Pathway

to a Resilient Greater Lehigh Valley

Carbon, Lehigh and Northampton Counties, PA with Warren County, NJ

PREPARED BY THE
LVPC
Lehigh Valley Planning Commission

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Prepared by the Lehigh Valley Planning Commission in partnership with the Lehigh Valley Transportation Study, the counties of Carbon, Lehigh and Northampton in Pennsylvania, and Warren in New Jersey, in the interest of the public health, safety and general welfare of the region.

Plan adopted: November 12, 2025
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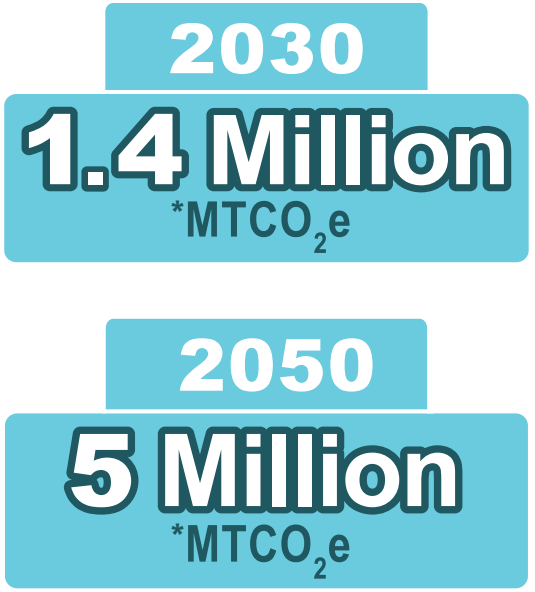
Executive Summary

The Greater Lehigh Valley is a dynamic region that is growing in population and businesses, but the challenges and opportunities that come with growth have the potential to threaten the environmental resoures that make the region so attractive.

This *Pathway to a Resilient Greater Lehigh Valley (RGLV)* is a strategic and comprehensive approach designed to protect and improve the Greater Lehigh Valley's environment through identifying and implementing strategies that will reduce carbon emissions, improve air quality, and enhance resiliency against significant weather events.

Economically diverse and centrally located within the Northeast commercial corridor, the Greater Lehigh Valley is projected to add another 112,000 people and 78,000 jobs by 2050. Planning for resiliency will support sustainable growth, regional competitiveness and economic development, and will include goals and proposed actions that will improve the health and well-being of the region.

This plan is a blueprint to offset the impacts of our growth and reduce emissions by:



*metric tons of carbon dioxide equivalent

Annually, the Greater Lehigh Valley emits 12.7 million metric tons of carbon dioxide equivalent ($MTCO_2e$), a unit to compare the warming impact of different atmospheric gases. Those emissions may grow to nearly 13.9 MTCO2e if proactive measures are not taken soon. Carbon dioxide (CO_2) is a gas that can be emitted into the atmosphere by human activities. CO_2 helps the atmosphere trap heat, so when there is more of it in the atmosphere, the earth's climate warms. This plan is a blueprint to offset the impacts of our growth and reduce emissions by 1.4 million $MTCO_2e$ by 2030 and 5 million $MTCO_2e$ by 2050.

The changing weather patterns experienced in this region show why this effort is so important to our economy, health and daily lives. The Greater Lehigh Valley has endured significant weather events such as Superstorm Sandy in 2012, Tropical Storm Isaias in 2020, the Canadian wildfires of 2023 that blanketed the Lehigh Valley region with smoke, and the Blue Mountain wildfire of 2024. Increasing temperatures, flooding and more extreme rainfall and heat events are projected to continue to occur more frequently, affecting everything from human health, agriculture, infrastructure design, recreation, environment and the economy. However, we can mitigate and avert the worst effects of weather-related events that impact the region. This plan will work alongside ongoing efforts at local, regional, state and federal levels.

The plan establishes goals, policies and implementation strategies across 10 sectors. These goals were selected for their direct impact on reducing emissions and their additional benefits to the communities of which they are a part. Analyzing these benefits can reveal broader improvements in areas such as air quality, public health and economic growth, making the case for decarbonization even stronger. Implementation of the strategies and recommendations will rely upon the intersection of collaborative regional solutions with locally appropriate action. This plan creates opportunities to work together at a range of scales to make progress everywhere as quickly as possible.

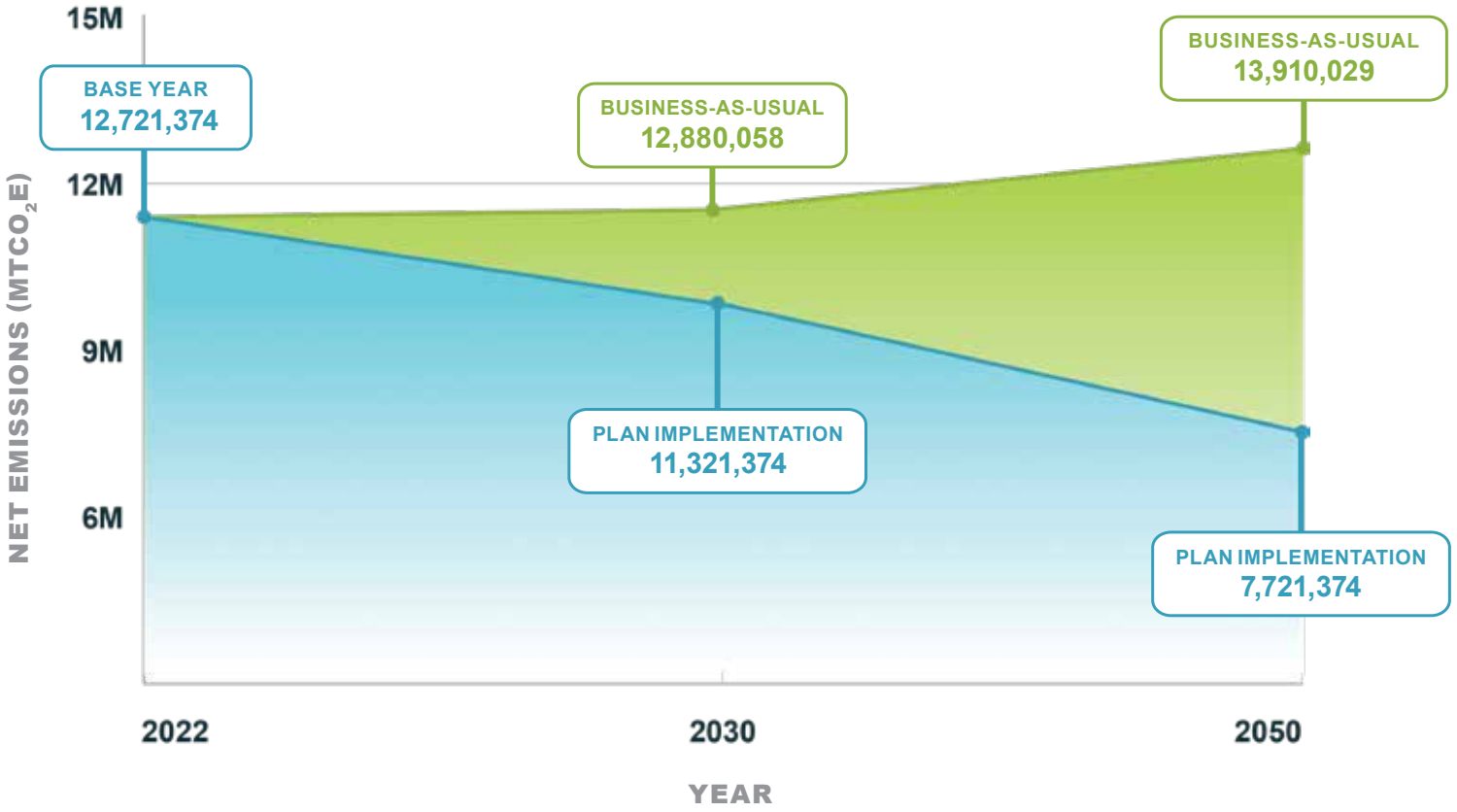
Additionally, the plan includes cost and savings estimates for the proposed policies to provide helpful context for selecting, prioritizing and communicating about the measures for implementation actions described in this plan, a review of the authority to implement policies ensuring legal and administrative feasibility, and progress indicators to be used in future monitoring are also included.

The LVPC will work with its community and business partners to create a robust monitoring plan to track and share progress on the plan strategies, which is the third phase of the Environmental Protection Agency (EPA) Climate Pollution Reduction Grant (CPRG) program.

The commitment to regional emission reductions through this plan reflects a forward-thinking approach to resiliency, balancing environmental imperatives with public health improvements, reduced energy costs and economic impact.

For this plan, the 'Greater Lehigh Valley' refers to the four county region of Lehigh, Northampton and Carbon counties in Pennsylvania and Warren County, NJ., which also makes up the Allentown-Bethlehem-Easton Metropolitan Statistical Area (MSA). The term 'Lehigh Valley' alone refers to Lehigh and Northampton counties.

Future Net Estimated Carbon Emissions ($MTCO_2e$)



Introduction

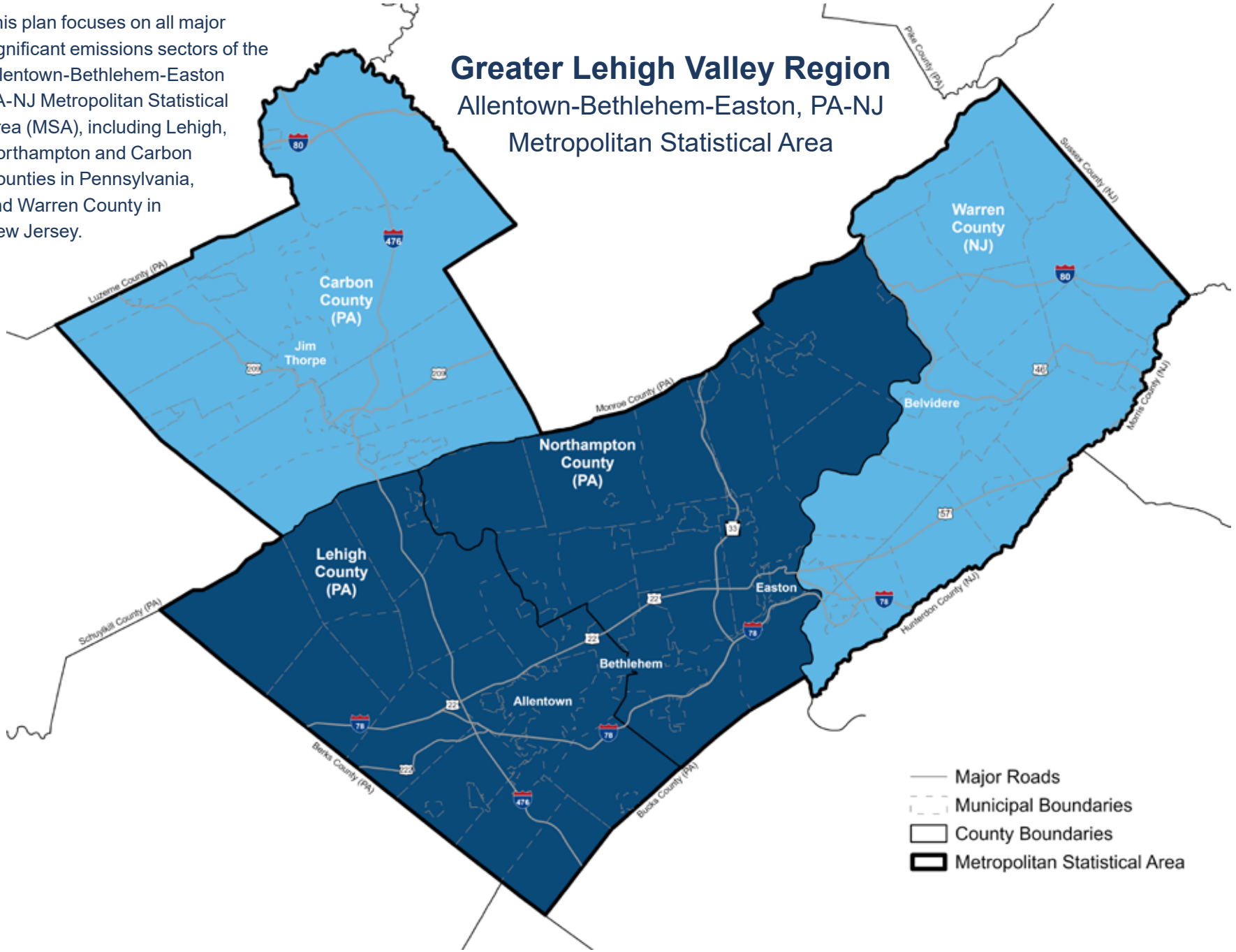
Introduction

The 2022 Inflation Reduction Act authorized the United States Environmental Protection Agency (EPA) to allocate funding to states, local governments, tribes and territories to reduce carbon gas emissions and other harmful air pollutants. Many of the largest metropolitan areas in the US received funding, including the Allentown-Bethlehem-Easton Metropolitan Statistical Area (MSA), for which the Lehigh Valley Planning Commission (LVPC) is the lead organization and official planning commission of Lehigh and Northampton counties.

Under this program, LVPC completed a Priority Climate Action Plan (PCAP), with this a comprehensive emissions reduction plan to follow, and will then report on plan progress and monitoring. This *Pathway to a Resilient Greater Lehigh Valley* serves as the comprehensive emissions reduction plan and focuses on reducing carbon emissions on an economywide scale across the MSA, also known as the Greater Lehigh Valley region.

Regional Plan Context

This plan focuses on all major significant emissions sectors of the Allentown-Bethlehem-Easton PA-NJ Metropolitan Statistical Area (MSA), including Lehigh, Northampton and Carbon Counties in Pennsylvania, and Warren County in New Jersey.



The Pathway Plan Includes:

This *Pathway to a Resilient Greater Lehigh Valley (RGLV)* is a strategic and comprehensive approach designed to reduce carbon and related emissions effectively within the Greater Lehigh Valley region. The RGLV plan includes:

A comprehensive emissions inventory, providing a detailed baseline and business-as-usual projection of emissions from all major sectors. The inventory sets the stage for targeted interventions, offers insights into potential future emission trends and estimates the impacts of various decarbonization strategies.

Economywide emission reduction targets, setting goals for near-term (2030) and long-term (2050) reductions.

Goals, policies and implementation actions to reduce emissions across all sectors, including implementation authorities, partners and metrics, community benefits, funding and alignment with existing plans.

Cost and savings estimates to provide helpful context for selecting, prioritizing and communicating about the measures for implementation described in this plan.

Regionwide co-pollutant benefits analysis to understand impacts from commonly emitted air pollutants including carbon monoxide (CO), ammonia (NH_3), particulate matter 2.5 & 10 (PM 2.5 & PM 10), sulfur dioxide (SO_2) and volatile organic compounds (VOCs). They do not create the same warming effects as carbon dioxide (CO_2), but can cause negative health impacts, particularly to the respiratory system. With the reduction of CO_2, these pollutants are also inherently reduced, improving air quality.

Workforce planning analysis to identify and analyze the region's green workforce and associated workforce development initiatives.

Implementation/Monitoring strategies to set structure and policy that oversees and tracks steps towards meeting regional emission reduction goals.

Carbon County, PA

Carbon County is situated in northeastern Pennsylvania and is largely rural with some urbanized areas. It is the least populous county in the greater region, with an estimated 65,018 residents in 2022. The county sits on the southern extent of the Pocono Plateau and is the only county in the MSA that is officially designated as part of the Appalachian region of the United States.

Lehigh County, PA

Lehigh County is the most populous county in the Greater Lehigh Valley, with 374,110 residents in 2022. It also contains the City of Allentown, the region's largest city, with 124,871 residents in 2023. The county has diverse municipality types, including the urban core of Allentown, with surrounding boroughs and suburban townships and the rural, agricultural townships to the north and south of the urbanized area. The county is named for the Lehigh River, which enters the county in the north at the Lehigh Gap and Appalachian Trail and travels through the urban corridor of Allentown and Bethlehem.

Northampton County, PA

Northampton County is the second-most populous county in the Greater Lehigh Valley with 314,299 residents in 2022. It has a mix of urban areas like the cities of Bethlehem and Easton, historic boroughs, suburban townships and rural townships. The Lehigh and Delaware rivers converge in Easton, which historically brought industry to the county, as natural resources could be brought down from the Poconos, and manufactured goods could easily be moved downstream to Philadelphia. One of the world's largest steel companies, Bethlehem Steel, was headquartered in Bethlehem until its liquidation in 2003, and other nationally recognized manufacturers such as Just Born candies and Crayola are still based in Northampton County today. Slate quarrying and cement manufacturing also contributed to the industrial rise of the county and remain prominent industries.

Warren County, NJ

Warren County has a population of 109,739, which is second least in the MSA. It is one of the most rural counties in New Jersey. The county's largest city, Phillipsburg, lies directly across the Delaware River from Easton, PA. Similar to the Pennsylvania counties in the greater region, Warren County grew in its early days from industrialization, including mining and metal refining activities as well as the transportation of goods occurred along the Morris Canal, to and from Jersey City. Today, Warren County experiences similar industrial development pressures to other areas in the MSA, as it contains both Interstates 78 and 80, connecting the county to the New York City metropolitan area and Pennsylvania. It is also the only county in the region with passenger rail service.

Local Programs and Planning

Pennsylvania's Local Climate Action Program provides free technical and personnel assistance to local governments that want to reduce emissions and adapt to environmental changes. The following Greater Lehigh Valley municipalities and institutions have participated in this program:

- City of Allentown
- City of Easton
- Lower Macungie Township
- Palmer Township
- Lehigh Valley Planning Commission
- Muhlenberg College
- Moravian University

The cities of Bethlehem and Easton, as well as Palmer Township, have adopted Climate Action Plans. Allentown's plan is underway and Lower Macungie Township has completed a communitywide emissions inventory. The State of New Jersey adopted Senate Bill No. 2607 in 2021 to enact an amendment to the New Jersey Municipal Land Use Law (MLUL) requiring that municipalities include in the land use plan element of their master plans a "climate related hazard vulnerability assessment" which shall analyze "current and future threats to, and vulnerabilities of, the municipality associated with climate related natural hazards."

Resilient NJ's Municipal Assistance Program (MAP) is a technical assistance program directed at providing municipalities with support to develop municipal resilience action plans and environmental hazard vulnerability assessments consistent with the State's Municipal Land Use Law (MLUL).

Timeline

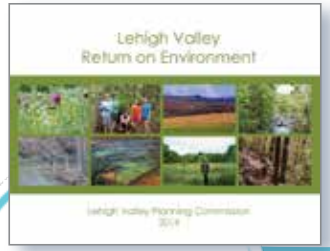
Cities, towns and counties are well suited to develop and implement plans that address environmental change, adaptation, resilience and mitigation. The following regional plans explicitly address environmental change through policies and actions. These plans also promote principles of smart growth, economic savings, natural resource protection, green infrastructure and sustainability, among others.

2013

CARBON COUNTY COMPREHENSIVE PLAN AND GREENWAY PLAN

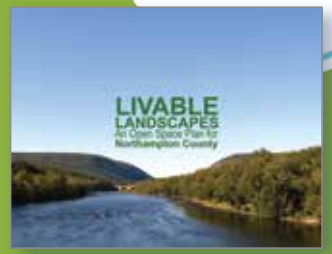
2014

CLIMATE + ENERGY ELEMENT



2014

LEHIGH VALLEY RETURN ON ENVIRONMENT

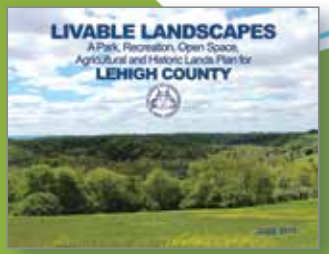


2016

LIVABLE LANDSCAPES: AN OPEN SPACE PLAN FOR NORTHAMPTON COUNTY

2017

GREEN INFRASTRUCTURE GUIDELINES

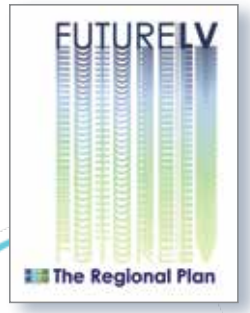


2018

LIVABLE LANDSCAPES: A PARK, RECREATION, OPEN SPACE, AGRICULTURAL AND HISTORIC LANDS PLAN FOR LEHIGH COUNTY

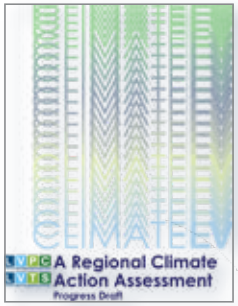
2018
LEHIGH VALLEY HAZARD MITIGATION PLAN

2018
WARREN COUNTY OPEN SPACE AND RECREATION PLAN

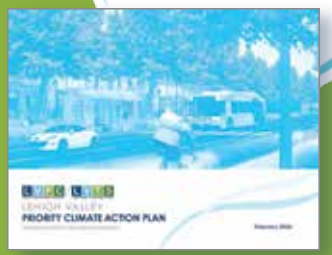


2019
FUTURELV: THE REGIONAL PLAN

2020
WALK/ROLLLV: ACTIVE TRANSPORTATION PLAN



2021
CLIMATELV: A REGIONAL CLIMATE ACTION ASSESSMENT



2024
LEHIGH VALLEY PRIORITY CLIMATE ACTION PLAN

2024
LEHIGH VALLEY HAZARD MITIGATION PLAN

Community and Stakeholder Engagement

The LVPC established public working groups in 2018 after an extensive Access to Opportunity Analysis, supporting the update of *FutureLV: The Regional Plan*. The resulting WorkshopLV groups are subject-area, open task forces on a variety of issues from the environment to freight and housing to multimodal transportation. Any person participating becomes a decision-maker, resulting in a comprehensive and collaborative process. As a result, WorkshopLV meetings and outreach provided better access to communities in the Lehigh Valley.

Throughout the development of the Pathway to a Resilient Greater Lehigh Valley, LVPC staff used the WorkshopLV format to receive feedback on emission reduction goals from residents and stakeholders of Carbon, Lehigh and Northampton counties, PA and Warren County, NJ. These workshops provided a forum to share CPRG and RGLV information and receive input and ideas directly from participants. Invitations to the workshops were sent to municipal officials, municipal environmental advisory councils (EACs), LVPC and LVTS members, non-profit groups, faith groups, colleges/universities, health networks, water and sewer authorities, engineers, commercial and industrial real estate interests, county farmland preservation boards, county conservation districts, manufacturers and citizens, among many others. The workshops were also promoted on the LVPC website, as well as on multiple social media platforms. Warren County and Carbon County also helped promote meetings in their service areas through existing media and contact lists. LVPC provided additional opportunities for input through a public survey, local government survey and comment portal at lvpc.org. These additional engagement opportunities were promoted online, through social media platforms, and during WorkshopLV Environment meetings.

126 People from across the Greater Lehigh Valley attended the five workshops and completed a regionwide survey.

Community and Stakeholder Engagement Summary

WORKSHOP LV ENVIRONMENT MEETINGS	MEETING DATE
MEETING 1 AT LVPC OFFICE	JANUARY 22, 2025
MEETING 2 AT WARREN COUNTY EAC	MARCH 19, 2025
MEETING 3 AT LVPC OFFICE	MARCH 26, 2025
MEETIGN 4 AT CARBON COUNTY	APRIL 21, 2025
MEETING 5 AT LVPC OFFICE	APRIL 23, 2025

A total of five in-person workshop meetings were conducted. Three of those five workshops were held at the LVPC Office's Conference Center. One was held in Warren County, NJ during the Warren County Environmental Advisory Council's regular public meeting, and another workshop was held in Carbon County, PA. At each workshop, participants were given an overview of the CPRG program, background information on the impact of carbon emissions on the environment and specific emission inventory data for the entire region by sector.

Sector Expert Roundtable Engagement

In March 2025, LVPC staff and various industrial sector experts met virtually to discuss ongoing sustainability initiatives at these industry's facilities. Representatives included Sean Pressman and Kate Arnold from PPL, Bryan Bell from Silbrico, Cody White from the Bethlehem Landfill, Lorraine Faccenda and Joe Uliana representing Holcim, and Delicia Nahman of Lafayette College. A separate discussion was held with Aidan Niggel - Director of Sustainability for Victaulic Industries.

During the roundtable structured meeting, LVPC asked the industry leaders to respond to the following three questions:

1. **What are the current initiatives that your company/ organization are doing in terms of sustainability/ emission reduction in the region?**
2. **Can you describe obstacles or challenges related to those initiatives that your company/organization are facing? Are there ways that the LVPC can help?**
3. **Any there any policies or measures that you would like to see included in this regional plan?**

The roundtable discussion with leaders from the industrial sector fostered a conversation where sustainability priorities, efforts and goals currently in place at these organizations as well as the role the LVPC could play in helping highlight these efforts in this plan were discussed and how collaboration between organizations is key for the region to mitigate and adapt to the impacts of carbon emissions.

The LVPC looks forward to continuing to collaborate and coordinate with these industry partners.

All participants during the community and stakeholder engagement process contributed to the vision, focus and goals of this regional plan, helping make this plan more meaningful and robust.

Interagency and Intergovernmental Coordination

The LVPC represents the 62 municipalities and two counties comprising the Lehigh Valley. Under a series of state and federal statutes, the LVPC is responsible for all coordination and collaborations on environmental, housing, economic, land use, farmland and open space preservation, parks and recreation, public facilities and utilities, water, sewer and transportation issues for the bi-county area. As such, the LVPC and its sister organization, the Lehigh Valley Transportation Study (LVTS), bring together governmental entities, authorities, boards, commissions, non-profits and for-profit entities in the interests of the public health, safety and general welfare of the Lehigh Valley.

Current relationships and partnerships with Carbon County, (Carbon County Commissioners and Planning Commission), Warren County NJ (Warren County Commissioners and Planning Commission), Workforce Board Lehigh Valley, Greater Lehigh Valley Chamber of Commerce Energy and Environment Committee, Wildlands Conservancy, Pennsylvania Department of Environmental Protection, Pennsylvania Department of Transportation, United Way of the Greater Lehigh Valley, Nurture Nature Center, City Mayor's Coalition, Municipal Environmental Advisory Council Network, Lehigh Valley Partnership, other municipal planning organizations such as Southwestern Pennsylvania Commission and Delaware Valley Regional Planning Commission, and many others have supported the development and implementation of this plan. This work happened through standing committees within partner organizations, through the WorkshopLV public engagement working groups as well as through other coordination meetings.

The plan was vetted and refined through the public participation process. Following the completion of the plan, the LVPC will begin monitoring progress on the plan strategies, which is the third phase of the EPA CPRG program.

Overall, it is the intent of this effort to support the creation of a 'green ribbon team' from among the various WorkshopLV, LVPC, General Assembly and LVTS participants and to develop a permanent infrastructure to further carbon emission reductions past the CPRG effort.

Local Impact of Carbon Emissions

The Earth's climate is largely controlled by a natural process where heat-trapping gases that naturally exist in the Earth's atmosphere act as a blanket around the planet, warming it to a temperature that can support life. Without this natural warming process, the Earth would be uninhabitable. However, the concentration of carbon dioxide (CO_2) and other heat-trapping gases is currently well above historic averages, resulting in higher global temperatures and altered weather patterns.

Scientists use atmospheric CO_2 concentrations as an accurate measure of the Earth's climate. The Earth's climate in the distant past can be understood by examining preserved air samples in ice sheets that are hundreds of thousands of years old. Research has shown that for the last 800,000 years, atmospheric CO_2 concentrations have fluctuated between 170 and 300 parts per million (ppm). However, since the industrial revolution of the 19th century, CO_2 concentrations have risen far above the historic range. Today on average, there is more carbon dioxide in Earth's atmosphere than at any previous time in human history.

