.

Table 12: GHGs Reductions from Actions to Implement Clean Energy and Energy Efficiency for Residential Buildings

Cumulative Reductions from 2025-2030 ($MTCO_2e$)	Cumulative Reductions from 2025-2050 ($MTCO_2e$)
3,495,987	53,680,675

This measure seeks to estimate emissions reductions potential from residential buildings. This measure was modeled utilizing ICF's CO_2Sight buildings tool, incorporating the Distributed Energy Resources Planner (DER Planner), a bottom-up model used to calculate technical, economic, and achievable potential estimates for energy change and resulting emission reductions. The Philadelphia region's building stock is represented by ResStock building characteristics and a range of energy efficiency, and electrification retrofits are adopted using DER Planner to determine overall energy change. In addition, an onsite solar PV and battery storage projection is made by combining technical potential and NREL Storage and Solar Futures studies. A detailed description of the CO_2Sight and DER Planner methodologies can be found in Appendix D. Note this measure is expressed in metric tons (MT), while the GHG inventory is expressed in million metric tons (MMT).

GHGs and Co-Pollutants Identification

This measure targets reductions of the following GHGs and co-pollutants listed in Table 13 associated with the production of energy consumed by residential buildings. Natural gas is widely used for heating and cooking needs, while natural gas and other fossil fuels, such as coal, are combusted to generate electricity at central station power plants for use in buildings. Some pollutants, such as lead, VOCs, and HAPs, lead to indoor air quality concerns and come from non-fuel sources found in buildings, such as paint.

Table 13: GHGs and Co-pollutants Associated with Actions to Decarbonize Residential Buildings

Pollutant	Air Pollutant Type	Impacted Measure Category
Carbon Dioxide (CO2)	GHG	All
Hydrofluorocarbons (HFCs)	GHG	Buildings, Transportation
Methane (CH4)	GHG	All
Nitrous Oxide (N2O)	GHG	Buildings, Transportation, Grid, Wastewater
Carbon Monoxide (CO)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Lead	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Nitrogen Oxides (NOx)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Particulate Matter (e.g., PM2.5)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Sulfur dioxide (SO2)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Ozone	Co-pollutant: Criteria Air Pollutant Air Pollutant	All
Volatile Organic Compounds (VOCs)	Co-pollutant: VOCs	Buildings, Transportation, Grid, Waste, Wastewater
Other hazardous air pollutants (HAPs)	Co-pollutant: Air Toxics	Buildings, Transportation, Grid, Waste

LIDAC Benefits Analysis

The following discussion is a preliminary, qualitative discussion of the potential LIDAC benefits expected to result from the implementation of Measure 2. It includes the ways this measure may benefit specific LIDAC populations and ways local governments can support their impact. Additional analysis of the benefits to LIDAC populations due to actions in this measure will be conducted moving forward for the CCAP.

Local governments and other key actors involved in planning, program, or policy implementation must intentionally center LIDAC communities in the development and implementation of this measure to ensure that they are prioritized and receive the maximum benefits possible from these actions. Table 14 below summarizes LIDAC benefits that may result from this measure. Important highlights include:

- Due to historically racist housing segregation policies, Black and minority households live in older, less energy efficient homes that often have deferred maintenance due to high upfront costs.[44] Renters in particular are unable to address home repair issues because of the split-incentive between renters and landlords wherein neither party has strong incentive to pursue energy upgrades. Creating intentional home repair programs for rental properties that address the split-incentive can preserve affordable housing that is healthy and safe, and reduces tenants' energy burden.

Table 14: LIDAC Benefits Associated with Actions to Implement Energy Efficiency, Electrification, and Clean Energy for Residential Buildings

LIDAC Benefits	Achieved by this Measure
Public Health Benefits	
Improved Air Quality	✔
Improved Protection from Climate-Related Disasters	✔
Safe and Healthy Buildings	✔
Safer Streets	
Reduced Noise Pollution	
Socioeconomic Benefits	
Local Job Creation and Economic Growth	✔
Reduced Household Costs	✔
Preserved and Improved Affordable Housing	✔
Improved Access to Clean Energy Technologies	✔
Increased Reliable and Clean Energy Sources	✔
Expanded Access to Public Transportation and Micromobility	

[44] *Lewis J, Hernández D, Geronimus AT. Energy Efficiency as Energy Justice: Addressing Racial Inequities through Investments in People and Places. Energy Effic. 2019 Mar;13(3):419-432. doi: 10.1007/s12053-019-09820-z.*

Key Metrics

Possible key outputs and outcomes to track performance of this measure over time include the following:

- Number of owner-occupied and renter-occupied homes in LIDACs served
- Dollars saved on monthly energy bills by residents
- kW of energy saved following energy efficiency and renewable energy upgrades to homes
- Number of heat pump units (for both heating and hot water) installed in residential homes/rental dwelling
- Number of rooftop solar installations
- Number of homes / rental dwellings weatherized and or retrofitted
- Number of new programs dedicated to residential decarbonization
- Number of LIDAC residents participating in residential decarbonization programs
- Job creation metrics

Measure 3: Actions to Implement Energy Efficiency, Electrification, and Clean Energy for Commercial Buildings

GHG Measure Description

Energy used in commercial buildings for heating, cooling, and electricity accounts for more than 20 percent of GHG emissions in the Philadelphia MSA. As with the residential building sector, significant action is needed in the commercial building sector to implement energy efficiency, electrification, and clean energy measures. A similarly coordinated ecosystem of partners will be needed to engage commercial businesses and their communities, conduct planning, develop programmatic tools and implementation support, and adopt supportive policy to ensure that this transition is centered on LIDAC communities first, and additionally provides the resources needed for all commercial properties to achieve decarbonization.

Decarbonization of commercial buildings will result in improved air quality due to reduced energy consumption, decreased on-site combustion of fossil fuels, and a concomitant decrease in local criteria and hazardous air pollutants including greenhouse gas emissions. There will be a particular emphasis on beneficial implementation of this measure in LIDACs, by targeting small and large commercial properties owned by or located in LIDAC communities. By supporting energy efficiency, electrification, and clean energy in small and large commercial buildings across the MSA, this measure can have a widespread impact that reduces GHG emissions and creates clean energy jobs in the construction and commercial building sector.

The aim of this measure is to highlight key priority actions that will enable equitable building decarbonization in the near term for both large and small commercial buildings. Decarbonization actions include programs and projects that increase building energy efficiency, reduce energy consumption, increase building electrification, and deploy renewable energy systems and storage in residential buildings.

Each local government within the MSA could support the development of actions to implement this measure. At the state, regional, and local level, governments could lead these efforts, working together and in partnership with local non-profits, CBOs, or agencies on implementation.

Case Study: Philadelphia Energy Benchmarking and Building Energy Performance Program
In addition to a city benchmarking ordinance, requiring large commercial buildings to track and report energy usage, the City of Philadelphia has a Building Energy performance Program. This policy requires that the largest commercial buildings not only benchmark, but also to reduce energy and water consumption by specific performance measures annually.

Case Study: Commercial Property-Assessed Clean Energy (C-PACE) Financing
C-PACE is a financing structure to fund energy efficiency or renewable energy upgrades by classifying clean energy upgrades as a public benefit. By lumping energy improvements to the property assessment, funding large-scale commercial energy upgrades can be paid with no upfront costs to building owners. C-PACE is available to commercial buildings in Pennsylvania,

This measure was also identified as a priority in nearly all state, subregional, and local climate action plans that were reviewed across the MSA for this PCAP (see Appendix C). This measure aligns with the FY 2022-2026 EPA Strategic Plan, particularly Goal #1: Tackle the Climate Crisis and Strategic Goal #4: Ensure Clean and Healthy Air for All Communities.[45]

Key Actions/Program Elements

Local governments and other implementing agencies will take actions under this measure to increase energy efficiency, electrification, and a clean energy supply for commercial buildings. Sample actions include:

- Conduct a comprehensive planning effort to identify the state of the commercial building stock and model the potential investment needed to achieve building decarbonization across the small and large commercial buildings sector, including owner-occupied and leased commercial space. This planning effort should prioritize the design of solutions and programs that center on the needs of LIDAC communities. Pilot projects can demonstrate the viability of scaling various decarbonization solutions.
- Implement benchmarking and Building Performance (BPS) programs for commercial buildings over a certain size. Benchmarking programs involve tracking and publicly disclosing energy use information each year, while BPS programs require buildings to meet certain energy performance standards. These programs set the foundation for commercial buildings to take informed action on decarbonization.
- Support and provide incentives for the project development and implementation of commercial building decarbonization solutions. This support will prioritize LIDAC communities and small commercial institutions by providing resources to minimize the upfront costs of these solutions, including:
    - Installation of energy efficient windows and building envelope updates.
    - High efficiency HVAC upgrades or, better yet, the electrification of heating, cooling and water heating systems.
    - Installation of building control systems that support the efficient use of heating and cooling technologies and may enable the future incorporation of these buildings into Distributed Energy Resource Aggregation programs, also known as Virtual Power Plants.
    - Installation of energy efficient lighting and appliances.
    - Electrification of cooking appliances.
    - Installation of distributed energy resources on commercial property, such as rooftop solar panels, solar parking canopies, geothermal energy systems, and battery storage systems.
- Provide specific decarbonization solutions and support for leased and rental commercial building spaces, such as outreach programs to promote energy efficient lighting, office thermostat policies, and tenant behavior changes.[46] Outreach programs can be conducted in partnership with utilities, who are familiar to businesses and can conduct energy assessments and install energy efficient hardware. Incentive programs can also be employed to encourage tenants and rental property owners to install energy efficient upgrades.
- Support community-scale aggregation programs, such as Solarize, that support the streamlined and scaled implementation of distributed energy resources and EV chargers for commercial properties. Program design should ensure that these solutions require minimal upfront cost for LIDACs.
- Support clean energy lending programs, such as C-PACE, to support the deployment of clean energy solutions like energy efficiency, electrification, and renewable energy systems. The lending ecosystem should include both large and small community lenders and CDFIs.
- Support the utilization of state and Federal tax incentives to support commercial building retrofits that include energy efficiency and renewable energy.

[45] *U.S. EPA. 2022. FY 2022-2026 EPA Strategic Plan Overview. www.epa.gov/system/files/documents/2022-03/fy-2022-2026-epa-strategic-plan-overview.pdf*
[46] *Energy Star. (n.d.). Renters and Tenants. energystar.gov. www.energystar.gov/buildings/resources-audience/small-biz/renters-and-tenants*

- Identify, amplify, and support programs that provide the necessary technical and workforce assistance backbone for commercial building decarbonization efforts. Support can include education for building trades and building owners (e.g., educational resources, networking opportunities, concierge and accelerator support); and workforce development assistance (e.g., workforce training, incentives for training participation, and job placement). As applicable, workforce development efforts should focus on creating additional clean jobs and economic opportunities in LIDACs.
- Evaluate and revise codes, ordinances, and permitting structures to support:
    - The introduction of stretch codes and provision of resources to strengthen the enforcement of current building and energy codes and appliance standards in commercial buildings to increase energy efficiency and better enable decarbonization.
    - Energy efficient and green building practices in new construction and major renovations such as solar-readiness, solar PV panels, LEED, Energy Star, electrification, solar orientation, EV charging stations, stormwater best management practices, etc. Support regulations that ensure that these solutions are low- to no-cost for LIDACs as possible.
    - Incentives and educational resources for commercial building owners and the builder community on completing electrification-ready upgrades when doing other work (e.g., panel upgrades to be prepared for a future heat pump or electric appliance) and steps to make buildings ready for charging infrastructure.
    - Zoning ordinances that enable behind the meter solar PV systems as by-right in all major districts, including residential. and provide reasonable pathways for medium and large-scale solar PV installations as well.
- Support the use of mechanisms to purchase renewable electricity or fuels from utilities, energy suppliers or through offsite clean energy projects such as power purchase agreements.
- Support the use of renewable energy certificates (RECs) or other clean energy financing tools to expand onsite clean energy. Philadelphia, New Jersey, Maryland, and Delaware all have solar REC (SREC) programs that homeowners with residential solar systems can participate in to sell SRECs earned from solar energy generation back to utilities.[47]

Geographic Coverage

As this measure will cover commercial buildings throughout the MSA, all areas within the MSA and in neighboring regions will benefit from steps to decarbonize commercial buildings across the MSA.

Implementation Considerations

Key Implementing Agencies

- **Counties, municipalities, and authorities.** Including all local government entities such as counties, cities, boroughs, townships, and other forms of local government as well as their respective public agencies (such as the Philadelphia Energy Authority, economic development authorities, industrial development authorities, and other similar entities).
- **Regional planning organizations.** In collaboration with state and local governments, DVRPC can provide support and best practices to enable the decarbonization of buildings.
- **State governments and agencies.** Including the Commonwealth of Pennsylvania, State of Delaware, State of New Jersey, State of Maryland and their respective public agencies. Among other actions, these state governments can enact financing mechanisms to help fund energy efficiency. For example, C-PACE, or Commercial Property Assessed Clean Energy, is a state financing mechanism that enables commercial property owners to fund energy efficiency, renewable energy, and resilience projects through a voluntary property assessment, repaid through property taxes. Pennsylvania,

[47] *DSIRE. N.d. Programs. NC Clean Energy Technology Center. programs.dsireusa.org/system/program?type=85&*

Maryland, and Delaware all have C-PACE programs at the state-level, while New Jersey's program is in development.

- **Utilities.** Local utilities will also need to be involved to provide relevant data, interconnection agreements, and to ensure the electricity grid can support electrification of government operations and the expansion of renewable energy and energy efficiency. Utilities also provide rebates to support project funding.
- **Local energy, climate, and community development nonprofits.** These organizations are key to supporting robust and inclusive community engagement in the design and implementation of commercial building decarbonization programs and solutions. Trusted organizations can share knowledge and resources or support implementation of energy efficiency, electrification, and clean energy throughout the MSA with an emphasis on LIDACs.
- **Contractors.** Partnership with contractors will be needed to ensure adequate resources, workforce, knowledge and capacity is available to implement and maintain best practice retrofits to the commercial building stock.
- **Property owners, developers, renters.** As end users, property owners, developers, and renters can make behavior changes and decisions that affect building efficiency. While property owners and developers generally have more control over changes to and within buildings, lessees can also make behavior and other changes that will result in GHG reductions.
- **Small and large financial institutions.** Small financial institutions, like community banks, community development financial institutions, and credit unions, provide localized funding and support for small-scale energy efficiency projects, fostering community-level sustainability. Meanwhile, large financial institutions, such as national banks and investment firms, offer substantial capital and expertise for larger-scale regional initiatives, driving the adoption of renewable technologies and advancing energy efficiency goals on a broader scale within the region.
- **Commercial business owner organizations.** These groups (e.g., Chambers of Commerce, Urban Land Institute) advocate for policies that incentivize energy-saving practices, provide resources and guidance to their members on implementing efficiency measures, and foster collaboration between businesses to share best practices and collectively drive energy conservation initiatives in the region.
- **Commercial corridor CDCs.** Community development corporations (CDCs) (e.g., Sustainable Business Network) spearhead community-based initiatives to improve energy efficiency in commercial buildings, often targeting LIDACs. They facilitate access to financing, coordinate outreach and education programs, and collaborate with local stakeholders to implement sustainable solutions, thus contributing to environmental resilience, economic development, and social equity within the region.
- **Labor and trade organizations.** These groups (e.g., unions) can advocate for workforce development programs tailored to the renewable energy and energy efficiency sectors, ensuring that workers are equipped with the necessary skills and training. They also collaborate with industry stakeholders to establish standards, certifications, and apprenticeship programs, promoting quality craftsmanship and safety standards in the installation and maintenance of energy-efficient technologies, thus driving the adoption of sustainable practices within the region.

Authority to Implement

Local governments within the MSA have the authority to support the implementation of decarbonization projects in commercial buildings either through programs, policies or projects within their respective jurisdictions. This measure falls under the local governments' regulatory authority to protect public health and welfare. To enact specific energy efficiency programs, policies, and/or projects, local governments may need to gain approval from a city or council or other administrative authority that oversees budgets and/or regulations. In implementing this measure local governments may need to partner with existing non-profits, contractors, or agencies to support programs and install actions.

Intersection with Other Funding

In addition to the federal, state, local, and other funding opportunities listed in the Table 15, municipal and county governments, community groups, and nonprofit organizations can refer to DVRPC's Municipal

Funding Guide for federal, state, county, and private sources of funding for locally initiated planning and development projects.

Table 15: Funding Opportunities for Measure 3

Program/Grant Name	Funding Source
State Energy Program	Federal – Formula
Energy Efficiency Revolving Loan Fund Capitalization Grant Program	Federal – Formula
Weatherization Assistance Program	Federal – Formula
Assistance for Latest and Zero Building Energy Code Adoption	Federal – Formula
Energy Efficiency and Conservation Block Grant	Federal – Formula
Green and Resilient Retrofit Program	Federal – Competitive
Rural Energy for America Program	Federal – Competitive
179D Commercial Buildings Energy-Efficiency Tax Deduction	Federal – Tax Deduction
New Jersey Utility Energy Efficiency Programs	Utility (PSE&G, Atlantic City Electric)
EmPOWER Maryland	Utility (Delmarva)
Pennsylvania's Energy Efficiency and Conservation (EE&C) Program	Utility (PECO, PPL, MetEd)
Delaware Energy Programs (Energy Efficiency Resource Standards Act of 2009)	Utility (Delmarva, Delaware SEU)
Green Energy Loan Fund	State (PA)
Commercial Property Assessed Clean Energy (C-PACE)	PA, MD, and DE State or County Governments; NJ in development
Maryland Clean Energy Capital Program	Private (Maryland Clean Energy Center)

Quantified GHG Reductions (MTCO2e)

This measure will lead to broad GHG reductions in the building and energy sectors.

