NOVEMBER 2023

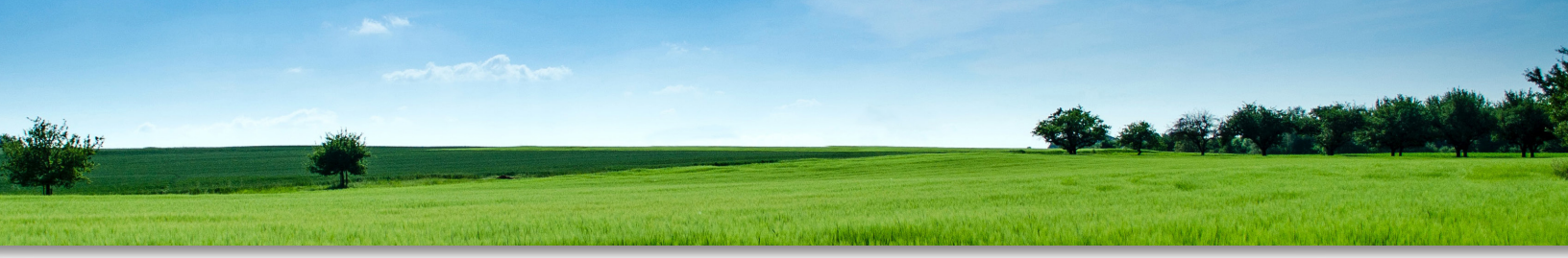
PENNSYLVANIA CARBON REDUCTION STRATEGY (CRS)

In Support of the Federal Carbon Reduction Program (CRP)




pennsylvania
DEPARTMENT OF TRANSPORTATION

IN CONSULTATION WITH PENNSYLVANIA METROPOLITAN AND RURAL PLANNING ORGANIZATIONS (MPOS/RPOS)



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1 PURPOSE AND ROLE OF CRS

Why We Need to Reduce Carbon

Carbon reduction is crucial because of the impact of greenhouse gases (GHGs), such as carbon dioxide (CO2), on our planet's temperature. In simple terms, GHGs act like a blanket, trapping heat close to the Earth. This causes global warming and unpredictable changes in our climate. Because of these changes, we're seeing more extreme weather, higher sea levels, and disruptions to our natural surroundings. All of these impact the daily lives of Pennsylvanians, including how we travel and use our transportation systems.

The Pennsylvania Department of Environmental Protection (DEP) states that some of the present and expected impacts of climate change in Pennsylvania include:

Warmer weather – Pennsylvania's climate has undergone warming of 1°C (1.8°F) over the past 110 years and is expected to warm by another 3.3°C (5.9°F) by 2050.

Wetter weather – Pennsylvania's climate has also gotten wetter with an average increase in precipitation of 10% and is expected to increase an additional 8% by 2050.

Increased risks of natural disasters, such as flooding and landslides – The frequency of heavy rain events in the nation's Northeast has increased by as much as 75%, resulting in more localized pockets of flood damage and subsequent **landslides**.

Health threats: Pennsylvanians' health will be negatively affected by climate change. This is due to factors such as worsened air quality, increased flooding, agricultural losses, and the spread of vector-borne diseases.

Find out more about climate change and its expected impacts in Pennsylvania at: **Climate Change in PA.**

These impacts and others are negatively affecting Pennsylvania's infrastructure including the transportation assets owned and maintained by the Pennsylvania Department of Transportation (PennDOT). In 2018, flooding and landslides resulted in approximately $125 million in damage to public infrastructure. PennDOT has highlighted some of these impacts in their **Extreme Weather Vulnerability Study** and continues to track historic flooding vulnerabilities and risks throughout the state.

As Pennsylvania faces the challenges of a changing climate, government bodies are not merely adapting, but are also proactively targeting carbon emissions. A central pillar of this mission is enhancing energy efficiency and championing the adoption of renewable energy. Embracing a low-carbon economy is expected to drive innovation, open doors to new employment opportunities, and stimulate economic growth.

Addressing transportation is crucial for cutting carbon emissions. As a significant source of GHGs (see Section 4), transportation needs a multi-pronged strategy. Adopting alternative fuels and electric vehicles can drastically reduce emissions from daily commutes. By improving traffic efficiency, we can decrease fuel consumption and congestion. Supporting public transit offers a greener alternative to individual car travel, and promoting walking and biking further reduces our carbon footprint. Collectively, these steps lead to a more sustainable transportation system.

Carbon Reduction Program (CRP)

The CRP was established under the **2021 Bipartisan Infrastructure Law (BIL)**, also known as the Infrastructure Investment and Jobs Act (IIJA), and codified in 23 U.S.C. 175. The federal legislation states that the purpose of the CRP is to provide funds for projects designed to reduce carbon emissions from on-road highway sources.

Pennsylvania is expected to receive about **$264 million** through fiscal year (FY) 2026 under the CRP. Sixty-five percent of this amount is allocated to urbanized areas and is distributed in relation to their relative shares of Pennsylvania's population. The remaining 35% of the CRP funding is distributed by PennDOT. CRP funds may only be used for projects that support the reduction of transportation emissions. Examples of these projects include:

- a project to replace street lighting and traffic devices with energy-efficient alternatives;
- efforts to reduce the environmental and community impacts of freight movement;
- a project that supports the deployment of alternative fuel vehicles;
- a project that reduces vehicle miles traveled for single occupancy vehicles and/or improves multi-modal access; and
- certain types of projects to improve traffic flow that do not increase the number of through lanes.

Other examples of eligible projects and more information about the CRP can be found at:
Bipartisan Infrastructure Law - Carbon Reduction Program (CRP) Implementation Guidance

The CRP requires that each state, in consultation with Metropolitan Planning Organizations (MPOs), develop a Carbon Reduction Strategy (CRS) by November 15, 2023. PennDOT's CRS has been developed in accordance with the guidelines of the CRP and in alignment with existing plans, strategies, and projects to reduce transportation GHG emissions across Pennsylvania. PennDOT's coordination includes not only the MPOs but also the state's Rural Planning Organizations (RPOs). Such collaboration is deemed crucial for the success of these programs.

Purpose of Carbon Reduction Strategy (CRS)

The CRS provides PennDOT with a guide and action plan for implementing the CRP and other carbon reduction activities. Pennsylvania's state CRS aims to:

CRS PURPOSE

- publicly share information on carbon reduction initiatives and funding **(Sections 1 and 2)**;
- support decision-making **(Sections 5, 6, 7)**;
- promote coordination **(Sections 3 and 6)**;
- guide project identification and prioritization **(Sections 5 and 6)**; and
- provide a path forward on broader-level policies and actions to reduce carbon emissions **(Section 7)**.

Each of these roles is discussed within specific sections of this document. PennDOT intends the CRS to be a "living document" that will be updated at least once every four years in accordance with federal requirements (23 U.S.C 175(d)(3) and (4)). Updates may include revisions to anticipated funding, enhancements to priority strategies, listings of completed carbon reduction projects under the CRP, status updates on other carbon reduction initiatives, revisions to project selection processes and procedures, and historic trends of transportation GHGs. At this time, PennDOT has not defined a specific schedule for the CRS updates.

CRP Funding Allocations

Of the $264 million apportioned to Pennsylvania under the CRP through FY2026, PennDOT has determined distributions and total funding for the five-year program (FY2022-2026). The anticipated funding allocations to areas within Pennsylvania are less than the documented apportioned amounts due to funding transfers, state-wide set-asides, and fiscal constraint requirements as regulated in 23 CFR 450. **Figure 1** highlights the anticipated distribution of CRP funds to each Pennsylvania MPO/RPO over the five-year program. The funding allocations include:

- mandated distributions to U.S. Census Bureau (Census) urbanized areas by population;
- state funds distributed to MPOs and RPOs using a federal formula similar to other funding programs;
- and a $10 million set-aside for projects under the Transportation Systems Management and Operations (TSMO) program for the later years of the program.

Figure 1: Estimated CRP Funding Allocations (FY 2022–2026)

MPO/RPO AREA	MANDATORY URBAN AREA DISTRIBUTIONS[1]	REMAINING NON-MANDATORY DISTRIBUTIONS	MPO/RPO CRP FUNDING TOTALS
DVRPC (Philadelphia)	$52,624,859	$9,940,904	$62,565,762
SPC (Pittsburgh)	$24,274,291	$9,354,622	$33,628,913
Lehigh Valley	$8,259,501	$2,210,190	$10,469,692
Harrisburg	$6,219,459	$2,385,221	$8,604,681
Scranton/Wilkes-Barre	$5,770,436	$1,926,304	$7,696,739
Lancaster	$5,355,626	$1,843,953	$7,199,579
SEDA-COG	$427,339	$5,950,466	$6,377,805
NEPA	$430,918	$5,785,800	$6,216,718
Erie	$2,591,002	$2,989,931	$5,580,933
Reading	$3,628,785	$1,537,813	$5,166,598
York	$3,150,377	$1,668,986	$4,819,363
Northwest	—	$4,703,260	$4,703,260
Northern Tier	$19,304	$4,618,046	$4,637,350
North Central	—	$4,515,119	$4,515,119
Southern Alleghenies	$247	$4,032,641	$4,032,888
Centre County	$1,153,015	$1,816,807	$2,969,822
Franklin	$754,312	$2,030,354	$2,784,666
Lebanon	$1,026,381	$1,657,813	$2,684,194
Johnstown	$885,046	$1,745,516	$2,630,562
Altoona	$1,043,047	$1,474,615	$2,517,662
Williamsport	$748,455	$1,740,908	$2,489,363
Adams[2]	$837,423	$1,485,685	$2,323,108
Mercer	$314,633	$1,799,036	$2,113,669
Wayne County	—	$965,347	$965,347
MPO/RPO Totals	**$119,514,456**	**$78,179,336**	**$197,693,793**
Two-Year Allocation to PennDOT TSMO Program[3]			$20,000,000
Total Five-Year Funding Allocations			**$217,693,793**

[1] Funding allocations in FY 2025-2026 affected by CENSUS2020 urban area designations

[2] Includes Hanover urban area distribution encompassing some of York County ons

[3] TSMO allocation only applies to FY 2025 and 2026 ($10,000,000 per year)

2 SUPPORTING PLANS AND INITIATIVES

Numerous state, regional, and local carbon reduction initiatives are currently underway in Pennsylvania, each playing a significant role in reinforcing and augmenting the CRP and PennDOT's state CRS. As these diverse initiatives progress, a focused commitment to information exchange and cooperative efforts is paramount. Such collaboration will not only maximize funding opportunities but will also stimulate innovative project ideas, thereby driving the success of PennDOT's carbon reduction objectives.