Carbon dioxide traps heat in the atmosphere, raising temperatures across the globe. These effects are also being felt locally, as the annual average temperature in the greater region has increased by 2.5 degrees Fahrenheit since the 1950s. In the future, average daily temperatures in Pennsylvania and the Greater Lehigh Valley are expected to increase by 6.7°F (3.7°C) by 2050 and up to 10.4°F (5.8°C) by 2100.

The 2024 Pennsylvania Climate Impact Assessment identifies that flooding, and significantly higher average temperatures are the two greatest environmental hazards that are facing Pennsylvania. The Greater Lehigh Valley has endured extreme weather events which may have been influenced by changes in the atmosphere, such as Superstorm Sandy in 2012, Tropical Storm Isaias in 2020, the Canadian wildfires of 2023 and the Blue Mountain wildfire of 2024.

These extreme weather event trends are projected to continue with an increase in severity and frequency and will affect nearly every aspect of the Greater Lehigh Valley's economy, health and natural environment. However, it is possible to mitigate or avoid the worst of these impacts, through implementing impactful emissions reduction strategies. The purpose of this plan is to bolster ongoing efforts at local, regional and state levels.

1951-2023

Change in Average Temperature (°F) in the Lehigh Valley

Greater Lehigh Valley Greenhouse Gas Inventory

The LVPC prepared the *Greater Lehigh Valley Greenhouse Gas Inventory* in 2024. This regional inventory update provides baseline emission estimates and a business-as-usual scenario projection of emissions through 2050. The emission estimates and projections are based on activities within the entire Allentown-Bethlehem-Easton, PA-NJ Metropolitan Statistical Area (MSA), with 2022 serving as the baseline year.

Sectors included industrial, transportation, residential and commercial energy, solid waste, agriculture, and water and wastewater.

The inventory results provide a detailed profile of emission sources within the Greater Lehigh Valley region — information that is key to guiding regional and local reduction efforts. This data will also provide a baseline against which the region will be able to compare future performance and demonstrate progress in reducing emissions.

ESTIMATED TOTAL GREENHOUSE GAS EMISSIONS

Lehigh & Northampton Counties, PA
9,803,367 $MTCO_2e$

Carbon County, PA
1,318,252 $MTCO_2e$

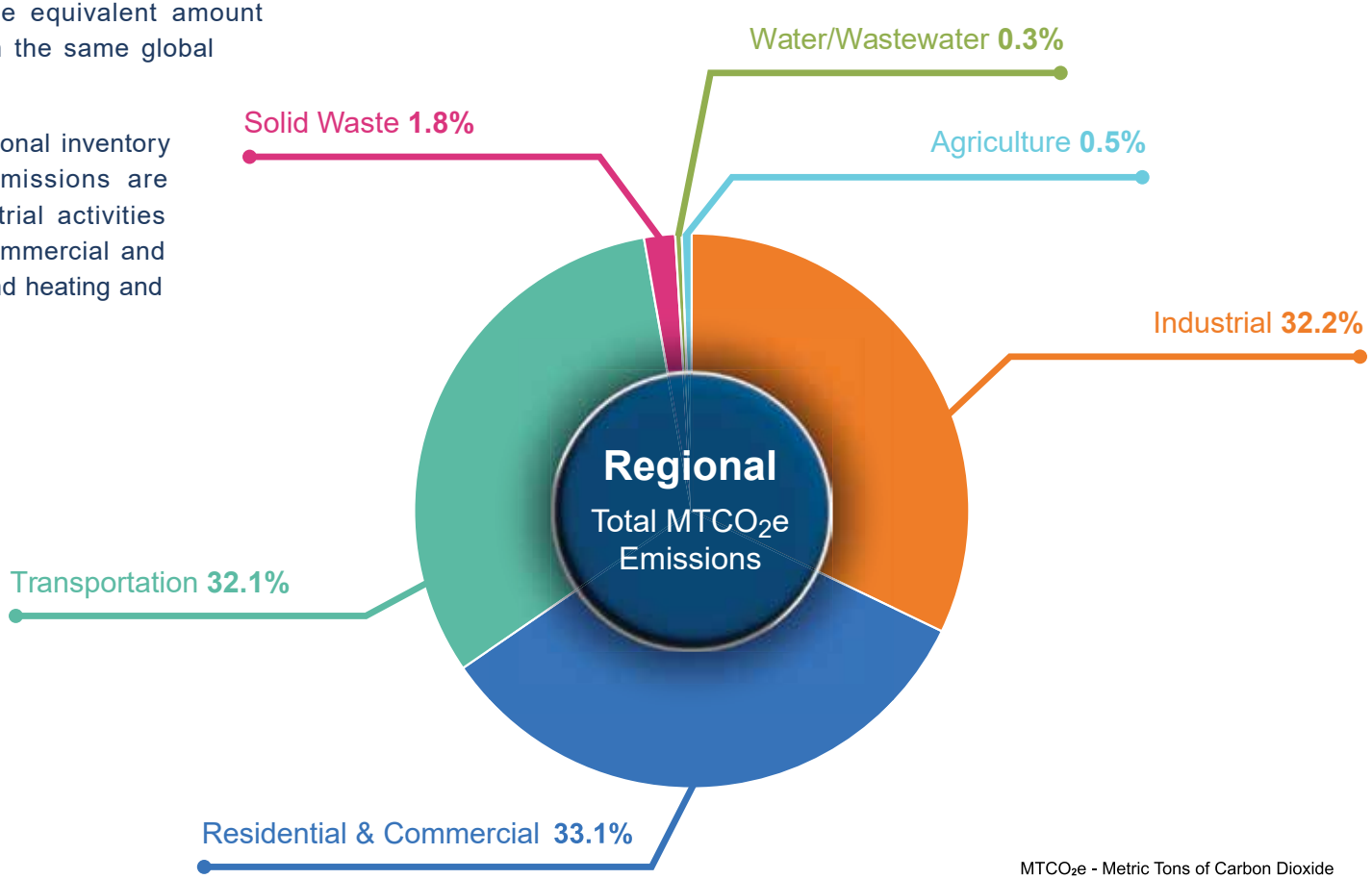
Warren County, NJ
1,599,755 $MTCO_2e$

Greater Lehigh Valley, PA
12,721,374 $MTCO_2e$

Results

This estimate represents emissions from energy consumption, as well as emissions from major carbon emitting activities in the region. This data is quantified in metric tons of carbon dioxide equivalent ($MTCO_2e$), which is a measure that converts the amounts of other gases within the atmosphere to the equivalent amount of carbon dioxide with the same global warming potential.

The results of the regional inventory indicate that most emissions are generated from industrial activities and electricity use, commercial and residential electricity and heating and vehicle miles traveled.



$MTCO_2e$ - Metric Tons of Carbon Dioxide

Industrial Energy And Processes

Industrial sector emissions consist of electricity and natural gas consumption of industrial users, as well as point source emissions at specific facilities.

Emissions from electricity and natural gas consumption are estimated by using the emissions factor for the region's power grid. This sector requires large amounts of grid electricity and produces emissions from various unique industrial processes. Industrial activities, which include cement production, iron and steel forging, manufacturing and food and beverage processing, create the most emissions in the greater region.

The INDUSTRIAL SECTOR is the region's largest source of carbon emissions, releasing

4,094,165

$MTCO_2e$ each year.

Transportation

Emissions attributed to the transportation sector result from fuel combustion during on-road vehicle travel within the Greater Lehigh Valley.

The data within this sector was provided by the Lehigh Valley Planning Commission's Travel Demand Model, the US Environmental Protections Agency (EPA) Motor Vehicle Emission Simulator (MOVES) and the EPA's National Emissions Inventory (NEI). Despite improvements in vehicle fuel efficiency and the increasing adoption of electric vehicles, emissions from this sector remain high, and will continue to increase, due in part to increasing regional population and vehicle miles traveled (VMT), the emergence of the Lehigh Valley as a logistics hub with heavy tractor-trailer traffic, and historic car-centric planning practices. More information on transportation emissions in the region can be found in the *Lehigh Valley Priority Climate Action Plan for Transportation Decarbonization*.

The TRANSPORTATION SECTOR is the region's 2nd largest source of carbon emissions, releasing

4,083,797

$MTCO_2e$ each year.

Commerical Energy

The Commercial Energy sector includes electricity and natural gas consumption for commercial buildings, and emissions are calculated using the emissions factor for the region's power grid.

Energy usage in the commercial sector is often for space heating and cooling, ventilation and lighting. The largest consumers of commercial energy include offices, educational institutions, retail businesses and malls, lodging and warehousing.

The COMMERCIAL ENERGY SECTOR is the region's 3rd largest source of carbon emissions, releasing

2,685,808

$MTCO_2e$ each year.

Residential Energy

Residential emissions generally stem from electricity demand for air conditioning, water heating, lighting, and appliances and natural gas usage for space and water heating.

The RESIDENTIAL ENERGY SECTOR is the region's 4th largest source of carbon emissions, releasing

1,530,452

$MTCO_2e$ each year.

Agriculture

Emissions in this sector consider emissions from agricultural fertilizer application and combustion from agricultural equipment and machinery. Fertilizer application can cause excess nitrogen to escape into the atmosphere as nitrous oxide.

The AGRICULTURE SECTOR is the region's 5th largest source of carbon emissions, releasing

65,794

$MTCO_2e$ each year.

Solid Waste

Emissions in this sector represent the total emissions from the four active landfills in the region. This inventory strictly measures the gross emissions from landfills within the greater region and does not consider where the waste in these landfills originated, nor waste generated in the Greater Lehigh Valley that is landfilled elsewhere.

The SOLID WASTE SECTOR is the region's 6th largest source of carbon emissions, releasing

223,609

$MTCO_2e$ each year.

Potable Water and Wastewater

This sector measures the emissions associated with the treatment of potable water and wastewater.

The POTABLE WATER AND WASTEWATER is the region's smallest source of carbon emissions, releasing

37,749

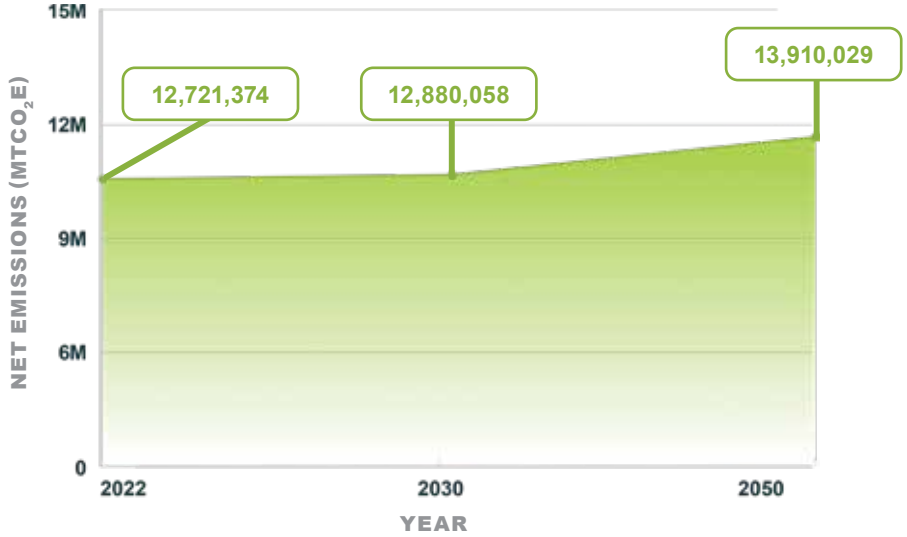
$MTCO_2e$ each year.

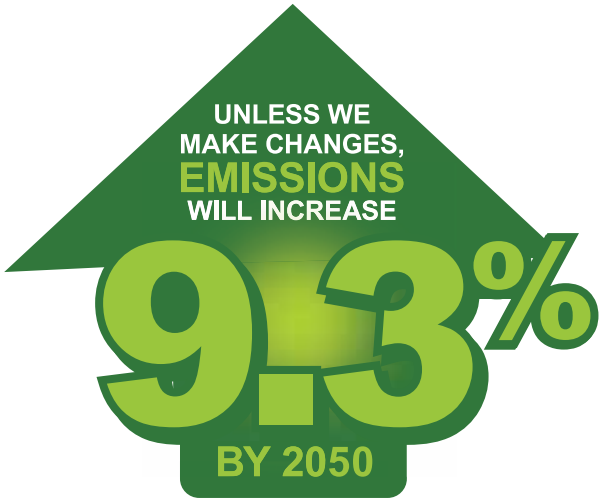
Business As Usual Scenario

The business-as-usual forecast represents an estimate of future emissions, based on regional population growth rates, and if further policies and technologies to reduce emissions are not implemented. It demonstrates what regional emissions may look like through 2050 if environmental resiliency action is not taken. Regional population growth rates, fuel efficiency standards and changes in county cropland acres form the basis for this forecast.

Individually, six of the seven emissions sectors within the inventory are expected to increase through 2050, with the exception being agriculture. Assuming current land use trends continue, the agriculture sector will see the largest percent reduction in emissions, as total cropland acreage in the region is projected to decline. Transportation emissions are forecast to shrink into the 2030s, largely due to fuel efficiency standards that require reduced fuel consumption and better efficiency for passenger cars and heavy-duty vehicles like trucks. However, without implementing reduction policies, emissions are projected to begin increasing after the mid-2030s, as increasing vehicle miles traveled may reverse the decline from emission reductions seen from improved fuel standards. By 2050, transportation emissions are predicted to pass the 2022 baseline level.

Greater Lehigh Valley Business-as-Usual Emissions Projection





Sequestration and Carbon Storage

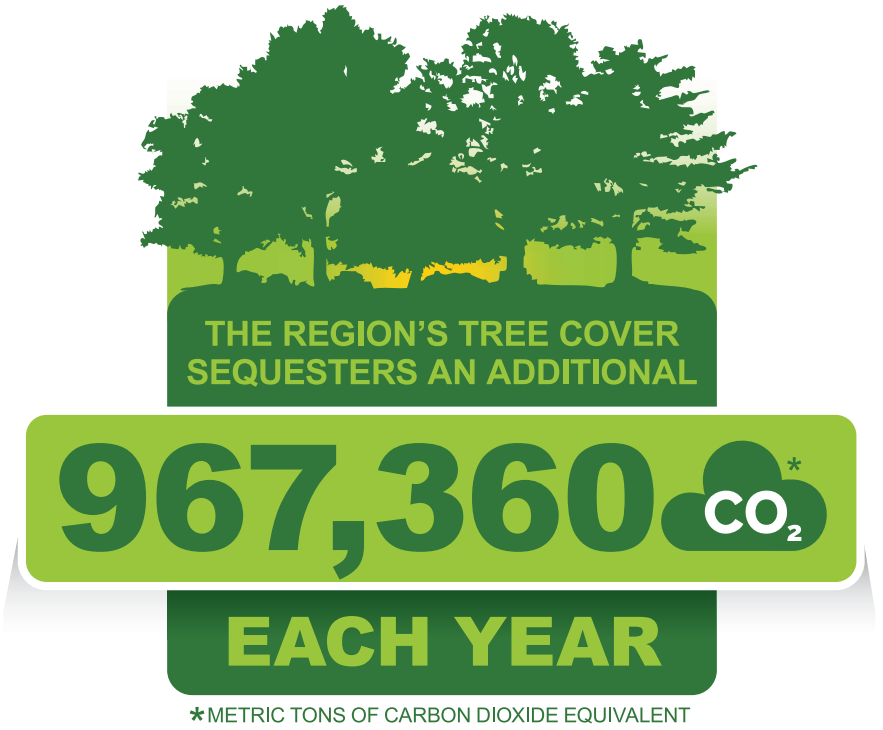
Carbon is part of a broader cycle of nutrient exchange and storage across air, soil and water. Environmental change is occurring in part because more carbon is emitted than can be stored, so it continues to accumulate in the atmosphere and trap heat, raising global temperatures. Places where carbon is stored and kept out of the atmosphere are called carbon sinks. The largest carbon sinks on the planet are the ocean, plants and fungi, soil and rocks. This section estimates the amount of carbon that is sequestered annually and stored by some of the largest sinks in the Greater Lehigh Valley, which include forests, agricultural lands and wetlands.

Tree Cover

All trees store carbon and established old-growth forests do so more efficiently than other types of tree habits. The Greater Lehigh Valley has large swaths of carbon sequestering forests in the Poconos and on the Kittatinny Ridge, also known as Blue Mountain. Urban tree plantings also take in carbon dioxide and improve local air quality while providing shade.

Agricultural Land

Agricultural land stores carbon in plant matter and soil. Soil carbon can be lost to the atmosphere by tilling and other agricultural practices which disturb the soil. Carbon sequestration of agricultural land through best management practices (BMPs) that maximize carbon uptake, keeping land in agricultural use, and expanding BMP usage, presents an opportunity for potential net emission reductions.



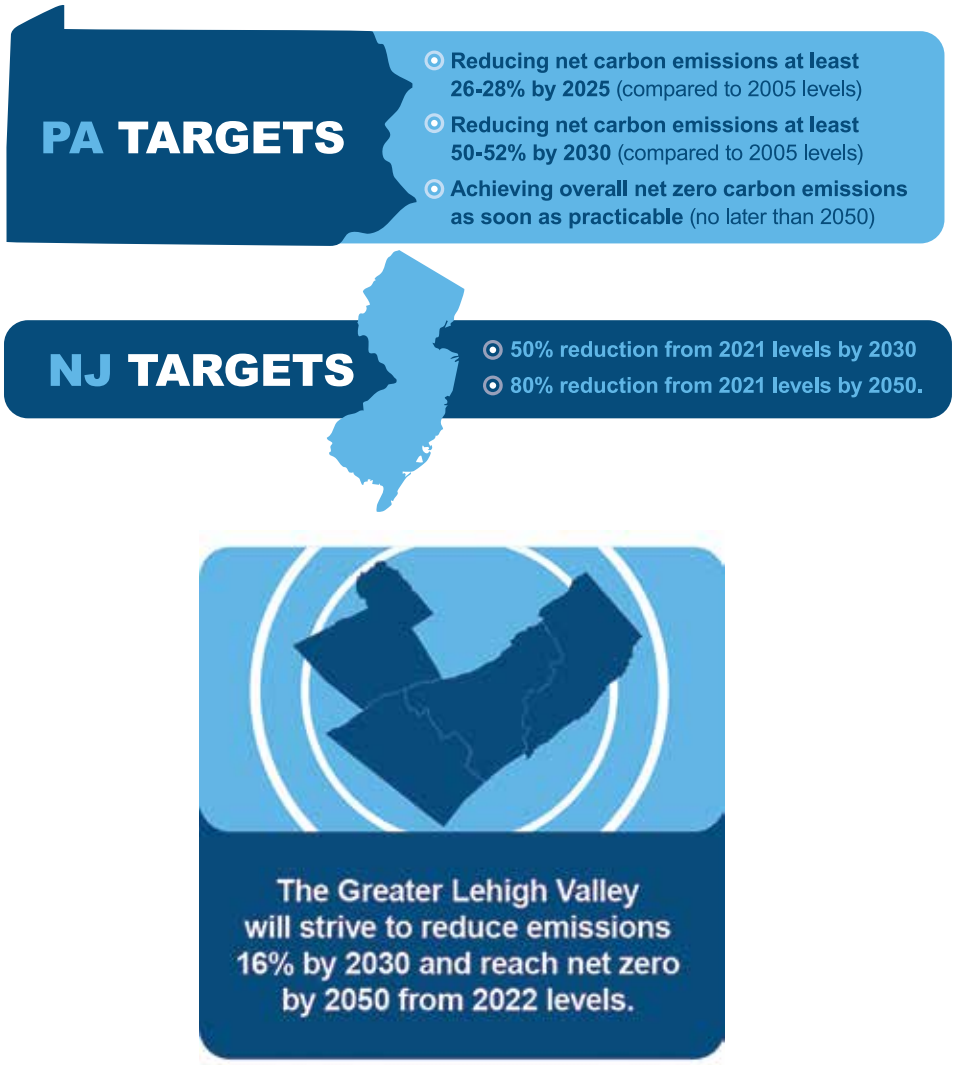
Near and Long-Term Emission Reduction Targets

Setting targets helps define why actions are needed, including improving our region's resiliency to extreme events, reducing energy use and cost, and improving air and water quality. The *Greater Lehigh Valley Greenhouse Gas Inventory* includes a "Business as Usual" projection, which shows that if the greater region continues on the same population and growth trajectory, without any additional reduction measures, regional emissions could increase by 9.3% by 2050.

The reduction targets consider various factors, including the region's baseline emissions date, the business-as-usual emissions trajectory, and alignment with established Pennsylvania and New Jersey state targets that have been based on climate science or technical/economic feasibility. The LVPC reviewed several guidance documents to help with this target setting including the Mitigation Goal Standard, US EPA's Local Action Framework, and the American Planning Association's 7 Principles of Strong Climate Planning. Pennsylvania reduction targets utilize 2005 as a base year, whereas New Jersey uses 2021 as its base year.

As described in the previous chapter, the *Greater Lehigh Valley Greenhouse Gas Inventory* utilized 2022 as its base year for calculating existing emissions and as its baseline for emission reduction goals.

Striking a balance between goals that are ambitious and those that are attainable, LVPC recommends aligning with the PA Statewide targets. Our targets reflect the PA Statewide targets, adjusted for the difference in Greater Lehigh Valley emission baseline year of 2022 vs. the state emissions baseline year of 2005.



System Linkages

This analysis reflects the evaluation of individual emissions reduction measures and more broadly these measures within a regional context, with a focus to improve access to clean transportation, energy efficiency assistance, and funding. Ideally, every proposed solution will address more than one problem at a time, creating a long list of benefits for people, nature and the economy.

These goals, policies and implementation strategies, coupled with ongoing improvements in clean fuel technologies and other climate sector emission reduction measures will benefit the Greater Lehigh Valley's communities, environment and economy. Considering that the Lehigh Valley's population is projected to grow by 15.9%, job growth by 23.9%, and Vehicle Miles Traveled (VMT) by 23% by 2050, the actual reduction in emissions is much more significant for each sector. Typically, emissions reduction strategies work together across sectors, compounding their effects.

Action Plan

Each section includes an overview of the topic. For relevant sections, a summary of emission reductions resulting from proposed actions, compared to the sector-specific Business-As-Usual (BAU) projections is provided.

Additionally, each section outlines several overarching goals, followed by a set of strategies and specific implementation actions.

Potential scenarios including associated reductions, where feasible, are presented including key implementation partners, activities and timeline, progress indicators, estimated costs and savings, and potential funding sources.

Cost and savings estimates included for many of the actions described in this plan reflect several approaches, based on available information and analytic tools. Many reflect data from similar projects or programs adjusting for regional differences, while others are predicted based on historic trends.

The inflation adjustments applied in all cost and benefit calculations were based on an assumed annual inflation rate of 3%, using data from Official Data's inflation calculator (Official Data, US Inflation Calculator 1950–2050). This approach ensured that financial estimates for 2030 and 2050 reflect realistic economic conditions by accurately projecting the future value of money.

Co-pollutant benefits are also included for each sector, along with the proposed strategies alignment with current LVPC, Carbon County and Warren County plans.

To complement the goals and implementation actions described in this plan, the LVPC has identified cross-cutting strategies that can apply to all the identified emissions sectors. These strategies can be utilized to increase the effectiveness of the plan's goals and policies and ensure that plan implementation is robust.

Cross-Cutting Implementation Strategies

The following three cross-cutting strategies detail goals and implementation actions that apply to all emission sectors. These include outreach and education, collaboration, workforce development and funding strategies critical to helping meet regional emission reduction targets. A commitment to unified leadership and action across goals, policies and actions in included. Beyond public policy, and where carbon reduction measures could be accurately assessed and calculated each is outlined. All in all, both qualitative and quantitative measures support improvements in air quality, resiliency, hazard mitigation and overall quality of life.

- Collaboration and Leadership
- Community Resilience
- Finance and Innovation

SECTOR

COLLABORATION AND LEADERSHIP

GOAL Create new patterns of regional collaboration that guide and connect actions

POLICY Create infrastructure to ensure plan implementation.

MEASURES

Create a formal, **COLLABORATIVE IMPLEMENTATION PARTNERSHIP** such as a Green Ribbon Committee.

Track performance towards reaching goals and targets.

PROMOTE AND SUPPORT IMPLEMENTATION of **Pennsylvania's Climate Action Plan** and **New Jersey Energy Master Plan: Pathway to 2050.**

GOAL Empower communities to lead

POLICY Develop a network of climate leaders and ambassadors at all levels.

MEASURES

Continue to collaborate with Warren County NJ Environmental Advisory Council and Carbon County Planning Commission utilizing an Metropolitan Statistical Area approach to coordination.

Develop educational opportunities and materials to advance emissions reductions measures. and goals through the Lehigh Valley Government Academy and similar training programs offered in Carbon County, PA and Warren County, NJ.

Support integration of emissions reduction policies into municipal comprehensive plans.

SECTOR

COMMUNITY RESILIENCE

GOAL Educate the public about climate vulnerability, resilience and action.

POLICY Proactively engage all communities in reducing emissions.

MEASURE

Develop and deploy a long-term strategy for climate resilience communications, outreach and education.

GOAL Support a robust network of resilience resources and programs.

POLICY Focus on emissions monitoring and communications

Further develop the LVPC website as a virtual hub for carbon emission reduction education and resilience resources.

MEASURES

Share resource information with Carbon County, PA and Warren County, NJ Planning Departments and agencies.County, NJ Planning Departments and agencies.

Maintain partnerships and build collaborative relationships with other organizations, including healthcare, **to better educate and serve residents.**

Expand the network of permanent air quality monitors.

GOAL Prepare for Climate Risks and Stresses.

POLICY Increase infrastructure redundancy and resiliency.

MEASURE

Broaden public understanding of resiliency opportunities.

SECTOR

FINANCE AND INNOVATION

GOAL Fund resiliency actions.

POLICY Identify and communicate opportunities to implement carbon

MEASURES

Develop innovative financing solutions to support climate initiatives.

ACTIVELY CONDUCT BUSINESS DEVELOPMENT AND MARKETING to utilize existing financial tools and incentives.

GOAL Leverage green economy through jobs training and the innovation ecosystem to accelerate emissions reductions.

POLICY Support and scale up resiliency-oriented workforce programs.

MEASURES

Invest in targeted energy and green infrastructure training in collaboration with workforce boards, employers and training and educational institutions.

Expand access to education and strengthen local workforce programs.

Tie resiliency action to existing business accelerator and incubator programs.

Launch innovation and design challenges to increase resiliency and support hazard mitigation and reduction.

Emission Reduction Strategies

The following section presents the goals and implementation actions recommended to move us on a pathway to reach regional carbon emissions reduction goals in the near- and long-term, while providing opportunities for a variety of important community benefits. LVPC has prioritized these strategies based on adopted regional and county plans, including the *Lehigh Valley Priority Climate Action Plan for Transportation Decarbonization*, input from its public and stakeholder engagement activities, and discussions with sector experts.