Table 16: GHGs reductions from Actions to Implement Energy Efficiency, Electrification, and Clean Energy for Commercial Buildings

Cumulative Reductions from 2025-2030 ($MTCO_2e$)	Cumulative Reductions from 2025-2050 ($MTCO_2e$)
3,286,695	40,622,805

This measure seeks to estimate emissions reductions potential from commercial buildings. This measure was modeled utilizing ICF's CO_2Sight buildings tool, incorporating the Distributed Energy Resources Planner (DER Planner), a bottom-up model used to calculate technical, economic, and achievable potential estimates for energy change and resulting emission reductions. The Philadelphia region's building stock is represented by ComStock building characteristics and a range of energy efficiency, and electrification retrofits are adopted using DER Planner to determine overall energy change. In addition, an onsite solar PV and battery storage projection is made by combining technical potential and NREL Storage and Solar Futures studies. A detailed description of the CO_2Sight and DER Planner methodologies can be found in Appendix D. Note this measure is expressed in metric tons (MT), while the GHG inventory is expressed in million metric tons (MMT).

GHGs and Co-Pollutants Identification

This measure targets reductions of the following GHGs and co-pollutants listed in Table 17 associated with the production of energy consumed by commercial buildings. Natural gas is widely used for heating and cooking needs, while natural gas and other fossil fuels, such as coal, are combusted to generate electricity at central station power plants for use in buildings. Some pollutants, such as lead, VOCs, and HAPs, lead to indoor air quality concerns and come from non-fuel sources found in buildings, such as paint.

Table 17: GHGs and Co-Pollutants associated with Actions to Implement Energy Efficiency, Electrification, and Clean Energy for Commercial Buildings

Pollutant	Air Pollutant Type	Impacted Measure Category
Carbon Dioxide (CO2)	GHG	All
Hydrofluorocarbons (HFCs)	GHG	Buildings, Transportation
Methane (CH4)	GHG	All
Nitrous Oxide (N2O)	GHG	Buildings, Transportation, Grid, Wastewater
Carbon Monoxide (CO)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Lead	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Nitrogen Oxides (NOx)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Particulate Matter (e.g., PM2.5)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Sulfur dioxide (SO2)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Ozone	Co-pollutant: Criteria Air Pollutant Air Pollutant	All
Volatile Organic Compounds (VOCs)	Co-pollutant: VOCs	Buildings, Transportation, Grid, Waste, Wastewater
Other hazardous air pollutants (HAPs)	Co-pollutant: Air Toxics	Buildings, Transportation, Grid, Waste

LIDAC Benefits Analysis

The following discussion is a preliminary, qualitative discussion of the potential LIDAC benefits expected to result from the implementation of Measure 3. This analysis includes a summary of how this measure may benefit specific LIDAC populations and how local governments can support their impact. Additional analysis of the benefits to LIDAC populations due to actions in this measure will be conducted moving forward for the CCAP.

Local governments and other key actors involved in planning, program or policy implementation must intentionally center LIDAC communities in the development and implementation of this measure to ensure that they are prioritized and receive the maximum benefits possible from these actions. Table 18 below summarizes LIDAC benefits that may result from this measure. Important highlights include:

- Small and disadvantaged business owners can benefit from specific and intentional commercial building decarbonization and energy efficiency programs by reducing business operating costs and addressing deferred maintenance. Struggling business owners that often provide vital services to LIDACs can be better protected from displacement forces, and therefore stay in their communities.

Table 18: LIDAC Benefits Associated with Actions to Implement Energy Efficiency, Electrification, and Clean Energy for Commercial Buildings

LIDAC Benefits	Achieved by this Measure
Public Health Benefits	
Improved Air Quality	✔
Improved Protection from Climate-Related Disasters	✔
Safe and Healthy Buildings	✔
Safer Streets	
Reduced Noise Pollution	
Socioeconomic Benefits	
Local Job Creation and Economic Growth	✔
Reduced Household Costs	✔
Preserved and Improved Affordable Housing	
Improved Access to Clean Energy Technologies	✔
Increased Reliable and Clean Energy Sources	✔
Expanded Access to Public Transportation and Micromobility	

Key Metrics

Possible key outputs and outcomes to track performance of this measure over time include the following:

- Number of buildings built in accordance with energy efficient building codes
- Number of buildings retrofit to meet energy efficiency standards and codes
- Number of buildings that meet LEED or other building standard
- kW of energy saved following energy efficiency and renewable energy upgrades to commercial buildings
- Number of heat pump units (for both heating and hot water) installed in commercial buildings
- Number of rooftop solar installations
- Number of commercial buildings weatherized
- Number of new programs dedicated to commercial decarbonization
- Job creation metrics

Measure 4: Actions to Transition Light Duty Vehicles to Low- or No-Carbon Emission Vehicles

GHG Measure Description

Transportation from light duty vehicles accounts for more than 25 percent of greenhouse gas emissions in the MSA. To address these emissions, this measure aims to accelerate the transition of light duty gas-powered vehicles to electric and other low-carbon vehicles. Supplemented by existing federal incentives, this measure will be supported through the creation and expansion of a robust charging network, development of incentive programs, and charging rate plans. Indirect co-benefits of this project, including improved public health and the creation of clean energy jobs, will spread throughout communities, with a particular emphasis on benefits to historically underserved LIDACs.

Case Study: Charge Up New Jersey
New Jersey is a leader in charging infrastructure incentives, with programs like Charge Up New Jersey offering incentives for electric vehicles and charging infrastructure. New Jersey is also providing incentives, rebates, and grants for multifamily buildings, tourism destinations, nonprofits, institutions, and local governments to install electric vehicle infrastructure and acquire electric fleets.

Case Study: Plug in Philly
Plug in Philly is a new apprenticeship program that will train primarily Black, Indigenous and People of Color in EVSE (electric vehicle supply equipment) and unlock high-paying job opportunities in the EV industry. Through partnership with electrician worker unions, educational institutions, and construction associations, the program aims to connect apprentice graduates

Key Actions/Program Elements

Actions to implement this measure could include, but are not limited to:

- Create programs providing technical or financial assistance to advance adoption of low- and no-emission vehicles in the MSA through increased infrastructure development. Programs may include local incentive programs, such as direct financial incentives or exemptions to certain restrictions (such as HOV lane exemptions or emission testing exemptions), specially designed charging rate plans, and the installation of public charging hubs, or financial incentives for charging installation in multifamily, public, commercial, and rental properties to provide increased access to charging for those who are unable to charge at home.
- Plan for, develop, procure, and maintain alternative fueling networks (e.g., hydrogen and biodiesel fueling stations, EV chargers), such as along Alternative Fuel Highway Corridors.
    - Create a regional fueling infrastructure plan in coordination with state DOTs. The plan will include resources to support implementation, such as a central repository of incentives and other project development resources. This plan will seek to expand public charging in communities where people lack “at-home” charging opportunities. Since approximately 80 percent of charging currently occurs at home, this plan will identify opportunities to invest in community charging hubs, chargers located at public facilities, in commercial districts, and in the vicinity of multi-family units to expand charging opportunities for LIDAC communities and reduce overall charging anxiety.
    - Identify appropriate locations throughout the MSA for clean fueling infrastructure on public (e.g., government buildings or parks) and private property (e.g., supermarkets, shopping plazas, gas and fueling stations).
    - Explore innovations in electric vehicle charging such as vehicle-to-grid capabilities and the use of solar canopies.

    - Conduct regular analysis of the state of clean fuel infrastructure to address any gaps in charging/refueling needs that may hamper the rate of transition.
    - Provide training (e.g., through the Electric Vehicle Infrastructure Training Program) for installation and maintenance of EV charging and fueling infrastructure.
    - To support tracking of outputs and outcomes and the maintenance of charging networks, implement systems to manage and use data on vehicle registrations and charging infrastructure (e.g., uptime) and fueling stations.
    - Implement legislation that provides incentives for development of clean fuel infrastructure.
- Use cooperative purchasing and community buyer co-ops, as well as partnerships with ride share and car share to expand low- and no-emission vehicle adoption and clean fueling networks. Focus these efforts in LIDACs to lower cost barriers and access to these vehicles.
- Encourage clean fueling infrastructure through permitting and zoning by streamlining the permit process for installing charging and fueling stations, reducing the associated fees, and providing expedited services (perhaps through partnerships with utilities). Local governments can also designate specific zones for charging and clean fueling stations in both residential and commercial areas through changes to zoning, parking, or other rules. Additionally, they can implement policies that require new constructions and major renovations to be EV-ready, thereby future-proofing the infrastructure.

Geographic Coverage

This measure is intended to reduce emissions across the entire MSA.

Implementation Considerations

Key Implementing Agencies

- **Counties, municipalities, and authorities.** Including all local government entities such as counties, cities, boroughs, school districts, townships and other forms of local government as well as their respective public agencies (such as the Philadelphia Energy Authority and other similar entities). Local governments can also implement community-wide buying co-ops for low- and no-emission vehicles for public and private fleets as well as personal vehicles.
- **Regional Planning Organizations.** In collaboration with state and local governments, DVRPC, South Jersey Transportation Planning Organization, and WILMAPCO can provide support and best practices to enable the deployment of low- and no-emission light duty vehicles.
- **State governments and agencies.** Including the Commonwealth of Pennsylvania, State of Delaware, State of New Jersey, State of Maryland and their respective public agencies. State Agencies with federal funding, are building out EV charging networks.
- **Utilities.** Local utilities will also need to be involved to ensure the electricity grid can support electrification of transportation and can provide additional incentives for transitioning to clean fuel vehicles surrounding electricity rates for home charging.

- **Private sector actors**. This includes transportation companies such as Uber and Lyft or ridesharing companies such as Zipcar, which can procure and offer alternative fuel vehicles and provide EV charging infrastructure. Partnerships with private sector EV charger companies such as EVgo, Chargepoint, Electrify America, Flow, and more can also be leveraged to build out EV charging infrastructure.
- **Grocery stores, shopping plazas, and gas and fueling stations**. These entities and other private, community-facing spaces can work with state and local governments and private sector actors to bring publicly accessible charging and fueling stations to the region.

Authority to Implement

Local jurisdictions have the authority to purchase vehicles for their fleets; such purchases have already been started across the MSA. In some instances, purchasing or procurement policies may need to be adjusted to prioritize low- and no-emission vehicles. Private and personal purchasing of low- and no-emission vehicles does not have any statutory limitations. Local zoning or code changes may need to be made for charging and fueling infrastructure. States are also using transportation funds to support the planning for and development of EV charging infrastructure.

Intersection with Other Funding

In addition to the federal, state, local, and other funding opportunities listed in Table 19, municipal and county governments, community groups, and nonprofit organizations can refer to DVRPC's Municipal Funding Guide for federal, state, county, and private sources of funding for locally initiated planning and development projects.

Table 19: Funding Opportunities for Measure 4

Program/Grant Name	Funding Source
Clean Vehicle Tax Credit	Federal – Formula
Previously Owned Vehicle Tax Credit	Federal – Formula
Clean Commercial Vehicle Tax Credit	Federal – Formula
Alternative Fuel Vehicle Refueling Property Tax Credit	Federal – Formula
National Electric Vehicle Infrastructure (NEVI) Program	Federal – Formula
Charging and Fueling Infrastructure Grants	Federal – Competitive
Clean Diesel Grant Program/Diesel Emissions Reduction Act	Federal – Competitive
Ride and Drive Electric	Federal – Competitive
Clean Heavy-Duty Vehicle Program	Federal – Formula
Alternative Fuel Vehicle Rebates for Consumers	State (PA)
Alternative Fuels Incentive Grants	State (PA)
eMobility Grants	State (NJ)
It Pay$ to Plug In	State (NJ)
Work Clean: Diesel Modernization Program	State (NJ)
Electric School Bus Grant Program	State (NJ)
Multi Unit Dwelling (MUD) EV Charger Incentive	State (NJ)
EV Tourism	State (NJ)
Clean Fleet EV Incentive Program	State (NJ)
Medium- and Heavy-Duty (MHD) Electric Vehicle Charging Program	State (NJ)
Charge Up New Jersey (Vehicle and In-Home Charger Rebates)	State (NJ)
The Delaware Clean Vehicle Rebate Program	State (DE)
Electric Vehicle Charging Equipment Rebates	State (DE)
Delaware Clean Vehicle Rebate Programs	State (DE)
Excise Tax Credit for Plug-in Electric Vehicles	State (MD)
Maryland Electric Vehicle Tax credits	State (MD)
New Jersey Zero-Emission Incentive Program (NJ ZIP)	Private (New Jersey Economic Development Authority (NJEDA))
Commercial Charger Rebate	Utility (PECO)
Pilot Discount for Fast Charging Infrastructure	Utility (PECO)

Quantified GHG Reductions (MTCO2e)

This measure will lead to broad GHG reductions in the transportation sector.

Table 20: GHGs reductions from Actions to Transition Light Duty Vehicles to Low- or No-Carbon Emission Vehicles

Cumulative Reductions from 2025-2030 ($MTCO_2e$)	Cumulative Reductions from 2025-2050 ($MTCO_2e$)
1,780,267	86,774,506

This measure models the resulting GHG emissions reduced if the Philadelphia MSA meets the Zero Emission Vehicle (ZEV) sales targets outlined by California's Advanced Clean Cars II (ACCII) rule for light-duty vehicles s(LDVs). ZEV adoption is modeled by transitioning baseline Vehicle Miles Traveled (VMT), vehicle population, energy consumption, and Scope 1 emissions from the EPA MOVES4 model to ZEVs based on the ACCII ZEV sales curve. A detailed description of the methodologies can be found in Appendix D. Note this measure is expressed in metric tons (MT), while the GHG inventory is expressed in million metric tons (MMT).

GHGs and Co-Pollutants Identification

This measure targets reductions of the following GHGs and co-pollutants listed in Table 21 associated with burning gasoline and diesel fuel for internal combustion engines in light duty vehicles, as well as the use of hydrofluorocarbons in vehicle air conditioning systems:

Table 21: GHGs and Co-pollutants associated with Actions to Transition Light Duty Vehicles to Low- or No-Carbon Emission Vehicles

Pollutant	Air Pollutant Type	Impacted Measure Category
Carbon Dioxide (CO2)	GHG	All
Hydrofluorocarbons (HFCs)	GHG	Buildings, Transportation
Methane (CH4)	GHG	All
Nitrous Oxide (N2O)	GHG	Buildings, Transportation, Grid, Wastewater
Carbon Monoxide (CO)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Lead	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Nitrogen Oxides (NOx)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Particulate Matter (e.g., PM2.5)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Sulfur dioxide (SO2)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Ozone	Co-pollutant: Criteria Air Pollutant Air Pollutant	All
Volatile Organic Compounds (VOCs)	Co-pollutant: VOCs	Buildings, Transportation, Grid, Waste, Wastewater
Other hazardous air pollutants (HAPs)	Co-pollutant: Air Toxics	Buildings, Transportation, Grid, Waste

LIDAC Benefits Analysis

The following discussion is a preliminary, qualitative discussion of the potential LIDAC benefits expected to result from the implementation of Measure 5. This analysis summarizes how this measure may benefit specific LIDAC populations, and ways in which local governments and other key implementing actors can support the impact of these benefits. Additional analysis of the benefits to LIDAC populations due to actions in this measure will be conducted moving forward for the CCAP.

Local governments and other key actors involved in planning, program or policy implementation must intentionally center LIDAC communities in the development and implementation of this measure to ensure that they are prioritized and receive the maximum benefits possible from these actions. Table 22 below summarizes LIDAC benefits that may result from this measure. Important highlights include:

Transportation emissions contain significant quantities of criteria air pollutants with older and less efficient vehicles producing these pollutants in greater quantities. Existing Incentives designed to reduce the gap in purchase or lease price between internal combustion engine (ICE) and electric vehicles still leave EVs out of reach for many LIDACs. In the near term, alternative ownership models such as EV car share provide the opportunity to access the benefits of EVs.

Table 22: LIDAC Benefits Associated with Actions to Transition Light Duty Vehicles to Low- or No-Carbon Emission Vehicles

LIDAC Benefits	Achieved by this Measure
Public Health Benefits	
Improved Air Quality	✔
Improved Protection from Climate-Related Disasters	
Safe and Healthy Buildings	
Safer Streets	
Reduced Noise Pollution	✔
Socioeconomic Benefits	
Local Job Creation and Economic Growth	✔
Reduced Household Costs	✔
Preserved and Improved Affordable Housing	
Improved Access to Clean Energy Technologies	✔
Increased Reliable and Clean Energy Sources	
Expanded Access to Public Transportation and Micromobility	

Key Metrics

Possible key outputs and outcomes to track performance of this measure over time include the following:

- Low- and No-Emission Vehicles
    - Number of low- and no-emission vehicles purchased, leased, and/or registered
    - Number of low- and no-emission vehicles registered in LIDAC Census tracts
- Supporting Infrastructure
    - Number of publicly accessible chargers by station type (e.g., Level 2, DC Fast Chargers)
    - Number of EV chargers and clean fueling stations installed in LIDAC tracts
    - Uptime Hours for EV charging stations
    - Number of maintenance/repair workers trained
- Amount of GHG emissions reduced
- Economic impact to businesses near charging stations

Measure 5: Actions to Expand and Improve Transit

GHG Measure Description

Improving and expanding transit is an effective method to reduce emissions from the transportation sector as increasing ridership often results in reducing vehicle miles traveled in single occupancy vehicles. Improved and expanded transit has the potential to reduce the cost burden of commuting for low-income workers, provide better connections to job opportunities, and improve accessibility to local and regional destinations, such as housing, jobs, medical amenities, and goods/services. Robust public transit service is a GHG-reducing force multiplier - it enhances the attractiveness, potential range, and safety of other low- or no-emission forms of transportation, such as micromobility, walking and cycling. This measure also encompasses efforts to reduce the carbon intensity of transit services themselves by connecting transit vehicles and facilities to sources of low- and zero-emission sources of power, such as the use of renewable energy to supply transit facilities and the installation of solar powered canopy microgrids to support electric transit bus charging.