Regional CRS

As with several of Pennsylvania's statewide plans and strategies, PennDOT recognizes that the Commonwealth's regions play a significant role in reinforcing and augmenting statewide initiatives. PennDOT encourages MPOs/RPOs to identify specific projects to reduce carbon emissions. The processes for identifying, prioritizing, and selecting carbon reduction projects can be integrated with ongoing activities related to local Climate Action Plans (CAPs), the Transportation Improvement Program (TIP), and the Long-Range Transportation Plan (LRTP).

Although not required under the CRP, regions may also consider the development of a formal regional CRS. MPOs/RPOs interested in developing a CRS should first consult with PennDOT's Center for Program Development and Management (CPDM) and the Federal Highway Administration (FHWA) Pennsylvania Division to review potential funding options and to evaluate the potential goals and objectives of the effort. If funded through the CRP, a regional CRS must align with the broader framework and priorities outlined in the state CRS, meet federal requirements, and be incorporated into the state CRS in future revisions.

Those regions that are developing a formal CRS should focus on expanding beyond the state plan by addressing the following key roles:

- **Coordinate with local agencies and climate action plans (CAPs)**

  The state CRS has been developed in coordination with Pennsylvania's MPOs/RPOs. A regional CRS can expand upon that coordination to include the counties and local governments within their region drawing from available local CAPs and initiatives.

- **Integrate with state CRS**
  A regional CRS is only eligible for CRP funds if it is integrated into the state CRS. In coordination with FHWA, PennDOT will determine a schedule and methods for integrating the regional and state CRS. The regional CRS should also be consistent with and support the goals of the state CRS.

- **Assess strategies that are most applicable to the region**
  The state CRS evaluates potential strategies drawing from the federal guidance on project eligibility, supporting cost-effectiveness data, and priorities from other state initiatives. A regional CRS should be consistent with the priority strategies outlined in the state plan. However, a regional CRS can refine that strategy toolbox to better match priorities in the region's LRTP and from local CAPs.

- **Identify specific strategy opportunities**
  A regional CRS should also focus on identifying specific project ideas, not just listing project categories. This may include identifying the locations of traffic flow improvement projects or alternative fuel infrastructure. These projects may be generated or extracted from other local plans or developed from expanded coordination efforts.

- **Provide a process to move strategy ideas to defined projects**
  The regional CRS should aim to support the integration of project ideas into the MPO/RPO TIP. As a result, concept projects should be evaluated to address project implementation, funding, and management.

- **Apply a project prioritization and selection process for CRP funding**

  The state CRS provides recommendations for local project prioritization and a selection process but remains flexible since each region in the state is unique with different levels of CRP funding. The regional CRS should provide specific methods for prioritizing and selecting projects for CRP funding. This may include the prioritization of certain project types, details on methods for scoring projects, and specific protocols for collaboration and engagement to identify project ideas and recommendations.

DEP Climate Action Plan and Alternative Fuels Initiatives

The **2021 Pennsylvania Climate Action Plan (CAP)** contains comprehensive guidance to assist Pennsylvania in achieving its GHG reduction goals and adapting to a changing climate. The plan outlines 18 strategies that have been determined by quantitative modeling to help meet the state's GHG reduction goals. This plan is required by the Pennsylvania Climate Change Act of 2008 and was produced by DEP and the Climate Change Advisory Committee (CCAC). DEP and the CCAC are required to update the CAP every three years. The plan identifies reducing the carbon emissions from transportation as a critical strategy for meeting the GHG reduction goals.

Four priority transportation strategies are provided in the 2021 CAP to significantly reduce GHG emissions and other air pollutants in the state. These strategies include:

- Increase fuel efficiency of all light-duty vehicles and reduce vehicle miles traveled (VMT) for single occupancy vehicles;
- Implement the multistate medium- and heavy-duty zero-emission vehicle memorandum of understanding (MHD ZEV MOU), of which the Commonwealth is a signatory;
- Increase usage of light-duty electric vehicles; and
- Implement a low carbon fuels standard (LCFS).

If implemented, these strategies are estimated to provide a 75% reduction in transportation GHG emissions by 2050. The CAP emphasizes the importance of vehicle technology in reducing carbon emissions. As such, the state CRS stresses the importance of alternative fuel infrastructure and other engine retrofits as provided in **Section 5**.

The **Pennsylvania Electric Vehicle Roadmap** examines the state's electric vehicle (EV) market and proposes strategies to support the expansion of the EV market. It also provides estimates of the potential statewide benefits and impacts of EVs.

DEP, PennDOT, and the **Drive Electric Pennsylvania Coalition** are working to implement measures in the Roadmap to prepare Pennsylvania to be part of a growing EV market. All government, business, academic, and community leaders are invited to use the Roadmap as part of their decision making. The current Roadmap and subsequent updates will continue to be referenced when evaluating priorities under the CRP.

In addition, DEP provides grant funding programs to support public agencies and businesses in transitioning to cleaner fuel transportation such as the **Alternative Fuels Incentive Grant Program**.

PennDOT NEVI Program

Under the BIL, PennDOT will receive $171.5 million through FY 2026 under the National Electric Vehicle Infrastructure (NEVI) Formula Program. The initial focus of this funding is to strategically deploy Direct Current Fast Charging (DCFC) stations along Pennsylvania's designated Alternative Fuel Corridors (AFCs) to help "build out" the national EV AFC network. PennDOT has announced the first round of conditional awards for NEVI funding. Fifty-four (54) projects in 35 counties were selected to expand access to and reliability of electric vehicle charging in Pennsylvania. The 54 projects conditionally awarded amount to a total federal investment of $33.8 million for Round 1. Once a state's AFC network is "fully built out" according to FHWA criteria, then PennDOT may use NEVI Formula Program funds for EV charging infrastructure on any public road or other publicly accessible location. By improving the infrastructure for EVs – such as charging stations and grid infrastructure – NEVI can encourage the purchase of these vehicles, thereby reducing the state's reliance on fossil fuel-powered vehicles and, consequently, reducing overall carbon emissions.

Learn more about PennDOT's NEVI Efforts: **PennDOT NEVI Formula Program**

Other PennDOT Programs That Can Support Carbon Reduction

PennDOT offers a variety of programs originally designed for different purposes, yet with the potential to significantly support carbon reduction. These initiatives, including the funding of multimodal travel, traffic flow improvements, air quality enhancements, and the integration of climate change assessments into National Environmental Policy Act (NEPA) evaluations, highlight the positive impacts on carbon reduction stemming from PennDOT's diverse efforts. Some examples of these programs include:

MULTIMODAL FUNDING

Enacted in 2013, Act 89 stands as a transformative piece of legislation that established the Multimodal Transportation Fund (MTF). This fund not only ensured stable funding for public transportation, ports, and rail freight, but also significantly boosted investments in aviation infrastructure and allocated dedicated resources for bicycle and pedestrian enhancements. The MTF's support for public transportation and active transportation aligns with efforts to reduce vehicle miles traveled, alleviate traffic congestion, and reduce carbon emissions throughout Pennsylvania, thereby advancing the state's broader environmental objectives. The Commonwealth Financing Authority MTF administered by the Pennsylvania Department of Community and Economic Development (DCED), also established under Act 89, funds similar transportation improvements.

PENNDOT'S TRAFFIC EFFICIENCY PROGRAMS

PennDOT's Green Light-Go, Automated Red Light Enforcement (ARLE), and Transportation Systems Management and Operations (TSMO) funding initiatives serve as integral components of the state's efforts to enhance transportation efficiency while concurrently contributing to carbon reduction goals. Green Light-Go optimizes traffic signal coordination, reducing congestion and idling times, thus curtailing carbon emissions from vehicles. ARLE focuses on enhancing traffic flow and safety, ultimately resulting in more efficient travel patterns that can lead to reduced emissions. Additionally, the TSMO initiative leverages intelligent transportation systems to manage traffic more efficiently, further decreasing fuel consumption and emissions.

CONGESTION MITIGATION AND AIR QUALITY (CMAQ)

PennDOT receives over $115 million per year under the CMAQ program to support transportation projects and programs that help meet the requirements of the Clean Air Act by reducing mobile source emissions. While CMAQ's primary focus is on criteria pollutants such as carbon monoxide, particulate matter, and ozone, its eligibility criteria largely mirror those of the CRP. As a result, numerous projects funded through this program are anticipated to have a positive impact on carbon emissions. Such funded projects encompass endeavors to mitigate congestion, encourage carpooling or public transit use, enhance bicycle and pedestrian infrastructure, and advance other emission-lowering transportation tactics. Through the sponsorship of these emission-reducing initiatives, CMAQ considerably bolsters PennDOT's carbon reduction objectives.