- Commercial and Residential
- Land Use
- Industrial
- Agriculture
- Transportation
- Solid Waste
- Water and Wastewater

SECTOR

COMMERCIAL AND RESIDENTIAL

GOAL Increase commercial and residential building efficiency across the region

POLICY Improve Energy Efficiency of Commercial Buildings

MEASURE

Carbon Emissions Reduction 2030: **33,510**

Carbon Emissions Reduction 2050: **167,549**

POLICY Improve Energy Efficiency of Residential Units

MEASURE

Carbon Emissions Reduction 2030: **157,424**

Carbon Emissions Reduction 2050: **1,259,395**

GOAL Increase commercial and residential use of solar power

POLICY Increase use of rooftop solar as an alternative residential & commercial property energy source

MEASURE

Carbon Emissions Reduction 2030: **430,823**

Carbon Emissions Reduction 2050: **1,836,236**

Detailed breakdown of each pollutant can be found in the regional benefits section

SECTOR
LAND USE

GOAL Support land use decision making that protects natural areas and farmland, utilizes degraded lands and ensures an efficient and cost effective regional development pattern

POLICY Reuse degraded sites such as abandoned mine lands and capped landfills for solar energy generation or other best appropriate uses

MEASURE

Carbon Emissions Reduction 2030: **49,690**

Carbon Emissions Reduction 2050: **248,452**

POLICY Increase farmland and natural resource preservation acreage to protect critical landscapes and encourage efficient development

MEASURE

Carbon Emissions Reduction 2030: **140,310**

Carbon Emissions Reduction 2050: **467,701**

GOAL Green the region through street trees, parks and stormwater infrastructure

POLICY Support increased greening using native species in open spaces, parks and recreation areas

MEASURE

Carbon Emissions Reduction 2030: **12,726**

Carbon Emissions Reduction 2050: **63,632**

SECTOR
INDUSTRIAL

GOAL Reduce industrial emissions in the Greater Lehigh Valley

POLICY Increase industrial efficiency by promoting electrification and low carbon fuel switching for on-site energy generation

MEASURE

Carbon Emissions Reduction 2030: **129,247**

Carbon Emissions Reduction 2050: **411,276**

POLICY Reduce process specific carbon emissions, with a focus on large regional point sources

MEASURE

Carbon Emissions Reduction 2030: **88,996**

Carbon Emissions Reduction 2050: **156,501**

GOAL Transition to a carbon free electricity grid

POLICY Reduce carbon emissions from generation plants by switching to low or zero carbon technologies

MEASURE

Carbon Emissions Reduction 2030: Not quantified

Carbon Emissions Reduction 2050: Not quantified

SECTOR
AGRICULTURE

GOAL Promote sustainable agricultural practices

POLICY Encourage increased adoption of sustainable agricultural practices including cover cropping and reduced/no-till.

MEASURE

Carbon Emissions Reduction 2030: **5,606**

Carbon Emissions Reduction 2050: **19,785**

Detailed breakdown of each pollutant can be found in the regional benefits section

SECTOR
TRANSPORTATION

GOAL Implement *Walk/RollLV: Active Transportation Plan*

POLICY Completion of priority bicycle corridors and work to eliminate sidewalk gaps

MEASURE

Carbon Emissions Reduction 2030: **1,149**

Carbon Emissions Reduction 2050: **1,200**

GOAL Increase Transit Ridership

POLICY Increase connection to, and investment in, public transportation infrastructure.

MEASURE

Carbon Emissions Reductions 2030: **1,833**

Carbon Emissions Reduction 2050: **3,720**

GOAL Support Deployment of Alternative Fueled Vehicles

POLICY Increase percentage share of Alternative Fuel Vehicle (AFV) registrations

MEASURE

Carbon Emissions Reduction 2030: **285,957**

Carbon Emissions Reduction 2050: **297,013**

Detailed breakdown of each pollutant can be found in the regional benefits section

GOAL Increase alternative fueling infrastructure

POLICY Increase number and geographic range of alternative fueling infrastructure

MEASURE

Carbon Emissions Reduction 2030: **5,644**

Carbon Emissions Reduction 2050: **13,791**

GOAL Reimagine and retrofit major transportation corridors with Green Infrastructure

POLICY Integrate carbon sequestration into transportation infrastructure

MEASURE

Carbon Emissions Reduction 2030: **8,035**

Carbon Emissions Reduction 2050: **51,835**

GOAL Plan and Implement Intelligent Transportation Systems

POLICY Reduce congestion on regional highways and major corridors

MEASURE

Carbon Emissions Reduction 2030: **2,527**

Carbon Emissions Reduction 2050: **2,010**

SECTOR
SOLID WASTE

GOAL Reduce emissions from landfills

POLICY Prioritize diverting organic waste from landfills and promoting soil health and organic waste reuse through compost application

MEASURE

Carbon Emissions Reduction 2030: **3,591**

Carbon Emissions Reduction 2050: **32,316**

POLICY Reduce the impact of current waste collection and disposal systems and encourage best practices for waste management

MEASURE

Carbon Emissions Reduction 2030: Not quantified

Carbon Emissions Reduction 2050: Not quantified

Detailed breakdown of each pollutant can be found in the regional benefits section

SECTOR

WATER AND WASTEWATER

GOAL Promote improved energy efficiency at water and wastewater treatment facilities

POLICY Reduce emissions of water and sewer systems and building infrastructure through efficiency upgrades and leakage emission initiatives

MEASURE

Carbon Emissions Reduction 2030: Not quantified

Carbon Emissions Reduction 2050: Not quantified

POLICY Reduce emissions from wastewater processing through recovery of waste products

MEASURE

Carbon Emissions Reduction 2030: Not quantified

Carbon Emissions Reduction 2050: Not quantified

Leveraging Funding Resources

The success of decarbonization initiatives across the Greater Lehigh Valley Region relies on the adept management and leveraging of funding resources and efficient resource allocation. Just as individual emissions reduction strategies work across sectors, compounding their effects, individual funding programs can be aggregated to maximize resources.

This process involves identifying and securing funding opportunities and ensuring that these resources are directed efficiently towards projects that offer the most carbon reduction, sustainability and community co-benefits.

This section includes a general overview of funding types for decarbonization efforts across the region's sectors. Specific funding sources/programs are included within each emitting sector's goals and policies section within this plan.

Securing Funding

A key strategy involves tapping into a variety of sources, allowing applicants to seek opportunities to attract more resources (cash, in-kind services) to multiply the impact of primary funding sources and meet potential match requirements. This is particularly applicable for more complex projects.

- Grants, whether federal, state or from non-governmental organizations, are a primary source. These grants often target specific areas, such as sustainable transportation or innovation in transit systems, residential and commercial building efficiency, industrial process efficiency, solar retrofits, farmland and open space preservation, and county and state waste management and recycling initiatives.
- Public-private partnerships (PPPs) leverage the strengths of both sectors – the efficiency and innovation of the private sector combined with the public sector's regulatory support and broad perspective. PPPs can be particularly effective in large-scale infrastructure projects or in areas where new technology is being implemented.
- Governmental budgets at the state and local levels are also crucial. Allocating funds from these budgets requires advocacy and lobbying to ensure decarbonization is prioritized within the broader context of government spending.

Allocating Resources Efficiently and Equitably

- Leveraging resources requires a strategic approach. Priority should be given to projects that promise the most significant carbon reduction. This involves a thorough analysis of potential projects based on criteria such as emission reduction potential, cost-effectiveness, feasibility and long-term sustainability.
- Resource allocation priorities must include evaluation of community impact to ensure that benefits are available and accessible to all community members. It also involves a balancing act between investing in proven technologies and innovative solutions. While established methods provide a certain level of security for outcomes, innovation is crucial for long-term advancements in decarbonization.

Monitoring and Evaluation

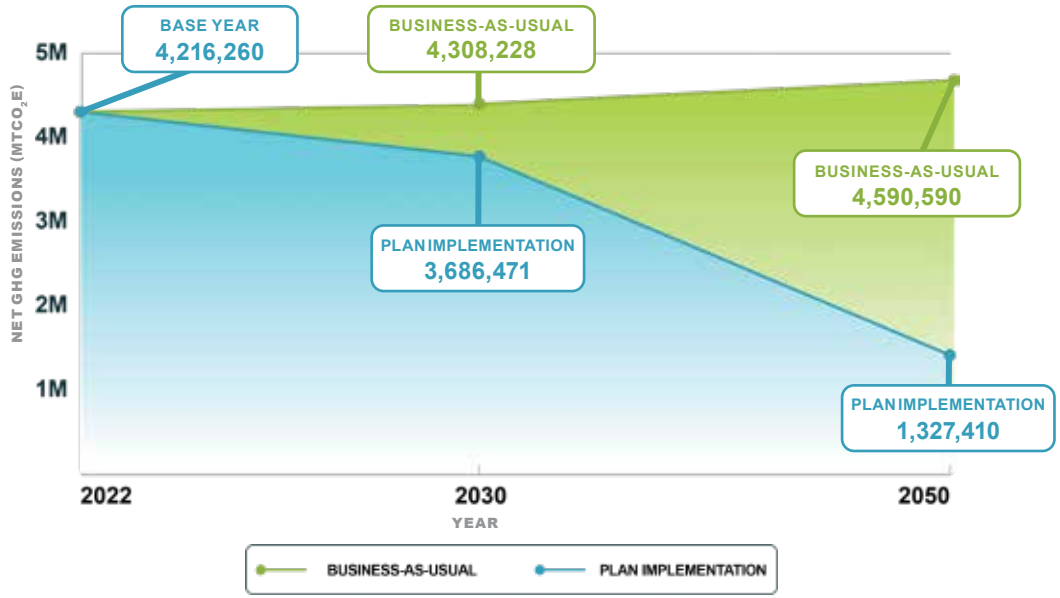
- Equally important is the establishment of robust monitoring and evaluation system. This ensures that resources are being used effectively and the projects are on track to meet their decarbonization goals.

Stakeholder Involvement

- Engaging stakeholders in the funding and resource allocation process also adds value. It ensures transparency and builds trust among the public and private entities involved. Stakeholder feedback can also provide insights into how resources can be best utilized to meet the community's needs.

Healthy and Resilient Homes and Buildings

Commercial/Residential Sector Emissions Reduction Estimates ($MTCO_2e$)



-14%

2030 Implementation
Estimated Emissions Reduction

-71%

2050 Implementation
Estimated Emissions Reduction

Impacted Sectors:
Commercial and Residential Energy

Overview

In the United States, on-site fossil fuel combustion primarily for space and water heating, accounts for 40% of on-site energy usage in commercial buildings. Even if a grid is converted to 100% renewable energy, more than half of on-site energy consumption remains to be decarbonized.

The U.S. commercial building stock consumes 11% of the natural gas and 34% of the electricity used in the country. This consumption, plus a smaller number of other fuels, means that the commercial sector is responsible for 16% of U.S. CO_2 emissions from energy consumption.

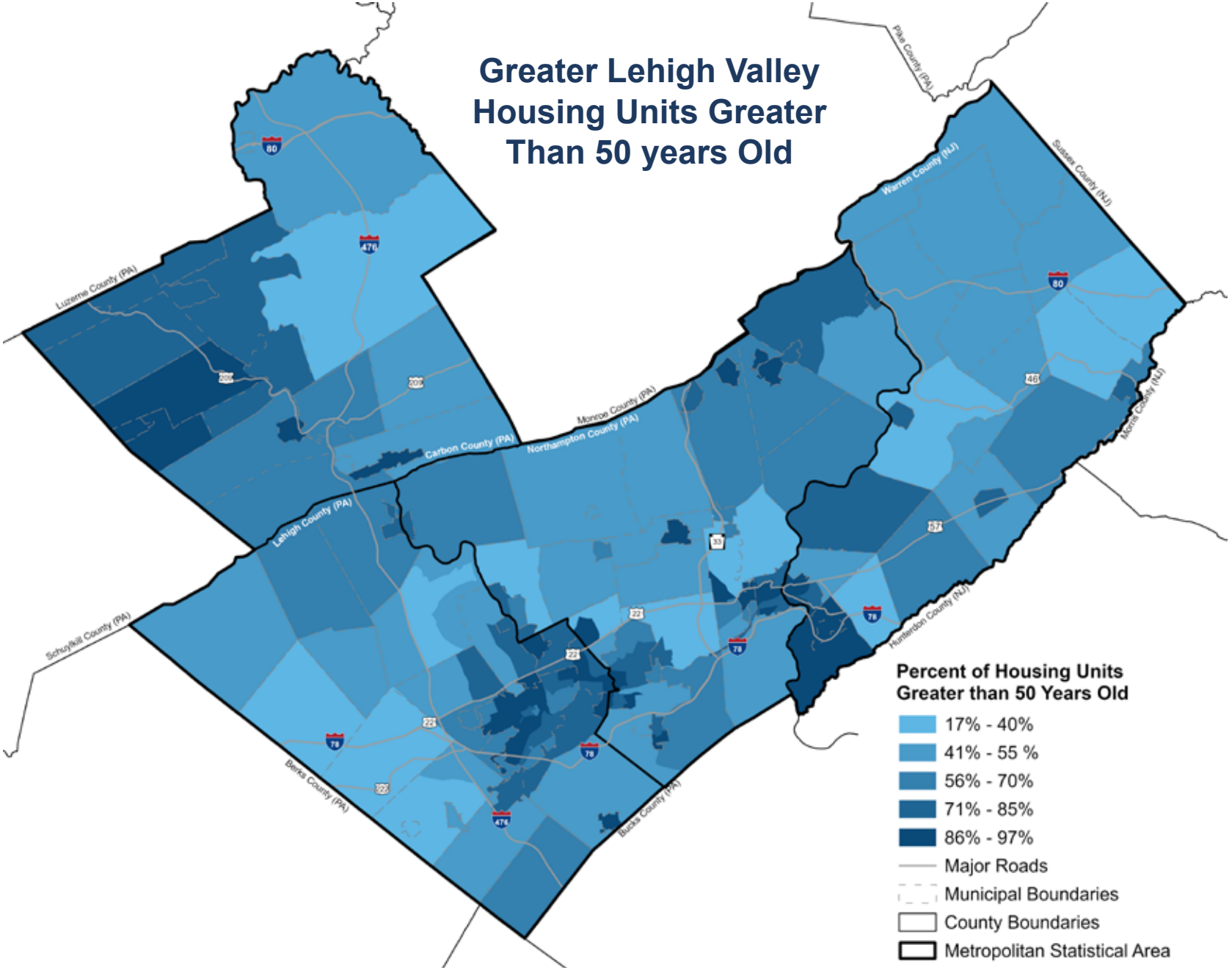
For the Greater Lehigh Valley, these two sectors combined are the largest source of carbon emissions at 33.1% or 4,216,260 $MTCO_2e$ yearly. Commercial emissions are typically derived from space heating, cooling, ventilation and lighting. Significant contributors are offices, educational institutions, retail businesses and warehousing. Residential emissions stem from electricity demand for heating, cooling, lighting and appliances. This combined sector offers significant opportunities for energy savings, increased efficiencies and reduced carbon gas emissions.

There are approximately 4,500 commercial facilities in the Greater Lehigh Valley region with over 137 specifically within the healthcare realm and 464 local and state-owned buildings. These buildings vary greatly in size, function and employment, but each offers locations to improve upon existing building controls, lighting, heating/cooling and water usage.

According to US Census American Community Survey, there are over 345,000 occupied housing units in the four-county Greater Lehigh Valley region. Approximately 213,000, or 62%, rely on natural gas, propane, or fuel oil. Conversely, 118,813 of the occupied housing units, or 34%, use electricity for energy. Less than 1% of the region's housing units rely on solar power.

Furthermore, the region contains a large amount of aging housing. About 65% of the region's housing stock is over 50 years old, with higher percentages in the older cities and boroughs. Aging buildings typically generate greater carbon emissions because they are more reliant on natural gas, propane, and heating oil. They can also have higher energy demand due to air seeping through older windows, doors and insulation, making heating and cooling systems operate less efficiently. This information was used to analyze specific targeting of older buildings for energy upgrades.

Greater Lehigh Valley Housing Units Greater Than 50 years Old



GOAL 1 Increase Commercial and Residential Building Energy Efficiency Across the Region

This goal will reduce emissions through a range of energy efficiency and electrification investments and land use policies within the region's commercial and residential building sectors. These include improvements to reduce gas and electricity use, promoting updates to building codes to encourage sustainable systems, and updating land use and building codes to support quality sustainable design and construction. This measure can be implemented by a range of stakeholders throughout the region.

Implementation Actions

1. Improve Energy Efficiency of Commercial Buildings.

- Encourage energy efficiency of through enhancements to building codes and land use ordinances to better enable sustainable development and reduce barriers to the use of renewable or alternative energy sources.
- Provide information on a range of financial assistance resources for benchmarking, building audits, and energy upgrades.
- Promote utility-based energy efficiency incentive programs available in PA and NJ to encourage improvements to commercial and industrial buildings.
- Increase percentage of energy efficiency upgrades for facilities including energy conservation measures discovered through energy auditing

2. Improve Energy Efficiency of Residential Units.

- Encourage energy efficiency of all new residential subdivisions and multi-family projects through building codes, zoning and site planning design that incorporate other accepted standards, including smaller lot sizes for new construction.
- Provide information on a range of financial assistance resources for benchmarking, home audits, and energy upgrades.
- Promote utility-based energy efficiency incentive programs available in PA and NJ to encourage home improvements.
- Increase percentage of energy efficiency upgrades for residential units, including targeted retrofitting of older residential buildings.

By 2050 – Emissions Could Be Reduced By:

- 16,545 $MTCO_2e$ annually if 50% of public buildings in Greater Lehigh Valley implemented energy efficiency upgrades.
- 6,209 $MTCO_2e$ annually if 50% of healthcare facilities implement energy efficiency upgrades.
- 589,055 $MTCO_2e$ annually if 50% of housing units over 50 years old implement energy efficiency upgrades.

GOAL 2 Increase Commerical and Residential Use of Solar Power

This goal includes actions to support funding and implementation for the installation of on-site distributed solar systems to provide alternative power sources and mitigate/reduce energy costs for commercial and residential buildings, primarily via roof mounted systems. Reductions calculated as 10% by 2030 and 40% by 2050, based on PA Solar Targets for 2030. These systems improve air quality by reducing emissions from grid electricity generation sources.

Implementation Actions

1. Increase use of rooftop solar as residential & commercial property energy sources.

- Support programs to increase access to and funding for solar power systems on commercial and residential properties.
- Provide tools for municipalities and business owners including supportive ordinances.
- Promote and educate public on benefits and funding resources.

2. Increase whole building performance and health for commercial buildings.

- Market building performance standards, energy benchmarking, and energy efficiency programming and incentives available through the Commonwealth of Pennsylvania, State of New Jersey and non-profit partners.
- Encourage certification of every public building for Energy Star or LEED.
- Encourage implementation of energy efficiency and renewable energy strategies at schools, universities, nonprofit organizations, libraries and other public facilities.

3. Increase healthy and resilient housing.

- Maximize savings through energy efficiency and healthy home programs.
- Embed energy efficiency and durability in affordable housing efforts.
- Encourage local governments to adopt and implement property maintenance codes to support healthy housing.
- Expand water use efficiency awareness and programs.
- Support housing preservation, restoration and rehabilitation

Key Implementing Agencies and Partners

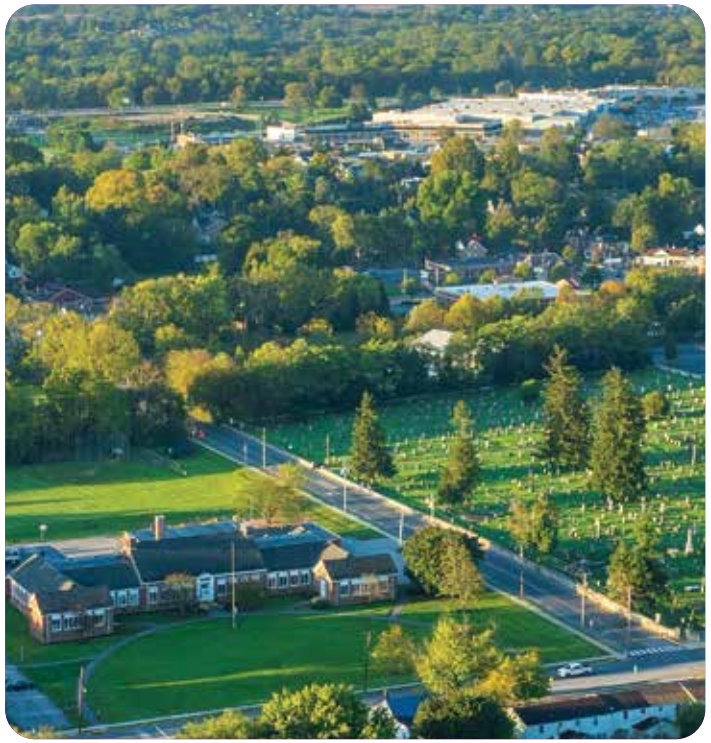
- County and Local Governments: LVPC, Carbon County and Warren County Planning Commissions
- State Agencies: PA Public Utilities Commission, PA Department of Environmental Protection energy program office and New Jersey Department of Environmental Protection
- Utilities: Met-ED, PPL, and Jersey Central Power & Light
- Property Owners, Developers and Renters
- Builders, Contractors and Equipment Service Providers
- Local Non-Profits

Authority to Implement

- Pennsylvania Utilities are mandated to provide energy efficiency programs through Pennsylvania Act 129.
- The LVPC and local Pennsylvania planning commissions are provided authority to regulate land use via PA Act 47 – The Pennsylvania Municipalities Planning Code.
- New Jersey, municipalities are granted the authority to plan and zone for development by the Municipal Land Use Law (MLUL). The MLUL requires that municipalities include in the land use plan element of their master plans a “climate-related hazard vulnerability assessment” that analyzes “current and future threats to, and vulnerabilities of, the municipality associated with climate related natural hazards
- Individual property owners can implement benchmarking activities including energy audits. Additionally, they can implement recommended changes/upgrades as appropriate based on energy efficiency goals and budget considerations.

Progress Indicators

- Investment in building upgrades
- Number and type of residential and commercial buildings retrofitted
- Energy savings and emission reductions from retrofits
- Workforce development training and jobs created for residents and in Greater Lehigh Valley
- Targeted education or skill uplift training and opportunities for building contractors
- Technical assistance requests
- Ordinances amended & adopted
- Energy audits completed
- Benchmark studies completed
- Investment for energy audits



Commercial/Residential - Estimated Costs and Savings

Implementation Action	Baseline Cost Info	Scenario Cost Info	Cost Savings 2030 (Regionwide)	Cost Savings 2050 (Regionwide)	Cost Savings 2030 (Unit)	Cost Savings 2050 (Unit)
Energy efficiency upgrades for commercial buildings (Wall & roof insulation, new windows, LED lighting, heat pump)	Masonry Wall cost $27-34/ ft²	Wall insulation costs $5/ ft² and $15 ft² for storm/low-e windows	Commercial (10% buildings): $18,063,321/year	Commercial (50% buildings): $174,882,912/year	Commercial: $38,351/ building/year	Commercial: $69,288/ building/year
	Average 60-watt incandescent bulb costs $19 every year when used for 5 hours each day	LED at $3.00–$4.00/ft² installation and between $2-3 when used 5 hours per day				
		Commercial heat-pump system $17-24/ ft²				
Energy efficiency upgrades for residential buildings (Energy Star heat pump with electric backup plus light touch envelope improvements)	Average installation cost new HVAC system ranges between $5,000 and $12,500	Home retrofit heat pumps cost about $17,000 before tax credits	Residential (10% households): $43,767,157/year	Residential (50% households): $423,602,529/year	Residential: $1,176/home per year	Residential: $2,124/home per year
	Combined heating + cooling costs for a typical U.S. home average $900–1,000/year	Heat pumps save homeowners $459 (vs electric) and $948 (vs oil) annually				
		Energy Star vinyl window retrofitting costs $90 per sq. ft. & saves approx. $311 per year				
Increasing % of commercial/ residential electricity demand met through solar	Average retail electricity price for residential customers: $0.18 cents per kwh	Home solar panels cost about $3 per watt ($14,000 avg per home) and can save $1,100 in energy costs annually	Residential (10% households): $105,573,790/year	Residential (40% households): $762,185,785/year	Residential: $2,838/home per year	Residential: $5,122/home per year
	Average retail electricity price for commercial customers: $0.11 cents per kwh	Commercial Installation cost Approximately $2.50 to $3.00 per watt, depending on system size and complexity	Commercial (10% buildings): $8,279,520/year	Commercial (40% buildings): $64,086,492/year	Commercial: $17,579/ building per year	Commercial: $31,742/ building per year

Funding Sources

Examples of potential funding sources include, but are not limited to:

- US Department of Energy (USDOE) Energy Efficiency and Conservation Block Grants
- USDOE Home Efficiency Rebates and Home Electrification and Appliance Rebates
- USDOE State Energy Program
- USDOE and State Weatherization Assistance Programs
- US Department of Housing and Urban Development Green and Resilient Retrofit Program
- The Keystone Energy Efficiency Program (KEEP) Home Energy Loan
- C-PACE (NJ and PA) – Commercial Property Assessed Clean Energy Program, Authorized in Lehigh, Northampton and Warren counties
- Pennsylvania Energy Development Authority (PEDA)
- PA Green Energy Loan Fund (GELF)
- PA Municipal Opportunities for Retrofits and Energy Efficiency (MORE) Program

Co-Pollutant Estimates

These are estimates of local co-pollutants such as carbon monoxide (CO), ammonia (NH_3), nitrogen oxide (NO_x), particulate matter 2.5 & 10, sulfur dioxide (SO_2) and volatile organic compounds (VOC), that would also be reduced along with carbon emissions, with implementation of this plan.

Commercial + Residential Sector Implementation Scenario Co-Pollutant Estimates			
Year	2022	2030	2050
Annual Emissions (Metric Tons)	45,528	39,853	14,364

For detailed co-pollutant breakdown estimates, please see Regional Benefits Analysis section.

COMMERCIAL AND RESIDENTIAL BUILDING SOLAR UPGRADES

EMISSION REDUCTION ESTIMATES
($MTCO_2E$)

2030

10% OF SECTOR ENERGY PRODUCED BY SOLAR
COMMERCIAL **273,579** | RESIDENTIAL **157,244**

430,823

2050

40% OF SECTOR ENERGY PRODUCED BY SOLAR
COMMERCIAL **1,157,089** / RESIDENTIAL **679,147**

1,836,236

Community Benefits

- Reduced energy costs for residents and small business owners.
- Reduced energy costs for local and county governments.
- Increased property values and potential tax revenue.
- Improved health outcomes; reductions in healthcare costs for residents.

Plan Alignment

LVPC – *FutureLV: The Regional Plan*

- Efficient and Coordinated Development Pattern
- Protected and Vibrant Environment

LVPC – *Climate and Energy Element*

- Create Land Use Patterns to help mitigate climate impacts.
- Provide Building and Site Design Practices to help mitigate climate impacts.
- Reduce Lehigh Valley carbon emissions from residences, government operations and businesses.
- Promote energy efficiency and natural resource conservation within existing and new buildings and land development.