Case Study: SEPTA Rail Vehicle Replacement Grant
Southeastern Pennsylvania Transportation Authority (SEPTA) received $317 million through a U.S. Department of Transportation RAISE (Rebuilding American Infrastructure with Sustainability and Equity) grant to purchase 200 new heavy-rail cars for the Market-Frankford Line, which is the most heavily used subway service in the region. New rail cars will improve reliability and reduce delays from aging equipment, expanding public transit's usefulness across the city.

Key Actions/Program Elements

Priority level actions to support near term implementation of this measure include, but are not limited to:

- Provide improvements and enhancements in public transit service to improve service frequency, reliability, and quality:
    - Expand and reconfigure public transit modes and vehicles through updates to operations and service – including enhancements to improve transit travel times, service frequency, efficiency, and coverage in the service area.
    - Support capital improvements such as benches and bus shelters, track realignment and reconfiguration, ADA station upgrades (elevators, ramps, high-level platforms), and the creation of mobility hubs to provide better and more seamless multimodal connections to improve service quality and access.
    - Keep the public transit system up-to-date and in a state of good repair through bus and rail maintenance and investments to improve reliability and quality of service.
- Implement incentives for increased use of transit, such as reduced fare or fare free transit or other transit ridership incentives including institutional bulk-fare product purchase programs for employers, colleges, and residential and commercial landlords.
- Reduce emissions from transit vehicles through adoption of zero-emission technology, such as electric or hydrogen fuel cell buses, and through the installation of clean supporting fueling infrastructure (e.g., solar panels at transit facilities for bus charging, use of hydrogen produced with renewable resources).
- Improve first- and last-mile connections to transit (e.g., shuttles, bicycle storage, safe and/or well-lit active transit connections such as bike lanes, trails, sidewalks and crossings, on-demand transit).
- Support integrated fare systems that support multiple transit options and first- and last-mile connections to transit, such as bike share.

- Support land use policies and public-private partnerships to encourage transit-oriented development and active transportation infrastructure near transit stops and stations.
- Prioritize transit in street design (e.g., dedicated bus lanes, signal prioritization for public transit, parking and loading management, etc.) utilizing the concepts of Complete Streets and Vision Zero.
- Promote and expand car/ride sharing to reduce single occupant vehicle travel through reduced parking minimums/parking maximums, parking pricing, and congestion pricing.
- Implement policies to manage travel demand, such as those that promote or require employer-based trip reduction, ride matching, and vanpool formation.

Geographic Coverage

This measure is intended to reduce emissions across the entire MSA.

Implementation Considerations

Key Implementing Agencies

- **Counties, municipalities, and authorities.** Responsible for land use planning and comprehensive planning; transportation planning, development and operations, including local transit; program development and administration (e.g., travel demand management programs), and local policies. In much of the MSA, roads are owned and maintained by county and municipal governments who make most design and maintenance decisions. These local governments also enact and enforce roadway rules, including those regarding bike lanes and bus lanes. States and the federal government provide transit guidance, funding, and regulations for counties and municipalities.
- **Transportation Management Associations (TMAs).** Agencies that work at a local level to advance and implement equitable, safe, and sustainable multimodal transportation solutions and aim to get more people out of single occupancy vehicles (SOVs). TMAs serve as a resource and collaborator across and between public, private, and non-profit sectors.
- **Nonprofits, advocacy organizations, and CBOs.** Local and regional nonprofits, community-based organizations, and advocacy groups are instrumental in expanding and improving transit. They lobby for equitable transit policies, engage in community outreach to understand transit needs, and work with transit authorities to implement solutions that enhance accessibility and efficiency.
- **Public transportation operators.** Southeastern Pennsylvania Transportation Authority (SEPTA), New Jersey Transit Corporation (NJ Transit), Port Authority Transit Corporation (PATCO), Delaware Transit Corporation (DART First State), Pottstown Area Rapid Transit (PART), Amtrak, and other public transportation providers. These organizations not only own, maintain, and operate transportation systems, but they can be community leaders in implementation beyond their property to create a better environment for transit users.
- **State Departments of Transportation (DOTs).** Will be key partners in transportation infrastructure planning, development, and operations, such as rail and changes to roads to prioritize bus transportation along state routes. State DOTs also receive transportation funding from the federal government, which trickles down to the county and municipal level.
- **Federal Highway Administration (FHWA).** The FHWA is the primary source of funding for transportation, and this funding is routed through state Departments of Transportation to the regional and local level. provides stewardship over the construction, maintenance, and preservation of the nation's highways, bridges, and tunnels. It supports state and local governments in the design, construction, and maintenance of the nation's highway system, and roads on federally and tribally owned lands. The FHWA also conducts research and provides technical assistance to state and local agencies to improve safety, mobility, and to encourage innovation.[48]

[48] *Federal Highway Administration. (2018). Safety First. U.S. Department of Transportation. www.transportation.gov/briefing-room/safetyfirst/federal-highway-administration*

- **Federal Transit Administration (FTA).** The FTA provides financial and technical assistance to local public transit systems, including buses, subways, light rail, commuter rail, trolleys, and ferries. It works to expand high-quality transit services that connect people and build communities in both urban and rural underserved areas. The FTA also supports the development of new technology and processes to support safer, greener, and more equitable transit systems.[49]
- **Regional planning organizations and commissions.** Plan for, evaluate, and in some cases fund transportation infrastructure investments and programs. This includes DVRPC and other regional planning agencies across the MSA.
- **Private sector actors.** Landowners, developers, and businesses play a key role in development decisions and design that affect the viability of using alternatives to driving. Businesses can also implement telecommuting policies and other policies that help manage travel demand.

Authority to Implement

Implementing changes that impact land use can be administered by local (municipal and county) jurisdictions through comprehensive plans, zoning codes, and guidance documents allowing developers to act on changes and build based on updated policies. For public transportation systems there may be a requirement of approvals from regional or state transportation agencies to be implemented with still higher levels of authorization needed depending on the scope and scale of changes to public infrastructure. Additional agencies will need to approve actions related to charges on travel (e.g., congestion pricing or parking pricing changes). Employers also play a key role in creating company policies to allow for teleworking or to provide incentives for transit ridership.

Intersection with Other Funding

In addition to the federal, state, local, and other funding opportunities listed in Table 23 below, municipal and county governments, community groups, and nonprofit organizations can refer to DVRPC's Municipal Funding Guide for federal, state, county, and private sources of funding for locally initiated planning and development projects.

Table 23: Funding Opportunities for Measure 5

Program/Grant Name	Funding Source
Urbanized Area Formula Program	Federal – Formula
State of Good Repair Formula Program	Federal – Formula
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	Federal – Competitive
Grants for Bus and Bus Facility Programs	Federal – Competitive
Capital Investment Grants Program	Federal – Competitive
Low or No Emission Grant Program	Federal – Competitive
Carbon Reduction Program	Federal – Formula
Congestion Mitigation and Air Quality (CMAQ) Improvement Program	Federal – Formula
Surface Transportation Block Grant Program	Federal – Formula
Clean Heavy-Duty Vehicle Program	Federal – Formula
Alternative Fuels Incentive Grants	State (PA)
Environmental Mitigation Trust Agreements	State (PA)

[49] *Federal Transit Administration. (n.d.). About FTA. U.S. Department of Transportation. www.transit.dot.gov/about-fta*

Quantified GHG Reductions (MTCO2e)

This measure will lead to broad GHG reductions in the transportation sector.

Table 24: GHGs Reductions from Actions to Expand and Improve Transit

Cumulative Reductions from 2025-2030 ($MTCO_2e$)	Cumulative Reductions from 2025-2050 ($MTCO_2e$)
177,327	1,593,876

This measure quantifies resulting VMT and GHG emissions reduced if the Philadelphia MSA enhances its public transportation by increasing transit service frequency, extending transit network coverage or hours, and implementing transit-supportive roadway treatments. The potential VMT reduction due to each of these actions was calculated based on the methodology outlined in the Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity.[50] A detailed description of the methodologies can be found in Appendix D. Note this measure is expressed in metric tons (MT), while the GHG inventory is expressed in million metric tons (MMT).

GHGs and Co-Pollutants Identification

This measure targets reductions of the following GHGs and co-pollutants listed in Table 25 associated with burning gasoline and diesel fuels for internal combustion engines in light-and heavy-duty vehicles, as well as the use of hydrofluorocarbons in vehicle air conditioning systems:

Table 25: GHGs and Co-pollutants Associated with Actions to Expand and Improve Transit

Pollutant	Air Pollutant Type	Impacted Measure Category
Carbon Dioxide (CO2)	GHG	All
Hydrofluorocarbons (HFCs)	GHG	Buildings, Transportation
Methane (CH4)	GHG	All
Nitrous Oxide (N2O)	GHG	Buildings, Transportation, Grid, Wastewater
Carbon Monoxide (CO)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Lead	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Nitrogen Oxides (NOx)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Particulate Matter (e.g., PM2.5)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Sulfur dioxide (SO2)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Ozone	Co-pollutant: Criteria Air Pollutant Air Pollutant	All
Volatile Organic Compounds (VOCs)	Co-pollutant: VOCs	Buildings, Transportation, Grid, Waste, Wastewater
Other hazardous air pollutants (HAPs)	Co-pollutant: Air Toxics	Buildings, Transportation, Grid, Waste

[50] *California Air Pollution Control Officers Association. 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. www.airquality.org/ClimateChange/Documents/Handbook percent20Public percent20Draft_2021-Aug.pdf*

LIDAC Benefits Analysis

The following discussion is a preliminary, qualitative discussion of the potential LIDAC benefits expected to result from the implementation of Measure 5. This analysis includes a summary of the ways in which this measure may benefit specific LIDAC populations, and ways in which local governments and other key implementing actors can support the impact of these benefits. Additional analysis of the benefits to LIDAC populations due to actions in this measure will be conducted moving forward for the CCAP.

Local governments and other key actors involved in planning, program or policy implementation must intentionally center LIDAC communities in the development and implementation of this measure to ensure that they are prioritized and receive the maximum benefits possible from these actions. Table 26 below summarizes LIDAC benefits that may result from this measure. Important highlights include:

- The co-benefits of expanded and improved public transportation have the potential for significant benefit to LIDACs, including expanded access to jobs, healthcare, healthy food, etc. A comprehensive approach to this action that is centered on LIDACS will address all challenges these communities face when using transit, including safety, cost, access, and travel time.

Table 26: LIDAC Benefits Associated with Actions to Expand and Improve Transit

LIDAC Benefits	Achieved by this Measure
Public Health Benefits	
Improved Air Quality	✔
Improved Protection from Climate-Related Disasters	
Safe and Healthy Buildings	
Safer Streets	✔
Reduced Noise Pollution	✔
Socioeconomic Benefits	
Local Job Creation and Economic Growth	✔
Reduced Household Costs	✔
Preserved and Improved Affordable Housing	
Improved Access to Clean Energy Technologies	
Increased Reliable and Clean Energy Sources	
Expanded Access to Public Transportation and Micromobility	

Key Metrics

Possible key outputs and outcomes to track performance of this measure over time include the following:

Mode Shift

- VMT and VMT per Capita
- Work mode share (i.e., percent of workers commuting by single occupant vehicles, rideshare, transit, active transportation, telework, etc.)
- Transit ridership
- Zero emission buses

Transit Infrastructure

- Miles of public transit routes available
- Commute time
- Percent of the MSA within walking distance of a transit stop
- Emissions from public transit vehicles by fuel type

Measure 6: Actions to Implement Bicycle, Pedestrian and Active Transportation Improvements

GHG Measure Description

This GHG reduction measure will implement policies and projects that invest in bike, pedestrian, and other active transportation improvements across Philadelphia MSA. States, counties, and municipalities will lead this measure's development with a collective goal to enhance and increase active transportation infrastructure and programming. This will lower transportation GHG emissions by promoting low/no carbon transportation alternatives. Indirect co-benefits of this measure, including increased connectivity within communities and improved safety, will spread throughout communities, and will provide a particular benefit to historically underserved LIDACs, which historically experience a disproportionate share of unsafe walking and biking conditions and rely more heavily on walking and biking to connect to transit services.

Key Actions/Program Elements

This measure focuses on improving accessibility and safety for active transportation modes between housing, jobs, and goods and services.

Actions to implement this measure could include, but are not limited to:

- Develop an active transportation plan for the region, including identification of gaps in the region's active transportation network.
- Develop and expand pedestrian and high-quality bike infrastructure; complete the region's interconnected multi-use trail network.
- Enable walking and biking to school, work, and transit options by implementing programs and road designs that center on safe and accessible routes.
- Ensure bike and pedestrian infrastructure is included in all road repair and planning.
- Improve the safety of pedestrian infrastructure, bike infrastructure, and road crossings through improved design, lighting, ADA accessibility, maintenance, etc.
- Implement road diets and other traffic-calming measures to make walking and cycling safer and more accessible.
- Provide secure bicycle storage options.
- Support funding for sidewalk design, construction and repair for publicly owned sidewalks and for sidewalks that are legally the responsibility of adjacent homeowners and require sidewalks in all new developments.
- Implement bike- or scooter-sharing programs. Where possible, include electric micromobility (e-micromobility) options.
- Implement e-bike incentive programs to facilitate biking for longer trip distances.

Geographic Coverage

This measure will cover local governments and municipalities across the entire Philadelphia MSA.

Implementation Considerations

Key Implementing Agencies

- **Counties, municipalities, and authorities.** Including all local government entities such as counties, cities, boroughs, townships and other forms of local government as well as their respective public agencies. Local government is responsible for land use planning and comprehensive planning; transportation planning, development and operations, including local transit; program development and administration (e.g., travel demand management programs), and local policies. In much of the MSA, county and municipal governments own and maintain most of the roads and are responsible for design and maintenance decisions, including those pertaining to bike and pedestrian infrastructure within public road rights-of-way.
- **Transportation Management Association (TMAs).** Agencies that work at a local level to advance and implement equitable, safe, and sustainable multimodal transportation solutions and aim to get more people out of single occupancy vehicles (SOVs). TMAs serve as a resource and collaborator across and between public, private, and non-profit sectors.
- **Regional planning organizations.** In collaboration with state and local governments, DVRPC, SJTPO, and WILMAPCO can provide support and best practices to support the expansion of active transportation options. These organizations can plan for, evaluate, and in some cases fund transportation infrastructure investments and programs.
- **State Departments of Transportation (DOTs).** State DOTs will be key partners in providing guidance and oversight regarding active transportation infrastructure planning, development, and operations, including implementing bicycle and pedestrian improvements along state routes. States provide guidance for local governments on how to establish bicycle facilities and pedestrian walkways. State DOTs receive transportation funding from the federal government, which is allocated to county and municipal governments for active transportation improvements.
- **Federal Highway Administration (FHWA).** The FHWA provides stewardship over the construction, maintenance, and preservation of the nation's highways, bridges, and tunnels. It supports state and local governments in the design, construction, and maintenance of the nation’s highway system, and roads on federally and tribally owned lands. The FHWA also conducts research and provides technical assistance to state and local agencies to improve safety, mobility, and to encourage innovation, including assistance regarding pedestrian walkways and bike lanes on roadways.
- **Nonprofits, advocacy organizations, and CBOs.** Local and regional nonprofits, community-based organizations, and advocacy groups are instrumental in expanding and improving transit. They lobby for equitable transit policies, engage in community outreach to understand transit needs, and work with transit authorities to implement solutions that enhance accessibility and efficiency.
- **Private sector actors.** Land owners, developers, and businesses play a key role in development decisions and designs that affect the viability of using alternatives to driving.

Case Study: Our Streets Trenton
Our Streets Trenton is a complete streets design handbook with award-winning community engagement in Trenton, New Jersey. Between 2008 - 2018, 50% of fatal crashes in Trenton killed people walking or biking and one third of Trenton households have no car. The plan has been a continuation of work to prioritize safety in disadvantaged communities, including complete streets policies, ordinances and plans adopted by the city of Trenton, and events featuring pilot bicycle lanes, crosswalk murals, and celebrating community.

Case Study: Bike Share Commitment to Equity
The Indego bike share system is an initiative of the City of Philadelphia. Now in its 8th year, the system includes 213 stations and over 2,200 bikes, a mix of both classic and electric. In 2023, Philadelphia launched a Bike Share Equity Plan that outline steps to improve access for all people, with particular attention to people who are BIPOC and people facing economic challenges. The plan outlines steps to reduce financial- and non-financial barriers to ridership for historically marginalized communities, the prioritization of community trust building and partnerships. The bike share system has a goal of adding another 150 stations over the next five years, concentrating the locations of these stations on underserved areas in historically marginalized communities. Currently, more than one third of Indego stations serve low- income communities.

Authority to Implement

State and local actors within the MSA that own, design and maintain transportation rights-of-way have the authority to implement active transportation improvement projects in their own operations, per this measure, within their respective jurisdictions.

Intersection with Other Funding

In addition to the federal, state, local, and other funding opportunities listed in Table 27, municipal and county governments, community groups, and nonprofit organizations can refer to DVRPC's Municipal Funding Guide for federal, state, county, and private sources of funding for locally initiated planning and development projects.