NEPA

While NEPA is not a program but a policy act, its requirements for environmental review can play a key role in PennDOT's carbon reduction strategy. It mandates all entities receiving federal funds, including various project sponsors like PennDOT, to weigh the environmental consequences of their actions, encompassing GHG emissions, during decision-making processes. Consequently, significant infrastructure undertakings, such as roads or bridges, must account for their carbon impact. This scrutiny can steer PennDOT towards environmentally friendlier alternatives, potentially molding its broader strategies and project rankings to prioritize low-carbon solutions. PennDOT has integrated GHG and climate evaluations into its project-level air quality manual, **PennDOT Publication 321**, and remains committed to refining these guidelines.

TRANSPORTATION DEMAND MANAGEMENT

Transportation Demand Management (TDM) is a defined set of strategies aimed at maximizing traveler choices, such as by encouraging ridesharing, teleworking, and the use of transit and/or nonmotorized modes of transportation. TDM helps to reduce the transportation sector's carbon emissions by shifting travel to outside of peak times and reducing the number of trips taken. This helps to lessen congestion and enhance system efficiency.

PennDOT's **Active Transportation Plan** outlines steps the Department has taken and will take to promote active modes of transportation in Pennsylvania. Other TDM initiatives include ridesharing programs, such as **CommuteInfo** (Pittsburgh), **Share-A-Ride** (Philadelphia area), **Commuter Services of Pennsylvania** (South Central PA), and **CATACOMMUTE** (Centre County and other nearby areas). PennDOT also continues to support active transportation and TDM initiatives including ongoing training and workshops like the Active Transportation training course (offered through **PennDOT Connects**).

Regional and Local Climate Action Plans

Numerous cities, counties, and local municipalities have formulated Climate Action Plans (CAPs). These CAPs can bolster the carbon reduction efforts of PennDOT and regional MPOs/RPOs, and support the identification of projects for CRP funding as follows:

- **Identify Priorities:** CAPs can identify and prioritize strategies for reducing GHG emissions, many of which may relate to transportation. These priorities can guide funding decisions.
- **Data Sharing:** CAPs often involve compiling data on local GHG emissions, including those from transportation. This data can be used by MPOs/RPOs to measure progress and guide investments.
- **Public Engagement:** The process of creating a CAP often involves significant public outreach and engagement. This can build support for carbon reduction initiatives, making it easier to implement and fund such programs.

- **Policy Alignment:** By aligning local policies with state and regional goals, CAPs can help create a more unified and effective approach to carbon reduction. For example, local plans might support zoning changes to encourage walkability or bike-friendly infrastructure, which could align with PennDOT or MPO/RPO strategies for reducing vehicle miles traveled.
- **Leveraging Funding:** Local CAPs can identify opportunities for leveraging local, state, federal, and private funding to implement carbon reduction strategies. For example, if a local government has a CAP that includes expanding public transit, and this aligns with PennDOT's CRP, it might be able to secure funding from PennDOT for this initiative.
- **Adaptation Strategies:** Apart from mitigating carbon emissions, CAPs often include strategies for adapting to the effects of climate change. These can help PennDOT and MPOs/RPOs plan for future transportation infrastructure needs in the face of changing climate conditions.

Ultimately, successful climate action planning will require coordination across all levels of government, and CAPs are an important tool for facilitating this coordination. **Figure 2** provides a listing of known CAPs and resources for finding them. This includes plans that have been developed via **DEP's Local Climate Action Program**, which connects local governments and college students to develop CAPs and GHG inventories. PennDOT, with the support of MPOs/RPOs, will continue to take initiatives to identify these plans as a future resource.

Figure 2: Identified Regional and Local Climate Action Plans by MPO/RPO Region

[MPOs/RPOs can provide future support in updating and enhancing this list.]

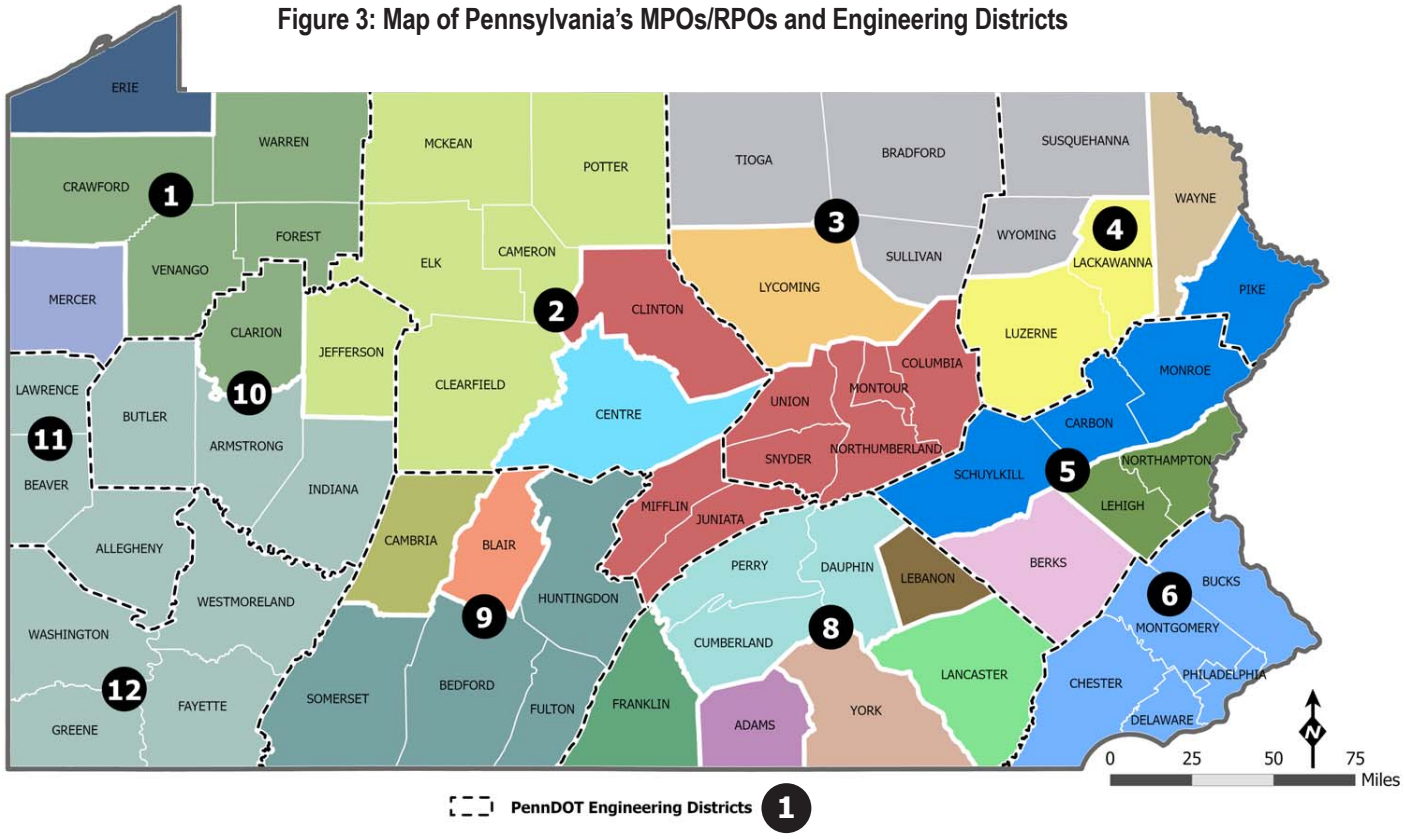
AREA	LINK	MPO/RPO REGION
PENNSYLVANIA COUNTY/REGIONAL CAPS		
Centre Region Council of Governments (CRCOG)	Centre Region Climate Action and Adaptation Plan	Centre County MPO (CCMPO)
Chester County Delaware County Montgomery County	Chester County Climate Action Plan Delaware County, Pennsylvania Climate Action Plan Green print for Montgomery County: Climate Change Action Plan	Delaware Valley Regional Planning Commission (DVRPC)
Congress of Neighboring Communities (CONNECT)	CONNECT Climate Action Plan	Southwestern Pennsylvania Commission (SPC)
Lehigh Valley, Philadelphia and Pittsburgh Regions	Awarded EPA Climate Pollution Reduction Grants ($1 million each) News item on federal funding award in 2023	Lehigh Valley Planning Commission (LVPC), DVRPC, SPC
Cumberland County	Cumberland County Climate Change Action Plan	Harrisburg Area Transportation Study (HATS)