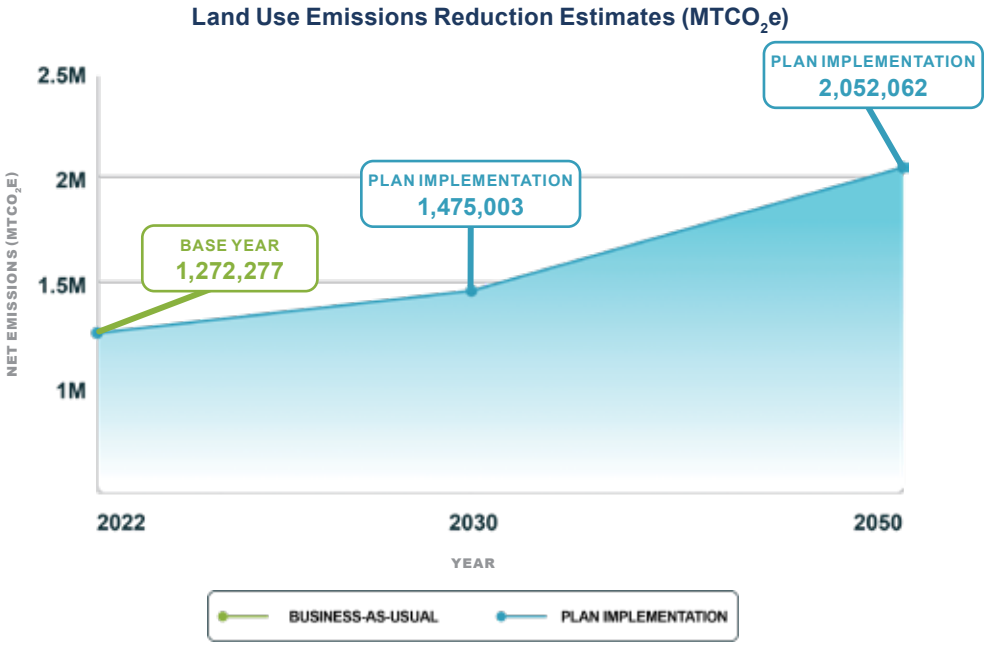
Carbon County – *Carbon County Implementable Comprehensive Plan Draft*

- Improve the built environment and support infrastructure that sustains the county's natural and cultural assets.

New Jersey Bureau of Public Utilities – *Energy Master Plan*

- Reduce energy consumption and emissions from building sector.

Community Greening



-16%
2030 Implementation
Estimated Emissions Reduction

-61%
2050 Implementation
Estimated Emissions Reduction

Impacted Sectors: Land Use, Agriculture

Overview

Protecting the region's farmland and natural areas can reduce carbon emissions by preserving natural carbon sinks, encouraging more efficient building construction and reducing vehicle travel. The Greater Lehigh Valley contains a diverse set of landscapes that make the region unique. Preserving the uniqueness of these landscapes helps ensure an attractive and vibrant region and is a theme of key LVPC planning documents, such as *FutureLV: The Regional Plan* and *Livable Landscapes.* The region's landscapes such as forests, wetlands and farmland also serve important roles as carbon sinks. They take carbon gases from the atmosphere and store them in the ground, in a process called sequestration. The Greater Lehigh Valley is one of the fastest-growing regions in the state, presenting unique challenges to the landscapes and environment.

Today, the Greater Lehigh Valley is growing rapidly and is projected to add more than 100,000 people by 2050. As people and commerce move to the region, there is intense pressure to develop land. Since 2000, most residential and commercial development in the region has been in suburban municipalities. Land use can be a significant contributor to regional carbon emissions because sprawl from low density development can increase car dependency and vehicle traffic, create carbon intensive and less efficient buildings, and disturb more land, disrupting natural carbon sinks.

In the 19th and 20th centuries, the Greater Lehigh Valley's economy was centered around manufacturing and natural resource extraction. Many of those operations have since closed or moved, often leaving behind environmentally degraded sites. Redeveloping these sites can reduce carbon emissions, by keeping travel generators within urban areas, lowering trip distances and making alternative transportation modes more viable. Carbon emissions can also be avoided by directing development demand to these already developed sites, rather than farmland or forests that actively sequester carbon. Costs can be reduced by capitalizing on existing infrastructure, such as electricity, roads and water and sewer. Numerous and diverse brownfield redevelopments have been implemented across the region, including the former Bethlehem Steel site, one of the largest in the nation.

LAND USE SECTOR SEQUESTRATION ESTIMATES (MTCO2E)

2022 (BASE YEAR)	2030 (PROJECTION)	2050 (PROJECTION)
IMPLEMENTATION SCENARIO	IMPLEMENTATION SCENARIO	IMPLEMENTATION SCENARIO
1,272,277	1,475,003	2,052,062

Implementation Actions

GOAL 1

Support land use decision-making that protects natural areas and farmland, utilizes degraded land, and ensures an efficient and cost-effective regional development pattern

1. Reuse degraded sites such as abandoned mine lands and capped landfills for solar energy generation or other best appropriate uses.

- Amend municipal ordinances to facilitate redevelopment of sites.
- Identify locations for redevelopment and infill in planning documents.
- Coordinate between municipalities and other stakeholders, including developers, state agencies and land trusts.

Degraded sites in suburban, exurban or rural areas provide opportunities for reuse as well. There are 31 sites in the region, all in Carbon County, that are identified by the Commonwealth of Pennsylvania as abandoned mine lands. In addition, there are nine landfills, both open and closed, across the greater region. While there are many considerations that determine if or how a degraded site is redeveloped, one opportunity identified by the US EPA and PA DEP is for solar energy generation. Solar on these sites can provide carbon-free electricity while serving as a source of revenue for municipalities who can lease public lands for these systems and sell excess back to grid. The EPA's RE-Powering Mapper tool prescreens contaminated lands, landfills and mine sites for renewable energy development, and across the greater region's abandoned mine sites and landfills, there is potential for over 1,100 megawatts (MW) of solar power. Installing solar facilities on these sites provides the opportunity for large reductions in carbon emissions. For example, the largest abandoned mine site in the greater region is 778 acres, with a solar potential of 113 MW. If such a solar facility was to exist, over the course of a year, it could reduce over 95,000 $MTCO_2e$ and produce enough electricity to power over 13,000 homes.

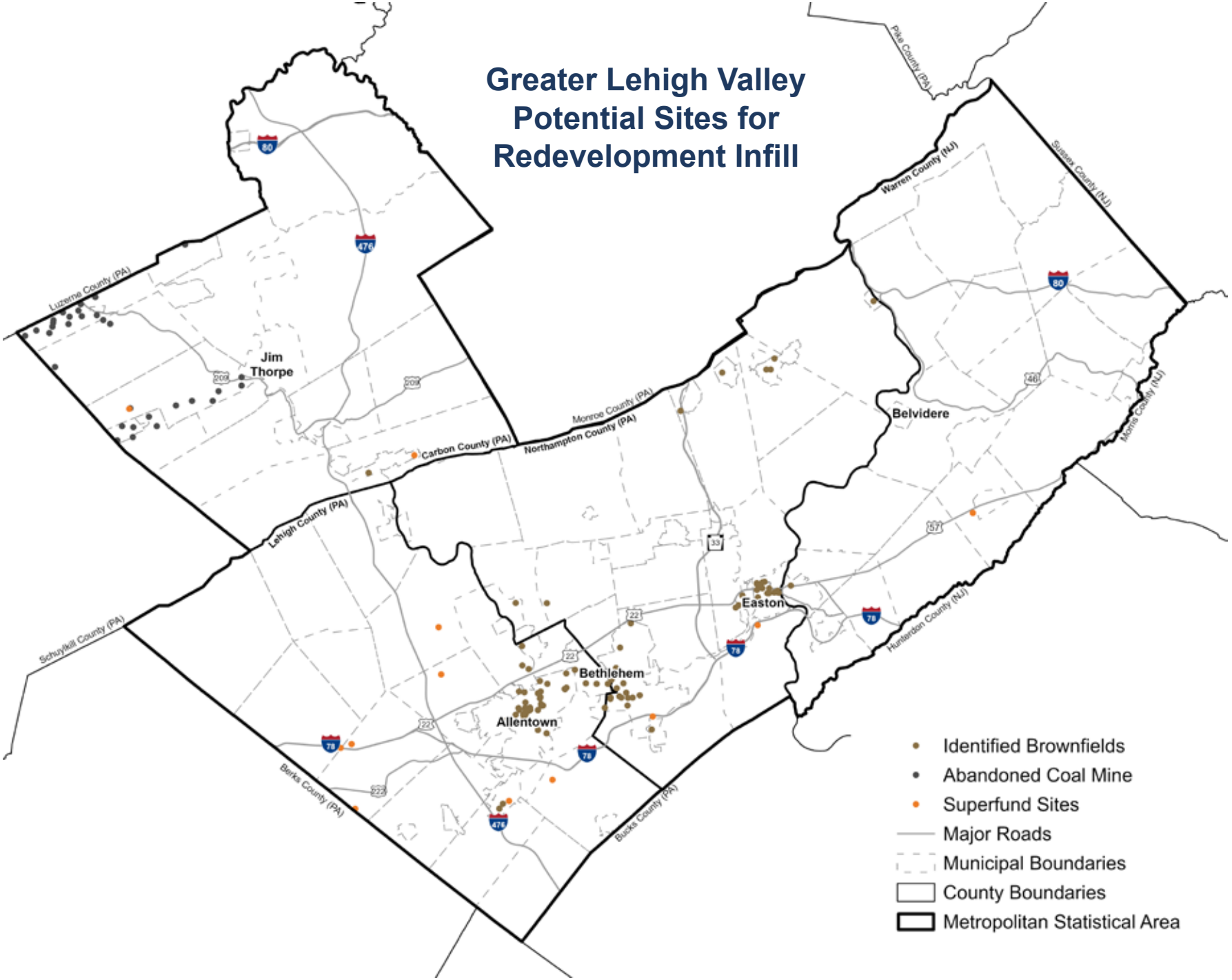
Notable Regional Examples of Brownfield Redevelopment

- Foul Rift solar installation on former mine site in White Township, Warren County
- Logistics complex on former Ingersoll-Rand chemical plant in Phillipsburg, Warren County
- Hackettstown Crossing mixed-use and transit-oriented redevelopment on former factory site in Hackettstown, Warren County
- Easton Silk Mill redevelopment in Easton, Northampton County
- Bethlehem Steel redevelopment in Bethlehem, Northampton County
  - At time of project, largest privately owned brownfield redevelopment in the nation
- Waterfront redevelopment in Allentown, Lehigh County
- Lehigh Gap Nature Center on former Palmerton zinc smelter site in Lehigh/Carbon County

2. Increase farmland and natural resource preservation acreage to protect critical landscapes and encourage efficient development.

- Increase enrollment in municipal Agricultural Security Area (ASA) program.
- Support increase in municipal open space and land conservation funding initiatives.
- Update and implement comprehensive plans to keep development in and around regional centers and corridors.
- Promote planning, zoning and ordinance updates to conserve natural resources.
- Support natural area restoration efforts, such as meadows and riparian buffers.

Greater Lehigh Valley Potential Sites for Redevelopment Infill



3. Create resilient, ecologically healthy landscapes.

- Conserve and protect the greater region's forests, floodplains, wetlands, riparian buffers and steep slopes.
- Increase naturalized and natively vegetated landscapes, especially on publicly owned lands.
- Invest in landscape-scale sequestration projects.
- Incentivize the use of green development practices.

Over 77,000 acres of farmland – equivalent of 120 square miles -- are preserved in the greater region. Widespread open space preservation prevents development in protected areas and encourages it to be focused in and around population and economic centers and corridors, which are generally better suited to accommodate this growth. The Greater Lehigh Valley benefits from a more efficient development pattern, as people can have more transportation options, shorter distances to amenities and enjoy abundant farmland and natural areas.

Both forests and wetlands provide immense environmental, recreational, economic and cultural benefits to the region.

Much of the Greater Lehigh Valley is covered by forest, particularly Carbon County, which is in the Appalachian Mountains. Forests take in and store large amounts of carbon and are more efficient at doing so when they are older and contiguous. While taking up a much smaller area, wetlands sequester carbon more efficiently and are a critical piece of the natural carbon cycle. Sprawl threatens the natural carbon sequestration process by fragmenting and removing sections of forests and wetlands, making them far less efficient or halting the process altogether.

In 2022, over

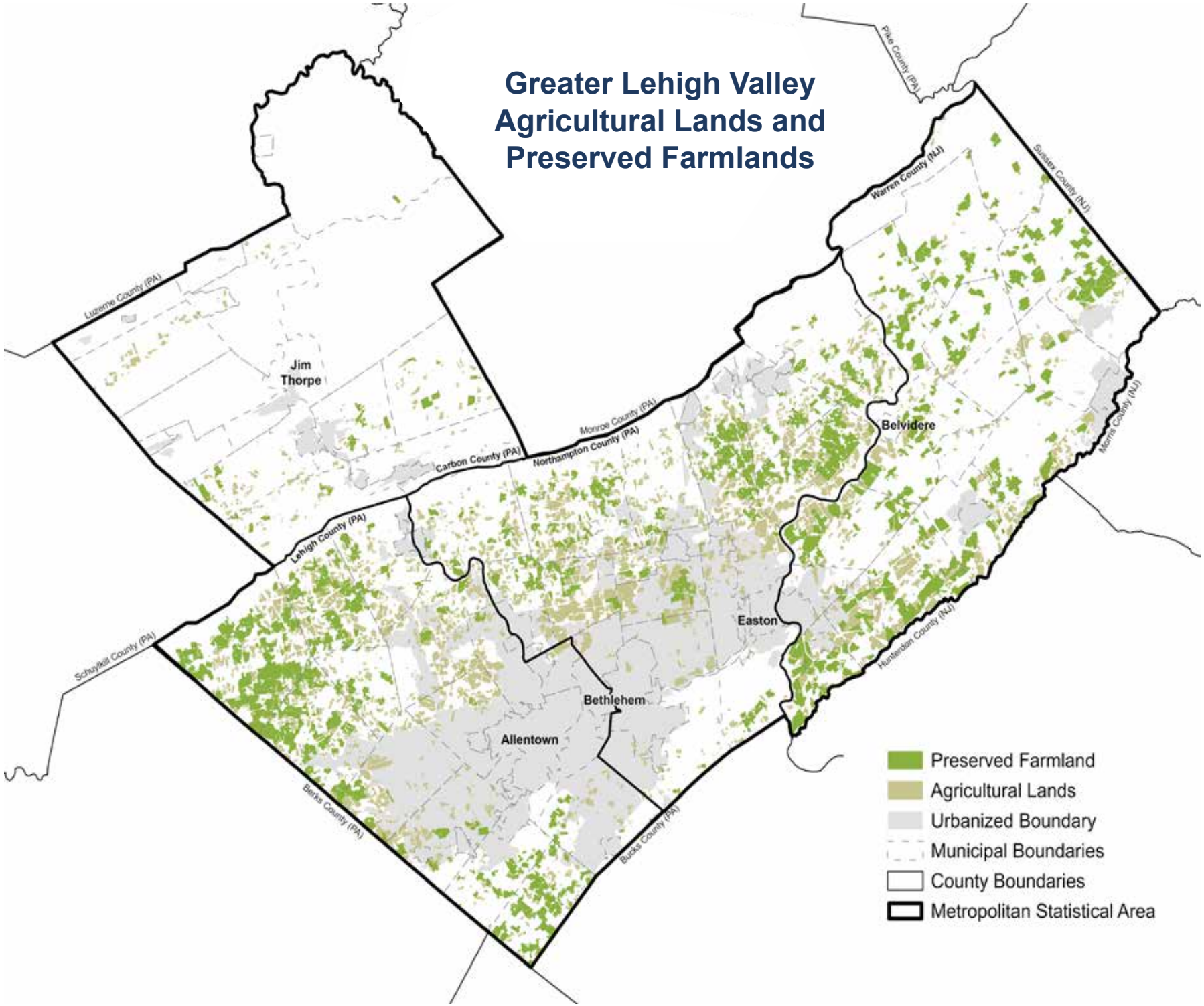
80%

of Carbon County voters approved a Water, Farms and Land referendum to spend

$10 MILLION

to support farmland preservation and natural lands conservation

Greater Lehigh Valley Agricultural Lands and Preserved Farmlands



Key Implementing Agencies and Partners

- County Planning Commissions
- Municipal Governments
- County Conservation Districts and Farmland/Open Space Preservation Boards
- State Agencies including the Pennsylvania Departments of Agriculture, and Environmental Protection, and New Jersey Departments of Agriculture and Environmental Protection
- Property Owners
- Non-Profits Organizations and Land Trusts

Authority to Implement

Municipalities have the authority to enforce codes, such as zoning and subdivision and land development, that guide land use decisions. The New Jersey Municipal Land Use Law (MLUL) requires that municipalities include in the land use plan element of their master plans a “climate-related hazard vulnerability assessment” that analyzes “current and future threats to, and vulnerabilities of, the municipality associated with climate related natural hazards. To further protect their natural and farmland resources, municipalities can establish open space/ farmland preservation boards or environmental advisory councils.

- Counties and municipalities are enabled to raise funds through open space bond referendums.

Progress Indicators

- Municipalities and total properties in ASA program
- Preserved farmland acreage across the greater region
- Preserved open space acreage across the greater region
- Proposed solar capacity on redevelopment sites
- Land development proposals on redevelopment sites
- Open space funding ballot referendums
- Number of environmental advisory councils in the greater region
- Counties and municipalities are enabled to raise funds through open space bond referendums

Land Use Sector - Estimated Costs and Savings

Implementation Action	Baseline Cost Info	Scenario Cost Info	Cost Savings 2030 (Regionwide)	Cost Savings 2050 (Regionwide)	Cost Savings 2030 (Unit)	Cost Savings 2050 (Unit)
Increasing acreage of farmland preservation land	Regional average cost of $3,460 per acre preserved Cropland in region provides $1,090 per acre per year in ecosystem services	**2030 Total Cost:** $35,400,037 Per Acre: $4,009 **2050 Total Cost:** $212,999,112 Per Acre: $7,244	Ecosystem services: $11,145,275	Ecosystem services: $67,072,186	Ecosystem services value per acre: $958	Ecosystem services value per acre: $1,729
Increasing regional tree canopy	**Ecosystem services per acre in region:** Wetland: $10,567 Riparian: $2,728 Forest:$1,643	Costs such as property acquisition, insurance, property taxes, and ecological management and restoration.	Ecosystem services: $8,349,073	Ecosystem services: $75,360,969	Ecosystem services value per acre: $1,904	Ecosystem services value per acre: $3,438
Increasing tree canopy in Urbanized Areas	Tree cover in Urbanized Area municipalities provides about $92.7 million worth of CO_2e sequestration Planting street trees costs about $250/tree	**2030 Total Cost:** $9,209,148 $290/tree $2,028/acre **2050 Total Cost:** $212,999,112 Per Acre: $46,043,712 $523/tree $3,663/tree	Ecosystem services: $2,150,609	Ecosystem services: $19,374,018	Ecosystem services value per acre: $474	Ecosystem services value per acre: $853

Land Use Sector - Estimated Costs and Savings

Implementation Action	Baseline Cost Info	Scenario Cost Info	Cost Savings 2030 (Regionwide)	Cost Savings 2050 (Regionwide)	Cost Savings 2030 (Unit)	Cost Savings 2050 (Unit)
Reusing degraded sites for solar generation	**Abandoned Mine Land** Acres in Region: 7,060 Solar Energy Potential: 1,023 MW **Landfills** Acres in Region: 1,039 Solar Energy Potential: 151 MW	Utility ground mount solar costs $1.20/watt Solar energy can be sold to grid at wholesale rate ($36/MWh for PPL in July 2025) Municipalities can lease land for about $800 to $2,200 per acre **2030 Total Cost:** $16,342,080/year Per Acre: $201,662/year **2050 Total Cost:** $29,381,220/year Per Acre: $363,340/year	Commercial (10% buildings): $18,063,321/year	Commercial (50% buildings): $174,882,912/year	Commercial: $38,351/ building/year	Commercial: $69,288/ building/year

Funding Sources

Examples of potential funding sources include, but are not limited to:

- PA Department of Conservation and Natural Resources (DCNR) Community Conservation Partnerships Program
- PA Department of Community and Economic Development (DCED) Act 13 programs
- PA DEP Growing Greener Program
- National Fish and Wildlife Foundation grants
- New Jersey Brownfields Redevelopment Incentive Program
- New Jersey Green Acres Program
- State, County and Municipal Farmland/Open Space Preservation Programs
- Pennsylvania Conservation Landscapes Mini Grants
- Kittatinny Ridge
- Lehigh Valley Greenways
- Pocono Forests and Waters

Community Benefits

- Increased tax revenue from redeveloped sites, including former brownfields or abandoned mines
- Improvement of the soil and water quality on cleaned and redeveloped former brownfields or abandoned mines
- Reduction in air pollutants from less vehicle travel
- Maintained and increased ecosystem services from landscapes
- Ecosystem services: Monetary value of landscapes provided through improving water quality, flooding, resilience, air quality, recreation, property values and more
- Wetlands: $12,410 benefit per acre; 35,683 acres; $377,078,462 total benefit
- Forests: $1,764 benefit per acre; 438,231 acres; $720,031,613 total benefit

Plan Alignment

LVPC - *FutureLV: The Regional Plan*

- Protected and Vibrant Environment

LVPC - *Climate + Energy Element*

- To create a land use pattern that helps to mitigate climate impacts through a compact urban development area, mixed land uses, higher densities in urban areas and through preserving land for agricultural and environmental purposes.

LVPC - *Livable Landscapes*

- Preserve farmland and farming to meet food production, economic and open space needs
- Carbon County - Implementable Greenways, Trails, & Open Space Plan
- Chapter 2 Goals 1-4
- Chapter 6 Goals 1 and 2

Warren County - *Warren County Open Space and Recreation Plan*

- Land bank as much land as possible for future use or conservation
- Acquire environmentally sensitive sites

Overview

Tree coverage and green space provide important benefits to the Greater Lehigh Valley, not only through carbon sequestration, but also increasing air quality, heat mitigation and general quality of life improvements. Over half of the Greater Lehigh Valley's total area is covered by tree canopy, which takes in and stores over 1 million $MTCO_2e$ per year. Trees can act as natural air filters, not only reducing the level of carbon dioxide (CO_2) in the air, but also other pollutants, such as particulate matter, carbon monoxide and sulfur dioxide. Trees across the greater region remove approximately 12,600 metric tons of these air pollutants per year. Air quality can vary widely across distances, and tends to be worse in urbanized areas, particularly near high volume roadways. Protecting and adding trees can provide significant benefits to those who live in and around these areas.

Trees and other vegetation reduce the effects of extreme heat, which is the deadliest weather event in Pennsylvania and the United States. Urban forests provide heat relief for residents, as they are about 3 degrees Fahrenheit cooler than urban non-green areas. Many of the greater region's densely populated areas are particularly vulnerable to extreme heat, as they have 4% less tree canopy than the regional average and 15% more impervious surface. Targeting tree planting efforts in these areas will have the greatest impact on local temperature.

Trees and green spaces are important elements of communities across the region. These places provide significant quality of life benefits, as studies have shown that exposure to green space generally improves mental health. Continuing to provide green space across the region is critically important, and local governments are actively working to increase access to these amenities by implementing and updating parks, recreation and open space plans.

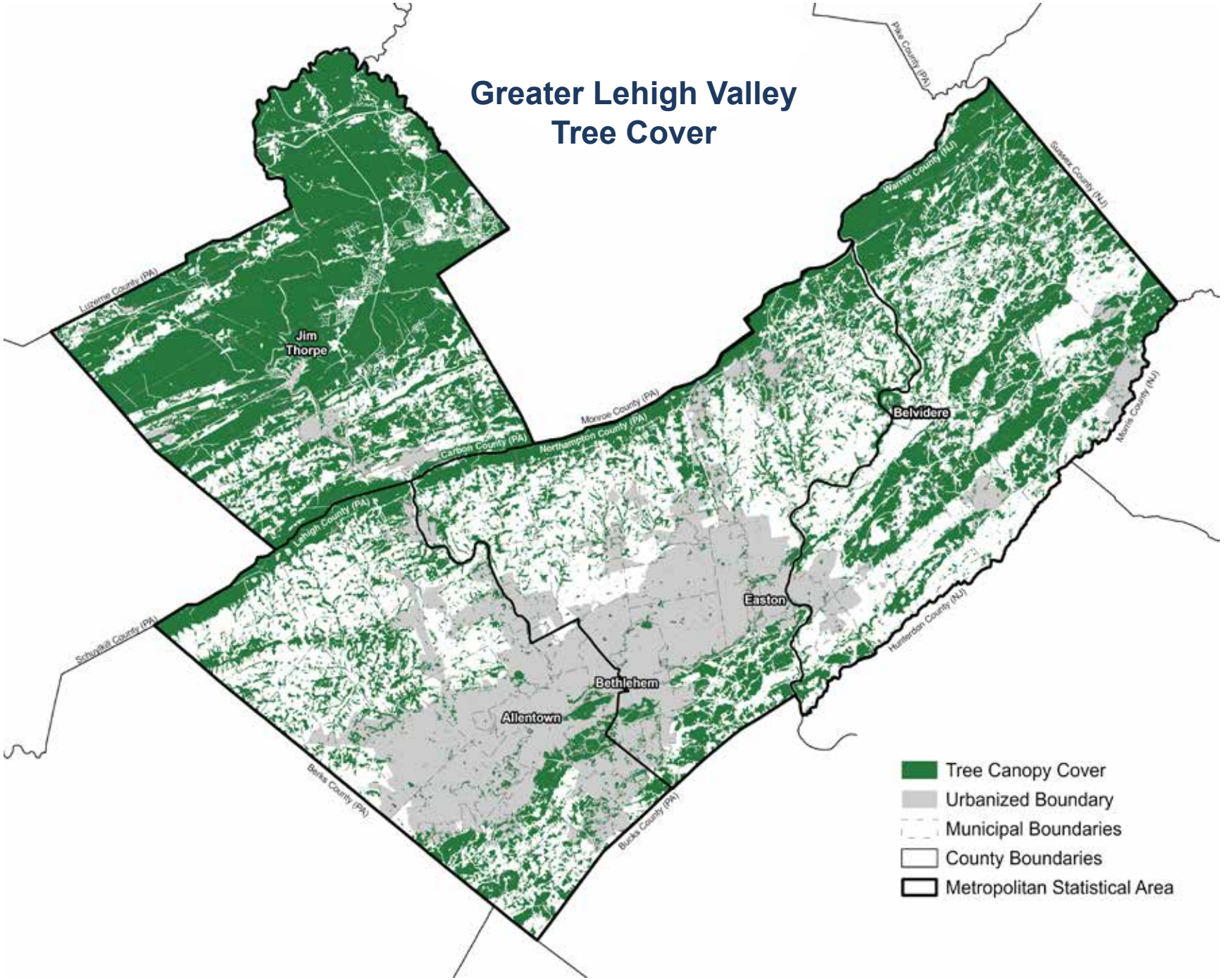
Implementation Actions

GOAL 2 **Green the greater region through street trees, parks and stormwater infrastructure.**

1. Support increased greening using native species in open spaces, parks and recreation areas.

- Increase tree canopy, particularly in urbanized areas, to reduce the urban heat island effect.
- Promote green stormwater infrastructure via ordinances.
- Conduct tree inventories.
- Update parks, recreation and open space plans.

Greater Lehigh Valley Tree Cover



Trees and other green spaces, such as meadows and stormwater bioswales reduce carbon gas emissions by taking in carbon from the air and storing it in plant material and the soil. Increasing their coverage across the Greater Lehigh Valley can bring carbon emission reductions, as well as additional benefits including cleaner air and water, cooler summer temperatures, slowing and filtering storm runoff and increased quality of life. Increasing use of green stormwater infrastructure in the region is also identified as a priority carbon emission reduction measure in the *Lehigh Valley Priority Climate Action Plan for Transportation Decarbonization*.