Table 27: Funding Opportunities for Measure 6

Program/Grant Name	Funding Source
Carbon Reduction Program	Federal – Formula
Congestion Mitigation and Air Quality (CMAQ) Improvement Program	Federal – Formula
Reconnecting Communities and Neighborhoods Program	Federal – Competitive
Rivers, Trails, and Conservation Assistance Program	Federal – Competitive
Safe Routes to School	Federal – Formula
Surface Transportation Block Grant Program	Federal – Formula
Transportation Alternatives Set-Aside Program	Federal – Competitive
Safe Streets and Roads for All	Federal – Competitive
National Highway Performance Program	Federal – Formula
Highway Safety Improvement Program	Federal – Formula
Active Transportation Infrastructure Investment Program (ATIIP)	Federal – Competitive
Regional Trails Program	Regional (DVRPC)
Travel Options Program	Regional (DVRPC)
Transportation and Community Development Initiative	Regional (DVRPC)
Community Conservation Partnership Program	State (PA)
Greenways, Trails and Recreation Program	State (PA)
Multi-modal Transportation Fund	State (PA)
Safe Routes to School	State (NJ)

Quantified GHG Reductions (MTCO2e)

This measure will lead to broad GHG reductions in the transportation sector.

Table 28: GHGs reductions from Actions to Implement Bicycle, Pedestrian and Active Transportation Improvements

Cumulative Reductions from 2025-2030 ($MTCO_2e$)	Cumulative Reductions from 2025-2050 ($MTCO_2e$)
117,678	1,063,981

This measure quantifies resulting VMT and GHG emissions reduced if the Philadelphia MSA enhances its active transportation infrastructure by improving pedestrian networks, expanding bike networks, and implementing an electric bikeshare program throughout the MSA. The potential VMT reduction due to each of these actions was calculated based on the methodology outlined in the Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity.[51] A detailed description of the methodologies can be found in Appendix D. Note this measure is expressed in metric tons (MT), while the GHG inventory is expressed in million metric tons (MMT).

GHGs and Co-Pollutants Identification

This measure targets reductions of the GHGs and co-pollutants listed in Table 29 associated with burning gasoline and diesel fuel for internal combustion engine vehicles, as well as the use of hydrofluorocarbons in vehicle air conditioning systems:

Table 29: GHGs and Co-pollutants associated with Actions to Implement Bicycle, Pedestrian and Active Transportation Improvements

Pollutant	Air Pollutant Type	Impacted Measure Category
Carbon Dioxide (CO2)	GHG	All
Hydrofluorocarbons (HFCs)	GHG	Buildings, Transportation
Methane (CH4)	GHG	All
Nitrous Oxide (N2O)	GHG	Buildings, Transportation, Grid, Wastewater
Carbon Monoxide (CO)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Lead	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Nitrogen Oxides (NOx)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Particulate Matter (e.g., PM2.5)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Sulfur dioxide (SO2)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Ozone	Co-pollutant: Criteria Air Pollutant Air Pollutant	All
Volatile Organic Compounds (VOCs)	Co-pollutant: VOCs	Buildings, Transportation, Grid, Waste, Wastewater
Other hazardous air pollutants (HAPs)	Co-pollutant: Air Toxics	Buildings, Transportation, Grid, Waste

[51] *California Air Pollution Control Officers Association. 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. www.airquality.org/ClimateChange/Documents/Handbook percent20Public percent20Draft_2021-Aug.pdf*

LIDAC Benefits Analysis

The following discussion is a preliminary, qualitative analysis of the potential LIDAC benefits expected to result from the implementation of Measure 6. Actions to Implement Bicycle, Pedestrian and Active Transportation Improvements. This analysis includes a summary of the ways in which this measure may benefit specific LIDAC populations, and ways in which local governments and other key implementing actors can support the impact of these benefits. Additional analysis of the benefits to LIDAC populations due to actions in this measure will be conducted moving forward for the CCAP.

Local governments and other key actors involved in planning, program or policy implementation must intentionally center LIDAC communities in the development and implementation of this measure to ensure that they are prioritized and receive the maximum benefits possible from these actions. Table 30 below summarizes LIDAC benefits that may result from this measure. Important highlights include:

- An improved active transportation system reduces road fatalities for cyclists and pedestrians, which have been steadily rising over the last decade.[52] Neighborhoods with more minorities and higher poverty rates have fewer adequate and continuous sidewalks.[53] Pedestrian and micro-mobility infrastructure that is continuous is essential to provide safe connectivity to jobs, schools, and other opportunities for people of all abilities and incomes.

Table 30: LIDAC Benefits Associated with Actions to Implement Bicycle, Pedestrian, and Active Transportation Improvements

LIDAC Benefits	Achieved by this Measure
Public Health Benefits	
Improved Air Quality	✔
Improved Protection from Climate-Related Disasters	
Safe and Healthy Buildings	
Safer Streets	✔
Reduced Noise Pollution	✔
Socioeconomic Benefits	
Local Job Creation and Economic Growth	✔
Reduced Household Costs	✔
Preserved and Improved Affordable Housing	
Improved Access to Clean Energy Technologies	
Increased Reliable and Clean Energy Sources	
Expanded Access to Public Transportation and Micromobility	✔

[52] *Badger, E. and Parlapiano, A. (2022). The Exceptionally American Problem of Rising Roadway Deaths. The New York Times. www.nytimes.com/2022/11/27/upshot/road-deaths-pedestrians-cyclists.html*

[53] *Badger, E. (2016). The Inequality of Sidewalks. The Washington Post. www.washingtonpost.com/news/wonk/wp/2016/01/15/the-inequality-of-sidewalks/*

Key Metrics

Possible key outputs and outcomes to track performance of this measure over time include the following:

- Increase in the proportion of people who commute by biking or walking
- Miles of expanded sidewalks and multi-use trails
- Number of bicycles purchased or donated
- GHG emission reduction
- Annual number of users of multi-use trail networks
- Number of eBike/eScooter purchases supported through the creation or expansion of an e-micromobility incentive programs
- Reduced transportation expenditures
- Increase in bike share program usage/trips

Measure 7: Actions to Implement a Clean Electricity Grid and Ensure Grid Reliability

GHG Measure Description

This measure focuses on a move to cleaner electricity resources while ensuring grid reliability and resilience. Transitioning away from reliance on the combustion of fuels that emit GHGs and other air pollutants to generate electricity towards resources with low or no emissions helps to mitigate climate change and reduce air pollution. A clean electricity grid relies on energy sources such as solar, wind, hydropower, and nuclear, which produce minimal or no GHG emissions. To ensure grid reliability, this measure encourages significant expansions of and upgrades to transmission and distribution networks in addition to supporting increased use of storage and the use of clean fuels (e.g., hydrogen or renewable natural gas). Investments in grid reliability will become increasingly important to support both the increased electric demand caused by building and vehicle electrification and to enable the integration of intermittent renewable sources such as wind and solar.

Case Study: PECO Energy Company's Creating a Resilient, Equitable, and Accessible Transformation in Energy for Greater Philadelphia (CREATE) Plan

Funded by the federal Grid Resilience and Innovation Partnerships (GRIP) Program (administered by the U.S. DOE's Grid Deployment Office), PECO's CREATE Plan seeks to improve resiliency and reliability across seven grid components in the Greater Philadelphia region. Through this measure, local governments can work with PECO to improve grid reliability and resilience to climate events like flooding, with a focus on benefits to LIDACs.

Key Actions/Program Elements

To drive the transition toward clean and reliable electricity supply across the Philadelphia MSA, local governments and other implementing agencies and partners will focus on implementing technologies, policies, and programs to support the investments needed. This measure is supported by PCAP measures 1-4, which prioritize investments in energy efficiency and distributed energy resources (DERs) that will be essential in helping mitigate strain on the grid from electrified buildings and vehicles.

- Conduct a comprehensive planning effort to identify the state of the distribution networks in the MSA and the ability of this network to support the integration of building and vehicle electrification in addition to the growth in distributed energy resources identified in this PCAP.
    - This planning effort should identify constraints that may be present in LIDACs and solutions to those constraints so that they can be prioritized.
    - Identify high energy users and critical infrastructure through a thorough assessment of current energy consumption patterns, sources, and infrastructure.
    - Coordinate with regulatory bodies on power sector planning and utility rate design to encourage the use of DERs, create targeted time of use rates for EV charging, and review demand management programs and incentives. Demand management – particularly for high energy users – is critical in reducing stress on the grid by incentivizing reduced energy consumption during peak times or extreme weather conditions.

- Support the development of local clean energy resources:
    - Local governments in NJ, DE, and MD portions of the MSA can support residential clean energy by supporting existing or establishing new community solar programs. Community solar is not currently enabled in Pennsylvania.
    - All local governments in the MSA can enter into clean energy agreements with utilities, such as a Community Choice Aggregation (CCA) program. CCAs allow local governments to procure clean power on behalf of residents while residents still receive transmission and distribution service from their existing utility.
    - Conduct site feasibility assessment and pre-construction planning for the identification of large-scale renewable energy projects at public buildings and facilities. Work with partners to conduct them at private sites as well.
    - Develop and support the adoption of model ordinances to facilitate local government approvals of medium- and large-scale renewable energy projects.
- Coordinate with state, regional, and local governments as well as power sector regulatory bodies (e.g., state public utility commissions, the Federal Energy Regulatory Commission, PJM (the regional transmission organization (RTO)) to reduce barriers to the deployment of grid-scale renewable energy development and to demonstrate support for orders and rate design that facilitate the equitable development of microgrids, integrated distributed energy resources, district heating and cooling facilities, and Distributed Energy Resource Aggregation programs, such as virtual power plants. Virtual power plants are disaggregated grid resources comprised of multiple end-users that aggregate their distributed resources and demand management solutions to be monetized in energy markets and can respond to alleviate grid constraints.

Geographic Coverage

The actions within this measure are focused on the entire MSA Area. DVRPC has taken actions to promote the adoption of a cleaner electricity grid. The overall measure is specific to the MSA and not meant to encompass a broader or smaller geographic area.

Implementation Considerations

Key Implementing Agencies

- **Counties, municipalities, and authorities.** Including all local government entities such as counties, cities, boroughs, townships and other forms of local government as well as their respective public agencies (such as the Philadelphia Energy Authority and other similar entities). Local government is responsible for land use planning and comprehensive planning, including siting and permitting for clean electricity generation and transmission infrastructure and grid enhancements.
- **Regional planning organizations.** In collaboration with state and local governments, DVRPC can provide support and best practices to enable electricity efficiency and decarbonization of the electric grid.
- **State governments and agencies.** Including the Commonwealth of Pennsylvania, State of Delaware, State of New Jersey, State of Maryland and their respective public agencies.
- **Public service commissions, utilities, energy suppliers, and other electricity grid stakeholders.** Participation and/or approval by energy utilities (e.g., PECO, Delmarva), their regulators, and grid operators (PJM), is critical for expanding clean energy, managing energy rates, increasing resiliency and for microgrid owners and operators. A range of electricity grid stakeholders including large users, local government and NGOs can also work together with regulators, utilities and market operators to change rules and reform electricity grid policies.
- **Private sector actors.** Support from the private sector, including key implementers and partners mentioned above, will be required for feasibility assessments, construction planning and development, and potential maintenance and operations.

- **Utilities.** Local utilities will also need to be involved to provide relevant data, interconnection agreements, and ensure the electricity grid can support electrification and the expansion of renewable energy and energy efficiency. Utilities also provide rebates to support project funding.

Authority to Implement

In working towards a clean, reliable, and resilient electric grid, interactions with existing infrastructure owned by energy utilities, operating under state law franchises, often necessitate utility participation and approval, typically overseen by state regulatory commissions. For municipally owned utilities, the authority usually lies within the local government. For new electricity generating projects, the regional grid operator (PJM) is involved in assessing and allowing interconnection of the project to the grid, and overlapping local and state authorities are involved in the siting and permitting process. Local governments and states do not have direct control over the full siting, permitting, interconnection and development process for new renewable projects. However, governments can work to streamline permitting and siting processes, and collaborate with state utility regulatory agencies, FERC, and PJM to advocate for improvements to the interconnection process to help facilitate the development of renewables and investments in the transmission and distribution grids. This would ensure there is sufficient capability to meet expected changes in demand from end-use electrification and from an increasing amount of distributed energy resources.

Intersection with Other Funding

In addition to the federal, state, local, and other funding opportunities listed in Table 31, municipal and county governments, community groups, and nonprofit organizations can refer to DVRPC's Municipal Funding Guide for federal, state, county, and private sources of funding for locally initiated planning and development projects.

Table 31: Funding Opportunities for Measure 7

Program/Grant Name	Funding Source
Energy Efficiency and Conservation Block Grant	Federal – Formula
Greenhouse Gas Reduction Fund	Federal – Competitive
Rural Energy for America Program	Federal – Competitive
Empowering Rural America Program	Federal -- Competitive
Grid Resilience Grants	Federal – Formula
New Jersey Utility Energy Efficiency Programs	Utility (PSE&G, Atlantic City Electric)
EmPOWER Maryland	Utility (Delmarva)
Pennsylvania's Energy Efficiency and Conservation (EE&C) Program	Utility (PECO, PPL, MetEd)
Delaware Energy Programs (Energy Efficiency Resource Standards Act of 2009)	Utility (Delmarva, Delaware SEU)
Philadelphia Green Capital Corporation	Private (Philadelphia Energy Authority)
Climate Catalytic Capital (C3) Fund	Private (Maryland Clean Energy Center)
Maryland Clean Energy Capital Program	Private (Maryland Clean Energy Center)

Quantified GHG Reductions (MTCO2e)

This measure will lead to broad GHG reductions in the power sector (Grid).

Table 32: GHGs reductions from Actions to Implement a Clean Electricity Grid and Ensure Grid Reliability

Cumulative Reductions from 2025-2030 ($MTCO_2e$)	Cumulative Reductions from 2025-2050 ($MTCO_2e$)
27,363,024	207,944,185

This measure seeks to estimate emissions reductions potential from a cleaner electricity grid. This measure was modeled comparing EIA's 2023 Annual Energy Outlook (AEO) Reference Case to the existing EPA eGRID emission rate and estimating future electricity use in the region using a combination of other modeling efforts and a population growth projection. A detailed description of the methodologies can be found in Appendix D. Note this measure is expressed in metric tons (MT), while the GHG inventory is expressed in million metric tons (MMT).

GHGs and Co-Pollutants Identification

This measure targets reductions of the GHGs and co-pollutants listed in Table 33 associated with combusting natural gas and coal, which were the two most common fuels used for U.S. electricity generation in 2022 and primary sources of emissions from electric power generation:[54]

Table 33: GHGs and Co-pollutants associated with Actions to Implement a Clean Electricity Grid and Ensure Grid Reliability

Pollutant	Air Pollutant Type	Impacted Measure Category
Carbon Dioxide (CO2)	GHG	All
Methane (CH4)	GHG	All
Nitrous Oxide (N2O)	GHG	Buildings, Transportation, Grid, Wastewater
Sulfur Hexafluoride (SF6)	GHG	Grid
Carbon Monoxide (CO)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Lead	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Nitrogen Oxides (NOx)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Particulate Matter (e.g., PM2.5)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Sulfur dioxide (SO2)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid
Ozone	Co-pollutant: Criteria Air Pollutant Air Pollutant	All
Volatile Organic Compounds (VOCs)	Co-pollutant: VOCs	Buildings, Transportation, Grid, Waste, Wastewater
Other hazardous air pollutants (HAPs)	Co-pollutant: Air Toxics	Buildings, Transportation, Grid, Waste

[54] *EIA. 2023. Electricity Explained. Eia.gov. www.eia.gov/energyexplained/electricity/*

LIDAC Benefits Analysis

The following discussion is a preliminary, qualitative discussion of the potential LIDAC benefits expected to result from the implementation of Measure 7. Actions to Implement a Clean Electricity Grid and Ensure Grid Reliability. This analysis includes a summary of the ways in which this measure may benefit specific LIDAC populations, and ways in which local governments and other key implementing actors can support the impact of these benefits. Additional analysis of the benefits to LIDAC populations due to actions in this measure will be conducted moving forward for the CCAP.

Local governments and other key actors involved in planning, program or policy implementation must intentionally center LIDAC communities in the development and implementation of this measure to ensure that they are prioritized and receive the maximum benefits possible from these actions. Additional group and individual discussions with stakeholders, including LIDAC-focused CBOs, will be held in preparation for the CCAP. Some CBOs who will be sought out for engagement related to this measure include PECO's Low Income Community Engagement team, Home Electrification Repair and Equity for Climate Justice (HERE4CJ) Coalition, and Interfaith Power and Light. Table 34 provides a summary of LIDAC benefits that may result from this measure. Important highlights include:

- Energy generation has historically been sited near and in low-income communities. Procedural justice measures provide opportunities to restore past wrong doings while improving outcomes from new energy generation projects. Community benefit agreements and equitable land use regulations for siting clean energy infrastructure are some of the tools that can mitigate impacts and ensure communities benefit.

Table 34: LIDAC Benefits Associated with Actions to Implement a Clean Electricity Grid and Ensure Grid Reliability

LIDAC Benefits	Achieved by this Measure
Public Health Benefits	
Improved Air Quality	✔
Improved Protection from Climate-Related Disasters	✔
Safe and Healthy Buildings	
Safer Streets	
Reduced Noise Pollution	
Socioeconomic Benefits	
Local Job Creation and Economic Growth	✔
Reduced Household Costs	
Preserved and Improved Affordable Housing	
Improved Access to Clean Energy Technologies	✔
Increased Reliable and Clean Energy Sources	✔
Expanded Access to Public Transportation and Micromobility	✔

Key Metrics

Possible key outputs and outcomes to track performance of this measure over time include the following:

- Number of approved/installed clean energy projects in the region
- Capacity of clean electricity installed

Measure 8: Actions to Reduce Solid Waste and Better Manage Waste Generated

GHG Measure Description

The solid waste sector emits GHG emissions, particularly methane and carbon dioxide, across the Philadelphia MSA region. Across the U.S., municipal waste landfills account for most solid waste sector emissions, followed by solid waste combustion and industrial landfills.[55] To address emissions from the waste sector within the MSA, this measure aims to increase waste diversion and reduce emissions at landfills and solid waste incinerators.[56] Proposed actions within this measure focus on waste diversion practices (e.g., composting and food waste reduction programs) and methane-capture technology. These actions and programs will reduce waste sector emissions and provide multiple benefits to communities, including reduced air pollution and improved waste management in LIDACs.