PENNSYLVANIA CITY CAPS		
Bethlehem Easton	City of Bethlehem, PA Climate Action Plan City of Easton Climate Action Plan	Lehigh Valley Planning Commission
Lancaster	City of Lancaster Municipal Climate Action Plan	Lancaster County Planning Commission
Meadville	Meadville Climate Action Plan	Northwest PA Regional Planning and Development Commission
Pittsburgh	City of Pittsburgh Climate Action Plan	Southwestern Pennsylvania Commission (SPC)
Philadelphia	Philadelphia Climate Action Playbook	Delaware Valley Regional Planning Commission
Shamokin	City of Shamokin Environmental Resiliency Plan	SEDA-Council of Governments (SEDA-COG)
PENNSYLVANIA BOROUGH AND TOWNSHIP CAPS		
Bellefonte Borough State College Borough	Bellefonte Borough Climate Action Plan State College's Sustainability Plan 2022	Centre County MPO (CCMPO)
Ben Avon Borough of Carnegie Borough of Etna Borough of Indiana Forest Hills Borough Millvale Borough Munhall Borough Sharpsburg Borough	Ben Avon Borough Climate Action Plan Borough of Carnegie Climate Action Plan Borough of Etna Climate Action Plan Borough of Indiana Climate Action Plan Forest Hills Borough Climate Action Plan Millvale Borough Climate Action Plan Munhall Borough Climate Action Plan Borough of Sharpsburg Climate Action Plan	Southwestern Pennsylvania Commission (SPC)
Camp Hill Borough Carlisle Borough	Camp Hill Climate Action Plan Carlisle Borough Climate Action Plan	Harrisburg Area Transportation Study (HATS)
Abington Township Haverford Township Middletown Township Narberth Borough	Abington Township Climate Action Plan (DRAFT) Haverford Township Climate Action Plan Middletown Climate Action Plan Narberth Climate Action Plan	Delaware Valley Regional Planning Commission
Lewisburg Borough	Lewisburg Borough Climate Action Strategy	SEDA-Council of Governments (SEDA-COG)
Millersville Borough	Millersville Borough Climate Action Plan	Lancaster County Planning Commission

3 COORDINATION AND OUTREACH FOR CRS DEVELOPMENT

The federal CRP guidance requires that each state develop its CRS in coordination with all MPOs designated within the state. **Figure 3** is a map of all MPOs and RPOs within Pennsylvania. The map also includes PennDOT's Engineering Districts who have also coordinated on the plan development and support the MPOs/RPOs in CRP implementation and project identification.

Figure 3: Map of Pennsylvania's MPOs/RPOs and Engineering Districts



- Adams County (ACTPO) MPO
- Altoona MPO
- Centre County MPO
- DVRPC MPO
- Erie County MPO
- Franklin County MPO
- Harrisburg Area Transportation Study (HATS)
- Johnstown MPO
- Lancaster MPO
- Lebanon County MPO
- Lehigh Valley Planning Commission
- NEPA MPO
- North Central RPO
- Northern Tier RPO
- Northwest RPO
- Reading MPO
- SEDA-COG MPO
- Southwestern PA Commission (SPC) MPO
- Mercer County MPO
- Lackawanna/Luzerne MPO
- Southern Alleghenies RPO
- Wayne County
- Lycoming County MPO
- York County MPO

Data Source: PennDOT; Map published by NEPA GIS: September 2022

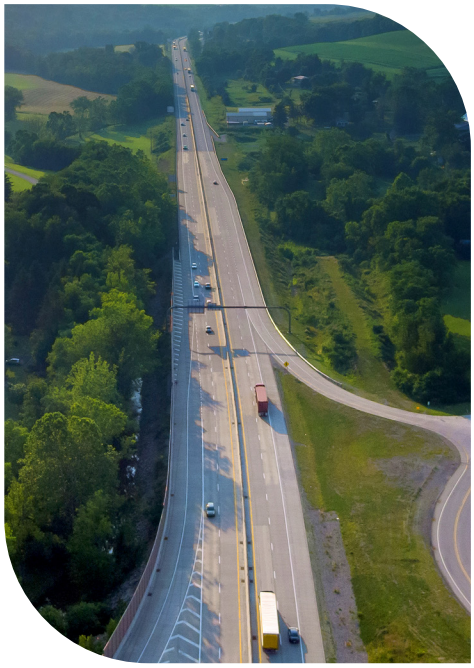
PennDOT's CRS was crafted in compliance with federal regulations. The process included an informational webinar conducted on February 28, 2023, that included participants from PennDOT, MPO/RPOs, and other state/federal agencies. This webinar laid the foundation for understanding the CRP and CRS prerequisites, explored the need for a project selection procedure, and assessed the future roles of MPOs/RPOs within the state. The event also spotlighted the formation of a workgroup designed to assist with CRS development.

CRS Workgroup

The workgroup developed to support the CRS development included participants from the following agencies:

CRS COORDINATION PARTNERS

- PennDOT Center for Program Development and Management (CPDM)
- PennDOT District Offices
- PennDOT Policy Office
- PennDOT Environmental Policy Development Division (EPDD)
- PennDOT Strategic Planning, Multimodal and Finance Offices
- FHWA and Federal Transit Administration (FTA)
- Pennsylvania Department of Environmental Protection (DEP)
- MPOs/RPOs (Allentown, Harrisburg, Reading, Pittsburgh, Philadelphia, Lancaster, Centre County, North Central)



GEORGETOWN CLIMATE CENTER

The CRS development collaboration involved four meetings held virtually between March 2023 and June 2023. These meetings, aimed at evaluating the plan outline and contents, attracted an average of 30 participants per meeting. The participants also contributed to the review of the draft document.

PennDOT also collaborated with the Georgetown Climate Center (GCC) to develop key resources and analyses to bolster the CRS and future carbon reduction initiatives. Founded in 2009, the GCC was initiated at the behest of state leaders who acknowledged the need to enhance the ties between climate policies and policymakers across various levels of government. The goal was to aid policymakers in developing synergistic strategies to effectively address climate change. PennDOT and the GCC have a history of working together on a wide range of climate planning and research initiatives.

The CRS is a public document that will be periodically updated. PennDOT will continue to coordinate with the workgroup on the CRS updates and other carbon reduction initiatives.

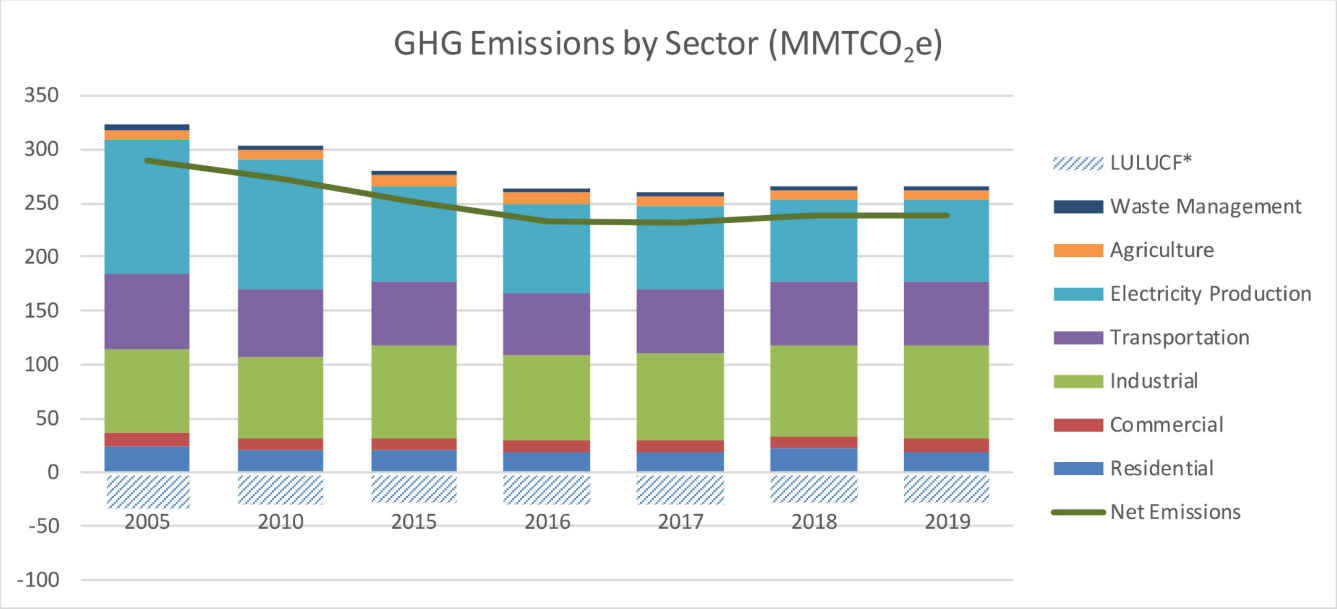
4 PENNYLVANIA GHG EMISSIONS AND TARGETS

The monitoring of GHG emissions trends and the establishment of reduction targets in Pennsylvania are critical components of effective climate action planning. A close analysis of trends offers valuable insights into the state's current environmental impact and helps pinpoint the most substantial sources of emissions. This data then enables the setting of strategic, realistic targets for GHG reduction. These targets serve as vital benchmarks for progress, guiding the development of strategic actions and policies aimed at achieving them.

Transportation's Role in Pennsylvania GHG Emissions

GHG emissions are measured in million metric tons of carbon dioxide equivalent (MMTCO2e). DEP is required by the Pennsylvania Climate Change Act to compile an **annual inventory of GHGs emitted in Pennsylvania**. The inventory includes GHG emission trends and contributions of major sectors, including the transportation, electricity generation, industrial, commercial, mineral and natural resources, production of alternative fuel, agricultural, and domestic sectors. In 2019, the most recent data available for the **2022 Inventory**, Pennsylvania was responsible for approximately 266 MMTCO2e being emitted into the atmosphere. The transportation sector contributed just over 22% (59.71 MMTCO2e) of the total emissions. **Figure 4** provides a historic trend of GHG emissions in Pennsylvania as provided in DEPs latest inventory.