Key Implementing Agencies and Partners

- County and Municipal Governments
- State Agencies: Pennsylvania Departments Agriculture and Environmental Protection, and New Jersey Departments of Agriculture and Environmental Protection
- Non-Profits

EMISSIONS REDUCTIONS FROM PRESERVING AND PLANTING TREES IN THE REGION ($MTCO_2e$)

2030	2050
1,728	8,641

Authority to Implement

- Municipalities are enabled through law, such as the Pennsylvania Municipalities Planning Code, to plan for and regulate land use.
- Pennsylvania counties are required to adopt watershed level stormwater management plans per PA Stormwater Management (Act 167).
- Various types of green stormwater infrastructure can be identified as best management practices in Act 167 plans.
- Stormwater management ordinances adopted as part of Act 167 are consistent with the U.S. Clean Water Act's Municipal Separate Storm Sewer Systems (MS4) discharge requirements for municipalities.
- PennDOT is required to develop a list of native vegetation species to be used in roadside work, per a 2024 Pennsylvania state law.

Progress Indicators

- Number of new or updated parks, recreation and open space plans or other related plans.
- Acres of new tree canopy added, particularly in densely populated areas.
- Number of municipalities creating tree commissions or hiring staff such as foresters or arborists.

Funding Sources

- Carbon County Open Space Grant Program
- Kittatinny Ridge Conservation Landscape Mini Grant Program
- Lehigh Valley Greenways Mini Grant Program
- NJ Urban and Community Forestry Grants
- NJ DEP Trees for Schools Program
- Northampton County Grow NORCO Grant Program
  Northampton County Livable Landscapes Grant Program
- PA DCNR Community Conservation Partnerships Program Grants
- PA DCNR Urban and Community Forestry Program
- PA DCED Greenways, Trails, and Recreation Program
- PA DEP Growing Greener
- Pocono Forests and Waters Conservation Landscape Mini Grants
- TreePennsylvania Bare Root Tree Program
- Warren County Municipal and Charitable Conservancy Trust Fund Committee

Community Benefits

- Increasing tree canopy improves air quality, heat mitigation and quality of life.
- Increased access to open space improves physical and mental health outcomes.
- Reduced heat island effects in urbanized areas, reducing health risks to seniors and other vulnerable populations.
- Increased job opportunities for residents of all educational backgrounds to support implementation activities, including tree planting and inventories.
- Trees in the region reduce levels of identified co-pollutants, such as:
  - Particulate Matter 2.5: 381 metric tons per year
  - Carbon monoxide (CO): 105 metric tons per year
  - Sulfur dioxide (SO2): 482 metric tons per year

Plan Alignment

LVPC - *FutureLV: The Regional Plan*

- Protected and Vibrant Environment

LVPC - *Climate + Energy Element*

- To create a land use pattern that helps to mitigate climate impacts through a compact urban development area, mixed land uses, higher densities in urban areas and through preserving land for agricultural and environmental purposes.

LVPC - *Livable Landscapes*

- Preserve farmland and farming to meet food production, economic and open space needs

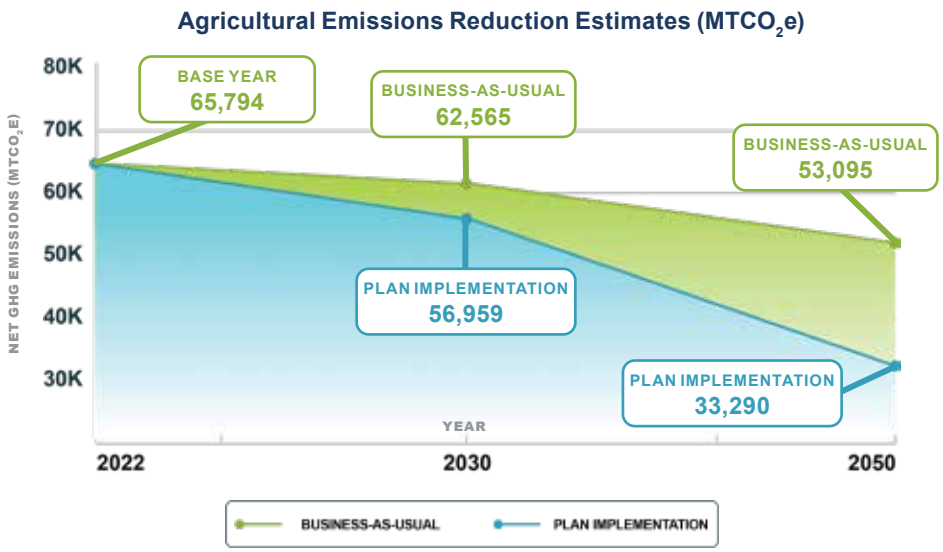
Carbon County - *Implementable Greenways, Trails, & Open Space Plan*

- Conserve open spaces and natural resources that support the community, improve quality of life, and strengthen ecosystem services.
- Balance the community's needs for both managed recreational spaces and natural spaces.

Warren County - *Warren County Open Space and Recreation Plan*

- Acquire properties or easements where necessary along streams and rivers to establish greenways and linear parks.

Food Systems



-9%

2030 Implementation
Estimated Emissions Reduction

-37%

2050 Implementation
Estimated Emissions Reduction

Overview

The Greater Lehigh Valley consists of nearly 1 million acres of land, and nearly 23% of it – 214,345 acres – is occupied by farms. Agriculture is a significant aspect of the region's economy and culture, particularly in Lehigh, Northampton and Warren counties, which have the largest amounts of suitable farmland.

The agricultural sector contributes less than 1% of regional carbon emissions but as a dominant land use, the sector plays an important role in the health of the environment. It produces emissions through activities including machinery usage, fertilizer application, raising livestock, and soil disturbance. As agricultural technology evolves, heavy machinery is becoming electrified and more efficient, reducing emissions from fossil fuel combustion. Progress will need to continue to reduce these emissions, and the policies and actions in this plan will place an emphasis on reducing agricultural carbon emissions from soil disturbance from tillage and increasing cropland's ability to act as a carbon sink through cover cropping.

Sustainable Agriculture Strategies

- **Reduced/zero soil tillage:** Keeps nutrients and sediment in soil and reduces the amount that washes into waterways by reducing soil disturbance.
- **Cover cropping:** Maintains soil health and prevents erosion by diversifying the species of plants and increasing the time of year that plants are growing on a given field.

Cover cropping and no-till farming are significant strategies to maintain soil health, improve water quality and prevent carbon emissions. However, there are many other practices, including but not limited to buffer strips, agroforestry, diverse crop rotations, composting, rotational grazing and organic livestock management.

Agricultural practices play a significant role in regional water quality. In Pennsylvania, farms are required to develop Agricultural and Erosion Sedimentation Control Plans, to preserve water quality in accordance with PA Chapter 102 regulations. Common water quality impacts from agriculture include:

- **Eutrophication:** Excess nutrients from fertilizer application and manure get into waterways, promoting harmful algae growth and reducing dissolved oxygen levels in water.
- **Sedimentation:** Excess soil and other sediment washing into waterways, exacerbated by intensive tilling of fields. Sedimentation in waterways prevents natural vegetation from growing and disrupts the food web.

Water resources are a critical natural asset of the Greater Lehigh Valley, as the region contains miles of designated High-Quality Cold-Water streams and significant portions of the Lehigh and Delaware Rivers. Many native species, such as the Eastern Brook Trout, require cold clean water to survive and are sensitive to changes in water quality and temperature. Furthermore, the Greater Lehigh Valley is situated within the Delaware River watershed, which provides drinking water to over 15 million people, or about 5% of the nation.

EMISSIONS REDUCTIONS FROM ADOPTION OF COVER CROPPING ($MTCO_2e$)

2030	2050
2,769	11,518

EMISSIONS REDUCTIONS FROM ADOPTING REDUCED OR NO TILL PRACTICES ($MTCO_2e$)

2030	2050
2,837	8,287

GOAL 1 Promote sustainable agricultural practices

Reduce emissions through improving cropland's ability to take in more carbon from the air, and hold it in the soil, rather than escaping into the atmosphere or into waterways.

Implementation Actions

1. Increase adoption of sustainable agricultural practices including cover cropping and reduced/no-till.

- Collaborate with regional agricultural agencies to promote environmental and agricultural benefits of sustainable practices.
- Integrate requirements for sustainable agricultural practices into county farmland preservation programs.
- Promote and recognize farms that set an example for sustainable agriculture.

2. Reduce carbon emissions and increase carbon sequestration within the regional food and agricultural sectors.

- Redirect quality, edible food to local food recovery programs.
- Support and encourage regenerative agricultural farming practices.
- Support farmland and open space preservation efforts.

3. Develop a regional food system that provides access and security to mitigate supply chain interruptions caused by changing weather patterns.

- Expand market demand for local food.
- Scale up local food production to respond to increasing demand for local food.
- Increase the number of neighborhood, suburban and urban farms, gardens and orchards.
- Facilitate updates to zoning codes to allow for increased suburban and urban agriculture
- Support local food access for all people

Key Implementing Agencies and Partners

- County Planning Agencies: LVPC, Carbon and Warren County Planning Commissions
- County Conservation Districts
- County and local farmland and open space preservation boards
- State Departments of agriculture and environmental protection
- Property Owners and Renters
- Other Non-Profits and Volunteer Groups: Rodale Institute, Pasa Sustainable Agriculture, Penn State Extension, and local watershed organizations

Authority to Implement

- Pennsylvania Chapter 102 of the Pennsylvania Code Erosion and Sediment Control regulates stormwater runoff and all farms that disturb soil, even using no-till practices. Landowners required to develop and implement an Agricultural and Erosion Sedimentation Control Plan to protect water quality.
- County conservation districts can help farmers develop these plans and identify best management practices on their cropland.
- Landowners are responsible for implementation of required measures.

Progress Indicators

- Acreage of cover cropping and no/reduced till practices in future U.S. Department of Agriculture (USDA) Census of Agriculture reports
- Grants awarded to farmers to implement sustainable agricultural practices
- Education programs provided to inform about sustainable agricultural practices
- Reduced levels of nitrate, phosphate, and sediment in local waterways

Cost Considerations

- Cost and yield considerations of no-till vs conventional till
- No-till requires higher cost for seeds, but lower costs for labor, fuel and maintenance.
- No-till yields tend to be less at first, but continuous no-till builds soil health and increases yields to conventional levels or higher.
- No-till farming increases land values.
- Improving water quality protects approximately $96.8 million in direct economic impact in Lehigh and Northampton counties through fishing and kayaking/canoeing.

Agricultural Sector - Estimated Costs and Savings

Implementation Action	Baseline Cost Info	Scenario Cost Info	Cost Savings 2030 (Regionwide)	Cost Savings 2050 (Regionwide)	Cost Savings 2030 (Unit)	Cost Savings 2050 (Unit)
Increasing cropland acreage practicing cover cropping techniques	Without cover crops, farmers save money on labor and seed costs	Cover crop costs range from $33-$70 per acre	$68,963 annually	$531,064 annually	$50 savings per acre	$128 savings per acre
	Soil loses more nutrients and requires more money spent on fertilizer and herbicide	Economic benefits range from $37-$78 per acre				
Converting cropland acres from intensive till practice to reduced or no-till practice	Tilling land requires time and labor cost	5,540 gallons of fuel saved by 2030	N/A	N/A	$14 per acre per number of passes per year	$25 per acre per number of passes per year
	Degrades soil quality over time, requiring additional nutrient inputs	16,620 gallons saved by 2050				
		No till saves 4 gallons of fuel per acre				
		Reduces labor costs and increases yields				

Funding Sources

Examples of potential funding sources include, but are not limited to:

- USDA Conservation Reserve Enhancement Program (CREP)
- USDA Environmental Quality Incentives Program (EQIP)
- USDA Conservation Stewardship Program (CSP)
- PA DEP Resource Enhancement and Protection (REAP)
- PA DEP Growing Greener Grant
- PA Department of Agriculture Sustainable Agriculture Program
- PA Department of Agriculture Alternative Crop Grant
- PA Department of Agriculture Agricultural Innovation Grant
- NJ Highlands Council Sustainable Agriculture Grant Program
- Northeast Sustainable Agriculture Research and Education (SARE) Farmer Grant Program

Co-Pollutant Estimates

- Cost and yield considerations of no-till vs conventional till:
  - No-till requires higher cost for seeds, but lower costs for labor, fuel and maintenance.
  - No-till yields tend to be less at first, but continuous no-till builds soil health and increases yields to conventional levels or higher.
  - No-till farming increases land values.
- Reduced or no-till and cover cropping improves regional water quality by reducing eutrophication and sedimentation.
- Converting to no-till can reduce levels of PM10, a harmful air pollutant.

Community Benefits

- Increased access to lower-cost local food
- Increased water quality

CO-POLLUTANT ESTIMATES

2022	2030	2050
ANNUAL EMISSIONS (METRIC TONS)	ANNUAL EMISSIONS (METRIC TONS)	ANNUAL EMISSIONS (METRIC TONS)
3,049	2,642	1,543

For detailed co-pollutant breakdown estimates, please see Regional Benefits Analysis section.

Plan Alignment

LVPC – *FutureLV: The Regional Plan*

- Protected and Vibrant Environment

LVPC – *Climate + Energy Element*

- To create a land use pattern that helps to mitigate climate impacts through a compact urban development area, mixed land uses, higher densities in urban areas and through preserving land for agricultural and environmental purposes.

LVPC – *Livable Landscapes*

- Preserve farmland and farming to meet food production, economic and open space needs.

Carbon County – *Implementable Greenways, Trails, & Open Space Plan*

- Provide education on preservation efforts at the resident level up to the municipal level.

Transportation

Overview

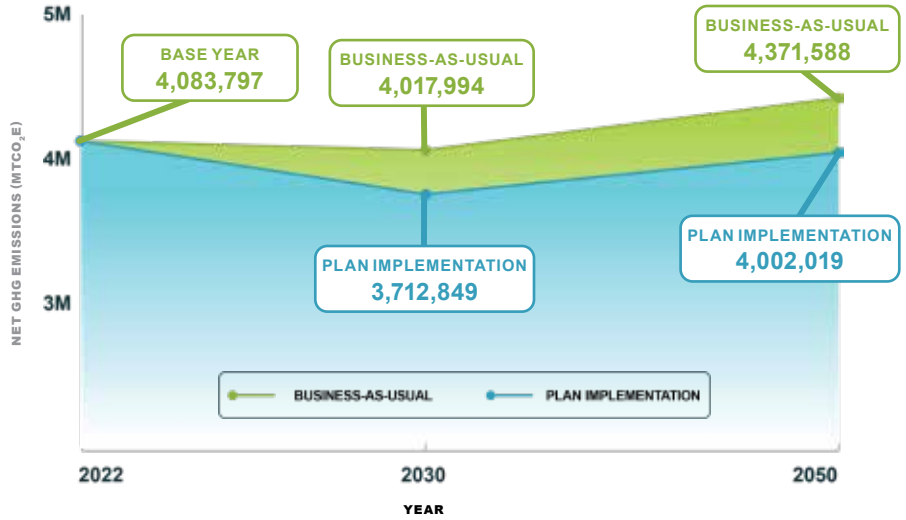
The Transportation and Mobile Sources Sector is the second-largest generator of carbon emissions at 32.1%. Three interstate highways, I-78, I-80 and I-476, run through the Greater Lehigh Valley, along with Routes 22, 33, 309, 378 and other heavily travelled corridors, which account for a significant portion of the greater region's vehicle travel and emissions.

The Greater Lehigh Valley is one of the fastest-growing regions in Pennsylvania, and by 2050, its population is projected to increase by over 100,000 people to 987,923. That is roughly equivalent to adding an additional City of Bethlehem and City of Easton. Employment opportunities are contributing to this rise, as job growth is forecast to increase by 23.9% by 2050 within Lehigh and Northampton counties alone. A large portion of this job growth is in the transportation and warehousing industries. The movement of goods and the associated employment opportunities in these industries are factors in the rise in vehicle miles traveled (VMT), traffic and transportation carbon gas emissions. This increasing transportation demand necessitates proactive planning to ensure a sustainable future for the region's transportation network.

Transportation Sector Implementation Scenario Co-Pollutant Estimates			
Year	2022	2030	2050
Annual Emissions (MTCO2e)	44,108	40,104	43,226

For detailed co-pollutant breakdown estimates, please see Regional Benefits Analysis section.

Transportation Sector Emissions Reduction Estimates ($MTCO_2e$)



-8%
2030 Implementation
Estimated Emissions Reduction

-8%
2050 Implementation
Estimated Emissions Reduction

GOAL 1 Implement *Walk/RollLV: Active Transportation Plan*

Incorporating planning for transit, bicycle and pedestrian networks within local and regional comprehensive plans can encourage development patterns that support multimodal transportation networks, reduced trip lengths, preservation of open space and agricultural land, and provide convenient trail networks. Through supportive land use-transportation decisions, the ability for residents to choose non-automobile travel modes for their trips reduces the amount of carbon emissions from vehicles.

Implementation Actions

1. Support the completion of priority bicycle corridors and work to eliminate sidewalk gaps.

- 25% of priority bicycle corridors completed by 2030, 50% by 2050.

ESTIMATE OF EMISSIONS REDUCTIONS ($MTCO_2e$) FROM WALKROLL LV: ACTIVE TRANSPORTATION PLAN

2030	2050
25% OF PRIORITY BICYCLE CORRIDORS COMPLETED	50% OF PRIORITY BICYCLE CORRIDORS COMPLETED
1,149	1,200

Key Implementing Agencies and Partners

- Municipalities
- Pennsylvania Department of Transportation
- Carbon, Lehigh, Northampton and Warren counties
- Regional Planning Agencies (LVPC/LVTS, Carbon County and Warren County planning commissions),
- Local active transportation non-profits and private/public organizations (e.g. Coalition for Appropriate Transportation, Lehigh Valley Greenways Partnership, Wildlands Conservancy)

Progress Indicators

- Increased bicycle and pedestrian traffic
- Increased use of electric assist bicycles
- Reduced vehicle usage
- Miles of trail constructed
- Number of trail and sidewalk gaps closed
- Active transportation projects completed from *FutureLV* Long-Range Transportation Plan (LRTP)/ Transportation Improvement Program (TIP)

Authority to Implement

- Municipalities have the authority to implement bicycle and pedestrian projects within their jurisdictions, which supports this measure.
- LVTS and regional MPOs can allocate funding from various federal and state sources for projects that improve pedestrian and bicycle infrastructure, and state Departments of Transportation and municipalities have final approval authority.

Funding Sources

- USDOT Carbon Reduction Program
- USDOT Congestion Mitigation and Air Quality Improvement Program
- USDOT Safe Streets for All grants program
- USDOT Surface Transportation Block Grant
- PA DCNR Community Conservation Partnerships Program
- PA DCED Greenways, Trails, and Recreation Program
- PennDOT Connects Program
- PennDOT Transportation Alternatives Set-Aside
- Lehigh Valley Greenways Mini Grants
- Local government budgets
- LVTS
- Private foundations

Community Benefits

- Increased mobility and connection to areas of the region that traditionally were only accessible via motorized transportation modes
- Connections to employment opportunities and educational and cultural resources
- Lower-cost travel options
- Health-supportive travel options
- Extension of the region's transit system, another low-cost travel mode
- Improvements to air quality and health outcomes

Plan Alignment

LVPC - *FutureLV: The Regional Plan*

- Efficient and Coordinated Development Pattern
- Connected Mixed-Transportation Region
- Safe, Healthy, Inclusive and Livable Communities

LVPC - *Walk/RollLV: Alternative Transportation Plan*

- Safety and Access
- Convenience and Connectivity
- Seamless Multimodal Integration
- Regional Coordination

LVPC – *Climate & Energy Element*

- To encourage alternatives to automobile use, both motorized and non-motorized

Northeastern Pennsylvania Alliance (NEPA) – *2050 Long Range Transportation Plan*

- Maintain safety and maintenance of the PA Bicycle Route Network through the region

North Jersey Transportation Planning Authority (NJTPA) – *North Jersey Regional Active Transportation Plan*

- Improve regional trail connections

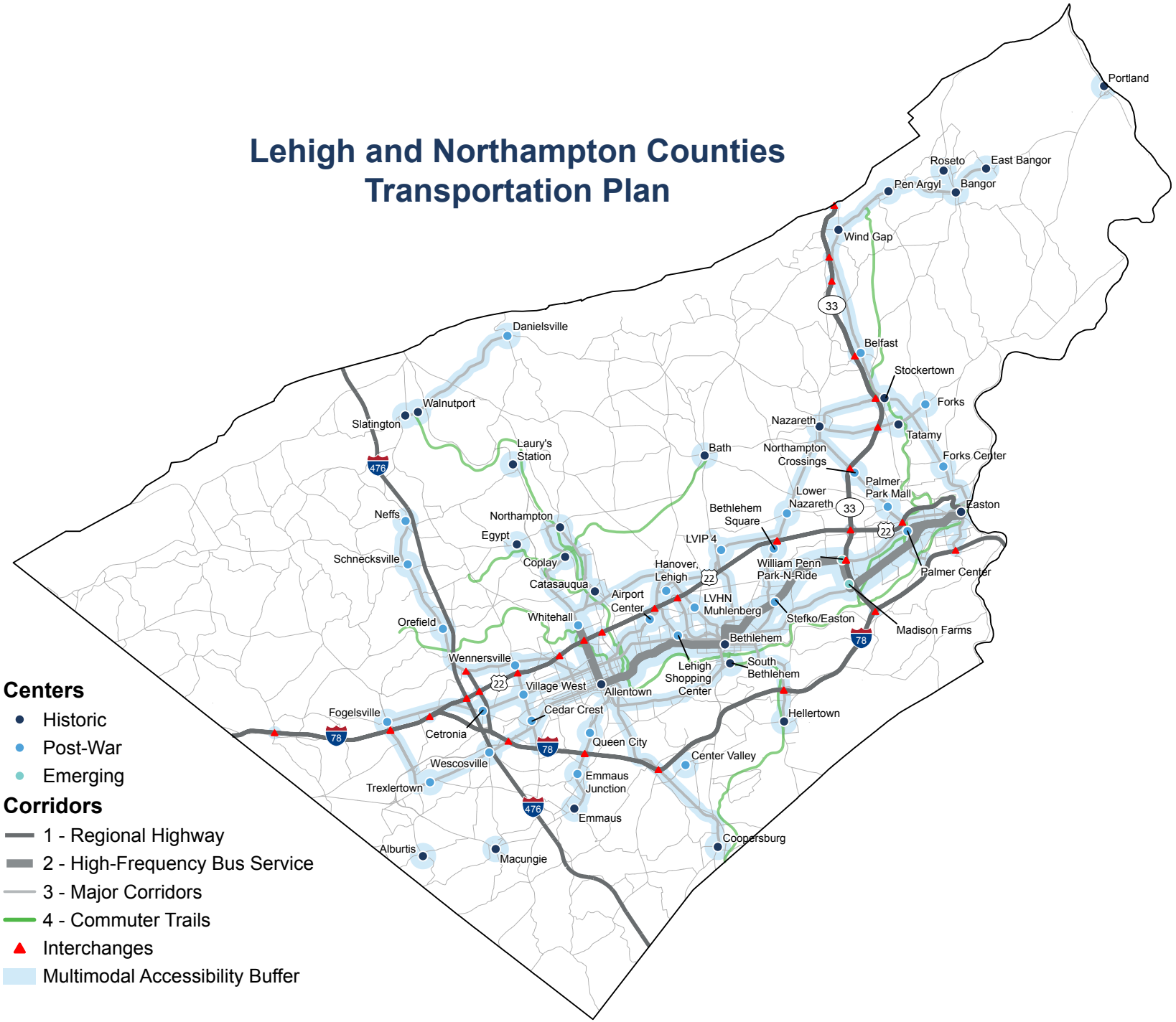
NJTPA – *Warren County Transportation Technical Study Update*

- Provide transportation choices that increase mobility, including improved public transportation and bicycle and pedestrian options

GOAL 2 Increase Transit Ridership

Transit is a necessary service that connects Centers and Corridors and makes travel more accessible for all people. The Lehigh and Northampton Transportation Authority (LANTA) is the main transit provider in the region, serving Carbon, Lehigh and Northampton counties, operating a fixed-route bus service along with flex and paratransit services. LANTA runs routes across its three-county service area and has begun enhancing service along the most populous and in-demand corridors in the Lehigh Valley.

Lehigh and Northampton Counties Transportation Plan



Enhanced Bus Service (EBS) is LANTA's branding for its bus rapid transit (BRT) operations. BRT is a more robust version of traditional bus service, as it includes elements of light rail, such as dedicated station and ticketing infrastructure, higher frequencies and limited stop or express service, while maintaining the flexibility and cost efficiencies of buses. LANTA is in the early phases of their EBS BRT plan and operates two EBS routes with limited stop service and minimal on-street infrastructure.

Bus service improvements will benefit current riders and attract new users, which will take vehicles off the road and reduce emissions. In addition, bus service promotes the revitalization of the Lehigh Valley's urban core and encourages economic activity along route Corridors.

Warren County does not receive service from LANTA, but riders can transfer from LANTA to NJ Transit buses at the Easton Intermodal Transit Center. NJ Transit provides transit service in Warren County, along with the Warren County Transportation system, which operates shuttle bus routes within the county. Along with buses, Warren County has a passenger rail station in Hackettstown, which receives regional rail service to and from Newark/New York City, operated by NJ Transit. Lehigh and Northampton counties do not currently receive passenger rail service, but studies are underway to determine potential routes and their feasibility.

Implementation Actions

1. Increase connection to and investment in public transportation infrastructure

- Increase per capita transit passenger trips 20% by 2030 and 40% by 2050.

ESTIMATE OF EMISSIONS REDUCTIONS ($MTCO_2e$) **FROM INCREASED TRANSIT TRIPS**

2030	2050
1,833	3,720

2. Reduce vehicle miles traveled by individuals in cars and trucks

- Increase and target sustainable, mixed-use and mixed-income development at key activity Centers and Corridors.
  - Along the LANTA Bus Rapid Transit Network
  - At key trail heads
  - At job centers
- Support and establish walkable, rollable, and bikeable neighborhoods.
  - Transit Investment Revitalization Districts, which encourage private real estate development in select areas with mass transportation facilities through the use of incremental new tax revenues to be invested in transit capital improvements, related site development improvements, and maintenance.
- Increase complete and green streets throughout the region which are designed for pedestrians, cyclists, drivers and public transit users of all ages and abilities.

3. Provide more afforable and safe transportation options

- Increase implementation of *Walk/RollLV: Active Transportation Plan* and NJTPA Technical Study recommendations
  - Create more protected and connected bike lanes
  - Support sidewalk and trail gap closures
  - Develop business plan for bike and/or scooter share systems
- Build out the LANTA Bus Rapid Transit system
  - Establish and support network of high-capacity, bus-based public transportation system that provides fast, reliable, and efficient service by incorporating features like dedicated bus lanes, and enhanced bus boarding locations.

Transportation Sector - Estimated Costs and Savings

Implementation Action	Baseline Cost Info	Scenario Cost Info	Cost Savings 2030 (Regionwide)	Cost Savings 2050 (Regionwide)	Cost Savings 2030 (Unit)	Cost Savings 2050 (Unit)
Complete priority bicycle corridors identified in *WalkRoll LV*	Replacing a single car trip with bike trip saves about $2.73 per mile for driver and society Savings from gas costs, congestion reduction, vehicle, roadway, & parking cost savings, energy conservation, air pollution reduction, and traffic safety improvements	Standard bike lane construction cost: $19,000/mile	25% of total cars reducing 2% of their VMT by switching to bike: $33,487,785	50% of total cars reducing 11% of their VMT by switching to bike: $478,988,063	Per car reducing 2% of their VMT/year: $403	Per car reducing 11% of their VMT/ year: $3,144
Increase per capita transit trips	Average individual vehicle ownership cost: $0.86 per mile	N/A	Per 20% increase in passenger transit trips per capita: $4,661,823	Per 40% increase of passenger transit trips per capita: $14,842,844.50	N/A	N/A

Authority to Implement

- LANTA has the authority to expand its service. Funds to do so can come from its budget, funding from federal programs, or action by the state legislature.
- Regional MPOs can allocate certain funding to transit agencies from federal programs and encourage transit ridership by investing in multimodal infrastructure projects that enhance connectivity to transit stops.
- County and Municipal Planning Commissions can support transit-friendly land development and redevelopment enabled by state planning laws.