Key Actions /Program Elements

Actions to implement this measure could include, but are not limited to:

- Expand and offer new programs to increase composting and commercial composting infrastructure. Include different types of composting programs, such as yard trimmings and food waste.
    - Curbside Composting Program: Establish a program where organic waste for compost, including yard trimmings and food waste, can be collected regularly with curbside trash and recycling collection. Collected organic waste will then be brought to a composting site instead of landfills or waste-to-energy facilities. Compost can then be used to produce soil additives for growing foods and plants. Compost can be collected curbside in city or county-provided composting bins, as proposed below.
    - Provide Residential Compost Bins: Provide free compost bins to residents, similar to how many cities and counties provide residents with recycling bins. Residents can pick up a compost bin at a city or county sanitation center. They can use the bins at their home to participate in a city or county-run curbside composting program, as described above, or to start their own at-home composting operation.
    - Encourage Commercial Composting: Establish an educational program to encourage businesses, including restaurants, Universities, multi-family buildings, and other entities to compost organics and food waste. Training and educational materials could highlight incentives such as GHG emissions reductions and cost-savings on waste hauling costs. Cities and counties could provide training materials for businesses, and potentially subsidize the cost of on-site composting vessels. Pairing this with additional investment in industrial composting facilities, as described below, and an expanded compost collection program would further encourage commercial composting.
    - Invest in Community-Scale and Industrial Composting Facilities: Invest in organic and food composting operations at existing and new solid waste facilities, including composting, mulching, and landfill facilities. Enhancing composting operations across the MSA would build capacity for a residential curbside composting program, as well as composting from commercial stakeholders with larger quantities of organic waste. Providing procurement opportunities for community-scale or locally run composting facilities provides an opportunity for local wealth-building and jobs.

[55] *U.S. EPA. 2024. Basic Information about Landfill Gas. EPA.gov. www.epa.gov/lmop/basic-information-about-landfill-gas*

[56] *Note: All waste incineration in the Philadelphia MSA is used for electricity generation. Currently, waste incineration results in a net decrease in GHG emissions by displacing electricity generation from a grid that is primarily powered by fossil fuels, while also eliminating waste that would otherwise generate methane and carbon dioxide emissions through anaerobic decomposition within landfills. In a cleaner electricity grid future, carbon reductions from waste incinerators would no longer be present and solid waste could be managed and diverted through the policies and actions described within this measure.*

- Improve practices to increase non-compost waste diversion.
    - Waste Education and Public Service Campaigns: Educate the public to promote behavioral changes that encourage waste diversion at the source. Establish a public service campaign and disperse educational materials that encourage households to reuse and buy in bulk. Include education that focuses specifically on limiting single-use materials and food waste. Additionally, educate businesses on how they can reduce waste in their operations or implement composting systems, as described in the above action.
    - Address Food Waste: Reducing, rescuing, and repurposing food waste can provide broader benefits to the region beyond GHG reductions. Addressing food challenges can bring health and nutritional benefits to LIDACs and reduce GHG emissions associated with food production and transportation, among many other benefits.
    - Product Innovation and Policy: Enact policies to ban or tax wasteful single-use packaging (e.g., plastic bags, plastic straws, polystyrene). Additionally, establish a program, potentially a grant, to promote research and develop new product designs to replace wasteful products sold and used in industrial processes in the region.
    - Landfill Convenience Center and Waste Transfer Station: Establish government-owned waste transfer stations that will service homeowners, small haulers, and large haulers. Waste collected at this facility will be transferred to other jurisdictions for processing, recovery, and disposal. The facility will incorporate a citizen convenience center, which will assist with reuse and waste diversion initiatives.
- Monitor, manage, and capture methane from landfills and food scrap/aerobic compost digester systems for beneficial use.
    - Use methane capture technology. Introduce methane capture technologies, such as anaerobic digesters or landfill gas (LFG) collection systems, via regional pilot or demonstration projects. Ensure project data can be easily tracked and monitored, and that projects can be scaled up if deemed effective.
    - Develop LFG-to-energy projects. Expand LFG treatment centers at landfills so that captured LFG can be converted into fuel for vehicles, electricity, and heating systems, rather than burned off.

Geographic Coverage

The actions within this measure are focused across the entire Philadelphia MSA.

Implementation Considerations

Key Implementing Agencies

- **Local government organizations.** Including all local government entities such as counties, cities, boroughs, townships and other forms of local government as well as their respective public agencies. Local government departments of public works or streets departments typically oversee landfills and solid waste management and recycling and typically can implement policies and general oversight for this work.
- **Regional planning organizations.** In collaboration with state and local governments, DVRPC can provide support and best practices to enable more efficient waste management and waste diversion in the region.

- **State governments and agencies.** Including the Commonwealth of Pennsylvania, State of Delaware, State of New Jersey, State of Maryland and their respective public agencies, including:
    - MD Department of the Environment: Handles solid waste management and recycling in the state.
    - PA Department of Environmental Protection Bureau of Waste Management: Responsible for recycling and solid waste programs.
    - NJ Department of Environmental Protection Division of Sustainable Waste Management: Oversees solid waste and recycling.
    - DE Solid Waste Authority: Manages state solid waste and recycling. Also oversees DSWA's Statewide Solid Waste Management Plan, which aims to maximize recycling and diversion of materials from landfill disposal and to help advance sustainable materials management practices and minimize greenhouse gas emissions in the state by 2030.
- **Private sector actors.** Solid Waste Authorities, privately-owned sanitation centers, and waste-related businesses support local and state governments in solid waste collection and management.

Case Study: Community Composting Diverts Solid Waste

In Media Borough, PA, all residents have access to a municipal curbside composting program. The program was piloted with 100 households in 2018 and expanded to all households by 2021. Media Borough's Public Works Department provides a bright yellow five-gallon bucket to residents to place their food scraps. Public Works picks the buckets up once a week, and the food waste is then sent to a private composting facility in Middletown Township, PA where it is composted into nutrient-rich soil. Media Borough's current recycling and yard waste programs divert close to 30% of residential solid waste from the incinerator in the City of Chester, PA. Adding the food scrap collection program reduces that figure by another 30%.

- **Waste-focused CBOs.** Local and regional CBOs play a role in waste management by promoting recycling, composting, and waste reduction initiatives. They educate the public about the importance of sustainable waste practices and often organize clean-up drives, contributing to a cleaner and healthier environment.

Authority to Implement

The implementing authorities for this measure are local governments and specific government agencies that manage waste (e.g., Public Works, Department of the Environment, etc.) in partnership, where applicable, with private utilities, landfills, and composting facilities. Public waste management, demonstration projects, waste-related policies, and public education campaigns can all be carried out under the policing powers of local governments. Support from the private sector will be required for projects that expand to private landfills and composting facilities.

Intersection with Other Funding

In addition to the federal, state, local, and other funding opportunities listed in Table 35, municipal and county governments, community groups, and nonprofit organizations can refer to DVRPC's Municipal Funding Guide for federal, state, county, and private sources of funding for locally initiated planning and development projects.

Table 35: Funding Opportunities for Measure 8

Program/Grant Name	Funding Source
Consumer Recycling Education and Outreach Grant Program	Federal – Competitive
Solid Waste Infrastructure for Recycling Grant Program	Federal – Competitive
Rural Energy for America Program	Federal – Competitive

Quantified GHG Reductions (MTCO2e)

This measure reduces GHG emissions from the solid waste sector.

Table 36: GHGs reductions from Actions to Reduce Solid Waste and Better Manage Waste Generated

Cumulative Reductions from 2025-2030 ($MTCO_2e$)	Cumulative Reductions from 2025-2050 ($MTCO_2e$)
2,843,163	24,262,580

This measure models the resulting GHG emissions reduced if regional waste management facilities deploy a range of solid waste practices to control landfill emissions, and implement waste management practices such as composting that reduce the amount of waste sent to landfills and incinerators. It leverages the EPA's U.S. State-level Non-CO_2 Greenhouse Gas Mitigation Potential: 2025-2050[57] study and Delaware County's Path Toward Zero Waste[58] to determine emissions reduction potential from landfills and incineration and scales them to the Philadelphia MSA's estimated waste emissions. A detailed description of the methodologies can be found in Appendix D. Note this measure is expressed in metric tons (MT), while the GHG inventory is expressed in million metric tons (MMT).

GHGs and Co-Pollutants Identification

This measure targets reductions of GHGs and co-pollutants listed in Table 37 associated with the landfilling and incineration of municipal solid waste:

Table 37: GHGs and Co-pollutants associated with Actions to Reduce Solid Waste and Better Manage Waste Generated

Pollutant	Air Pollutant Type	Impacted Measure Category
Carbon Dioxide (CO2)	GHG	All
Methane (CH4)	GHG	All
Lead	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Nitrogen Oxides (NOx)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Particulate Matter (e.g., PM2.5)	Co-pollutant: Criteria Air Pollutant	Buildings, Transportation, Grid, Waste
Ozone	Co-pollutant: Criteria Air Pollutant Air Pollutant	All
Volatile Organic Compounds (VOCs)	Co-pollutant: VOCs	Buildings, Transportation, Grid, Waste, Wastewater
Other hazardous air pollutants (HAPs)	Co-pollutant: Air Toxics	Buildings, Transportation, Grid, Waste

[57] *US EPA. U.S. State-level Non-CO2 Greenhouse Gas Mitigation Potential 2025-2050. www.cfpub.epa.gov/ghgdata/nonco2/usreports*
[58] *Delaware County, Pennsylvania. Delaware County's Path Toward Zero Waste (Pre-Circulation Draft 2023).*

LIDAC Benefits Analysis

The following discussion is a preliminary, qualitative discussion of the potential LIDAC benefits expected to result from the implementation of Measure 8. Actions to Reduce Solid Waste and Better Manage Waste Generated. This analysis includes a summary of the ways in which this measure may benefit specific LIDAC populations, and ways in which local governments and other key implementing actors can support the impact of these benefits. Additional analysis of the benefits to LIDAC populations due to actions in this measure will be conducted moving forward for the CCAP.

Local governments and other key actors involved in planning, program or policy implementation must intentionally center LIDAC communities in the development and implementation of this measure to ensure that they are prioritized and receive the maximum benefits possible from these actions. Additional group and individual discussions with stakeholders, including LIDAC-focused CBOs, will be held in preparation for the CCAP. Table 38 provides a summary of LIDAC benefits that may result from this measure. Important highlights include:

- Waste reduction and diversion actions have direct benefits for LIDACs as waste facilities, such as landfills or trash incinerators, are more likely to be found in LIDACs than in other communities. In 2021, data from the Greenhouse Gas Reporting Program (GHGRP) showed that of 1,026 landfills, over 1.26 million people lived within one mile of one of these facilities. Of this population, 47 percent were people of color and 31 percent were low income. These proportions increase in areas where landfills are more densely populated.[59] Therefore, waste diversion tactics such as large-scale composting facilities and improved landfill management can mitigate landfill gas and methane emissions directly benefitting LIDACs.

Table 38: LIDAC Benefits Associated with Actions to Reduce Waste and Better Manage Waste Generated

LIDAC Benefits	Achieved by this Measure
Public Health Benefits	
Improved Air Quality	✔
Improved Protection from Climate-Related Disasters	
Safe and Healthy Buildings	✔
Safer Streets	
Reduced Noise Pollution	
Socioeconomic Benefits	
Local Job Creation and Economic Growth	✔
Reduced *Household* Costs	
Preserved and Improved Affordable Housing	
Improved Access to Clean Energy Technologies	
Increased Reliable and Clean Energy Sources	
Expanded Access to Public Transportation and Micromobility	

[59] *Environmental Integrity Project. 2023. Trashing the Climate: Methane from Municipal Landfills. EIP. environmentalintegrity.org/wp-content/uploads/2023/05/Trashing-the-Climate-report-5.18.23-updated.pdf*

Key Metrics

Possible key outputs and outcomes to track performance of this measure over time include the following:

- Weight of waste diverted from landfills or waste-to-energy facilities
- Weight of waste composted, number of households and businesses participating in programs
- Total waste generated and waste composition profiles
- Number of people reached via waste diversion education programs and public service campaigns (e.g., clicks, views, webinar attendees, fliers passed out)

Measure 9: Actions to Reduce Emissions at Wastewater Treatment Plants and to Increase Generation of Biomethane

GHG Measure Description

This measure aims to decrease greenhouse gas emissions in wastewater treatment plants (WWTPs) by increasing energy efficiency, pursuing electrification, and reducing methane emissions. This measure also includes the potential for WWTPs to increase the generation of biomethane and its enabling infrastructure across the MSA. WWTPs can be equipped with technologies to capture nutrients, organic matter, and solid waste from sewage and wastewater sludge. These captured materials can be used as an input in an anaerobic digester to produce biogas. This biogas can then be upgraded to create biomethane, which is a near-pure source of methane that can be used instead of natural gas to generate electricity, heat buildings, fuel, stoves, and power industry and vehicles.[60]

Local governments and privately-owned WWTPs in the region will lead this measure's development through policies, programming, and project implementation. Indirect co-benefits of this work, including improved public health, will spread throughout communities, with a particular emphasis on benefits to historically underserved LIDACs.

Key Actions/Program Elements

Actions to implement this measure could include, but are not limited to:

- Expansion of energy efficiency and electrification in WWTPs to reduce greenhouse gas emissions.
- Monitor, manage, and capture methane from WWTPs.
- Implement biomethane generation technologies such as biodigesters and gas recovery systems.
- Improve stormwater debris control.

Geographic Coverage

This measure will cover local governments and municipalities across the entire Philadelphia MSA. There are also potential benefits for neighboring MSAs.

[60] *IEA. 2020. Outlook for biogas and biomethane: Prospects for organic growth. www.iea.org/reports/outlook-for-biogas-and-biomethane-prospects-for-organic-growth, License: CC BY 4.0.*

Implementation Considerations

Key Implementing Agencies

- **WWTPs and their owners (if private), or the local governments that operate them.** Below is a limited sample of public operators of WWTPs within the Philadelphia MSA. In addition to the operators listed below, there are dozens of other publicly operated regional or municipal water/wastewater authorities that treat wastewater, as well as many privately-owned wastewater treatment plant operators.
    - Commonwealth of Pennsylvania
    - State of Delaware
    - State of New Jersey
    - State of Maryland
    - Philadelphia Water Department
    - Chester Water Authority
    - Trenton Water Works
    - Camden County Municipal Utilities Authority
    - New Castle County, DE Public Works
    - City of Wilmington, DE
    - Cecil County, MD Department of Public Works Wastewater Division
- **Public service commissions, utilities, energy suppliers.** Participation and/or approval by energy utilities (e.g., PECO) and their regulators, is critical for the interaction of biomethane with utility infrastructure.
- **State governments and agencies.** Including the Commonwealth of Pennsylvania, State of Delaware, State of New Jersey, State to Maryland and their respective public agencies.

Authority to Implement

Local jurisdictions within the MSA can work with WWTPs and utilities to implement this measure. Some WWTP systems are owned by local governments, who have the authority to implement projects directly within their respective jurisdictions.

Intersection with Other Funding

In addition to the federal, state, local, and other funding opportunities listed in Table 39, municipal and county governments, community groups, and nonprofit organizations can refer to DVRPC's Municipal Funding Guide for federal, state, county, and private sources of funding for locally initiated planning and development projects.

Table 39: Funding Opportunities for Measure 9

Program/Grant Name	Funding Source
Greenhouse Gas Reduction Fund	Federal – Competitive
Clean Water State Revolving Fund	Federal – Formula
Clean Diesel Grant Program/Diesel Emissions Reduction Act	Federal – Competitive

Quantified GHG Reductions (MTCO2e)

This measure will lead to broad GHG reductions in the wastewater sector.

Table 40: GHGs reductions from Actions to Reduce Emissions at Wastewater Treatment Plants and Increase the Generation of Biomethane

Cumulative Reductions from 2025-2030 ($MTCO_2e$)	Cumulative Reductions from 2025-2050 ($MTCO_2e$)
232,907	1,823,670

This measure models the resulting GHG emissions reduced if wastewater treatment plants deploy a range of abatement measures primarily aimed at capturing and methane from plants. It leverages the EPA's U.S. State-level Non-CO_2 Greenhouse Gas Mitigation Potential: 2025-2050[61] study to determine emissions reduction potential from wastewater treatment plants nationally and scales them to the Philadelphia MSA's estimated WWTP emissions. A detailed description of the methodologies can be found in Appendix D. Note this measure is expressed in metric tons (MT), while the GHG inventory is expressed in million metric tons (MMT).

Biomethane captured will be used for energy generation and lead to emissions, however emissions will be carbon dioxide rather than methane, leading to an overall decrease in GHG impact. In addition, the captured biomethane used for energy generation will displace fossil fuels that would have otherwise been used to produce the same quantity of energy. Accordingly, the net decrease in emissions equals the entirety of the methane that would have been released directly to the atmosphere.

GHGs and Co-Pollutants Identification

This measure targets reductions of GHGs and co-pollutants listed in Table 41 associated with non-energy-related emissions from wastewater treatment plants[62].