Figure 4: Pennsylvania GHG Emission Inventory Trends (2022 Version)



**LULUCF = Land Use, Land Use Change, and Forestry*

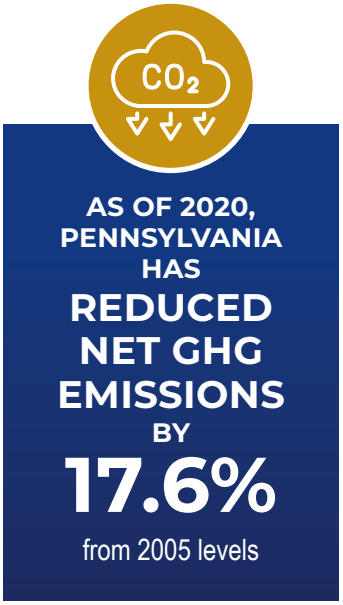
The emissions attributed to the transportation sector result from fuels combusted to provide transportation for various types of vehicles within the state. In order of decreasing use in 2019, these fuels include gasoline, diesel, jet fuel, and natural gas. The emissions related to electricity use in transportation are accounted for in the electricity generation sector. At this time, it is not possible to determine what existing or future portion of the electricity generation sector is related to transportation.

EPA also produces an annual inventory of GHGs by state. The reported historic inventories are available through **EPA's Greenhouse Gas Inventory Data Explorer Tool**. Note there are some differences between the inventory values between the EPA and DEP inventories, though results and trends are generally consistent. As a comparison to Pennsylvania, nationwide transportation emissions in 2020 accounted for the largest share (27%) of total US GHG emissions.

Statewide GHG Goals

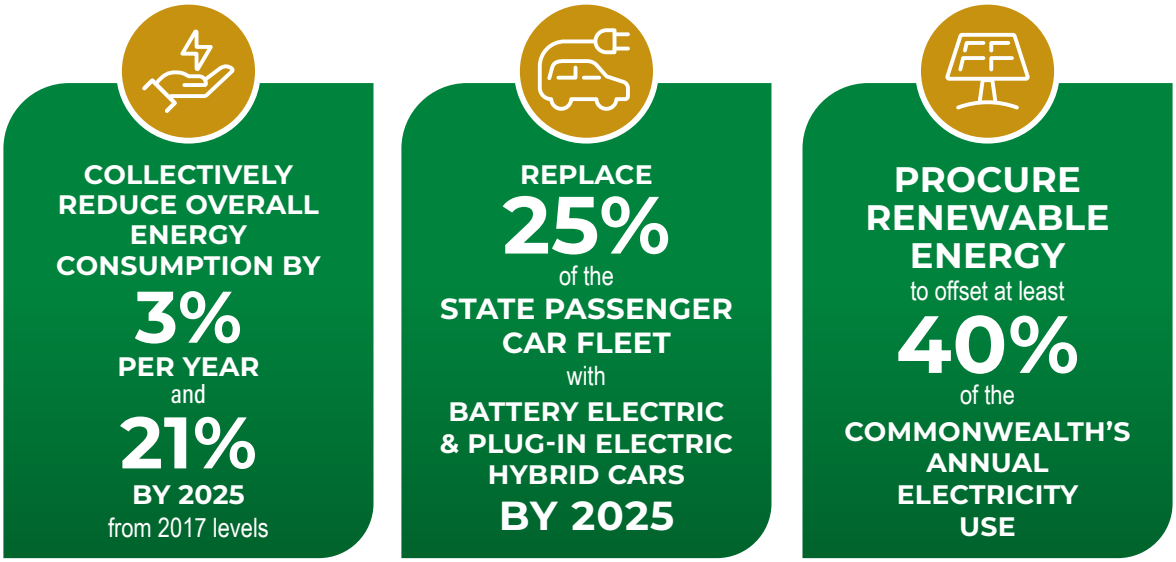
PennDOT is not establishing a specific transportation sector GHG emission goal or target within the state CRS. PennDOT will continue to evaluate trends and potential strategy impacts and may consider adopting goals and targets in the future in coordination with the MPOs/RPOs.

Statewide across all sectors, Pennsylvania's climate goal is to reduce GHG emissions by 26% by 2025 from 2005 levels and an 80% reduction by 2050 from 2005 levels. This goal was established by Former Pennsylvania Governor Tom Wolf in 2019 in **Executive Order 2019-01**. According to the 2022 Pennsylvania Greenhouse Gas Inventory Report, in 2019, the Commonwealth had reduced its net GHG emissions by 17.6% from 2005 levels. More recently, the U.S. EPA's Greenhouse Gas Inventory Data Explorer tool, states that, as of 2020, Pennsylvania had reduced its net GHG emissions by 25.4% from 2005 levels.



The Executive Order also established specific performance goals for all state agencies, including those highlighted in **Figure 5**. Although these goals apply to PennDOT, they do not address the entire transportation system.

Figure 5: Examples of Agency Performance Goals



PennDOT continues to coordinate with other state agencies and the Governor's Office in tracking and monitoring progress on specific performance goals.

Additional Agency goals and performance are addressed in the 2021 **Annual Report** issued by the **GreenGov Council**, the body designated by Executive Order 2019-01 to help state agencies achieve their performance goals.

Evaluating Transportation GHG Trends and Scenarios

Evaluating GHG emission trends and forecasts are essential for any organization, including PennDOT, aiming to reduce its carbon footprint and mitigate the impacts of climate change. Such efforts can:

- Enable PennDOT to discern if the implemented strategies are effectively reducing GHG emissions, as well as evaluate any additional factors that might be influencing these reductions.
- Offer a structure for transparently illustrating and communicating progress to the broader public.
- Assess the potential benefits of alternative strategies in reducing GHGs and meeting state goals and assisting PennDOT in setting future transportation-specific goals.

GHG PERFORMANCE METRICS AND REPORTING

PennDOT plans to coordinate with MPOs/RPOs to evaluate ways to better track and report progress in reducing GHG emissions. This includes the development of performance metrics and the evaluation of ways to share those metrics to the public. Key sources for performance metrics include:

- GHG emission inventories prepared by DEP every three years for the **Pennsylvania Climate Action Plan**. This document serves as a resource for monitoring and assessing statewide transportation GHG emissions. At this time, the inventory does not specifically quantify the benefits of electric vehicle adoption on GHG emissions and does not provide emissions at the regional level.
- The **proposed National Performance Management Measures; Assessing Performance of the National Highway System, Greenhouse Gas Emissions Measure** was initiated in October 2022. This proposal advocates for a national GHG performance metric. This measure is simple to calculate and is based on statewide fuel consumption reported by the Energy Information Administration (EIA) and supporting highway characteristics from FHWA's annual Highway Statistics reports. This measure only addresses the National Highway System (NHS) but can be expanded to provide a broader coverage of facilities. Since fuel consumption data is typically not reported lower than the state level, regional emission metrics would not be available under this approach.
- Regional "bottom-up" emission inventories using tools and data applied for transportation conformity analyses and State Implementation Plans (SIPs) could provide information on regional and state GHG emissions and trends. These inventories would be based on data from PennDOT's Roadway Management System (RMS), MPO regional travel demand models, and other available fleet information from the Pennsylvania Department of Motor Vehicles (DMV) including the number of registered electric vehicles. EPA's MOtor Vehicle Emission Simulator (MOVES) emission factor model can be used with other custom tools available to PennDOT to translate traffic information into GHG emissions.

To ensure sustained progress and updated data, PennDOT will coordinate with MPOs/RPOs on the frequency of these performance evaluations, which may align with the biennial TIP cycle, LRTPs, PennDOT annual reports, and/or other MPO/RPO reporting efforts. This would ensure that GHG reduction goals are consistently factored into broader transportation planning and improvement efforts.

GHG SCENARIO EVALUATIONS

In collaboration with MPOs/RPOs, PennDOT is evaluating ways to assess the GHG emission benefits associated with a range of EV adoption rates and transportation investment scenarios. Such initiatives can offer critical perspectives on investment priorities to achieve state GHG reduction goals, the influence of different projects on GHG emission trajectories, and the cost-effectiveness of individual projects. This in-depth analysis could enable PennDOT and MPOs/RPOs to evaluate the potency and merits of an array of strategies.

To support the evaluation of strategy investment scenarios, methods like the “bottom-up” emission inventories, as discussed previously, and the application of specialized tools will be needed. PennDOT is part of a group of state DOTs currently collaborating with the GCC in the development and application of the Transportation Evaluation and Carbon Reduction Tool (TEA-CART). TEA-CART will support transportation GHG emission inventories for custom investment and fleet electrification scenarios. This comprehensive and dynamic tool is aimed at assisting states and possibly MPOs/RPOs with selecting and prioritizing transportation capital program investments to effectively support GHG reduction. TEA-CART is designed to accept inputs typically available during the programming process. It provides key outputs including:

- A baseline inventory and forecast of GHG emissions.
- GHG impacts of a capital program or a hypothetical set of capital projects.
- Information on the cost-effectiveness of various project types. More information can be provided as the tool is officially distributed.

TEA-CART is a planning-level tool. It is designed to accept relatively simple inputs, typically available at the long-range planning or programming stage, characterizing the number, size, context, and type of transportation projects that could reduce GHG emissions. As such, TEA-CART relies on data that is typical for projects of a given type. **Figure 6** highlights some of the key GHG inventory products output from the tool. The tool is currently in a “beta” release for testing by PennDOT. It will be formally implemented in late 2023/early 2024 to support PennDOT carbon reduction planning and to evaluate

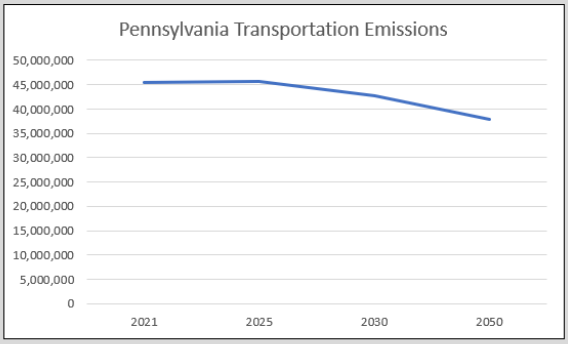
strategy effectiveness in meeting state reduction goals. The tool can also be complemented by other federal analysis tools including the **FHWA CMAQ Emissions Calculator Toolkit**.