Key Implementing Agencies and Partners

- LANTA
- LVPC/LVTS
- Municipalities

Funding Sources

- USDOT Carbon Reduction Program
- USDOT Congestion Mitigation and Air Quality Improvement Program
- USDOT Surface Transportation Block Grant
- US EPA Climate Pollution Reduction Grant Implementation Grants
- Federal Transit Administration (FTA) grants
- Public-private partnerships

Progress Indicators

- Ridership numbers
- Frequency of service
- Expansion of current routes/number of new routes
- New vehicles in fleet

Community Benefits

- Increased connection to desired travel destinations, such as educational and employment opportunities and essential services
- Improved viability of transit as an alternative transportation mode by reducing barriers, such as availability of transit stops, shelters from the elements and reducing time burdens because of bus frequency or trip travel times
- Increased travel options for individuals who do not have access to a vehicle (zero-vehicle households)
- Increased use of public transportation can reduce traffic congestion, lower emissions and improve air quality

Plan Alignment

LVPC - *FutureLV: The Regional Plan*

- Efficient and Coordinated Development Pattern
- Connected Mixed-Transportation Region
- Safe, Healthy, Inclusive and Livable Communities

LVPC - *Walk/RollLV: Active Transportation Plan*

- Safety and Access
- Convenience and Connectivity
- Seamless Multimodal Integration
- Regional Coordination

LVPC - *Climate & Energy Element*

- To encourage alternatives to automobile use, both motorized and non-motorized

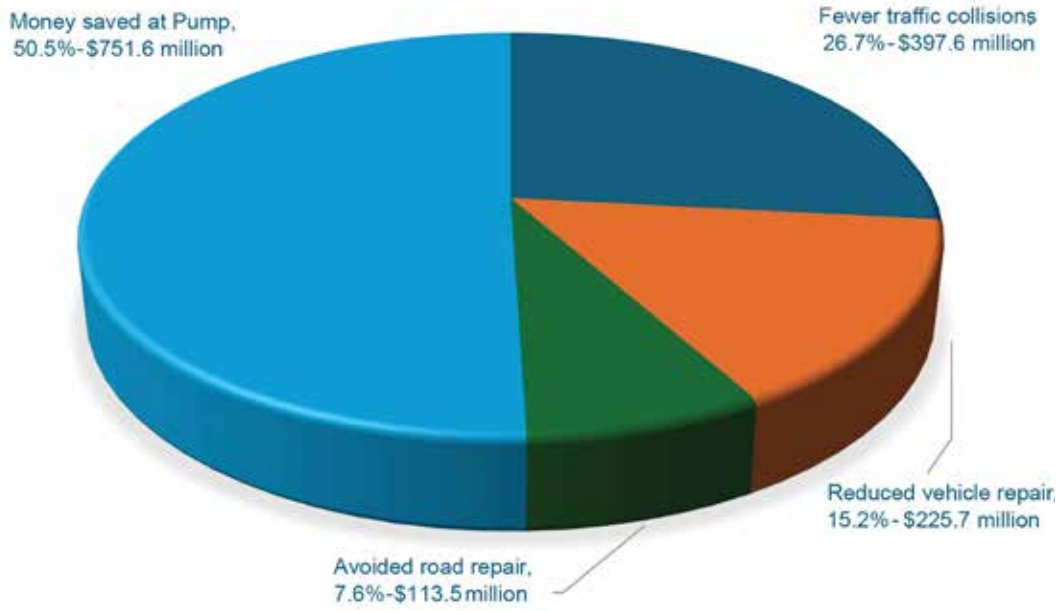
Northeastern Pennsylvania Alliance (NEPA) – *2050 Long Range Transportation Plan*

- Update and implement the region's local coordinated plan

NJTPA - *Warren County Transportation Technical Study Update*

- Provide transportation choices that increase mobility including improved public transportation, and bicycle and pedestrian options

Economic Savings From 1% Reduction in the Driving Growth Rate 2024-2050



LVPC used an advanced statistical method to estimate how regional driving could change over time based on a scenario where there's just a 1% annual reduction in vehicle miles traveled starting in 2024. This led to a 32% reduction in annual vehicle miles traveled by 2050.

LVPC used multipliers adopted from the Massachusetts Student Public Interest Research Group (MASSPIRG) and Transportation for Massachusetts Study published November 2015 . Using these multipliers and factoring in regional transportation data and estimates, the Greater Lehigh Valley, could achieve $1.48 billion in total savings by 2050.

The savings break down:

- Over half - $751.6 million - comes from money saved at the pump.
- Traffic collisions would decrease, saving nearly $388 million.
- Reduced vehicle repair adds another $225 million in savings.
- And fewer miles on the road means less wear and tear, saving $113 million in road repair costs.

This illustrates that even modest reductions in driving behavior can generate substantial long-term economic benefits.

GOAL 3 Support Deployment of Alternative Fueled Vehicles

Increased investment in low-carbon fuel and vehicle technologies is a critical component of transportation decarbonization. Transitioning to clean and sustainable fuel options, such as electric vehicles and biomass fueled vehicles, is expected to drive most emissions reductions in the United States (US Department of Energy, 2023).

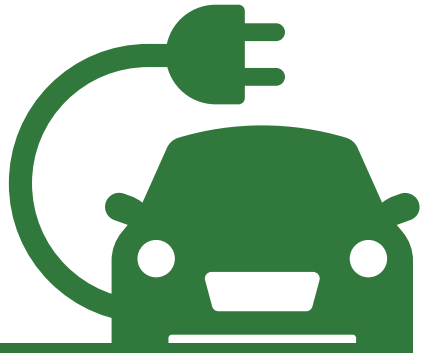
These innovations need to be paired with supporting alternative fueling infrastructure that is readily available and accessible to all users. Rapid adoption of these practices may be constrained due to the need to increase generation of power within the existing power distribution network, including substations and utility lines, to meet increased use of alternative fuel vehicles. In addition, there are major limitations currently in battery technologies.

Implementation Actions

1. Increase share of Alternative Fuel Vehicle (AFV) registration to 9% by 2030 and 21% by 2050

Adoption targets included in this plan are based on the trajectory from the 2022 Pennsylvania State Plan for Electric Vehicle Mobility. The adoption rate for alternative fueled vehicles can vary widely based on federal policy setting mileage standards and providing tax incentives for purchasers. Vehicle registration data indicates AFVs comprised 1.6% of total vehicles registered in 2022 in the Greater Lehigh Valley Region.

ESTIMATE OF EMISSIONS REDUCTIONS ($MTCO_2e$) FROM TRANSITIONING TO CLEAN OR ZERO EMISSION FUELS



2030	2050
285,957	297,013

Key Implementing Agencies and Partners

- Vehicle manufacturers
- Businesses/organizations
- State legislative bodies and associated regulatory agencies
- Transit authorities
- Local governments
- Power and fuel generation and distribution companies

Progress Indicators

- Number of AFVs sold/registrations from base year
- Increase in alternative fueled government fleet vehicles
- Percent of commercial light- and heavy-duty trucks transitioned to hybrid and/or fossil free fuels

Authority to Implement

- The LVPC/LVTS, other MPOs and planning organizations can coordinate with state and federal agencies to support programs that make AFVs more accessible and attainable.
- State and federal legislators can create programs to reduce the costs of alternative fuel vehicles (AFVs), such as tax credits or rebates.
- Car manufacturers can provide consumers with cash back programs to incentivize sales.
- Transit authorities, school districts, municipalities and private companies can increase the adoption of AFVs by converting their fleets to these vehicles.

Funding Sources

- USDOT
- Carbon Reduction Program
- US EPA
- Climate Pollution Reduction Grant Implementation Grants
- Clean School Bus Program
- Charge Up New Jersey
- NJ Zero Emission Incentive program (NJZIP)
- NJ Clean Fleet EV Program
- Public-private partnerships
- Private initiatives

Community Benefits

- Increased availability of alternative fuel vehicles
- Reduced asthma rates due to improved air quality

Plan Alignment

LVPC - *FutureLV: The Regional Plan*

- Protected and Vibrant Environment
- Connected Mixed-Transportation Region

LVPC - *Walk/RollLV: Active Transportation Plan*

- Air Quality and Climate

LVPC - *Climate & Energy Element:*

- To encourage alternatives to automobile use, both motorized and non-motorized.

New Jersey Bureau of Public Utilities - *Energy Master Plan*

- Decarbonize the transportation sector

GOAL 4 Increase Alternative Fueling Infrastructure

Innovations in the development of clean or zero-emissions fuel technology need to be paired with continuing federal and state support for the development of alternative fueling infrastructure and deployment. As more vehicles transition to these low-carbon alternatives, supporting fueling/recharging infrastructure must similarly be scaled up to match the demand and be widely accessible and convenient to users.

Implementation Actions

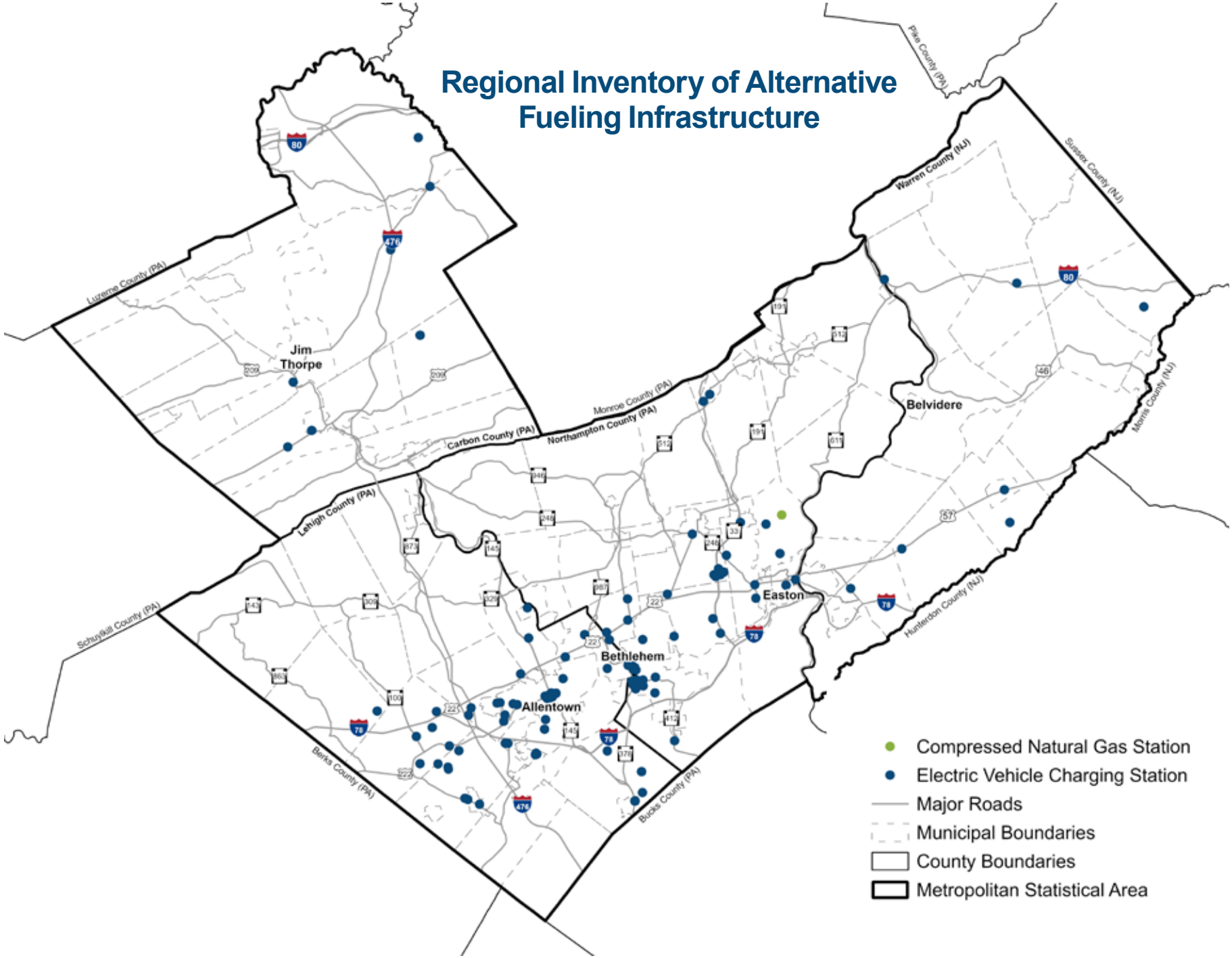
1. Increase quantity and geographic availability of alternative fueling infrastructure

- Increase alternative fueling infrastructure by 25% by 2030 and 40% by 2050

2. Shift the regional fleet to low- and no-carbon emission vehicles

- Expand electric vehicle charging infrastructure throughout the region
  - Support fueling diversification
  - Municipal, transit agency and other public fleets
  - Freight and other private sector fleets

Regional Inventory of Alternative Fueling Infrastructure



Key Implementing Agencies and Partners

- Vehicle manufacturers
- Businesses/organizations
- Federal and state legislative bodies and associated regulatory agencies
- Transit authorities
- MPOs
- Local governments
- Power and fuel generation and distribution companies

Authority to Implement

- Municipal and County Planning organizations can recommend alternative fueling infrastructure to be included when applicable in land development reviews.
- Municipalities can require alternative fueling infrastructure in land development projects via specific standards/criteria within zoning or subdivision and land development regulations.
- LVTS, Northeast Pennsylvania Alliance (NEPA) and North Jersey Transportation Planning Authority (NJTPA) can allocate funding for alternative fuel infrastructure projects, as they select projects for certain federal funding programs.

Progress Indicators

- New alternative fueling stations added
- New charging stations added in Economic Impact Area

Funding Sources

- USDOT National Electric Vehicle Infrastructure Program
- USDOT Congestion Mitigation and Air Quality Improvement Program
- USDOT Carbon Reduction Program
- US EPA Climate Pollution ReductionGrant Implementation Grants
- Private investment
- State funds
- Federal incentives
- Potential public-private partnerships

Community Benefits

- Increased access to alternative vehicle infrastructure reduces barriers to owning AFVs
- Reduced asthma rates due to improved air quality

Plan Alignment

LVPC - *FutureLV: The Regional Plan*

- Protected and Vibrant Environment
- Connected Mixed-Transportation Region

LVPC - *Walk/RollLV: Active Transportation Plan*

- Air Quality and Climate

LVPC - *Climate & Energy Element:*

- To encourage alternatives to automobile use, both motorized and non-motorized Northeastern Pennsylvania Alliance (NEPA) – 2050 Long Range Transportation Plan
- Evaluate priority locations for Electric Vehicle charging stations New Jersey Bureau of Public Utilities - Energy Master Plan
- Decarbonize the transportation sector

Implementation Action	Baseline Cost Info	Scenario Cost Info	Cost Savings 2030 (Regionwide)	Cost Savings 2050 (Regionwide)	Cost Savings 2030 (Unit)	Cost Savings 2050 (Unit)
Increase share of AFV registrations and increase AFV charging infrastructure	Gas costs about $0.18 per mile	EV home charging costs about $0.04 per mile	Per 9% of cars switching from gas to electric: $47,245,259	Per 21% of the cars switching from gas to electric: $182,284,718	Per car: $1,579	Per car: $2,849
		EVs cost about $0.08 per mile maintenance				
	Gas-powered vehicles cost about $0.10 per mile in maintenance	Residential Level 2 charger installation: $1,354				
		Workplace Level 2 charger installation: $2,223				

GOAL 5 Reimagine and retrofit major transportation corridors with Green Infrastructure

Green infrastructure refers to the interconnected network of open spaces and natural areas, often used to manage stormwater, improve water quality and reduce hazard impacts to public health and safety. When communities utilize and enhance their natural environmental assets as an integral part of their infrastructure, they can reduce their impact on carbon emissions and increase their ability to adapt to changes that may occur.

Integrating carbon sequestration into transportation infrastructure signifies an innovative step in environmental management. It involves capturing CO_2 and storing it in a manner that prevents it from contributing to global warming.

Key Implementing Agencies and Partners

- PennDOT
- Pennsylvania Turnpike Commission
- LVPC/LVTS
- Municipalities

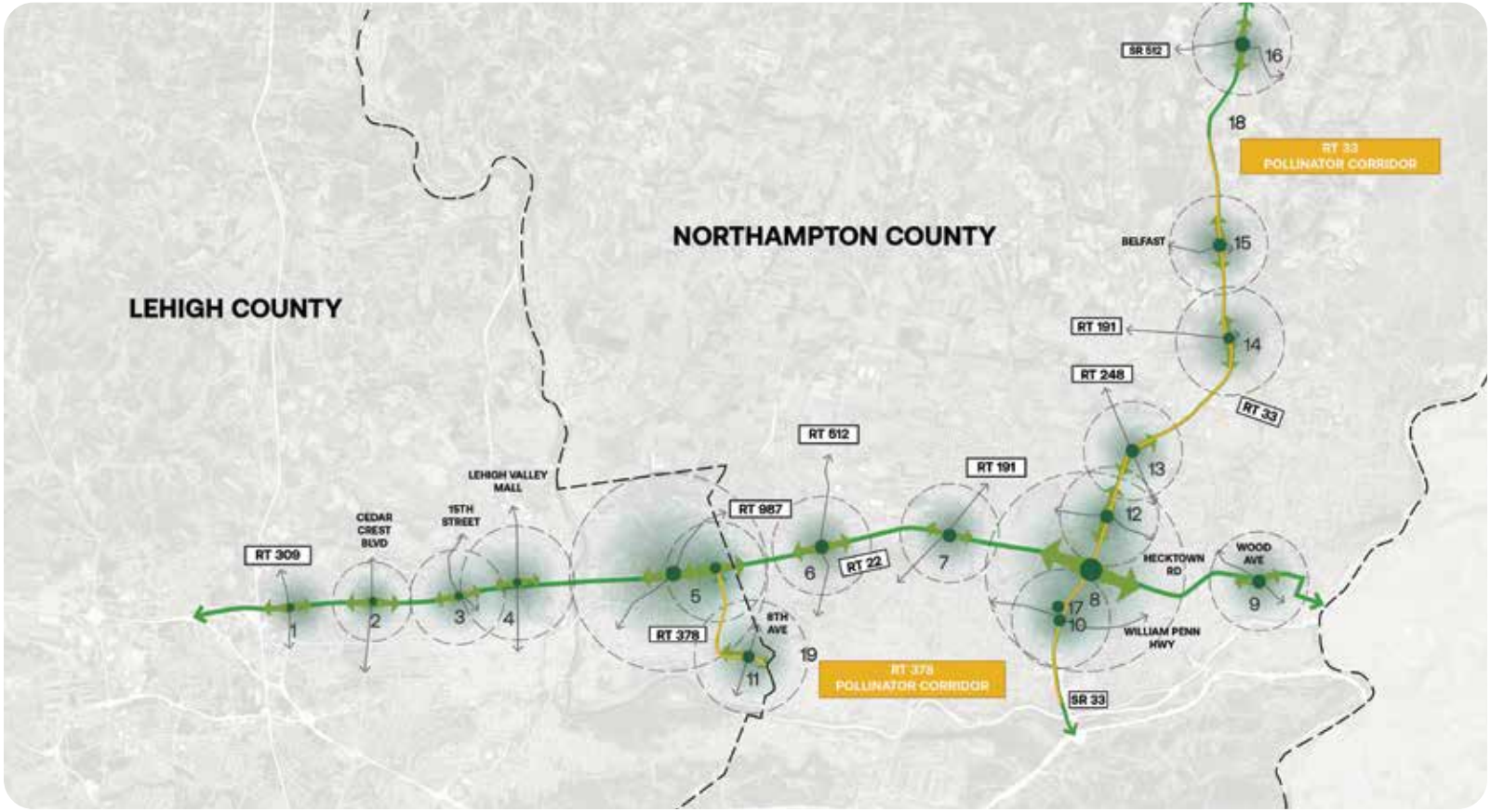
Implementation Actions

1. Integrate carbon sequestration into transportation infrastructure

- Create 522 acres of green infrastructure in PennDOT rights-of-way along Routes 22, 33 and 378, at 16 interchanges, two linear corridors and the park-and-ride lot in Bethlehem Township.

This approach adds green infrastructure along some of the Lehigh Valley's busiest transportation corridors. It would include planting 123 acres of deciduous trees and 166 acres of meadows, many of which would serve as pollinators corridors. Another 12 acres of bioswales would be installed, and where applicable, the sites would be fitted with light-emitting diode lighting (LED), state-of-the art traffic controls, and in the case of the park-and-ride lot, electric charging stations.

Priority Green Transportation Interchanges and Corridors



Authority to Implement

- Municipalities can require green infrastructure/ carbon sequestration measures be prioritized in land development projects via specific standards/criteria within zoning, subdivision and stormwater regulations.
- LVPC, through its stormwater ordinance regulatory oversight power, can assure consistency with adopted stormwater provisions.
- LVTS, NEPA, NJTPA can allocate funding from various sources towards green infrastructure projects on state and locally owned roads. State agencies and municipalities have final approval authority over these projects.
- Pennsylvania DOT, NJ DOT, Pennsylvania Turnpike Commission have authority over green infrastructure efforts on their rights-of-way.

Funding Sources

- US DOT Carbon Reduction Program
- LVTS
- Municipalities

Progress Indicators

- Air quality improvements
- Lawn and impervious areas converted to forested areas or meadows
- Number, size and type of trees planted
- Number of nature-based stormwater control measures constructed
- Volume of stormwater managed via nature-based systems

ESTIMATE OF EMISSIONS REDUCTIONS ($MTCO_2e$) FROM TRANSPORTATION GREEN INFRASTRUCTURE RETROFITS

2030 GREEN INFRASTRUCTURE RETROFIT	2050 GREEN INFRASTRUCTURE RETROFIT
8,035	51,835

Transportation Sector - Estimated Costs and Savings

Implementation Action	Baseline Cost Info	Scenario Cost Info	Cost Savings 2030 (Regionwide)	Cost Savings 2050 (Regionwide)	Cost Savings 2030 (Unit)	Cost Savings 2050 (Unit)
Green infrastructure retrofits along 19 highway right of way locations and addition of energy efficient lighting	Project engineering, design and construction costs implemented over 5-year time frame – sites range from $400,000 – $24,991,000	$115 million total from LVPC CPRG Implementation Grant Application	Ecosystem benefit: $234,192	Ecosystem benefit: $422,874	Ecosystem benefit per acre: $1,904	Ecosystem benefit per acre: $3,438

Community Benefits

- Enhanced resilience of communities to prevent or minimize property loss or damage due to extreme weather events, such as flooding
- Reduced heat island effects
- Improved air quality and reduced adverse health outcomes
- Improved aesthetics and mental health

Plan Alignment

LVPC - *FutureLV: The Regional Plan*

- Protected and Vibrant Environment

LVPC - *Climate & Energy Element*

- Promote energy efficiency and natural resources conservation within existing and new buildings and land development.

Northeastern Pennsylvania Alliance (NEPA)
- 2050 Long Range Transportation Plan

- Collaborate with environmental resource agencies to incorporate best management practices into transportation projects and planning.

GOAL 6 Plan and Implement Intelligent Transportation Systems

The integration of Transportation Systems Management and Operations (TSMO) strategies represents a forward-thinking approach to decarbonization and efficient resource utilization. By focusing on reducing traffic congestion, these strategies are key in creating a more sustainable transportation network.

Prioritizing TSMO strategies achieves a dual objective of enhancing the efficiency of the transportation system while simultaneously reducing vehicle miles traveled (VMT).

Reducing congestion is a critical component of this strategy. Congestion leads to increased emissions due to idling and stop-and-go traffic and contributes to time loss and decreased economic efficiency. By implementing TSMO strategies, such as optimizing traffic signal timings, managing road space and promoting real-time traffic information systems, the region can significantly reduce congestion. These goals not only make transportation more efficient but also contribute to lowering carbon gas emissions.

Implementation Actions

1. Reduce congestion on regional highways and major corridors

- By 2030, fully integrate Transportation Systems Management and Operations (TSMO) strategies along all regional roadways experiencing major congestion.

2. Increase the resilience of the transportation system

- Encourage a shift to other transportation options through parking policy.
- Redesign and upgrade critical and vulnerable infrastructure.
- Improve aesthetics, stormwater management, flood mitigation, habitat quality and opportunities for carbon storage through enhanced landscaping improvements along major roadways.
- Use technology to monitor integrity of transportation infrastructure and relay real-time data to ensure responsiveness and limit disruptions.
- Integrate water resource and transportation system planning, design and management.

ESTIMATE OF EMISSIONS REDUCTIONS ($MTCO_2e$) FROM TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS INTEGRATIONS

2030 FULLY INTEGRATE TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS STRATEGIES	2050 FULLY INTEGRATE TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS STRATEGIES
2,527	2,010

Key Implementing Agencies and Partners

- PennDOT
- NJDOT
- USDOT
- Lehigh Valley Transportation Study
- Northeast Pennsylvania Alliance
- North Jersey Transportation Planning Authority

Authority to Implement

- USDOT can establish nationwide or statewide TSMO strategies and provide funding and policy guidance for state, regional and local implementation.
- PennDOT has the authority to implement TSMO projects on state roadways and responsible for statewide transportation planning, funding allocation and adherence to federal and state transportation regulations.
- New Jersey Department of Transportation (NJDOT) is responsible for maintaining and operating the State's highway and public road system, planning and developing transportation policy and assisting with rail, freight and intermodal transportation issues.
- NJDOT - Transportation Systems Management is responsible for ensuring safe and reliable movement of people and goods on New Jersey's highway system through the oversight and management of the Division of Traffic Operations and the Division of Mobility and Systems Engineering (MSE).
- LVTS, Northeast Pennsylvania Alliance (NEPA) and North Jersey Transportation Planning Authority (NJTPA) have the authority to conduct regional transportation planning and to prioritize projects for funding from both state and federal sources.
- Municipalities have the authority to implement TSMO measures on local roadways. This includes adopting traffic ordinances, approving the installation of traffic control devices and enhancing local road infrastructure.