Table 41: GHGs and Co-pollutants associated with Actions to Reduce Emissions at Wastewater Treatment Plants and to Increase Generation of Biomethane

Pollutant	Air Pollutant Type	Impacted Measure Category
Carbon Dioxide (CO2)	GHG	All
Methane (CH4)	GHG	All
Nitrous Oxide (N2O)	GHG	Buildings, Transportation, Grid, Wastewater
Ozone	Co-pollutant: Criteria Air Pollutant Air Pollutant	All
Volatile Organic Compounds (VOCs)	Co-pollutant: VOCs	Buildings, Transportation, Grid, Waste, Wastewater

[61] *US EPA. U.S. State-level Non-CO2 Greenhouse Gas Mitigation Potential 2025-2050. www.cfpub.epa.gov/ghgdata/nonco2/usreports*

[62] *Note: Energy-related emissions from wastewater treatment plants, which are significant, are captured in Measure 3: Actions to Implement Energy Efficiency, Electrification and Clean Energy in Commercial Buildings of this PCAP.*

LIDAC Benefits Analysis

The following discussion is a preliminary, qualitative discussion of the potential LIDAC benefits expected to result from the implementation of Measure 9. Actions to Reduce Emissions at Wastewater Treatment Plants and to Increase Generation of Biomethane. This analysis includes a summary of the ways in which this measure may benefit specific LIDAC populations, and ways in which local governments and other key implementing actors can support the impact of these benefits. Additional analysis of the benefits to LIDAC populations as a result of actions in this measure will be conducted moving forward for the CCAP.

Local governments and other key actors involved in planning, program or policy implementation must intentionally center LIDAC communities in the development and implementation of this measure to ensure that they are prioritized and receive the maximum benefits possible from these actions. Table 42 provides a summary of LIDAC benefits that may result from this measure.

Table 42: LIDAC Benefits Associated with Actions to Reduce Emissions at Wastewater Treatment Plants and to Increase Generation of Biomethane

LIDAC Benefits	Achieved by this Measure
Public Health Benefits	
Improved Air Quality	✔
Improved Protection from Climate-Related Disasters	
Safe and Healthy Buildings	
Safer Streets	
Reduced Noise Pollution	
Socioeconomic Benefits	
Local Job Creation and Economic Growth	✔
Reduced Household Costs	
Preserved and Improved Affordable Housing	
Improved Access to Clean Energy Technologies	✔
Increased Reliable and Clean Energy Sources	✔
Expanded Access to Public Transportation and Micromobility	

Key Metrics

Possible key outputs and outcomes to track performance of this measure over time include the following:

- Energy use (in BTUs or kWh) reduced from wastewater treatment plants
- Volume of biomethane generated

Moving Forward

CPRG Implementation Grants

DVRPC, local governments and associated agencies, and tribes in the Philadelphia MSA are eligible to participate in the general competition for CPRG implementation grants, competing against other similar entities for up to $4.6 billion in funding through individual grants ranging from $2 million to $500 million. Implementation grant applications are due April 1, 2024, with awards anticipated by the end of 2024. It is the intention of state and local governments within the Philadelphia MSA to apply for and/or be a part of a consortia of applicants to access these funds. DVRPC worked with the PCAP Steering Committee to solicit implementation grant ideas and connected potential applicants to one another to develop joint applications. For more information about the implementation grant applications and competition see: www.epa.gov/inflation-reduction-act/about-cprg-implementation-grants.

Other CPRG Planning Grant Deliverables

As the lead organization for CPRG planning deliverables, along with this PCAP DVRPC is responsible for developing a CCAP by mid-2025 and a Status Report on CCAP progress due to EPA in 2027.

Through the CCAP process DVRPC will continue to meaningfully engage with stakeholders, including industry, community organizations, local governments, the public and more. Their input will be essential to providing clear paths to implement actions to reduce GHG emissions.

Per the CPRG guidance, the CCAP will include the following:

- An updated GHG inventory for the MSA
- Business As Usual (BAU) GHG emissions projections and an economy wide GHG emissions reductionscenario
- GHG reduction targets for the MSA (short- and long-term)
- A comprehensive list of GHG reduction measures that address economy-wide emissions. Building on the PCAP, this will include the following for each measure:
    - Quantified estimates of GHG reduction and costs
    - Key implementing agency or agencies
    - Implementation schedule and milestones
    - Expected geographic location, if applicable
    - Quantified estimates of co-pollutant reductions (e.g., PM2.5, NOx, SO2, VOCs, air toxics)
    - A more robust or quantified analysis of benefits for LIDACs
    - A review of the statutory or regulatory authority to implement the measure (and a schedule and milestones for key entities to obtain it if not existing)
    - Identification of funding sources that have been secured for implementation
    - Metrics for tracking progress
    - A workforce planning analysis

In 2027 DVRPC will develop and share a CPRG Status Report that will include the following:

- The implementation status of the quantified GHG reduction measures from the CCAP
- Relevant updated analyses or projections supporting CCAP implementation
- Next steps and future budget or staffing needs to continue CCAP implementation

For additional information, project updates, and to get involved please visit: www.dvrpc.org/cprg.

Appendices

A. LIDAC Census Tracts
B. List of Steering Committee Organizations
C. List of Plans Reviewed
D. Detailed Greenhouse Gas Reduction Calculation Methodology
E. LIDAC Benefits Summary

PRIORITY
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ACTION
PLAN

Appendix A: LIDAC Census Tracts

The following is a list of LIDAC Census tracts (per the 2020 U.S. Census) in the MSA that are affected by this PCAP, according to CEJST. Due to the holistic nature of this PCAP, this list includes every LIDAC within the MSA, and Mercer County, New Jersey.

Table A-1: List of LIDAC Census Tracts in Philadelphia MSA

Census Tract 2020 ID	County Name	State/Territory
10003000300	New Castle County	Delaware
10003000400	New Castle County	Delaware
10003000500	New Castle County	Delaware
10003000601	New Castle County	Delaware
10003000602	New Castle County	Delaware
10003000900	New Castle County	Delaware
10003001600	New Castle County	Delaware
10003001902	New Castle County	Delaware
10003002100	New Castle County	Delaware
10003002200	New Castle County	Delaware
10003002300	New Castle County	Delaware
10003002400	New Castle County	Delaware
10003002500	New Castle County	Delaware
10003002600	New Castle County	Delaware
10003002700	New Castle County	Delaware
10003002900	New Castle County	Delaware
10003003002	New Castle County	Delaware
10003012300	New Castle County	Delaware
10003012900	New Castle County	Delaware
10003013614	New Castle County	Delaware
10003014100	New Castle County	Delaware
10003014908	New Castle County	Delaware
10003015502	New Castle County	Delaware
10003015802	New Castle County	Delaware
10003016000	New Castle County	Delaware
10003010702	New Castle County	Delaware
10003013615	New Castle County	Delaware
24015030400	Cecil County	Maryland
24015030503	Cecil County	Maryland
34005700703	Burlington County	New Jersey
34005700900	Burlington County	New Jersey
34005701001	Burlington County	New Jersey
34005701204	Burlington County	New Jersey
34005702207	Burlington County	New Jersey
34005702208	Burlington County	New Jersey
34005702603	Burlington County	New Jersey
34005704600	Burlington County	New Jersey
34005704802	Burlington County	New Jersey
34007600200	Camden County	New Jersey
34007600400	Camden County	New Jersey
34007600700	Camden County	New Jersey
34007600800	Camden County	New Jersey
34007600900	Camden County	New Jersey
34007601000	Camden County	New Jersey

34007601101	Camden County	New Jersey
34007601102	Camden County	New Jersey
34007601200	Camden County	New Jersey
34007601300	Camden County	New Jersey
34007601400	Camden County	New Jersey
34007601500	Camden County	New Jersey
34007601600	Camden County	New Jersey
34007601700	Camden County	New Jersey
34007601800	Camden County	New Jersey
34007601900	Camden County	New Jersey
34007602000	Camden County	New Jersey
34007602503	Camden County	New Jersey
34007602602	Camden County	New Jersey
34007604100	Camden County	New Jersey
34007605200	Camden County	New Jersey
34007607000	Camden County	New Jersey
34007607701	Camden County	New Jersey
34007608210	Camden County	New Jersey
34007608503	Camden County	New Jersey
34007608600	Camden County	New Jersey
34007609000	Camden County	New Jersey
34007609204	Camden County	New Jersey
34007610300	Camden County	New Jersey
34007610400	Camden County	New Jersey
34007610500	Camden County	New Jersey
34007610800	Camden County	New Jersey
34007611600	Camden County	New Jersey
34015500400	Gloucester County	New Jersey
34015501002	Gloucester County	New Jersey
34015501402	Gloucester County	New Jersey
34021000100	Mercer County	New Jersey
34021000200	Mercer County	New Jersey
34021000300	Mercer County	New Jersey
34021000400	Mercer County	New Jersey
34021000500	Mercer County	New Jersey
34021000600	Mercer County	New Jersey
34021000700	Mercer County	New Jersey
34021000800	Mercer County	New Jersey
34021000900	Mercer County	New Jersey
34021001000	Mercer County	New Jersey
34021001101	Mercer County	New Jersey
34021001102	Mercer County	New Jersey
34021001200	Mercer County	New Jersey
34021001300	Mercer County	New Jersey
34021001401	Mercer County	New Jersey
34021001402	Mercer County	New Jersey
34021001500	Mercer County	New Jersey
34021001600	Mercer County	New Jersey
34021001700	Mercer County	New Jersey
34021001800	Mercer County	New Jersey
34021001900	Mercer County	New Jersey
34021002000	Mercer County	New Jersey
34021002100	Mercer County	New Jersey
34021002200	Mercer County	New Jersey
34021002400	Mercer County	New Jersey
34021002500	Mercer County	New Jersey
34021002601	Mercer County	New Jersey
34021002800	Mercer County	New Jersey
34021003400	Mercer County	New Jersey

34021003601	Mercer County	New Jersey
34021004403	Mercer County	New Jersey
34021004406	Mercer County	New Jersey
34033020200	Salem County	New Jersey
34033020300	Salem County	New Jersey
34033021900	Salem County	New Jersey
34033022000	Salem County	New Jersey
34033022100	Salem County	New Jersey
42017100104	Bucks County	Pennsylvania
42017100207	Bucks County	Pennsylvania
42017100304	Bucks County	Pennsylvania
42017100700	Bucks County	Pennsylvania
42017101605	Bucks County	Pennsylvania
42017103103	Bucks County	Pennsylvania
42029300700	Chester County	Pennsylvania
42029305400	Chester County	Pennsylvania
42029305500	Chester County	Pennsylvania
42029305600	Chester County	Pennsylvania
42029305700	Chester County	Pennsylvania
42029306503	Chester County	Pennsylvania
42029308000	Chester County	Pennsylvania
42029311600	Chester County	Pennsylvania
42045400301	Delaware County	Pennsylvania
42045400302	Delaware County	Pennsylvania
42045400401	Delaware County	Pennsylvania
42045400402	Delaware County	Pennsylvania
42045400500	Delaware County	Pennsylvania
42045400700	Delaware County	Pennsylvania
42045402400	Delaware County	Pennsylvania
42045402600	Delaware County	Pennsylvania
42045402700	Delaware County	Pennsylvania
42045402900	Delaware County	Pennsylvania
42045403402	Delaware County	Pennsylvania
42045403702	Delaware County	Pennsylvania
42045404300	Delaware County	Pennsylvania
42045404500	Delaware County	Pennsylvania
42045404700	Delaware County	Pennsylvania
42045404800	Delaware County	Pennsylvania
42045404900	Delaware County	Pennsylvania
42045405000	Delaware County	Pennsylvania
42045405100	Delaware County	Pennsylvania
42045405200	Delaware County	Pennsylvania
42045405300	Delaware County	Pennsylvania
42045405400	Delaware County	Pennsylvania
42045406300	Delaware County	Pennsylvania
42045406401	Delaware County	Pennsylvania
42045406402	Delaware County	Pennsylvania
42045406500	Delaware County	Pennsylvania
42045406600	Delaware County	Pennsylvania
42045410500	Delaware County	Pennsylvania
42045410700	Delaware County	Pennsylvania
42045400801	Delaware County	Pennsylvania
42091201302	Montgomery County	Pennsylvania
42091203500	Montgomery County	Pennsylvania
42091203601	Montgomery County	Pennsylvania
42091203700	Montgomery County	Pennsylvania
42091203801	Montgomery County	Pennsylvania
42091203803	Montgomery County	Pennsylvania
42091203804	Montgomery County	Pennsylvania

42091203901	Montgomery County	Pennsylvania
42091203902	Montgomery County	Pennsylvania
42091207201	Montgomery County	Pennsylvania
42091208801	Montgomery County	Pennsylvania
42091208802	Montgomery County	Pennsylvania
42091208904	Montgomery County	Pennsylvania
42091209000	Montgomery County	Pennsylvania
42101000200	Philadelphia County	Pennsylvania
42101000500	Philadelphia County	Pennsylvania
42101000902	Philadelphia County	Pennsylvania
42101002100	Philadelphia County	Pennsylvania
42101002500	Philadelphia County	Pennsylvania
42101002701	Philadelphia County	Pennsylvania
42101002801	Philadelphia County	Pennsylvania
42101003001	Philadelphia County	Pennsylvania
42101003100	Philadelphia County	Pennsylvania
42101003200	Philadelphia County	Pennsylvania
42101003300	Philadelphia County	Pennsylvania
42101003600	Philadelphia County	Pennsylvania
42101003701	Philadelphia County	Pennsylvania
42101003702	Philadelphia County	Pennsylvania
42101003901	Philadelphia County	Pennsylvania
42101004001	Philadelphia County	Pennsylvania
42101004101	Philadelphia County	Pennsylvania
42101004102	Philadelphia County	Pennsylvania
42101004201	Philadelphia County	Pennsylvania
42101004202	Philadelphia County	Pennsylvania
42101005400	Philadelphia County	Pennsylvania
42101005500	Philadelphia County	Pennsylvania
42101005600	Philadelphia County	Pennsylvania
42101006000	Philadelphia County	Pennsylvania
42101006100	Philadelphia County	Pennsylvania
42101006200	Philadelphia County	Pennsylvania
42101006300	Philadelphia County	Pennsylvania
42101006400	Philadelphia County	Pennsylvania
42101006500	Philadelphia County	Pennsylvania
42101006600	Philadelphia County	Pennsylvania
42101006700	Philadelphia County	Pennsylvania
42101006900	Philadelphia County	Pennsylvania
42101007000	Philadelphia County	Pennsylvania
42101007101	Philadelphia County	Pennsylvania
42101007102	Philadelphia County	Pennsylvania
42101007200	Philadelphia County	Pennsylvania
42101007300	Philadelphia County	Pennsylvania
42101007400	Philadelphia County	Pennsylvania
42101008101	Philadelphia County	Pennsylvania
42101008102	Philadelphia County	Pennsylvania
42101008200	Philadelphia County	Pennsylvania
42101008301	Philadelphia County	Pennsylvania
42101008302	Philadelphia County	Pennsylvania
42101008400	Philadelphia County	Pennsylvania
42101008500	Philadelphia County	Pennsylvania
42101008602	Philadelphia County	Pennsylvania
42101009200	Philadelphia County	Pennsylvania
42101009300	Philadelphia County	Pennsylvania
42101009400	Philadelphia County	Pennsylvania
42101009500	Philadelphia County	Pennsylvania
42101009600	Philadelphia County	Pennsylvania
42101010000	Philadelphia County	Pennsylvania

42101010100	Philadelphia County	Pennsylvania
42101010200	Philadelphia County	Pennsylvania
42101010300	Philadelphia County	Pennsylvania
42101010400	Philadelphia County	Pennsylvania
42101010500	Philadelphia County	Pennsylvania
42101010600	Philadelphia County	Pennsylvania
42101010700	Philadelphia County	Pennsylvania
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42101011200	Philadelphia County	Pennsylvania
42101011300	Philadelphia County	Pennsylvania
42101011400	Philadelphia County	Pennsylvania
42101011800	Philadelphia County	Pennsylvania
42101011900	Philadelphia County	Pennsylvania
42101012201	Philadelphia County	Pennsylvania
42101013100	Philadelphia County	Pennsylvania
42101013200	Philadelphia County	Pennsylvania
42101013700	Philadelphia County	Pennsylvania
42101013800	Philadelphia County	Pennsylvania
42101013900	Philadelphia County	Pennsylvania
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42101016200	Philadelphia County	Pennsylvania
42101016300	Philadelphia County	Pennsylvania
42101016400	Philadelphia County	Pennsylvania
42101016500	Philadelphia County	Pennsylvania
42101016600	Philadelphia County	Pennsylvania
42101016701	Philadelphia County	Pennsylvania
42101016702	Philadelphia County	Pennsylvania
42101016800	Philadelphia County	Pennsylvania
42101016901	Philadelphia County	Pennsylvania
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42101017100	Philadelphia County	Pennsylvania
42101017201	Philadelphia County	Pennsylvania
42101017202	Philadelphia County	Pennsylvania
42101017300	Philadelphia County	Pennsylvania
42101017400	Philadelphia County	Pennsylvania
42101017500	Philadelphia County	Pennsylvania
42101017601	Philadelphia County	Pennsylvania
42101017602	Philadelphia County	Pennsylvania
42101017701	Philadelphia County	Pennsylvania
42101017702	Philadelphia County	Pennsylvania
42101017800	Philadelphia County	Pennsylvania
42101017900	Philadelphia County	Pennsylvania
42101018002	Philadelphia County	Pennsylvania
42101018800	Philadelphia County	Pennsylvania