Figure 6: Illustration of Sample Outputs from TEA-CART Planning Tool

Baseline GHG Forecast

Transportation GHG Forecast

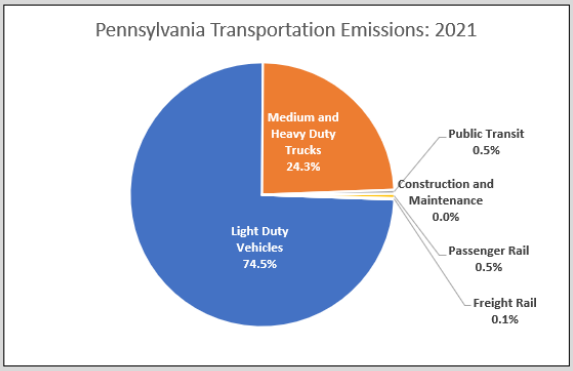
Emissions (MT CO2e)	2021	2025	2030	2050
Light Duty Vehicles	33,831,208	34,397,066	32,369,514	28,392,059
Medium and Heavy Duty Trucks	11,030,571	10,761,469	9,883,597	8,878,835
Public Transit	224,524	224,524	224,524	224,524
Passenger Rail	236,200	236,200	236,200	236,200
Freight Rail	60,964	62,578	64,655	73,677
Construction and Maintenance	0	0	0	0
Total (Onroad Vehicles)	44,861,779	45,158,535	42,253,111	37,270,894
Total (All Transportation)	45,383,466	45,681,836	42,778,490	37,805,294
Change from Base Year (%)		1%	-6%	-17%



Transportation Emissions by Source

Select Year:	2021

	MT CO2e	%
Light Duty Vehicles	33,831,208	74.5%
Medium and Heavy Duty Trucks	11,030,571	24.3%
Public Transit	224,524	0.5%
Passenger Rail	236,200	0.5%
Freight Rail	60,964	0.1%
Construction and Maintenance	0	0.0%
Combined	45,383,466	100.0%



5 PRIORITY STRATEGIES FOR CRP FUNDING

PennDOT is committed to implementing a CRS that efficiently and responsibly reduces the Commonwealth's carbon footprint. This section provides an overview of eligible project types and a listing of priority strategies that are being emphasized by PennDOT for CRP funding. PennDOT will continuously refine and update the CRS to address carbon reduction priorities based on insights on project delivery, research on new and emerging strategies, and further evaluation of project cost-effectiveness including insights from the application of analysis tools.

While the priority strategies serve as guiding factors in decision-making processes, each MPO/RPO and PennDOT District has the flexibility to assess other project types and to develop their own prioritization and selection processes as addressed in **Section 6**. Factors such as equity and deliverability will be considered alongside carbon reduction potential in these assessments.

CRP Guidance on Project Eligibility

The **FHWA CRP Guidance** provides a detailed list of eligible project categories that contribute to carbon reduction. These range from alternative fuel infrastructure projects to traffic flow improvements and travel demand management strategies. The guidance should serve as a key resource for all regional project selection processes.

Figure 7a provides the eligible strategies specifically listed in the FHWA CRP Guidance. Other projects not specifically listed as eligible within the guidance may be eligible for CRP funding if a supporting GHG project-level emission analysis is completed that demonstrates reduction in CO2 emissions over the project's lifecycle. **Figure 7b** highlights examples from the FHWA CRP guidance of other projects that may be eligible with a supporting emission analysis.

Consistent with the CRP's goal of reducing transportation emissions, projects to add general-purpose lane capacity for single occupant vehicle use will not be eligible absent analyses demonstrating emissions reductions over the project's lifecycle. Both PennDOT and FHWA should be consulted regarding project eligibility questions and decisions.

Figure 7a: Eligible Projects Listed in CRP Guidance

A.	a project described in 23 U.S.C. 149(b)(4) to establish or operate a traffic monitoring, management, and control facility or program, including advanced truck stop electrification systems;
B.	a public transportation project eligible for assistance under 23 U.S.C. 142 (this includes eligible capital projects for the construction of a bus rapid transit corridor or dedicated bus lanes as provided for in BIL Section 11130 (23 U.S.C. 142(a)(3));
C.	a transportation alternatives project as described in 23 U.S.C. 101(a)(29) as in effect prior to the enactment of the FAST Act, including the construction, planning, and design of on-road and off-road trail facilities for pedestrians, bicyclists, and other nonmotorized forms of transportation;
D.	a project described in section 23 U.S.C. 503(c)(4)(E) for advanced transportation and congestion management technologies;
E.	a project for the deployment of infrastructure-based intelligent transportation systems capital improvements and the installation of vehicle-to-infrastructure communications equipment, including retrofitting dedicated short-range communications (DSRC) technology deployed as part of an existing pilot program to cellular vehicle-to-everything (C-V2X) technology;
F.	a project to replace street lighting and traffic control devices with energy-efficient alternatives;
G.	development of a carbon reduction strategy (as described in the Carbon Reduction Strategies section above);
H.	transportation demand a project or strategy designed to support congestion pricing, shifting transportation demand to nonpeak hours or other transportation modes, increasing vehicle occupancy rates, or otherwise reducing demand for roads, including electronic toll collection, and travel demand management strategies and programs;
I.	efforts to reduce the environmental and community impacts of freight movement;
J.	a project to support deployment of alternative fuel vehicles, including— (i.) the acquisition, installation, or operation of publicly accessible electric vehicle charging infrastructure or hydrogen, natural gas, or propane vehicle fueling infrastructure; and (ii.) the purchase or lease of zero-emission construction equipment and vehicles, including the acquisition, construction, or leasing of required supporting facilities;
K.	a project described under 23 U.S.C. 149(b)(8) for a diesel engine retrofit;
L.	certain types of projects to improve traffic flow that are eligible under the CMAQ program, and that do not involve construction of new capacity; (23 U.S.C. 149(b)(5) and 175(c)(1)(L)); and
M.	a project that reduces transportation emissions at port facilities, including through the advancement of port electrification.

Figure 7b: Examples of Other Potential Eligible Projects Listed in CRP Guidance Requiring an Emission Analysis

SUSTAINABLE PAVEMENTS AND CONSTRUCTION MATERIALS	Sustainable pavements technologies that reduce embodied carbon during the manufacture and/or construction of highway projects could be eligible for CRP if a lifecycle assessment (LCA) demonstrates substantial reductions in CO2 compared to the implementing Agency's typical pavement-related practices. The LCA Pave Tool can be used to assess the CO2 impacts of pavement material and design decisions.
CLIMATE USES OF HIGHWAY RIGHT-OF-WAY	Projects including alternative uses of highway right-of-way (ROW) that reduce transportation emissions are also eligible. For example, renewable energy generation facilities, such as solar arrays and wind turbines, can reduce transportation emissions. Biologic carbon sequestration practices along highway ROW to capture and store CO2 may demonstrate potential for substantial long-term transportation emissions reductions. State DOTs Leveraging Alternative Uses of the Highway Right-of-Way Guidance provides information on these practices.
MODE SHIFT	Transportation Demand Management projects that maximize the existing right-of-way for accommodation of nonmotorized modes and transit options that increase safety, equity, accessibility, and connectivity may be eligible. Projects that separate motor vehicles from pedestrians and bicyclists, match vehicle speeds to the built environment, increase visibility (e.g., lighting), and advance implementation of a Safe System approach and improve safety for vulnerable road users may also be eligible. Micromobility and electric bike projects, including charging infrastructure, may also be eligible.

Priority Strategies for Regional Consideration

Within the state CRS framework, PennDOT is prioritizing several strategy categories from the FHWA CRP Guidance eligibility list. These strategies align with major state initiatives anticipated to deliver significant reductions in GHG emissions. As regions design their project selection processes, these strategies should play a central role in project evaluations and, where relevant, scoring. PennDOT acknowledges the myriad of considerations in project selection, including deliverability, equity, and regional context. Consequently, these priorities are guidelines rather than directives for project selection.

The priorities outlined in this section are founded on:

- Key transportation strategies identified in Pennsylvania's Climate Action Plan.
- Strategies poised to yield considerable long-term GHG emission reductions.
- Strategies that reinforce other central PennDOT initiatives and programs.

Travel Demand Management (TDM) and Multimodal Strategies

The state climate action plan prioritizes reducing VMT to lower GHG emissions. Many MPOs/RPOs are focusing more on non-vehicular transportation options like public transit and cycling to meet this goal. This shift not only supports cleaner air but also aligns with broader sustainability efforts. PennDOT's comprehensive approach emphasizes the adoption of Travel Demand Management (TDM) strategies, aiming to significantly reduce VMT. These strategies not only manage and reduce transportation demand, resulting in fewer vehicles on our roads, but also lead to reduced carbon emissions. Recognizing the potential of alternative modes of transportation, PennDOT also advocates

for multimodal improvements, encompassing enhanced public transit options, as well as bike and pedestrian strategies. To maximize the benefits of multimodal strategies in transportation, their effectiveness must be coupled with integrated land use planning. This ensures that the creation of walkable, bike-friendly, and transit-supportive communities is at the forefront, directly influencing and enhancing the reduction in VMT. This integrative approach not only offers a broader range of sustainable transportation alternatives but also complements the overarching carbon reduction initiatives. The GCC's research further validates the cost-effectiveness of these combined strategies in curtailing carbon emissions.