Progress Indicators

- Percent reduction in peak hour traffic congestion and associated carbon gas emissions
- Improvement in traffic safety and operational efficiency
- Adoption rates of ITS and utilization of optimized infrastructure
- Ratio of cost savings to investment
- Public satisfaction with transportation improvements

Community Benefits

- Improved air quality
- Reduced noise pollution
- Improved traffic safety

Implementation Action	Baseline Cost Info	Scenario Cost Info	Cost Savings 2030 (Regionwide)	Cost Savings 2050 (Regionwide)
Fully integrate transportation systems management & operations strategies	Cost of 4 identified projects in *Future LV: The Regional Plan:* 11,172,000	Examples of Integrated Corridor management (ICM) 10 year cost benefits	$66,724,046	$50,769,792
		Minneapolis: Cost: $4M Benefit: $82M		
		Dallas: Cost: $14M Benefit: $264M		
		San Diego: Cost: $12M Benefit: $104M		

Funding Sources

- Federal Transit Administration
- USDOT Congestion Management Air Quality (CMAQ) Program
- USDOT Surface Transportation Block Grant Program
- PennDOT Statewide TSMO Funding
- PennDOT Automated Red Light Enforcement Funding
- PennDOT Multimodal Transportation Fund, PennDOT Green Light-Go Program
- PennDOT Act 89 Transportation Plan
- PennDOT State Transportation Innovation Council Incentive Program
- Bond Financed Programs
- Pennsylvania Infrastructure Bank
- Local government budgets
- Regional transportation authorities
- Public-private partnerships
- Transportation Infrastructure Finance and Innovation Act Loans

Plan Alignment

LVPC - *FutureLV: The Regional Plan*

- Connected Mixed-Transportation Region
- Safe, Healthy, Inclusive and Livable Communities

LVPC - *Walk/RollLV: Active Transportation Plan*

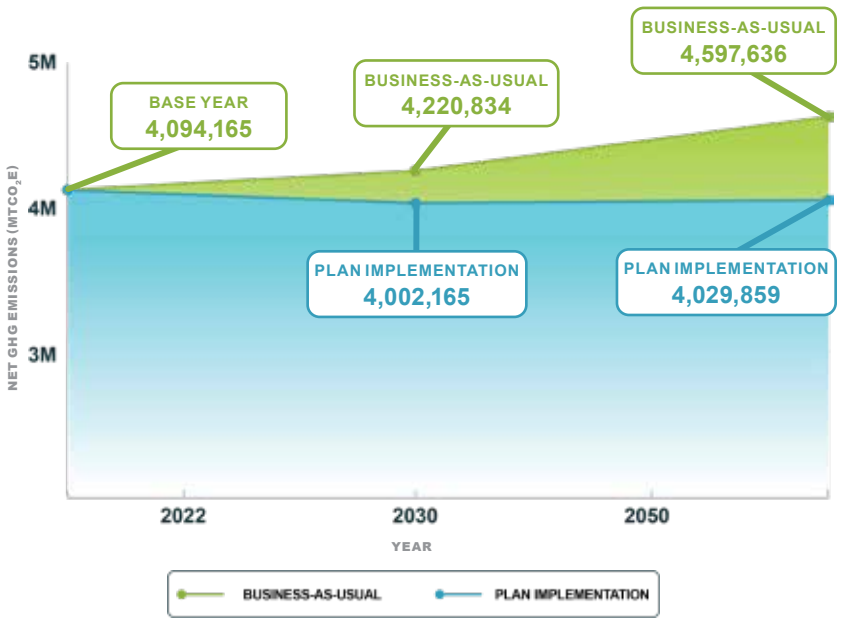
- Air Quality and Climate
- Emerging Technologies

New Jersey Bureau of Public Utilities - *Energy Master Plan*

- Improve connections between people, jobs and services

Industry and Energy Generation

Industrial Sector Emissions Reduction Estimates ($MTCO_2e$)



-5%
2030 Implementation
Estimated Emissions Reduction

-12%
2050 Implementation
Estimated Emissions Reduction

Overview

The Greater Lehigh Valley has a long industrial history, and despite many changes over the last few decades, industry remains a key component of the regional economy. Manufacturing employs over 11% of the workforce, and industrial users account for 32% of regional carbon emissions. The industrial sector is unique because while it does account for carbon emissions through electricity and natural gas demand, like the residential and commercial sectors, point sources are responsible for two-thirds of industrial sector emissions. Point sources are identifiable locations where pollutants can be traced, unlike electricity or natural gas, which comes from a grid system. These emissions can come from processes including heating boilers or furnaces and chemical reactions. Overall, emissions reductions from the industrial sector will largely be a product of improving efficiency, switching to lower carbon fuel sources and implementing specific strategies to reduce emissions from each industry's unique processes. Industrial carbon emissions in New Jersey and Pennsylvania have decreased since the mid-2000s and only two industrial sites in the Greater Lehigh Valley still use coal for on-site energy.

GOAL 1

Reduce industrial emissions in the Greater Lehigh Valley through improving efficiency and reducing environmental impacts of industrial processes, buildings and sites

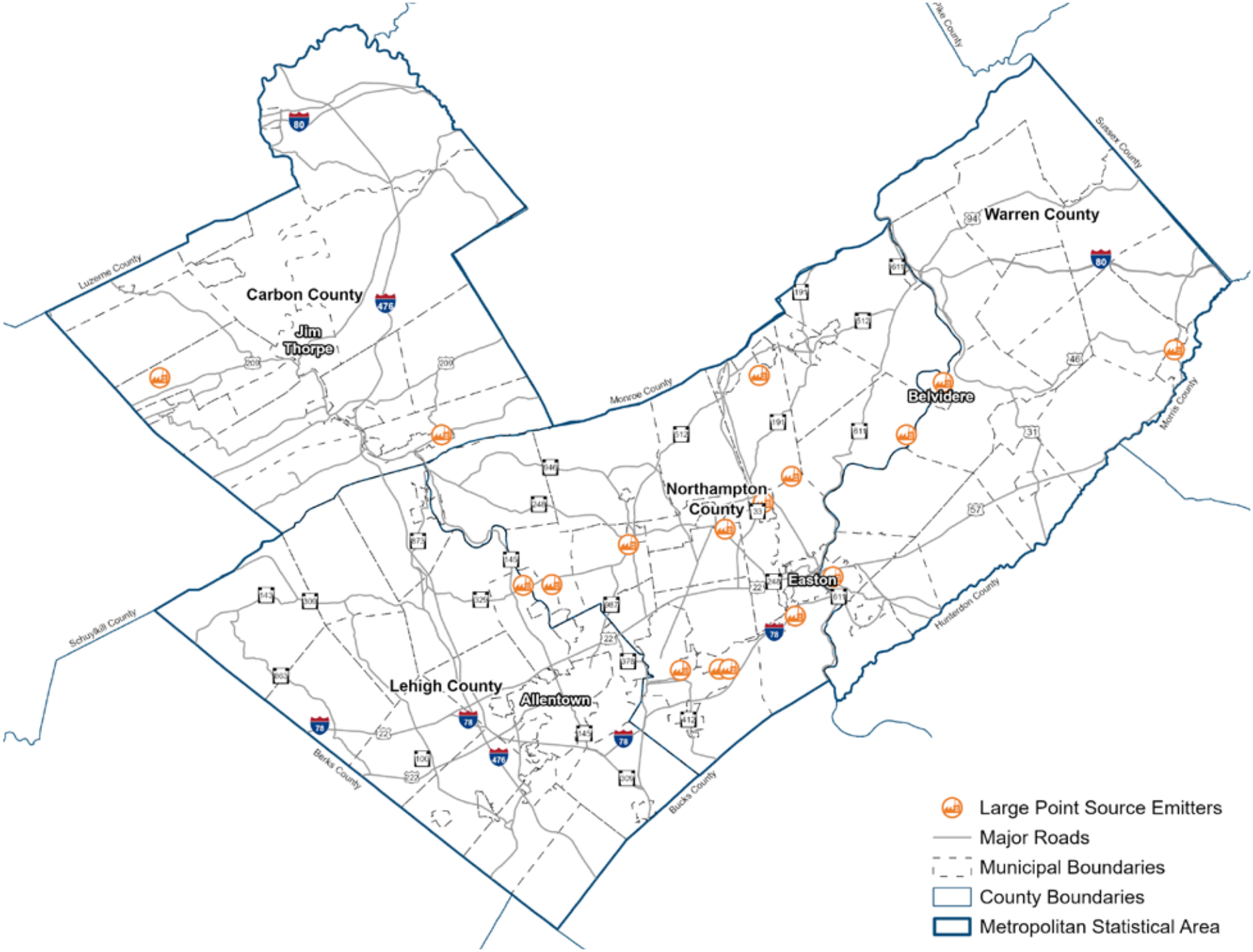
Implementation Actions

1. Increase industrial efficiency by promoting electrification and low-carbon fuel switching for on-site energy generation.

- Connect industry to local, state and federal funding opportunities
- Facilitate coordination between companies to identify opportunities for sustainable collaboration

Industrial facilities often need a large amount of energy they can produce at any one time. Different types of industries have different energy demands. Some of the Greater Lehigh Valley region's most prevalent industries, such as food and beverage production have lower temperature processes, while other common industries in the region, like metals manufacturing and cement production require high temperature processes. Fossil fuels are usually used to power industrial operations, particularly ones that require high temperatures.

However, there are also opportunities to electrify lower temperature industrial processes. Across industry, emissions can also be reduced by changing what types of fuel are used, and abandoning the most polluting energy types, such as coal. Many industrial facilities are now using natural gas for energy, which produces fewer carbon emissions than coal when burned. The Pennsylvania DEP identifies biomethane and hydrogen as other lower carbon fuel switching options for industries.


Carbon County
Jim Thorpe
Warren County
Belvidere
Northampton County
Easton
Lehigh County
Allentown
Luzerne County
Monroe County
Sussex County
Morris County
Hunterdon County
Bucks County
Berks County
Schuylkill County
Large Point Source Emitters
Major Roads
Municipal Boundaries
County Boundaries
Metropolitan Statistical Area

2. Reduce process specific carbon emissions, with a focus on large regional point sources

- Connect industry to local, state and federal funding opportunities.
- Convey benefits of reducing emissions.
- Compare emission trends of industries to published sustainability goals and reduction targets.

A large source of industrial carbon emissions is unique processes from specific industries. The largest emitting industry in the Greater Lehigh Valley is cement production, which accounts for approximately 2.1 million $MTCO_2e$ annually. This trend is seen globally, as cement production accounts for up to 9% of all human-made CO_2 emissions per year. A significant portion of the cement industry's carbon emissions come from the chemical reaction to produce clinker, a component of cement. Emissions from cement can be reduced through altering the materials used in production or by using less clinker, and manufacturers in the Greater Lehigh Valley are helping develop and sell these lower-carbon types of cement. Other large manufacturers in the region include metals production and food and beverage processing.

Many of the region's industrial stakeholders have ambitious corporate sustainability goals, which often include a significant reduction in carbon emissions, or going net-zero, by 2050. Reducing carbon emissions from these industrial processes will be a critical step to reaching sustainability goals and the LVPC can play a role in education and connecting stakeholders in the region to funding.

Emission reduction estimates were developed using scenarios from the Rocky Mountain Institute's Energy Policy Simulator for Pennsylvania.

ESTIMATE OF EMISSIONS REDUCTIONS ($MTCO_2e$) FROM FUEL SWITCHING FOR FOSSIL FUEL-BASED ON-SITE ENERGY PLANT SYSTEMS

2030	2050
INDUSTRIAL-EFFICIENCY IMPROVEMENTS & IMPROVED DESIGN	INDUSTRIAL-EFFICIENCY IMPROVEMENTS & IMPROVED DESIGN
129,247	411,276

ESTIMATE OF EMISSIONS REDUCTIONS ($MTCO_2e$) FROM INDUSTRY EFFICIENCY

2030	2050
INDUSTRIAL-CEMENT CLINKER SUBSTITUTION	INDUSTRIAL-CEMENT CLINKER SUBSTITUTION
88,996	156,501

GOAL 2 Transition away from fossil fuel power plants to a carbon-free electricity grid

According to the PA DEP's Pennsylvania Climate Action Plan Update 2024, electricity generation accounts for 29% of the state's total carbon emissions. In the Greater Lehigh Valley, power plants are the largest point source emitters of carbon emissions, producing 3,685,159 $MTCO_2e$. In this plan, instead of being its own sector, power plant emissions are accounted for through regional industrial, commercial and residential electricity demand, as electricity cannot be fully traced from source to user, so this method provides a more accurate estimate of emissions from regional demand.

Electricity generated from power plants in the region goes into the ReliabilityFirst Corporation (RFC) East power grid, which serves several Mid-Atlantic states, including all of New Jersey and Pennsylvania. Over half of the electricity generated within the RFC East grid comes from natural gas, which is higher than the national average. However, over one-third of grid level electricity comes from nuclear energy, which produces no carbon emissions.

To reduce emissions from electricity generation, the proportion of electricity generated by fossil fuels, such as coal and natural gas will need to be reduced by bringing more low-carbon sources of electricity online. PA DEP's 2024 plan estimates that 39.42 million $MTCO_2e$ emissions can be reduced by 2050 through having an electricity grid consisting of nuclear, solar, wind, hydro, battery storage, biomass, and coal and natural gas power plants with carbon capture technology. Progress has already been made, as Pennsylvania's electricity generation emissions have decreased by 38% from 1990 to 2021, mostly due to shifting from coal to natural gas power plants. Less than 5% of electricity on the RFC East grid comes from coal, lower than the national average.

However, natural gas is still a significant contributor to carbon emissions through combustion and methane (CH_4) leakage. Methane is more effective at trapping heat than carbon dioxide (CO_2) and is often difficult to track. Continuing to reduce CO_2 and CH_4 emissions from the electric grid will increase the effectiveness of various emissions reduction policies stated in this plan, including increasing alternative fuel vehicle usage and industrial, residential and commercial energy efficiency upgrades.

Implementation Actions

1. Reduce carbon emissions from generation plants by switching to low- or zero-carbon technologies.

- Support electric utilities' need to increase low-carbon energy generation, distribution and system resiliency.
- Identify suitability of areas for solar facilities.
- Communicate opportunities/challenges of low-carbon technologies.
- Coordinate with municipalities and developers to ensure consistency with comprehensive plans.
- Assist in municipal zoning code and SALDO updates to guide the location and size of energy facilities.

Reducing carbon emissions from electricity generation requires a high level of collaboration among municipalities, planning commissions, state and federal agencies and the private sector. Maintaining a consistent supply of energy on the grid has been identified as a top priority for many stakeholders and transitioning to a higher share of low- or zero-carbon technologies will need to ensure that this supply is maintained. To continue towards net-zero carbon emissions, the region will see more renewable energy facilities, including solar installations. Development of these sites will need to balance the region's low-carbon energy needs with preserving high-quality farmland and natural areas. The LVPC and partner planning organizations will continue to assist municipalities, providing tools needed to plan for these uses.

Key Implementing Agencies and Partners

- LVPC, Carbon and Warren County Planning Commissions
- Pennsylvania Energy Development Authority (PEDA), Pennsylvania Department of Community and Economic Development (PA DCED), Commonwealth Financing Authority (CFA), Pennsylvania Department of Environmental Protection (PA DEP), C-PACE program administrators and New Jersey Department of Environmental Protection.
- Industry
- Regional Transmission Organizations (RTOs) (PJM Interconnection)
- Utilities

Progress Indicators

- Number of industrial emissions reduction projects in region
- Energy demand on grid from industrial sector
- Reported carbon and co-pollutant emissions
- Industrial grant applications won in region

Authority to Implement

- States are enabled to carry out regulations described in the federal Clean Air Act.
- State legislatures can fund current or new programs to support industrial carbon emissions reductions.
- PJM, the Regional Transmission Organization, has the authority to bring power plants on and off the grid and maintain the flow of electricity across the region to the electric utilities and their customers.

Implementation Action	Baseline Cost Info	Scenario Cost Info	Cost Savings 2030 (Regionwide)	Cost Savings 2050 (Regionwide)	Cost Savings 2030 (Unit)	Cost Savings 2050 (Unit)
Industrial efficiency and design improvements (EPA Industrial 100% rollout of Improved System Design, Material Efficiency, Longevity, and Re-Use, and Industry Energy Efficiency Standards)	$13 per million BTU** for using alternative fuels (including nuclear and biomass)	$15 per million BTU for industrial facilities There are about 700 manufacturing firms in the Lehigh Valley	Per 112 manufacturing firms (16%) /year: $1,250,647	Per 462 manufacturing firms (66%)/year: $8,037,386	Per 1 manufacturing firm/year: $11,166	Per 1 manufacturing firm/year: $17,397
Reducing cement production GHG emissions through reducing the amount of clinker in cement with other substitutes	A typical cement plant requires a cement price of $130/ton	Compared with Ordinary Portland Cement, low-carbon cement types can reduce production costs by up to 25%, due to lower energy requirements	Across the 4 cement plants in region: $6,480,106	Across the 4 cement plants in region: $21,120,337	Per plant/year: $1,620,026	Per plant/year: $5,280,084

Funding Sources

Examples of potential funding sources include, but are not limited to:

- New Jersey Clean Energy Loans
- PA DCED Alternative and Clean Energy Program (ACE)
- PA DEP Commercial-Property Assessed Clean Energy (C-PACE) financing program
- PA DEP RISE PA grant program and Green Energy Loan Fund (GELF)
- Pennsylvania Energy Development Authority (PEDA)

INDUSTRIAL SECTOR IMPLEMENTATION SCENARIO CO-POLLUTANT ESTIMATES

2022	2030	2050
ANNUAL EMISSIONS (METRIC TONS)	ANNUAL EMISSIONS (METRIC TONS)	ANNUAL EMISSIONS (METRI C TONS)
27,078	26,472	26,668

For detailed co-pollutant breakdown estimates, please see Regional Benefits Analysis section.

Community Benefits

- Reduced energy costs for industrial facilities
- Additional funding opportunities through sustainability initiatives that can create jobs for residents
- Reduced workplace health risks for industrial workers
- Improved health outcomes for residents

Plan Alignment

LVPC - *FutureLV: The Regional Plan*

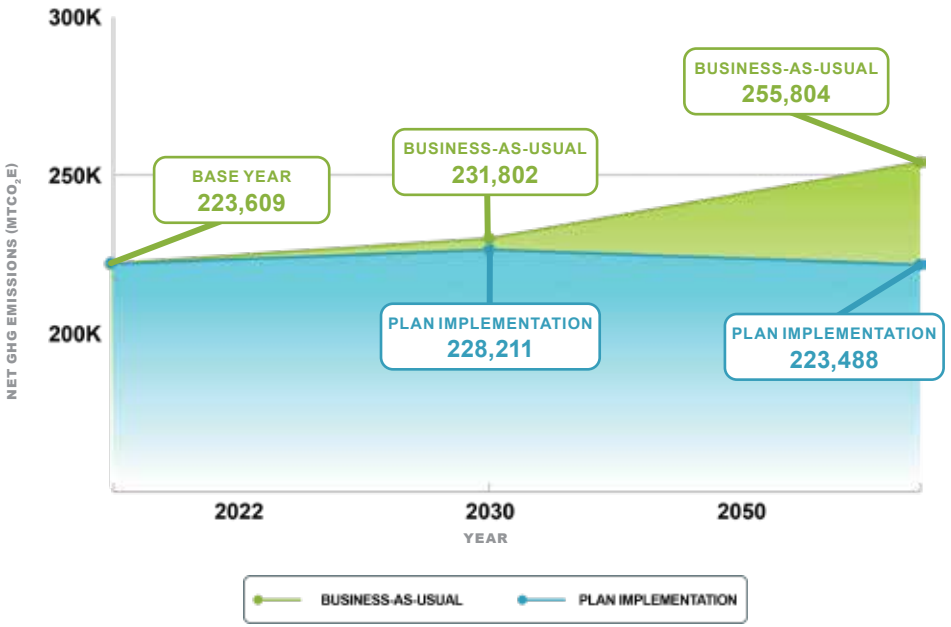
- Efficient and Coordinated Development Pattern
- Protected and Vibrant Environment

LVPC - *Climate + Energy Element*

- To support the diversification of energy sources

Waste Management

Solid Waste Emissions Reduction Estimates ($MTCO_2e$)



-2%

2030 Implementation
Estimated Emissions Reduction

-13%

2050 Implementation
Estimated Emissions Reduction

Overview

Solid waste can affect air quality and public health by emitting methane, carbon dioxide and other harmful pollutants, particularly at landfills. However, the Greater Lehigh Valley region has opportunities to reduce these emissions through improved waste management strategies such as expanding recycling and composting programs, investing in waste-to-energy technologies and promoting sustainable consumption practices. These strategies are already being implemented, and greater adoption will help the region move toward a more sustainable future.

According to a waste characterization study prepared for the Pennsylvania Department of Environmental Protection, in 2021, Pennsylvanians generated approximately 9.6 million tons of municipal waste annually, which is the equivalent to 1,480 pounds of waste per person every year. The largest contributor to that municipal waste is food waste, which contributes 17% of waste generated. The breakdown of food waste in landfills produces methane, a potent atmospheric warming gas. There are multiple strategies to confront this issue, including reducing the overall amount of waste that is landfilled and capturing the methane emissions of waste that does end up in landfills.

To divert organic and recyclable materials from landfills, curbside recycling and composting programs can be expanded. Another way to divert food waste from landfills is to encourage food recovery programs. There are several food recovery programs in the Greater Lehigh Valley area, including but not limited to:

- The Food Recovery Network
- Active chapters at Lafayette College and Lehigh University
- Second Harvest Food Bank of the Lehigh Valley
- Jewish Family Services Community Food Pantry

These programs encourage diversion of waste from landfills and support people in need throughout the Greater Lehigh Valley region. Public education campaigns are another tool that can be used. Promoting sustainable consumption habits such as reducing single-use plastics, repairing rather than discarding items, buying in bulk and composting can significantly lower per capita waste generation. Additionally, regional collaboration between municipalities or counties across Pennsylvania and New Jersey can foster shared infrastructure and coordinated waste management policies, improving efficiency and reducing emissions.

Another emission reduction strategy is to invest in waste-to-energy facilities which help convert methane from decomposing waste into pipeline-quality natural gas. In the Greater Lehigh Valley, there are several landfills that convert methane to energy at their plants. These facilities offset traditional natural gas demand, create utility from a waste product and provide a renewable energy source.

GOAL 1 Reduce emissions from landfills through waste diversion and best management practices

Implementation Actions

1. Prioritize diverting organic waste from landfills and promoting soil health and organic waste reuse through compost application.

- Support programs and incentives to reduce or divert waste through improved food waste collection services and through the establishment of curbside composting programs.
- Enable community scale composting facilities via county incentives and ordinance guidance to ensure facilities are appropriately located.
- Encourage municipalities to provide residential compost bins.
- Educate public about food waste importance and reduction strategies.
- Green the supply chain using recycled and other environmentally preferable products and services.
- Promote recycling education and advocacy

2. Reduce the impact of current waste collection and disposal systems and encourage best practices for waste management.

- Encourage the conversion of waste-hauling fleets from diesel-powered vehicles to low- or no-emission vehicles.
- Promote residential municipal “single hauler” contracting to reduce truck miles and tailpipe emissions.
- Encourage capture/use of released methane from landfills and transfer stations.

Key Implementing Agencies and Partners

- US EPA
- Pennsylvania and New Jersey Departments of Environmental Protection
- County Governments and Planning Commissions
- Municipal governments
- Waste Haulers and Landfill Operators
- Colleges and Universities.
- Non-profits and Community Groups such as Lehigh Valley Food Policy Council, Second Harvest Food Bank of the Lehigh Valley and Northeast Pennsylvania, Meal Recovery Coalition in New Jersey and New Jersey Composting Council.

ESTIMATE OF EMISSIONS REDUCTIONS ($MTCO_2e$) FROM WASTE DIVERSION

2030	2050
10% INCREASE IN FOOD WASTE COMPOSTED	50% INCREASE IN FOOD WASTE COMPOSTED
3,591	32,316

Authority to Implement

- The U.S. Environmental Protection Agency (EPA) sets national guidelines and regulations under laws such as the Resource Conservation and Recovery Act.
- PA DEP and NJ DEP have regulatory oversight for waste management facilities, recycling goals and emissions standards. Both states set statewide waste reduction and recycling targets, provide grants and approve county waste management plans.
- Local Governments have the authority to implement solid waste emission reduction strategies. Counties also have the authority to create a regional composting program. Municipalities can implement waste collection, recycling programs and adopt ordinances on practices such as composting and plastic bag bans.
- County Planning Commissions review municipal ordinances, can coordinate cross-jurisdictional strategies for emission reduction and infrastructure improvements and create plans that include waste management and sustainability goals.
- Private waste haulers, landfill operators and environmental organizations can drive innovation and public participation through partnerships and pilot programs surrounding waste management.

Progress Indicators

- Local governments implementing or expanding composting and recycling programs
- Increased amount of material going to municipal composting and recycling centers
- Reduction in waste per capita in the greater Lehigh Valley region's landfills
- Increased collection of landfill gas
- Reduced travel and emissions from waste hauling vehicles
- Maintaining and expanding education efforts in schools and the broader community

Solid Waste Sector - Estimated Costs and Savings

Implementation Action	Baseline Cost Info	Scenario Cost Info	Cost Savings 2030 (Regionwide)	Cost Savings 2050 (Regionwide)	Cost Savings 2030 (Unit)	Cost Savings 2050 (Unit)
Increasing food waste composted and reducing waste sent to landfills	Landfill operators pay $6.25 per ton of waste in fees Food waste costs individual US consumers $728 per year	$91 savings per household annually	Reduction in fees paid by region's landfills per year: $79,553	Reduction in fees paid by region's landfills per year: $718,538	Consumer savings per year: $85	Consumer savings per year: $762

Funding Sources

Examples of potential funding sources include, but are not limited to:

- PA Food Recovery Infrastructure Grant
- PA Act 101, Section 901, County Planning Grants
- PA Act 101, Section 901, Household Waste Education
- PA Act 101, Section 902, Recycling Program Development and Implementation Grants
- PA Act 101, Section 904, Recycling Performance Grants
- US EPA Solid Waste Infrastructure for Recycling Grant Program
- US EPA Diesel Emissions Reduction Act Grants
- US Department of Agriculture Community Facilities Grants
- PA DEP Growing Greener Grant Program
- NJ Recycling Enhancement Act Grant Program
- NJ DEP Sustainable Jersey Grants
- Tipping Fees and Solid Waste Service Fees
- PENNVest Grants

SOLID WASTE SECTOR IMPLEMENTATION SCENARIO CO-POLLUTANT ESTIMATES

2022	2030	2050
ANNUAL EMISSIONS (METRIC TONS)	ANNUAL EMISSIONS (METRIC TONS)	ANNUAL EMISSIONS (METRIC TONS)
5,410	5,521	5,409

For detailed co-pollutant breakdown estimates, please see Regional Benefits Analysis section.

Community Benefits

- Increased food access through food rescue and recovery programs.
- Potential employment opportunities created by various actions, including countywide yard waste collection and community-scale composting.
- Improved waste management in neighborhoods can reinforce environmental sustainability and economic vitality.

Plan Alignment

LVPC - *FutureLV: The Regional Plan*

- Efficient and Coordinated Development Pattern
- Protected and Vibrant Environment
- Safe, Healthy, Inclusive and Livable Communities

LVPC - *Climate + Energy Element*

- To protect residents, property and critical facilities from natural hazards as evolving over time due to changing weather patterns.
- To provide building and site design practices that help to mitigate changing weather pattern impacts.
- To reduce Lehigh Valley carbon gas emissions from residences, government operations and businesses.
- To support the diversification of energy sources.
- To advocate increased energy conservation and efficiency awareness.

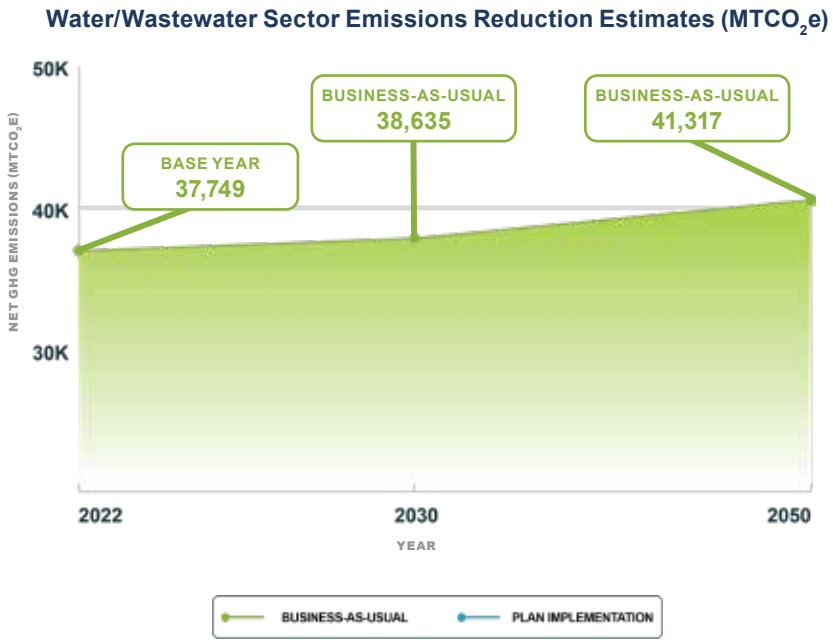
LVPC - *Livable Landscapes: A Park, Recreation, Open Space, Agricultural and Historic Lands Plan for Lehigh County and Livable Landscapes: An Open Space Plan for Northampton County*

- Preserve farmland and farming to meet food production, economic and open space needs.
- Advance County natural, recreational, agricultural and historical resources and usage through funding, promotion, education, partnerships and other strategies.