42101019000	Philadelphia County	Pennsylvania
42101019100	Philadelphia County	Pennsylvania
42101019200	Philadelphia County	Pennsylvania
42101019501	Philadelphia County	Pennsylvania
42101019502	Philadelphia County	Pennsylvania
42101019700	Philadelphia County	Pennsylvania
42101019800	Philadelphia County	Pennsylvania
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42101020400	Philadelphia County	Pennsylvania
42101020500	Philadelphia County	Pennsylvania
42101023900	Philadelphia County	Pennsylvania
42101024100	Philadelphia County	Pennsylvania
42101024200	Philadelphia County	Pennsylvania
42101024300	Philadelphia County	Pennsylvania
42101024400	Philadelphia County	Pennsylvania
42101024500	Philadelphia County	Pennsylvania
42101024600	Philadelphia County	Pennsylvania
42101024700	Philadelphia County	Pennsylvania
42101024800	Philadelphia County	Pennsylvania
42101024900	Philadelphia County	Pennsylvania
42101025200	Philadelphia County	Pennsylvania
42101025300	Philadelphia County	Pennsylvania
42101026100	Philadelphia County	Pennsylvania
42101026200	Philadelphia County	Pennsylvania
42101026400	Philadelphia County	Pennsylvania
42101026500	Philadelphia County	Pennsylvania
42101026600	Philadelphia County	Pennsylvania
42101026700	Philadelphia County	Pennsylvania
42101026800	Philadelphia County	Pennsylvania
42101027000	Philadelphia County	Pennsylvania
42101027100	Philadelphia County	Pennsylvania
42101027200	Philadelphia County	Pennsylvania
42101027300	Philadelphia County	Pennsylvania
42101027401	Philadelphia County	Pennsylvania
42101027402	Philadelphia County	Pennsylvania
42101027500	Philadelphia County	Pennsylvania
42101027600	Philadelphia County	Pennsylvania
42101027700	Philadelphia County	Pennsylvania
42101027800	Philadelphia County	Pennsylvania
42101027901	Philadelphia County	Pennsylvania
42101027902	Philadelphia County	Pennsylvania
42101028000	Philadelphia County	Pennsylvania
42101028100	Philadelphia County	Pennsylvania
42101028200	Philadelphia County	Pennsylvania
42101028300	Philadelphia County	Pennsylvania
42101028400	Philadelphia County	Pennsylvania
42101028500	Philadelphia County	Pennsylvania
42101028600	Philadelphia County	Pennsylvania
42101028700	Philadelphia County	Pennsylvania
42101028800	Philadelphia County	Pennsylvania
42101028901	Philadelphia County	Pennsylvania
42101028902	Philadelphia County	Pennsylvania
42101029000	Philadelphia County	Pennsylvania
42101029100	Philadelphia County	Pennsylvania

42101029200	Philadelphia County	Pennsylvania
42101029300	Philadelphia County	Pennsylvania
42101029400	Philadelphia County	Pennsylvania
42101029800	Philadelphia County	Pennsylvania
42101029900	Philadelphia County	Pennsylvania
42101030000	Philadelphia County	Pennsylvania
42101030100	Philadelphia County	Pennsylvania
42101030200	Philadelphia County	Pennsylvania
42101030501	Philadelphia County	Pennsylvania
42101030502	Philadelphia County	Pennsylvania
42101030900	Philadelphia County	Pennsylvania
42101031000	Philadelphia County	Pennsylvania
42101031101	Philadelphia County	Pennsylvania
42101031102	Philadelphia County	Pennsylvania
42101031200	Philadelphia County	Pennsylvania
42101031300	Philadelphia County	Pennsylvania
42101031401	Philadelphia County	Pennsylvania
42101031402	Philadelphia County	Pennsylvania
42101031501	Philadelphia County	Pennsylvania
42101031502	Philadelphia County	Pennsylvania
42101031600	Philadelphia County	Pennsylvania
42101031700	Philadelphia County	Pennsylvania
42101031800	Philadelphia County	Pennsylvania
42101031900	Philadelphia County	Pennsylvania
42101032000	Philadelphia County	Pennsylvania
42101032100	Philadelphia County	Pennsylvania
42101032300	Philadelphia County	Pennsylvania
42101032500	Philadelphia County	Pennsylvania
42101032600	Philadelphia County	Pennsylvania
42101032900	Philadelphia County	Pennsylvania
42101033000	Philadelphia County	Pennsylvania
42101033101	Philadelphia County	Pennsylvania
42101033102	Philadelphia County	Pennsylvania
42101033200	Philadelphia County	Pennsylvania
42101033300	Philadelphia County	Pennsylvania
42101033400	Philadelphia County	Pennsylvania
42101033500	Philadelphia County	Pennsylvania
42101033600	Philadelphia County	Pennsylvania
42101033701	Philadelphia County	Pennsylvania
42101034501	Philadelphia County	Pennsylvania
42101034502	Philadelphia County	Pennsylvania
42101034600	Philadelphia County	Pennsylvania
42101035500	Philadelphia County	Pennsylvania
42101035601	Philadelphia County	Pennsylvania
42101035701	Philadelphia County	Pennsylvania
42101035702	Philadelphia County	Pennsylvania
42101035800	Philadelphia County	Pennsylvania
42101035900	Philadelphia County	Pennsylvania
42101036000	Philadelphia County	Pennsylvania
42101036400	Philadelphia County	Pennsylvania
42101037200	Philadelphia County	Pennsylvania
42101037700	Philadelphia County	Pennsylvania
42101038000	Philadelphia County	Pennsylvania
42101038100	Philadelphia County	Pennsylvania
42101038200	Philadelphia County	Pennsylvania
42101038300	Philadelphia County	Pennsylvania
42101038900	Philadelphia County	Pennsylvania
42101039000	Philadelphia County	Pennsylvania
42101989100	Philadelphia County	Pennsylvania

Appendix B: List of Steering Committee Organizations

Table B-1: List of Steering Committee Organizations

Organization Name
Bucks County, PA
Chester County, PA
Delaware County, PA
Montgomery County, PA
Pennsylvania Department of Environmental Protection (PADEP)
Philadelphia Energy Authority
Philadelphia Green Capital Corp.
Philadelphia Office of Sustainability
Burlington County, NJ
Camden County, NJ
Gloucester County, NJ
Mercer County, NJ
Salem County, NJ
New Jersey Department of Environmental Protection (NJDEP)
New Jersey Board of Public Utilities (NJBPU)
South Jersey Transportation Planning Organization (SJTPO)
New Castle County, DE
Wilmington Area Planning Council (WILMAPCO)
Cecil County, MD
Maryland Department of the Environment (MDE)
Delaware Department of Natural Resources and Environmental Control (DNREC)
Pennsylvania Department of Transportation (PennDOT)

Appendix C: List of Plans Reviewed

Table C-1: List of Climate Plans Reviewed from the MSA

Plan Name	Responsible Entity
Bucks County Climate Actions List	Bucks County
Camden County Sustainability Plan (2018)	Camden County
Cecil County Green Infrastructure Plan	Cecil County
Chester County Climate Action Plan	Chester County
Energy Poverty Alleviation Strategy	City of Philadelphia
Municipal Clean Fleet Plan	City of Philadelphia
Municipal Energy Master Plan	City of Philadelphia
Philadelphia Climate Action Playbook	City of Philadelphia
Delaware Transit Corporation Climate Action Plan	DE Transit Corporation
DNREC Natural and Working Lands Policy Report	Delaware
Sustain Delco: A Sustainable Plan for Delaware County	Delaware County
DelDOT SR1 Coastal Corridor Resiliency Study *(Outside of MSA)*	DelDOT
DelDOT Transportation Resilience and Sustainability	DelDOT
Delaware CAP supporting technical GHG mitigation analysis report	DNREC
Delaware Climate Action Plan	DNREC
Delaware GHG Inventory 2018	DNREC
DVRPC Regional Benchmarking Program	DVRPC
2030 GHG Reduction Act Plan	MDE
Maryland Climate Pathway Report	MDE
Maryland State-wide GHG Emissions Inventory	MDE
Mercer County Clean Energy Program LGEA Presentation	Mercer County
Comprehensive Plan 2022 for Middletown, DE	Middletown, DE
Climate Change Potential Vulnerability Assessment	Montgomery County
Montco 2050	Montgomery County
Greenprint	Montgomery County
New Castle County Comprehensive Plan 2050	New Castle County
Newark, DE's Plan for Sustainability (2019)	Newark, DE
Benchmarking Program for Large Commercial Buildings	NJDEP
NJ Ground Source Heat Pump Baseline Report	NJDEP
Global Warming Response Act 80x50 Recommendations Report	NJDEP
NJ Code Collaborative Roadmap	NJDEP
NJ Energy Master Plan	NJDEP
RGGI Strategic Funding Plan	NJDEP, NJEDA, NJBPU
2022 Update to 2012 Odessa, DE Comprehensive Plan	Odessa, DE
2020 Rehoboth Beach Comprehensive Development Plan *(Outside of MSA)*	Rehoboth Beach, DE
Resilient Wilmington	Wilmington, DE

Appendix D: Detailed Greenhouse Gas Reduction Calculation Methodology

The following is a list of methods used for calculating emissions reductions in the Philadelphia MSA PCAP. In developing these values, ICF sought to determine reasonable GHG emissions reductions from the deployment of specific measures. In some cases, there may be areas of overlap between emissions reduction values between measures. For example, light duty electric vehicles are included both in the Local Government Operations measure and the Light Duty Vehicles measure. Additionally, ICF used electricity emissions factors associated with a progressively cleaner grid to determine emissions reduction potential for a range of measures. This might result in double counting when comparing it to the Clean Electricity Grid measure.

Actions to Support Decarbonization of Local Government Operations

Approach

This measure quantifies resulting GHG emissions reduced if the Philadelphia MSA's local governments (including counties, cities, towns and other forms of local government) implemented a broad set of building, fleet and renewable energy projects within their own facilities. The modeling scaled plans and emissions reduction potential from the City of Philadelphia's operations to the region.

To develop an understanding of the City of Philadelphia's carbon reduction plans, existing public plans such as the Municipal Energy Master Plan for the Built Environment[63] and Philadelphia's Municipal Clean Fleet Plan[64] were referenced, additionally, through conversations with the Philadelphia Municipal Energy Office, data for the Philadelphia School District's facilities and fleet were provided and combined with EPA emissions factors and AEO emissions factors to determine baseline emissions.

The City of Philadelphia's plans for facilities call for a 50 percent reduction in emissions by 2030 from a 2005 base year, this track of emissions reductions was matched for PSD facilities. Additionally, 90 percent reduction in emissions by 2050 for Philadelphia operations was projected to determine emission reduction potential from 2030-2050. The results of Philadelphia's fleet, general fund facilities and school were scaled to provide regional greenhouse gas reduction potential for the region. 2020 Census population data was used to scale data.

Assumptions and Data Sources

- Regional facilities and fleets have similar energy use and emissions profiles and reduction potential as the City of Philadelphia's operations.
- A 90 percent reduction potential in emission for all operations by 2050 is feasible.

Actions to Implement Energy Efficiency, Electrification and Clean Energy for Residential Buildings and Commercial Buildings

Both residential and commercial buildings used the same tools and approach to determining both energy efficiency, electrification and renewable energy potential. After the modeling was complete, residential and commercial results were separated into the two measures.

Buildings Approach

Building energy use and building emission projections are based on energy consumption from electricity, natural gas, fuel oil, and propane in existing residential (single-family, multifamily, and mobile homes) and

[63] *City of Philadelphia. Municipal Energy Master Plan for the Built Environment 2017. www.phila.gov/documents/municipal-energy-master-plan/*

[64] *City of Philadelphia, Municipal Clean Fleet Plan 2021. www.phila.gov/documents/philadelphias-municipal-clean-fleet-plan/*

commercial buildings (office, food service, school, hotel, healthcare, retail, and warehouse). The base year and projections for energy consumption in existing buildings are built from the 2022 Annual Energy Outlook (AEO)[65], which represented projected energy user prior to the passage of the Inflation Reduction Act, from the U.S. Energy Information Administration (EIA). AEO data is scaled to the Philadelphia Metropolitan Area counties by scaling AEO census level data with the ResStock and ComStock building models of North American building stock with county-level resolution. The tool first calibrates ComStock and ResStock energy consumption to AEO energy consumption on a census division level. It then proportionally adjusts county-level energy consumption to the scaled census division level. Energy use values have been integrated with emissions factors for primary fuels (electricity, gas, propane and fuel oil) to provide total emissions. Results are provided every five years from 2020 to 2050 and interpolated for years in between. For the Philadelphia Metro Area, modeling assumed an accelerated electrification scenarios for HVAC, and for Water Heating and Cooking, and a high scenario for building envelope implementation in alignment with sources outlined below.

Buildings Calculating Energy Change

The approach utilizes CO_2Sight and ICF's Distributed Energy Resources Planner (DER Planner) model for modeling existing buildings. DER Planner is a bottom-up model that is built upon the best practice principles for potential modeling outlined by the National Action Plan for Energy Efficiency (NAPEE) in their Guide for Conducting Energy Efficiency Potential Studies[66]. The model can be used to calculate technical, economic, and achievable potential estimates. Together, the CO2Sight platform and DER Planner estimate energy and emissions changes from a range of decarbonization strategies, including electrification retrofits and energy efficiency, as presented in these results.

Building characteristics and energy use data for modeling buildings are derived from ResStock[67] and ComStock[68] datasets provided by the National Renewable Energy Laboratory (NREL). These datasets integrate large public and private data sources statistical sampling, detailed sub-hourly building simulations, and high-performance computing. By synthesizing multiple sources into a single resource, these data allow for a granular understanding of the housing and commercial stock and the impacts of building technologies in different communities and businesses. These data are comprehensive and widely used across similar analyses and modeling efforts, and thus allow for development of comparable results. The ResStock and ComStock energy use data are calibrated to match the EIA's AEO dataset.

DER Planner, informed by stock CO_2Sight measures data, has the capabilities to model various energy efficiency, electrification, and building envelope measures in selected building types. This tool allows the analysis of over 80 residential and commercial measures in selected regions applied to the Philadelphia Metro Areas counties' building characteristics. The model uses key inputs such as equipment stock, participation rate curves, and energy change per measure and estimates potential savings from applying efficient measures available for each building type and end-use. Given the efficient technologies available, this quantifies how much energy could be reduced. To compute total savings potential, the model runs all permutations combining savings per EE measure unit, expected measure penetration, and total number of measure units (or total eligible stock) by all adoption types (ROB and RET).[69] By integrating DER-Planner and comprehensive datasets such as ResStock and ComStock, CO2Sight aggregates energy and emissions changes to estimate changes in energy use. expert judgment, and available national data sources inform these measures' impacts on energy use.

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[65] *www.eia.gov/outlooks/aeo/*

[66] *National Action Plan for Energy Efficiency (2007). Guideline for Conducting Energy Efficiency Potential Studies. www.epa.gov/sites/production/files/2015-08/documents/potential_guide_0.pdf*

[67] *www.nrel.gov/buildings/resstock.html*

[68] *comstock.nrel.gov/*

[69] *Measures' adoption type definitions:*

- *Replace on Burnout (ROB) implies that the technology will be adopted when the previous technology needs to be replaced*
- *Retrofit (RET) implies that the technology is adopted before the previous technology needs to be replaced*

Measure Intensities and Participation Curves

As an input into DER Planner, each measure has participation (or technology adoption curves) connected to them. A range of factors can impact whether new electric or efficiency technologies are adopted. This approach builds from NREL's Electrification Future Study, from which many of the adoption curves are provided. It accounts for costs, supporting infrastructure, ownership and availability, health and sustainability (including policies) and other factors that could influence technology change. Adoption curves are also provided from the implementation energy efficiency programs and informed by ICF expertise.

For ease of use, users can select prepopulated groupings of participation curves to match the types of energy change they want to model.

Emissions Factors

For the BAU, EPA eGRID electric grid emissions factor data for 2019 were used and held constant. For a clean grid scenario, emissions factor projections were sourced from EIA's AEO 2023 Reference Case. Values from EPA's GHG Emission Factors Hub[70] were used for natural gas and propane reductions.

Buildings Assumptions and Data Sources

- Modeling assumed accelerated electrification scenarios for HVAC measures and Water Heating and Cooking measures meaning a large amount of electrification prior to equipment reaching the end of its useful life.
- Modeling assumed a High Building Envelope Scenario with Significant building envelope work and deep energy retrofits.
- Modeling included a high amount of energy efficiency work occurring in including Full lighting retrofits and lighting controls, Smart Thermostats and Building Automation Systems, New EE appliances and New EE HVAC equipment.
- ComStock and ResStock data sets
- EPA's ENERGYSTAR Equipment performance thresholds
- ICF's building modeling experience informed by industry standards
- Various state's Technical Reference Manual
- NREL's Electrification Future Study
- DOE's equipment purchasing profiles
- PNNL's Building Retuning materials

Renewable Energy Approach

Emissions reductions from renewable energy were projected through the forecasted adoption of rooftop solar systems in the MSA. The total technical potential for rooftop solar was aggregated from Project Sunroof's estimates of the technical potential in each of the counties and cities in the MSA.[71] To determine an adoption rate, the most aggressive 2050 adoption scenario from NREL's Storage Futures Study (20 percent) was applied to the total technical potential.[72]

For the MSA territory in Pennsylvania, existing rooftop solar capacity assumptions were sourced from PJM's 2023 Load Forecast[73] for the PECO zone and then grown to meet the assumed 2050 level. For the MSA territory in New Jersey, rooftop solar installation data was sourced from NJBPU's Solar Activity Reports, part of the State's Clean Energy Program.[74]

To calculate the kWh of solar output, the analysis used the capacity factor for residential solar from NREL's annual technology baseline corresponding to the geography of the MSA. The incremental growth in solar output from current levels, multiplied by grid emissions factors, resulted in the potential avoided emissions from rooftop solar.