Electric Vehicle Infrastructure and Incentives

PennDOT places a strong emphasis on EV infrastructure projects as a key component of the Department's carbon reduction funding initiatives. This strategic alignment dovetails with the DEP Climate Action Plan, further underlining Pennsylvania's unified commitment to carbon reduction and sustainable practices. The NEVI funding program is also a significant driver of PennDOT's focus on EV infrastructure. Through this program, PennDOT continues to expand Pennsylvania's EV charging network, thereby facilitating the broader adoption of EVs. The CRP provides another means to support and supplement these existing funding programs and initiatives.

However, PennDOT recognizes the unique challenges and concerns related to installing and managing EV infrastructure projects and ensuring benefits are shared equitably. These initiatives often involve collaboration with private companies for implementation and hosting, a dynamic that both PennDOT and MPOs/RPOs may find unfamiliar due to a lack of extensive experience. As Districts and MPOs/RPOs navigate this new terrain, PennDOT is committed to developing resources that will support and guide project implementation. As part of the ongoing implementation of the NEVI program, PennDOT is exploring the possibility of creating a Delivery Handbook or Checklist. This resource could help PennDOT and MPOs/RPOs understand key management issues associated with these types of projects, facilitating a more comfortable and informed approach to programming and managing EV infrastructure projects.

MPOs/RPOs will take on a more prominent role in EV planning and support local governments in addressing funding and infrastructure challenges. PennDOT and DEP will work together to streamline and communicate funding opportunities for EV projects to both regional and local governments.

In addition, EV infrastructure has become a primary focus for the automotive industry. Tesla, as well as a group of other auto manufacturers, continue to invest in charging infrastructure. PennDOT continues to monitor and evaluate these private interest initiatives and is evaluating the impact on the Commonwealth's charging infrastructure.

Traffic Operation and Freight Strategies

Traffic operation initiatives can reduce GHG emissions through improved traffic flow and reduced congestion. PennDOT, in cooperation with MPOs/RPOs, should strategically direct CRP funding towards such strategies in areas burdened by heavy congestion and high traffic volumes. This focused strategy is anticipated to result in the most substantial decrease in emissions and optimization of fuel efficiency.

PennDOT's TSMO program supports the programming of cost-effective strategies that can reduce GHG emissions. The program focuses on predicting and managing disruptions in transportation systems, such as traffic congestion, which contribute significantly to emissions. TSMO strategies that have the potential to reduce GHG emissions include:

Traffic Incident Management: Effective traffic incident management can reduce the duration of traffic incidents and thus the associated traffic congestion, thereby reducing vehicle idling and associated emissions.

Safety Service Patrols: These patrols can assist stranded motorists and help clear road incidents quickly, thereby reducing traffic congestion and subsequent emissions.

Traffic Signal Optimization/Retiming & Traffic Adaptive Signal Control: These strategies aim to improve traffic flow through intersections, reducing stop-and-go traffic, leading to lower emissions.

Electronic Toll Systems: Electronic toll collection can reduce idling and congestion at toll plazas, leading to emissions reductions. The Pennsylvania Turnpike Commission has implemented **All-Electronic Tolling** across the Turnpike.

Traveler Information and Incentive Apps: Providing real-time information about traffic conditions and incentives for choosing more sustainable travel options can help road users make decisions that result in lower emissions.

These potential benefits have led PennDOT to allocate $20 million of CRP funding to TSMO projects through FY 2026. PennDOT continues to explore and evaluate these and other innovative strategies to ensure the transportation system operates efficiently, sustainably, and resiliently. For example, PennDOT can aim to further expand the TSMO toolbox to include additional operational strategies that improve mobility for bike and pedestrian connectivity and transit.

The PennDOT **Regional Operations Plans (ROPs)** should play a critical role in identifying carbon reduction strategies, specifically those involving traffic flow improvements. Priority should be given to ongoing projects that were previously included in ROPs and qualify for CRP funding.

Freight and operation improvement projects are emphasized by PennDOT for CRP funding, with a particular focus on reducing truck emissions. This approach draws from the GCC's draft evaluations highlighting these strategies as some of the most cost-effective in reducing carbon emissions.

APPLICATION OF LOWER CARBON MATERIALS

PennDOT sees potential in exploring the use of lower carbon materials as a priority initiative. This endeavor would further reduce Pennsylvania's carbon footprint by integrating sustainable materials into statewide infrastructure. PennDOT continues to coordinate with key construction industry organizations

and material suppliers to identify strategies that may be eligible for CRP funds.

Examples of materials with lower carbon emissions include, but are not limited to, asphalt mixtures with reclaimed asphalt pavement (RAP), asphalt mixtures produced at lower production temperatures, asphalt mixtures utilizing other recycled content, asphalt materials produced through improvements in the production process, concrete pavements ability to reabsorb CO2 through a carbonation process, and concrete materials that utilize Type1L cement. Some of these strategies may also be coordinated with other programs, like the **Federal Buy Clean Program**. PennDOT will continue to evaluate these opportunities and provide more guidance to Districts and MPOs/RPOs.

Evaluating Other Project Priorities

PennDOT remains steadfast in its commitment to constantly appraise and discover additional priority strategies that can be targeted for CRP funding. This might involve assessing CRP projects that have been successfully implemented in various regions throughout the state, as well as scrutinizing the cost-effectiveness of different strategies leveraging the capabilities of the TEA-CART and other national research.

As a valuable resource, TEA-CART can empower PennDOT in the selection and prioritization of transportation capital program investments, thereby supporting Pennsylvania's aim of achieving statewide GHG reduction targets. As was previously mentioned, the tool is currently in its beta testing phase. As its development progresses, PennDOT anticipates that its analytical insights will play a pivotal role in guiding Pennsylvania's carbon reduction strategy priorities. Additionally, the regional implementation of the CRP project selection process will offer valuable perspectives on regional necessities and potential, which could highlight key strategy priorities not currently emphasized. PennDOT will maintain collaboration with each District and MPO/RPO to further assess statewide priorities and needs.

6 INTEGRATING A CRP PROJECT SELECTION PROCESS

CRP funding may be used on a wide range of projects that support the reduction of transportation emissions as provided in FHWA's **CRP guidance** and emphasized through PennDOT's priorities (**Section 5**). Projects must be identified in the TIP and be consistent with the MPO's/RPO's LRTP.

Framework for a Project Selection Process

PennDOT recommends that each MPO/RPO develop a project identification and prioritization process to guide the selection of projects for CRP funding. This should include close coordination between MPO/RPO and District staff, additional coordination with other regional stakeholders, scoring of projects for prioritization, eligibility reviews with PennDOT CPDM and the FHWA Pennsylvania Division, and entering selected project information in PennDOT's Multimodal Project Management System (MPMS).

Figure 8: Potential Components of the Project Selection Process

This recommendation is similar to the requirements for a documented process that currently applies to the CMAQ funding program. A clear process helps ensure that identified projects align with the program's overarching goal - reducing carbon emissions. It helps establish the basis for identifying projects that have the highest potential for cost-effectively achieving this goal.

PennDOT is providing flexibility on how the regional CRP project identification and selection processes are determined and documented. Smaller regions with less allocated CRP funding may rely on simplified procedures that promote coordination, while larger regions may have more sophisticated processes that may be integrated with their current CMAQ project selection process.

Regional Coordination on Project Ideas

Allocating CRP funding for existing programmed TIP/LRTP projects and coordinating with other funding programs with similar eligibility requirements and ability to reduce emissions (e.g., CMAQ and TASA) will require coordination between the MPO/RPO and the PennDOT District Office. However, identifying new CRP strategies and projects may include a broader coordination effort that may be integrated with the existing TIP and LRTP processes.

An expanded coordination effort may focus on:

- discussions with local municipalities on project ideas,
- review and coordination with strategies identified in regional or local climate action plans,
- outreach to transit operators on future strategy and project initiatives,
- coordination with PennDOT traffic operations and TSMO staff on planned strategies including listed strategies and priorities in the PennDOT Regional Operations Plans (ROPs),
- coordination with EV planning and applications review under PennDOT's NEVI program,
- outreach to regional utility providers,
- coordination with active transportation organizations, Transportation Management Associations (TMAs), plans, and identified priority strategies, and
- evaluations of how to leverage other funding sources with CRP to provide additional emission reductions.

Several of the larger MPOs are implementing processes for a "call for projects" specific to carbon reduction strategies rather than just linking to other TIP and LRTP project requests. The North Central RPO highlighted an example of their methods for requesting project ideas that fall outside of the RPO's typical TIP and LRTP requests. This **example framework**, which uses web-based GIS tools, may apply to future CRP applications. Other MPOs believed that CRP projects can be integrated with their current solicitation processes for other programs.

The CRP is also guided by the **Justice40 Initiative** which was created by **Executive Order 14008**. Justice40 is a federal goal that 40% of the overall benefits of federal investments in clean energy and climate solutions flow to traditionally underserved and underrepresented populations. To support this initiative, MPOs/RPOs need to address the needs and opportunities in disadvantaged areas. This may include targeted outreach to such communities or coordination on needs and strategy prioritization with other environmental justice (EJ) efforts conducted for the TIP and LRTP. PennDOT will continue to work with MPOs/RPOs on developing resources to assist with the evaluation of these equity needs and issues.