Carbon County - *Carbon County Greenways, Trails and Open Space Plan*

- Make County open spaces a model of best land management practices and policies to preserve the most sensitive and desirable natural resources. Employ optimal land management practices and policies to safeguard sensitive natural resources, ensuring the county's open space program is a model for land protection and conservation.

Water and Wastewater Sector



Overview

The water and wastewater sector contributes to carbon gas emissions through energy-intensive treatment processes, chemical use and aging infrastructure. In the Greater Lehigh Valley, it is the smallest source of the region's carbon gas emissions at 0.3% or 37,749 $MTCO_2e$ yearly. Although water and wastewater treatment is the smallest emissions sector identified in the plan, it has an outsized impact on municipalities, as it is typically the largest energy consumer for municipal governments, accounting for 30 to 40 percent of their total energy consumption on average across the United States. Water and wastewater treatment is a vital service which supports public health, environmental quality and regional resilience.

Emissions reductions for the water and wastewater sector are not quantified in this plan; however, the implementation and adoption of the proposed goals, policies and actions can still meaningfully contribute to emission reductions. Beyond emissions, the improvements and policies in this plan can enhance community resilience by reducing operational costs, safeguarding water quality and ensuring reliable service, which is especially important in the face of climate-related stresses like increased flooding or drought. The recommended policies and actions in this section support both climate goals and local environmental and economic vitality.

GOAL 1 Promote improved energy efficiency at water and wastewater treatment facilities

This regional plan aims to reduce carbon emissions in the water and wastewater sector by enhancing energy efficiency through upgrades on aging systems, as well as the installation of renewable energy at wastewater treatment plants to offset and reduce current emissions and energy costs.

Another way to reduce emissions in this sector is to encourage the use of biogas as energy to power wastewater treatment plants. Biogas is produced when organic waste decomposes and creates methane, and its use can lower carbon emissions and energy costs. Lehigh County Authority's Kline's Island Wastewater Treatment Plant (WWTP) in Allentown employs this technology, and according to the authority, in 2018, the digesters produced about 290,000 to 350,000 cubic feet of biogas per day.

There are approximately 30 wastewater treatment facilities in the Greater Lehigh Valley, and across these facilities, there are two main processes used to treat wastewater:

- Aerobic: Microbes in system require oxygen and it is less energy efficient and more expensive to operate. Often used by treatment authorities for nitrogen and phosphorus removal capabilities and ability to meet regulatory standards.
- Anaerobic: Microbes in system don't use oxygen. Better suited for high levels of organic matter and allows for recovery of biogas.

Anaerobic processes are increasingly being integrated, reflecting a trend toward more sustainable and efficient wastewater treatment practices. Modernizing operations and infrastructure can reduce this sector's environmental impact, while continuing to ensure reliable and sustainable water treatment services.

About 14% of the water produced by a water system is lost to leaks in the distribution network. These leaks result in lost revenue for authorities and wasted money and energy on water treatment processes. Upgrades to aging infrastructure and implementation of system monitoring technologies will help authorities reduce energy usage and emissions and provide better service for their customers.

Individuals can reduce their water use by adopting practices such as upgrading to water-efficient appliances, collecting rainwater, and landscaping using native plants. Communitywide efforts to educate the public about the environmental impacts of water use and encouraging conservation behaviors can be impactful as well.

Implementation Actions

1. Reduce carbon emissions of water and sewer systems and building infrastructure through efficiency upgrades and leakage emission initiatives.

- Support system and facility upgrades.
- Encourage installation of renewable energy at wastewater treatment plants.

2. Reduce carbon emissions from wastewater processing through recovery of waste products.

- Encourage biogas utilization at wastewater treatment plant facilities to reduce reliance on fossil fuels, lower carbon emissions and reduce energy costs.
- Upgrade wastewater facilities to improve aerobic processes and transition to and upgrade anaerobic digestion processes.

Key Implementing Agencies and Partners

- Water and Sewer Authorities, such as Lehigh County Authority, Easton Suburban Water Authority, Carbon County Municipal Authority and Warren County Municipal Utility Authority
- Regional and County Planning Organizations such as Carbon County Planning Commission, Lehigh Valley Planning Commission and Warren County Planning & Zoning Commission
- NEPA Alliance
- State Environmental Protection Departments
- County Conservation Districts
- Municipal Governments
- Non-profits and Community Groups

Authority to Implement

Pennsylvania DEP and New Jersey DEP oversee regulations for water quality, wastewater discharge and stormwater management. PA DEP regulates emissions from water and wastewater treatment plants under the Clean Water Act and Air Quality programs. NJ DEP has a similar role to PA DEP and implements the NJ Global Warming Response Act and regulates carbon gas emissions with specific mandates for public utilities and facilities.

County Planning Commissions (LVPC, CCPC) review municipal ordinances, sewage facility planning modules and official plans, coordinating cross-jurisdictional strategies for emission reduction and infrastructure improvements and create plans that include water and sewer planning initiatives and sustainability goals. Warren County, NJ Planning and Zoning Commission supports sustainable water and wastewater planning through land use, environmental and infrastructure coordination functions.

- County Conservation Districts review and approve Erosion and Sediment Pollution Control plans for construction and land development, oversee NPDES permits for stormwater discharges and ensure that proper post-construction stormwater management best practices are implemented
- Municipal water and sewer authorities execute infrastructure upgrades, improve energy efficiency and integrate low-emission technologies into water and wastewater operations.
- Local governments can integrate water sustainability into land use decisions, policy development and zoning. Municipalities can implement local emissions reduction policies, by adopting ordinances related to water efficiency, stormwater management and renewable energy use at facilities.

Progress Indicators

- Number and type of facility upgrades
- Number of facilities utilizing anaerobic digestion and collecting biogas
- Reduced overall energy consumption at facilities

Cost Considerations – Not included for this sector as policies were not quantified.

Funding Sources

Examples of potential funding sources include, but are not limited to:

- DEP Growing Greener Plus Grants
- PENNVEST Funding
- PA Small Water and Sewer Grant Programs
- Clean Water State Revolving Fund
- Infrastructure Investment and Jobs Act Funding
- Water and Waste Disposal Loan & Grant Program (USDA Rural Development)
- New Jersey Infrastructure Bank
- New Jersey Future Funding Navigator

Community Benefits

- Decreased utility costs due to more efficient system upgrades.
- Increased efficiency for municipal authorities in the Economic Impact Area.

Plan Alignment

LVPC - *FutureLV: The Regional Plan*

- Efficient and Coordinated Development Pattern
- Protected and Vibrant Environment
- Competitive, Creative and Sustainable Region

LVPC - *Climate + Energy Element*

- Reduce Lehigh Valley carbon emissions from residences, government operations and businesses.
- Promote energy efficiency and natural resource conservation within existing and new buildings and land development.
- Advocate for increased energy conservation and efficiency awareness.

LVPC - *Livable Landscapes*

- Conserve, restore and enhance natural resources.
- Conserve, restore and enhance a greenways and blueways network.
- Advance County natural, recreational, agricultural and historical resources and usage through funding, promotion, education, partnerships and other strategies.

Regional Benefits Analysis

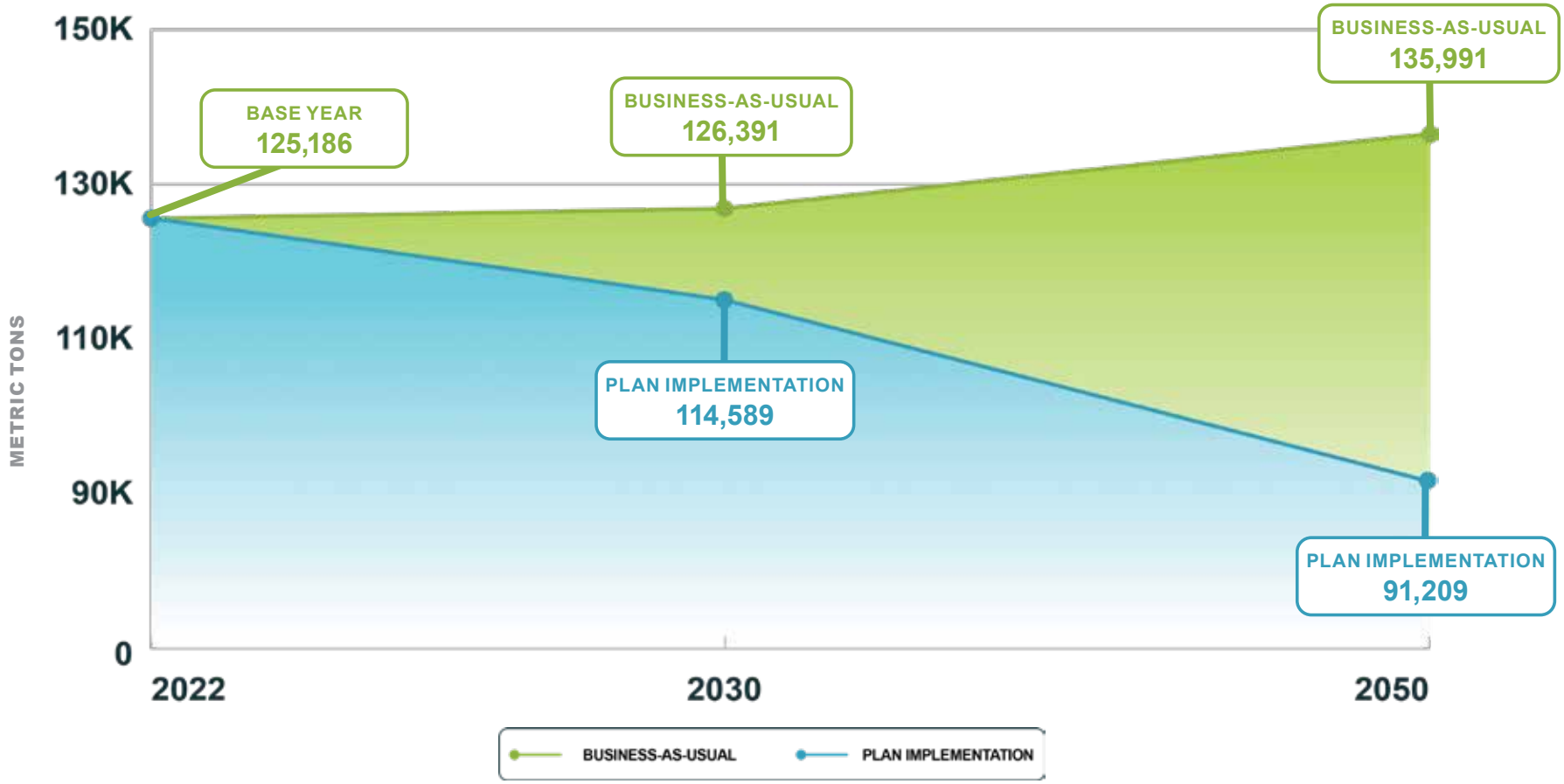
Regional Benefits Analysis

Reducing carbon gas emissions is vital to the health of our environment, but implementing the goals, policies and actions of the Pathway to a Resilient Greater Lehigh Valley will go well beyond cleaner air and water. The impacts will have a cascading effect of reducing other harmful pollutants and increasing the quality of life for people in our communities, while producing economy and job growth in fields related to environmental sustainability. The following section describes results from regionwide benefits analyses of co-pollutants and workforce planning.

Co-Pollutants Analysis

Co-pollutants are air pollutants that are often emitted with atmosphere warming gasses such as carbon dioxide and methane. The co-pollutants analyzed in this inventory are carbon monoxide (CO), ammonia (NH_3), particulate matter 2.5 and 10 (PM 2.5 & PM 10), sulfur dioxide (SO_2) and volatile organic compounds (VOCs). In the Greater Lehigh Valley, carbon monoxide (CO) accounts for approximately two-thirds of regional co-pollutant emissions. Co-pollutants do not create the same warming effects as carbon dioxide and methane but can cause negative health impacts. Studies have linked long-term exposure to these pollutants to a variety of health issues, including asthma, heart attacks and strokes, cancers, birth defects and overall reduced lung function. Reducing co-pollutant emissions can provide immediate, tangible and local benefits. Emission reduction measures aim to reduce co-pollutants but can increase them in certain circumstances. Impacts of proposed emission reduction policies, including changes in co-pollutant emissions, are described within the analyses for each sector covered in the plan.

Greater Lehigh Valley Future Co-Pollutants Emissions Scenarios



The US EPA's National Emissions Inventory (NEI) provided the 2022 baseline data for this analysis. Because they are often emitted along with atmospheric warming gases such as carbon dioxide and methane, co-pollutant emissions are projected to increase at a similar rate in the business-as-usual inventory. The transportation sector accounts for the greatest share of co-pollutant emissions in the region. This is likely due to the large amount of vehicle traffic in the region, which causes co-pollutant emissions through tire friction and braking, as well as engine combustion. The commercial, residential and industrial sectors also significantly contribute to regional co-pollutant emissions. The following charts include detailed co-pollutant breakdowns for the following sectors:

- Commercial and Residential
- Agricultural
- Industrial
- Solid Waste
- Transportation

Co-Pollutant Emissions Estimates

- Tables list individual co-pollutants by source (point or non-point)
- Point Sources include individual facilities and are emitted directly from a source such as construction sites, airports, large energy and industrial sites.
- Non-point sources include agriculture, most industrial, commercial, institutional and residential fuel burning, and mobile sources such as motorized vehicles.

Note - Values over 100 are rounded to the nearest whole number.

CO - Carbon Monoxide NOx – Nitrous Oxides PM_{10} – Particulate Matter (particle size 10 micrometers) SO_2 – Sulfur Dioxide
NH_3 – Ammonia NO_2 – Nitrogen Dioxide $PM_{2.5}$- Particulate Matter (particle size 2.5 micrometers) VOC – Volatile Organic Compounds

BAU – Business as Usual – Projections without any action Scenarios – Implementation measures described in this plan

Commercial & Residential Sectors

Sum of 2022 Emissions (Metric Tons) Baseline					Projections (BAU vs. Scenarios)			
Pollutant	**Source**	**Commercial**	**Residential**	**2022 Combined**	**2030 BAU**	**2030 Scenario**	**2050 BAU**	**2050 Scenario**
CO	Nonpoint	14,491	14,261	28,751	29,412	25,177	31,428	9,083
NH_3	Nonpoint	6	175	182	187	160	201	58
NO_x	Nonpoint	1,159	1,156	2,315	2,368	2,027	2,530	731
PM10-PRI	Nonpoint	2,429	1,622	4,051	4,140	3,544	4,415	1,276
PM2.5-PRI	Nonpoint	836	1,605	2,441	2,500	2,140	2,681	775
SO_2	Nonpoint	29	51	80	82	70	88	25
VOC	Nonpoint	5,807	1,790	7,597	7,754	6,638	8,240	2,381
CO	Point	40.26		40	41	35	43	13
NH_3	Point	1.12		1	1	1	1	0
NO_x	Point	50.81		51	52	44	55	16
PM10-PRI	Point	8.51		9	9	7	9	3
PM2.5-PRI	Point	7.47		7	8	7	8	2
SO_2	Point	0.58		1	1	1	1	0
VOC	Point	2.77		3	3	2	3	1
Grand Total		24,868	20,660	45,528	46,557	39,853	49,704	14,364

Source: US EPA - National Emissions Inventory (NEI)

Agricultural Sector*

Sum of 2022 Emissions (Metric Tons) Baseline			Projections (BAU vs. Scenarios)			
Pollutant	**Source**	**2022**	**2030 BAU**	**2030 Scenario**	**2050 BAU**	**2050 Scenario**
CO	Nonpoint	331	315	287	267	168
NH_3	Nonpoint	1,074	1,022	931	867	544
NO_x	Nonpoint	155	147	134	125	78
PM10-PRI	Nonpoint	1,086	1,033	941	877	550
PM2.5-PRI	Nonpoint	235	223	203	189	119
SO_2	Nonpoint	3	3	3	3	2
VOC	Nonpoint	165	157	143	133	83
Grand Total		3,049	2,900	2,642	2,461	1,543

*Note - Agricultural co-pollutants only include non-point sources
Source: National Emissions Inventory / Projections based on GHG reduction

Industrial Sector

Sum of 2022 Emissions (Metric Tons) Baseline			Projections (BAU vs. Scenarios)			
Pollutant	**Source**	**2022**	**2030 BAU**	**2030 Scenario**	**2050 BAU**	**2050 Scenario**
CO	Nonpoint	1,652	1,703	1,615	1,855	1,627
NH_3	Nonpoint	16	16	16	18	16
NO_x	Nonpoint	973	1,003	951	1,093	958
PM10-PRI	Nonpoint	810	835	792	910	798
PM2.5-PRI	Nonpoint	500	516	489	562	492
SO_2	Nonpoint	113	116	110	127	111
VOC	Nonpoint	728	751	712	818	717
CO	Point	9,490	9,784	9,278	10,657	9,346
NH_3	Point	125	129	122	140	123
NO_x	Point	3,960	4,082	3,871	4,447	3,900
PM10-PRI	Point	1,686	1,738	1,648	1,894	1,661
PM2.5-PRI	Point	1,263	1,302	1,235	1,418	1,244
SO_2	Point	4,907	5,059	4,797	5,510	4,833
VOC	Point	855	881	835	960	842
Grand Total		27,078	27,916	26,472	30,408	26,668

Source: US EPA - National Emissions Inventory (NEI)

Solid Waste Sector

Sum of 2022 Emissions (Metric Tons) Baseline			Projections (BAU vs. Scenarios)			
Pollutant	**Source**	**2022**	**2030 BAU**	**2030 Scenario**	**2050 BAU**	**2050 Scenario**
CO	Nonpoint	3,199	3,316	3,265	3,659	3,198
NH_3	Nonpoint	244	253	249	279	244
NO_x	Nonpoint	96	100	98	110	96
PM10-PRI	Nonpoint	495	513	505	566	495
PM2.5-PRI	Nonpoint	450	467	460	515	450
SO_2	Nonpoint	33	34	34	38	33
VOC	Nonpoint	520	539	530	594	520
CO	Point	103	107	105	118	103
NH_3	Point	7	7	7	8	7
NO_x	Point	38	40	39	44	38
PM10-PRI	Point	125	130	128	143	125
PM2.5-PRI	Point	42	44	43	48	42
SO_2	Point	46	47	47	52	46
VOC	Point	11	11	11	13	11
Grand Total		5,410	5,608	5,521	6,188	5,409

Source: US EPA - National Emissions Inventory (NEI)

Transportation Sector*

Sum of 2022 Emissions (Metric Tons) Baseline			Projections (BAU vs. Scenarios)			
Pollutant	**Source**	**2022**	**2030 BAU**	**2030 Scenario**	**2050 BAU**	**2050 Scenario**
CO	Nonpoint	32,070	31,553	29,158	34,330	31,429
NH_3	Nonpoint	448	441	407	479	439
NO_x	Nonpoint	5,531	5,442	5,029	5,921	5,421
PM10-PRI	Nonpoint	2,551	2,510	2,319	2,731	2,500
PM2.5-PRI	Nonpoint	583	574	530	624	571
SO_2	Nonpoint	19	19	17	20	18
VOC	Nonpoint	2,906	2,859	2,642	3,111	2,848
Grand Total		44,108	43,397	40,104	47,216	43,226

*Note - Transportation co-pollutants only include non-point sources
Source: US EPA - National Emissions Inventory (NEI)

Workforce Planning Analysis

An analysis of workforce development activities needed to implement the policies and actions recommended in this regional emissions reduction plan was prepared to understand the potential impacts of climate-focused initiatives on the regional workforce. Its primary objective is to assess how strategic development within targeted green economy sectors — specifically building retrofits, energy efficiency, and green infrastructure — can drive economic growth, enhance job quality and create opportunities for communities within the Greater Lehigh Valley.

The analysis includes the following components:

- Identification of high-impact occupations and industry sectors that are integral to achieving climate goals.
- Evaluation of current and historical employment data, including workforce demographics (age & education level), and general labor market characteristics.
- Addressing the Labor market gap in these occupations, projecting future demand and growth potential.
- Mapping existing workforce development programs and strategies to bridge skill gaps.

GREATER LEHIGH VALLEY PRIORITY OCCUPATIONS FOR TARGETED GREEN OCCUPATIONS
Business Operations Specialists, All Other (Building Auditors, Inspectors)
Carpenters
Construction Laborers
Operating Engineers and Other Construction Equipment Operators
Electricians
Insulation Workers (Floor, Ceiling, Wall / Mechanical)
Painters, Construction and Maintenance
Plumbers, Pipefitters, and Steamfitters / Pipelayers
Construction and Building Inspectors
Heating, Air Conditioning, and Refrigeration Mechanics and Installers
Industrial Machinery Mechanics / Maintenance Workers
Maintenance Workers, Machinery
Welders, Cutters, Solderers, and Brazers / Welding Machine Operators
Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders
Landscape Architects
Building and Grounds Cleaning and Maintenance Occupations
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers
Landscaping and Groundskeeping Workers
Tree Trimmers and Pruners

Key Findings of the Workplace Planning Analysis Include

- A total of 14 building retrofit and energy efficiency occupations and five green infrastructure improvement occupations were identified as central to the greater region's emissions reduction strategy.
- Approximately 7% of the workforce in the study area is currently employed in these 19 key occupations.
- The age distribution of employees differs across sectors: building retrofit, and energy efficiency roles are characterized by an aging workforce, while green infrastructure occupations attract younger workers.
- The educational attainment of workers in these sectors underscores the availability of these jobs to individuals with varying educational backgrounds.
- On-the-job training (OJT) and related work experience are the primary requirements for entering these occupations, highlighting the importance of practical skills and training opportunities over higher education.
- Projection through 2032 indicates growth across all identified occupations except for Carpenters, suggesting broad-based demand in energy-efficient construction and green infrastructure.
- All occupations exhibit positive annual demand, with roles such as Installation, Maintenance & Repair Occupations, Maintenance & Repair Workers, General, Building & Grounds, Cleaning & Maintenance Occupations, and Landscaping & Groundskeeping Workers showing particularly strong market needs.
- In terms of compensation, all but three identified occupations offer higher median hourly wages than the average for all occupations, and most surpass Pennsylvania and national wage levels, indicating strong job quality.
- To address workforce gaps, the region is served by three regional Workforce Boards—Workforce Board LV, Pocono Counties Workforce Development Board (PCWDB), and Workforce Development Board of Northwest New Jersey (WDB NNJ). These organizations support skills development through education programs, training funds, industry partnerships, and apprenticeship programs, aimed at equipping the local workforce with the skills necessary for emerging building retrofit and energy related jobs.

Conclusion

Conclusion

The Greater Lehigh Valley is a growing region where location, economy, open space and a strong workforce attract thousands of new residents and businesses every year, and the recommendations in this Pathway to a Resilient Greater Lehigh Valley are designed to maintain and enhance the quality of life that's made it so appealing.

These goals were selected for their direct impact on reducing carbon emissions and their additional benefits to the communities of which they are a part. Analyzing these benefits can reveal broader improvements in areas such as air quality, public health and economic growth, making the case for decarbonization even stronger.

Throughout this plan we have identified targets and metrics, which must be monitored on an annual basis to understand progress towards the plan's goals. This will require coordinated actions and commitments from a variety of public, private and non-profit entities. The LVPC will continue to build upon its engagement activities with community members, businesses, institutions, local governments and our many regional community partners to provide guidance and resources to enable implementation of the recommendations in this plan. With the completion of the RGLV, the LVPC will work with its community and business partners to create a robust monitoring plan to track and share progress on the plan strategies.

Numerous regions across the United States have established commissions, or networks of committed business and government leaders that provide oversight and coordination to help meet sustainability and energy efficiency planning targets in the building sector. From Boston's Green Ribbon Commission to Philadelphia and Pittsburgh's 2030 Districts Networks, these efforts help strengthen commitments to practices that help reduce air pollution and provide critical resources for funding and technical assistance to meet target emission reduction goals.

Boston's green ribbon commission is among the most active in the country and could be a good model for a similar effort for the Greater Lehigh Valley. Our bi-state, cross county region includes similar influential sectors, such as higher education, health care, real estate, industry/manufacturing, and cultural institutions, that can work together to increase community capacity to mitigate carbon emissions and build a climate resilient region.

The commitment to regional carbon emission reductions through this RGLV reflects a forward-thinking approach that balances environmental imperatives with public health and economic opportunity. Potential carbon emission reductions resulting from the policies and actions outlined in this plan are estimated to result in a reduction of 5,032,432 Metric Tons of Carbon Dioxide Equivalents or nearly 40% by 2050 when compared to the region's Business as Usual Projections.

Call to Action

Lehigh, Northampton, Carbon and Warren counties are poised to implement common sense activities and actions that will help make the region's air cleaner, reduce energy costs, improve community health, and make the Greater Lehigh Valley more resilient to changing weather patterns. Many of these actions have multiple benefits as described in this document including reduced energy costs, cleaner air, healthier neighborhoods, and more resilient infrastructure. The changes to our climate experienced at a global level may seem impossible to reverse with these more local actions, but collectively we can make an important difference where we live, work and play. How we choose to drive, or utilize our parks and trails, or how we steward our unique land and water resources are impactful at many different scales, but ultimately, we can find common ground around actions that, when implemented, benefit our broader community.

The data exists to understand the chemical composition of our atmosphere and the cleanliness of air discharging from a local industry or landfill. Whether it's to save energy costs at your business, reduce the cost of heating your home, or deciding to walk or bike instead of driving, it all matters in our growing region.

Many municipalities have adopted ambitious emission reduction goals in our region and others are underway. The cities of Allentown, Bethlehem and Easton have created sustainability offices and hired coordinators, a great signal of the region's commitment to this effort.

The Greater Lehigh Valley and its broader region continue to attract new businesses, families, and tourists, but with this popularity comes the responsibility to manage growth and protect, preserve and steward its environmental heritage for its current and future population. The RGLV provides a pathway for a longer-term commitment for the region to ensure a healthy, robust and sustainable future.

Let's start by making those small changes and committing ourselves to be more careful about our planet, not just today, but for the future. We've seen significant reductions over the past 20 years in the Greater Lehigh Valley and these plans will provide the foundation for continuing these trends for the next 25 years.

By working together — residents, businesses, local governments, and community organizations — we can build momentum toward a cleaner, healthier and more sustainable Greater Lehigh Valley. The steps outlined in this plan are not just environmental strategies; they are investments in the long-term vitality, livability and resilience of our region. Every action, no matter how small, contributes to a collective impact that ensures future generations inherit a region where clean air, economic opportunity, and environmental integrity go hand in hand. Now is the time to turn our shared vision into action, because the choices we make today will shape the Greater Lehigh Valley of tomorrow.

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