[70] *www.epa.gov/climateleadership/ghg-emission-factors-hub*
[71] *Google. "Project Sunroof". Accessed Feb 13, 2024. sunroof.withgoogle.com/*
[72] *NREL. "Storage Futures Study." www.nrel.gov/analysis/storage-futures.html*
[73] *www.pjm.com/-/media/library/reports-notices/load-forecast/2023-load-report.ashx*
[74] *NJBPU. "Solar Activity Reports". Accessed Feb 15, 2024. www.njcleanenergy.com/renewable-energy/project-activity-reports/project-activity-reports*

Renewable Energy Assumptions and Data Sources

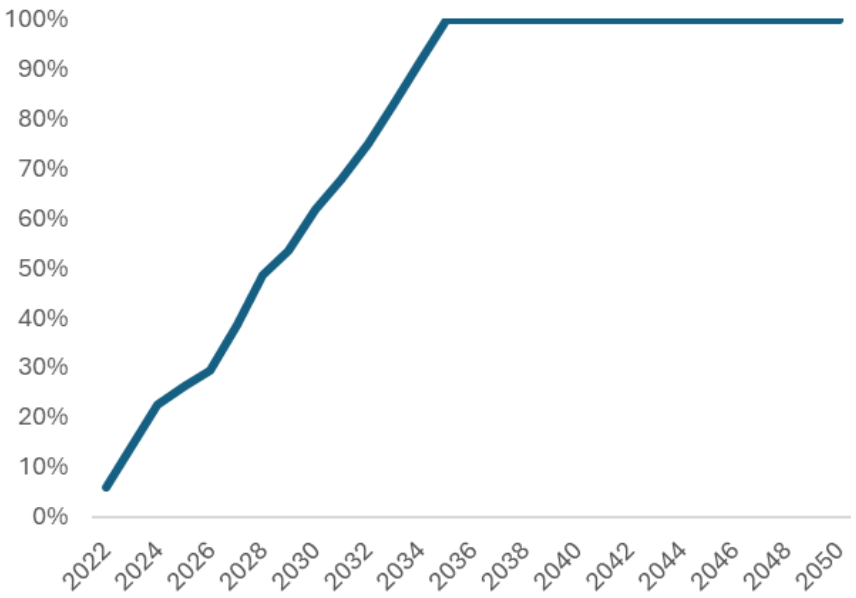
- Constant technical potential per building over time
- Constant ratio of commercial to residential rooftop solar capacity
- No incremental rooftop PV installation beyond existing in BAU case
- Linear growth of PV installations between 2023 and 2050 in Policy Case
- BAU emissions factors (2020 eGRID held flat)
- PCAP Policy emission factors (2020 eGRID grown based on 2023 AEO Reference Case)
- Storage Futures Study: Distributed Solar and Storage Outlook: Methodology and Scenarios (2021), NREL
- 2023 Load Forecast, PJM (2023)
- Solar Activity Reports, NJBPU (Dec 2023)
- Project Sunroof data explorer, (June 2019), Google
- Annual Technology Baseline, Residential PV (2023), NREL

Actions to Transition Light Duty Vehicles to Low- or No-Carbon Emission Vehicles

Approach

This measure models the resulting GHG emissions reduced if the Phila MSA meets the ZEV sales targets outlined by California's Advanced Clean Cars II (ACCII) rule for light-duty vehicles (LDVs). New Jersey, Maryland, and Delaware are among the 14 states (including Washington, D.C.) that have already adopted California's ACCII rule. The figure below shows the sales targets assumed for LDVs.

Figure D-1: Percent sales of light-duty vehicles that are zero-emission vehicles



The model uses outputs from the EPA Motor Vehicle Emissions Simulator (MOVES4) to project baseline VMT, vehicle population, energy consumption, and Scope 1 emissions for on-road transportation in the MSA by fuel type (gasoline, diesel, ethanol (E-85), compressed natural gas, and electricity), vehicle source type, and model year. Default input values were used.

Scope 2 emissions from electricity consumption by EVs were found using the following equation:

$$\text{Scope 2 Emissions} = \text{Electricity Consumption} \times \text{Electricity Emission Factor}$$

The electricity emissions factor was held at 2019 eGRID levels for the RFCE subregion, which includes the Phila MSA, through 2050 for the baseline.

To model GHG emissions reductions in the policy scenario, for each model year, a fraction of VMT was designated as fuel type "electricity" the ZEV sales curve. The resulting energy consumption was found using the following equation:

$$Energy\ Consumption = VMT \times Energy\ Efficiency$$

Where energy efficiency was in units of kJ/mi for battery electric vehicles (BEVs). Implied BEV energy efficiencies from the MOVES4 baseline results were used. Scope 1 emissions were found by reducing baseline ICEV emissions by the ZEV sales fraction. Scope 2 emissions were found using Equation (1). Electricity emissions factor projections were sourced from EIA's Annual Energy Outlook (AEO) for the PJME region.

Assumptions and Data Sources

- ZEVs exist in the vehicle fleet for the same length of time as ICEVs.
- ZEV activity/use is identical to an ICEV.
- The annual ZEV sales fraction applies to every fuel type.
- All LDVs ZEVs are modeled as BEVs.
- All BEV populations 2021 and earlier are EPA MOVES4 default.
- The methodology in some cases required re-allocating MOVES4 baseline projected electric vehicle back to ICEVs. Where this was necessary, LDVs were designated as gasoline.
- This analysis sourced data from EPA MOVES4, eGRID, EIA AEO, and the Alliance for Automotive Innovation.

Actions to Expand and Improve Transit

Approach

This measure models resulting VMT and GHG emissions reduced if the Phila MSA enhances its public transit system by increasing transit service frequency, extending transit network coverage or hours, and implementing transit-supportive roadway treatments throughout the MSA. The measure assumes these strategies only result in light-duty passenger vehicle VMT reduction. The potential VMT reduction due to each of these actions was calculated based on the methodology outlined in the *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity,*[75] a document compiled for the California Air Pollution Control Officers Association to provide methods for estimating GHG reductions resulting from various measures.

The resulting passenger VMT reduction is shown in Table D-1. Larger reductions are possible when this measure is paired with other items such as improved transit-oriented development, congestion and/or VMT pricing, encouragement of teleworking, and other disincentives for driving, which are not quantified as part of this PCAP measure and will be further reviewed as part of the CCAP process.

Table D-1: Potential Passenger VMT Reductions with Actions to Expand and Improve Transit

Strategy Name	Potential VMT Reduction by 2030	Potential VMT Reduction by 2050
Increase Transit Service Frequency	-0.10%	-0.21%
Extend Transit Network Coverage or Hours	-0.26%	-0.53%
Implement Transit-Supportive Roadway Treatments	-0.017%	-0.033%

[75] *www.airquality.org/ClimateChange/Documents/Handbook percent20Public percent20Draft_2021-Aug.pdf*

Where calculation input data from specific plans were not available, conservative estimates were made for each transit strategy based on the maximum input value listed in the *Handbook*.

Assumptions and Data Sources

- VMT reduction only applies to passenger vehicles.
- VMT reductions are taken from the baseline discussed for light-duty electrification.
- Maximum VMT reductions are achieved by 2050 and half of the maximum reductions are achieved by 2030.
- This analysis sourced data from EPA MOVES4, eGRID, FWHA NHTS 2017 Statistics, and the *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity*[76]

Actions to Implement Bicycle, Pedestrian and Active Transportation Improvements

Approach

This measure models resulting VMT and GHG emissions reduced if the Philadelphia MSA enhances its active transportation infrastructure by improving pedestrian networks, expanding bike networks, and implementing an electric bikeshare program throughout the MSA. The measure assumes these strategies only result in light-duty passenger vehicle VMT reduction. The potential VMT reduction due to each of these actions was calculated based on the methodology outlined in the Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity,[77] a document compiled for the California Air Pollution Control Officers Association to provide methods for estimating GHG reductions resulting from various measures.

Passenger vehicle VMT reduction due to active transportation enhancements was modeled for all counties in the MSA. The resulting passenger VMT reduction across the MSA is shown in Table D-2. Larger reductions are possible when this measure is paired with other items such as improved transit-oriented development, congestion and/or VMT pricing, encouragement of teleworking, and other disincentives for driving, which are not quantified as part of this PCAP measure and will be further reviewed as part of the CCAP process.

Table D-2: Potential Passenger VMT Reductions with Actions to Implement Bicycle, Pedestrian and Active Transportation Improvements

Strategy Name	Potential VMT Reduction by 2030	Potential VMT Reduction by 2050
Provide Pedestrian Network Improvement	-0.25%	-0.50%
Expand Bikeway Network	-0.0043%	-0.0085%
Implement Electric Bikeshare Program	N/A	-0.0053%

Where calculation input data from specific plans were not available, conservative estimates were made for each active transportation strategy based on the maximum input value listed in the Handbook.

Assumptions and Data Sources

- VMT reduction only applies to passenger vehicles.
- VMT reductions are taken from the baseline discussed for light-duty electrification.

[76] *California Air Pollution Control Officers Association. 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. www.airquality.org/ClimateChange/Documents/Handbook percent20Public percent20Draft_2021-Aug.pdf*

[77] *California Air Pollution Control Officers Association. 2021. Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity. www.airquality.org/ClimateChange/Documents/Handbook percent20Public percent20Draft_2021-Aug.pdf*

- Maximum VMT reductions are assumed to be achieved in 2050. Half of maximum reductions are achieved by 2030, except for electric bikeshare which is assumed to be implemented after 2030.
- This analysis sourced data from EPA MOVES4, eGRID, FWHA NHTS 2017 Statistics, and the Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity.

Actions to Implement a Clean Electricity Grid and Ensure Grid Reliability

Approach

Emission reductions from a clean energy grid were estimated from a Scope 2 perspective. First, a BAU for purchased electricity (kWh) was developed, starting from the 2019 GHG Inventory for the MSA. Purchased electricity in buildings was grown in alignment with the regional population growth rate through 2050; transportation electricity consumption from on-road vehicles followed the EPA MOVES4 baseline modeling (see Actions to Electrify Light Duty Transportation); and electricity consumption from rail was assumed to remain flat. For the BAU the grid emissions factor was held constant over time from 2019 levels (sourced from EPA eGRID), while the clean grid emissions factors were sourced from AEO's 2023 Reference Case, which includes federal tax credit incentives for clean energy as well as state clean grid policies (e.g., Renewable Portfolio Standards, Regional Greenhouse Gas Initiative). The potential GHG emission reductions were calculated as the difference between emissions using the BAU emissions factor and electricity consumption, and emissions using the AEO Reference Case emissions factor and projected electricity consumption.

Assumptions and Data Sources

- EPA eGRID, electric grid emissions factor data, 2019
- Electric Grid Emission Factor Projections, AEO 2023 Reference Case.
- Municipal and County-Level Population and Employment Forecasts, 2015 - 2050

Actions to Reduce Solid Waste and Better Manage Waste Generated

Approach

This measure models the resulting GHG emissions reduced if regional waste management facilities deploy a range of solid waste practices to control landfill and incineration emissions. The modeling uses the EPA's U.S. State-level Non-CO_2 Greenhouse Gas Mitigation Potential: 2025-2050 study[78] to determine emissions reduction potential from landfills in New Jersey and Pennsylvania. The model also uses Delaware County's Path Toward Zero Waste[79] to determine emissions reduction potential from composting efforts and scales results to the Philadelphia MSA's estimate waste emissions reductions.

For landfill emissions reductions, the model uses data from the EPA study to calculate the average percentage emissions reduction from its BAU for New Jersey and Pennsylvania for 2025- 2050 on a five-year basis. It then applies the reduction potential to the estimated regional waste emissions from landfills, which are primarily a result of methane release from landfills. For avoided emissions from a composting program, the model uses results from Delaware County's zero waste approach to model robust composting within the County. It assumes the region as a whole will compost 70 percent of achievable total compostable material (as identified by Delaware County) and compares composted material to an incineration alternative. The model estimates a sector specific BAU for waste emissions based on population growth from DVRPC[80] and applies the percentage reductions from the landfill work and the total net reduction from the composting program against that BAU growth in emissions. Table D-3 outlines the mitigation reduction percentage by year applied to the Philadelphia MSA landfill waste BAU.

[78] *US EPA. U.S. State-level Non-CO2 Greenhouse Gas Mitigation Potential 2025-2050. www.cfpub.epa.gov/ghgdata/nonco2/usreports*
[79] *Delaware County, Pennsylvania. Delaware County's Path Toward Zero Waste (Pre-Circulation Draft 2023).*
[80] *Municipal and County-Level Population and Employment Forecasts, 2015 - 2050 (dvrpc.org).*

Table D-3: Non-CO2 Mitigation Potential Average of PA and NJ by Year

	Average Mitigation of Non-CO2 by Year
2025	-7.2%
2030	-8.6%
2035	-10.8%
2040	-10.8%
2045	-11.1%
2050	-11.3%

Assumptions and Data Sources

- New Jersey and Pennsylvania landfills have similar landfill mitigation potential as the broader MSA.
- Counties will be able to build composting programs with the capability to receive 70 percent of all compostable materials as outlined in Delaware County's Zero Waste Plan modeling
- Philadelphia MSA regional population growth will track similar to DVRPC's regional growth.

Actions to Reduce Emissions at Wastewater Treatment Plants and to Increase Generation of Biomethane

Approach

This measure models the resulting GHG emissions reduced if wastewater treatment deployed a range of abatement measures primarily aimed at capturing methane from plants. It leverages the EPA's U.S. State-level Non-CO_2 Greenhouse Gas Mitigation Potential: 2025-2050[81] study to determine emissions reduction potential from wastewater treatment plants nationally and scales them to the Philadelphia MSA's estimated WWTP emissions. Using data from the study, it estimates a 20 percent reduction in methane emissions is possible by 2030 and applies the reduction potential to the estimated regional WWTP emissions, which are primarily a result of methane release. The model estimates a sector specific BAU for wastewater treatment emissions based on population growth from DVRPC[82] and applies the percentage reductions against that BAU growth in emissions.

Assumptions and Data Sources

- National WWTP have similar mitigation potential as the Philadelphia MSA
- Philadelphia MSA regional population growth will track similar to DVRPC's regional growth

[81] *US EPA. U.S. State-level Non-CO2 Greenhouse Gas Mitigation Potential 2025-2050. www.cfpub.epa.gov/ghgdata/nonco2/usreports*
[82] *Municipal and County-Level Population and Employment Forecasts, 2015 - 2050 (dvrpc.org).*

Appendix E: LIDAC Benefits Summary

Table E-1: Summary LIDAC Benefit Table

	Measure 1: *Support Decarbonization of Local Government Operations*	***Measure 2:*** *Implement Energy Efficiency, Electrification, and Clean Energy for Residential Buildings*	***Measure 3:*** *Implement Energy Efficiency, Electrification, and Clean Energy for Commercial Buildings*	***Measure 4:*** *Transition Light Duty Vehicles to Low- or No-Carbon Emissions Vehicles*	***Measure 5:*** *Expand and Improve Transit*	***Measure 6:*** *Implement Bicycle, Pedestrian, and Active Transportation Improvements*	***Measure 7:*** *Implement a Clean Electricity Grid and Ensure Grid Reliability*	***Measure 8:*** *Reduce Waste and Better Manage Waste Generated*	***Measure 9:*** *Reduce Emissions at Wastewater Treatment Plants and Increase Generation of Biomethane*
Public Health Benefits									
Improved Air Quality	✔	✔	✔	✔	✔	✔	✔	✔	✔
Improved Protection from Climate-Related Disasters	✔	✔	✔				✔		
Safe and Healthy Buildings	✔	✔	✔						
Safer Streets					✔	✔			
Reduced Noise Pollution				✔	✔	✔			
Socioeconomic Benefits									
Local Job Creation and Economic Growth	✔	✔	✔	✔	✔	✔	✔	✔	✔
Reduced Household Costs		✔	✔	✔	✔	✔			
Preserved and Improved Affordable Housing		✔							
Improved Access to Clean Energy Technologies		✔	✔	✔			✔		✔
Increased Reliable and Clean Energy Sources	✔	✔	✔				✔		✔
Expanded Access to Public Transportation and Micromobility	✔					✔	✔		

PRIORITY CLIMATE ACTION PLAN (PCAP)

EPA'S CLIMATE POLLUTION REDUCTION GRANT PROGRAM

Publication Number: 24137

Date Published: March 2024

Geographic Area Covered:
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA: Bucks, Chester, Delaware, Montgomery, and Philadelphia counties, Pennsylvania; Burlington, Camden, Gloucester, and Salem counties, New Jersey; New Castle County, Delaware; and Cecil County, Maryland. DVRPC added Mercer County, NJ as it is one of DVRPC's member governments but is within the Trenton-Princeton, NJ MSA.

Key Words:
Climate pollution, climate action, Environmental Protection Agency (EPA), Climate Pollution Reduction Grant (CPRG), Inflation Reduction Act, greenhouse gas (GHG) emissions, GHG inventory, low income and disadvantaged communities (LIDACs), decarbonization, clean energy, energy efficiency, electric vehicles, transit, bicycle, pedestrian, active transportation, clean electricity grid, waste, wastewater, biomethane

Abstract:
The Priority Climate Action Plan identifies high priority, ready-to-implement greenhouse gas (GHG) reduction measures that will provide significant GHG reductions and other benefits to the Philadelphia MSA. A measure's inclusion is a prerequisite for agencies and organizations to compete for implementation grant funding in the second phase of the CPRG program. Accordingly, the measures identified are designed to be broad enough to encompass regional and local priorities for addressing climate pollution. The nine measures are actions to: support decarbonization of local government operations, implement energy efficiency, electrification and clean energy for residential and commercial buildings, transition light-duty vehicles to low- or no-carbon emission vehicles, expand and improve transit, implement bicycle, pedestrian, and active transportation improvements, implement a clean electricity grid and ensure grid reliability, reduce waste and better manage waste generated, and reduce emissions at wastewater treatment plants and increase generation of biomethane. The PCAP was produced through an inclusive process, within a very limited timeline, that centered those most marginalized by the impacts of climate pollution. The PCAP sets the foundation for upcoming deeper engagement, to ensure equitable outcomes, through the creation of the Comprehensive Climate Action Plan (CCAP) through 2024 and 2025.

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DVRPC's vision for the Greater Philadelphia Region is a prosperous, innovative, equitable, resilient, and sustainable region that increases mobility choices by investing in a safe and modern transportation system; that protects and preserves our natural resources while creating healthy communities; and that fosters greater opportunities for all.

DVRPC's mission is to achieve this vision by convening the widest array of partners to inform and facilitate data-driven decision-making. We are engaged across the region, and strive to be leaders and innovators, exploring new ideas and creating best practices.

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