PENNDOT ACTION ITEMS FOR FUTURE CRS UPDATES:

Share MPO/RPO case studies of coordination efforts related to the CRP.

Evaluate resources and tools that can support MPO/RPO project identification

Criteria for Project Selection

For regions that implement a more detailed project selection process, specific criteria should be identified and used for project evaluation. This may include the example criteria provided in **Figure 9**, which PennDOT will continue to refine and update in coordination with the MPOs/RPOs and Districts.

Figure 9: Sample Criteria for Project Selection

These and other criteria can be integrated into a quantitative or qualitative project scoring process, especially if more projects are identified than funding available. If a scoring process is developed, it should ensure that certain project types are not biased based on the selected criteria. For example, multiple congestion categories may add to scoring for those types of projects. Some brief notes on the potential sample criteria are provided below.

PRIORITY STRATEGY IN CRS

MPOs/RPOs and District project selection processes should consider the PennDOT priorities highlighted in **Section 5** of the CRS. Such projects are not required to be funded by CRP, but such criteria should be incorporated into project evaluations and scoring in some form.

COST EFFECTIVENESS

The cost-effectiveness of reducing GHG emissions refers to the relationship between the financial investment required to implement a certain emission reduction measure and the amount of GHG emissions that are actually reduced. Limited information is currently available on the cost-effectiveness of strategies. PennDOT continues to evaluate available research including the GCC evaluations and tools referenced earlier. These insights to date have informed the priority strategies listed in **Section 5**. Regional project selection processes may draw from additional research, local insights, or custom analyses to further inform the evaluation of project cost-effectiveness.

EQUITY

Projects implemented using CRP funding should be equitable and align with the guidelines outlined in the **CRP Implementation** guidance and the federal **Justice40 initiative**. Projects should include elements that remove barriers to opportunity and address social and economic inequities. Projects should strive to also provide benefits to traditionally underserved and underrepresented populations in transportation planning. Several resources are available to support equity assessments for project locations. USDOT's **Equitable Transportation**

Community (ETC) Explorer is an interactive web application that supports the evaluation of equity issues and burdens. In addition, the Pennsylvania EJ data and tools used for the TIP development and DEP's **PennEnviroScreen** tool can support evaluations.

CONSISTENCY WITH LRTP

The CRS, along with its related projects, needs to be synchronized with the transportation planning processes of the state and the MPO/RPO, inclusive of LRTPs. Future updates of both state and MPO/RPO LRTPs should incorporate and cite the CRS. Furthermore, if strategies eligible for CRP are a focus in the plans of the state or MPO/RPO, they should be prioritized during the selection process for CRP projects.

CONSISTENCY WITH REGIONAL OPERATIONS PLANS OR CONGESTION MANAGEMENT PROCESS (CMP)

PennDOT anticipates a portion of CRP funding will be dedicated to increasing system efficiency while simultaneously reducing carbon emissions. These projects include new signal timing technologies, incident management strategies, and other intersection improvement projects. Roadway expansion and widening are not included as a priority under these priority strategies. Strategies or projects that have been previously pinpointed in available ROPs or the Congestion Management Process are of particular importance. To streamline the process and leverage existing plans, these pre-identified strategies should be prioritized and fast-tracked in the distribution of CRP funds.

PROVIDED IN A CAP OR BY SUPPORTING PUBLIC STAKEHOLDER

Transportation projects identified in regional or local CAPs or from other climate-driven stakeholder processes should be given emphasis for CRP project selection. These projects typically align with the environmental goals of the community and have been vetted for feasibility, public acceptance, and potential impact. Therefore, giving priority to these projects for carbon reduction funding can help ensure the effective use of resources and the highest potential for impactful carbon reduction. Additionally, funding these projects can strengthen collaborative efforts between different levels of government and stakeholders, facilitating a more integrated and holistic approach to climate change mitigation.

COORDINATION WITH OTHER EV INITIATIVES AND PROGRAMS

The importance of allocating carbon reduction funds to address EV infrastructure gaps identified through federal programs like NEVI cannot be overstated. NEVI's comprehensive assessments have pinpointed these gaps and needs, ensuring that proposed projects are targeted and effective in meeting them. By emphasizing these identified areas for carbon reduction funds, PennDOT ensures a strategic, needs-based approach to resource allocation. Moreover, there may be worthy projects identified by NEVI that did not receive funding. These projects should not be overlooked, as they represent well-vetted, ready-to-implement solutions for enhancing EV infrastructure. By considering these unfunded projects for other sources of funding, PennDOT can maximize the value of NEVI's prior work, accelerating progress toward Pennsylvania's carbon reduction goals.

DELIVERABILITY

The deliverability of a project is an important consideration that needs to be addressed in project selection. MPOs have previously highlighted the issues they have had in implementing

certain project types under the CMAQ program. A project may be an excellent idea to reduce carbon emissions, but if it cannot be delivered and managed, then it will not be a good project selection. Project deliverability should be addressed in any project selection process.

Template for Simplified Project Selection

Similar to the CMAQ program, PennDOT is working to establish an Excel spreadsheet template to support MPO/RPO project selection processes. This tool is not required for use but is an available resource to promote and document coordination, strategy ideas, and support a prioritized investment plan, especially for areas where a large number of projects are identified for CRP funding.

The Excel tool includes a scoring system that integrates cost-effectiveness with other qualitative criteria, as highlighted in **Figure 10**. The cost-effectiveness ranking is assigned by the project eligibility type based on analyses and research conducted by the GCC. This information will be continually refined as new research is completed.

Figure 10: CRP Excel Template for Project Prioritization (Sample: In Development)

Project Selection Factors (0=lowest, 100=highest rank) ; Weights must sum to 100%								Average Project Rank Score (0-100)
30%		10%	20%	10%	10%	10%	10%	
FHWA Cost Effectiveness	*Cost Effectiveness Override Value - Required for "Other" Projects*	*Consistency with LRTP*	*Corridor Congestion & Priority*	*Nonattainment or Maintenance for Ozone and PM2.5*	*Project Readiness and Sponsor Capacity*	*Benefits EJ Population*	*Other Factors*	
81	Medium (50)	High (100)	Low (0)	0	High (100)	Medium (50)	Low (0)	40

Providing CRP Project Information in MPMS

Like CMAQ, PennDOT has included several fields in the MPMS system that should be populated to support eligibility reviews by FHWA, as highlighted in **Figure 11**. The completion of the CRP fields in MPMS will help to expedite eSTIP approval for this funding. These are provided under the MPMS Section Titled "Carbon Reduction Program (CRP)." In addition, the Air Quality Impact Description (AQID) can be used to provide further details on the project description that may justify eligibility under CRP. This field is also used for CMAQ and Regional Transportation Conformity. MPOs/RPOs and District staff should coordinate on what agencies are responsible for entering and maintaining the MPMS project information.

Development of FAQs

As an action item, PennDOT CPDM intends to assemble a Frequently Asked Questions (FAQs) section on the CPDM website to address and share questions related to CRP eligibility, funding, project selection, and/or implementation. The FAQ will support PennDOT District Offices and MPOs/RPOs with implementation of the CRP. PennDOT Districts and MPOs/RPOs should continue to share questions with CPDM and FHWA.

Figure 11: MPMS Fields Related to CRP Project Entry

Project Eligibility Category: <*DROPDOWN*>
? HELP Text Note: "Provide the eligibility category from the CRP Implementation Guidance section G.3"

A. Traffic Monitoring – Truck Stop Electrification per 23 U.S.C. 149(b)(4)
B. Public Transportation eligible under 23 U.S.C. 142
C. Transportation Alternatives (Non-Motorized)
D. Congestion Management Grants per 23 U.S.C. 503(c)(4)(E)
E. Intelligent Transportation Systems (ITS)
F. Energy Efficient Alternatives for Lighting and Traffic Control Devices
G. Carbon Reduction Strategy – requires coordination with PennDOT and FHWA
H. Travel Demand Management
I. Reduce Impacts of Freight Movement
J. Alternative Fuels (EV Charging) or zero-emission CON equipment and vehicles
K. Diesel Engine Retrofit per 23 U.S.C. 149(b)(8)
L. Traffic Flow Improvements eligible under CMAQ (No New Capacity)
M. Reduce CO2 Emissions at Port Facilities
OTHER – Not Listed in CRP Implementation Guidance

Project CO2 Emission Benefit: <*TEXT BOX*>
? HELP Text Note: "Projects listed with an "Other" eligibility category require an emissions analysis. See CRP Implementation Guidance section G.3 for more details. Positive values indicate a benefit."

7 A TOOLBOX FOR FURTHER REDUCING TRANSPORTATION'S CARBON FOOTPRINT

The core focus of the state CRS revolves around federal CRP funds designated for transportation projects. PennDOT also intends to evaluate key areas of its operations - including planning, programming, design, environmental oversight, system operations, and maintenance to identify sustainable practices and procedures conducive to carbon reduction. Some of these practices may also apply to supporting MPO/RPO activities.

Figure 12 provides example strategies extracted from the National Cooperative Highway Research Program (NCHRP) and the Transportation Research Board's (TRB) project titled ***Reducing Greenhouse Gas Emissions: A Guide for State DOTs*** (referred to as the NCHRP Guidebook). PennDOT intends to evaluate this strategy toolbox with each of the agency's deputates and bureaus to identify and document what strategies or initiatives are already completed or underway, ones that intend to be evaluated in the future, and additional opportunities and actions to support carbon reduction. Some of these actions are consistent with recommendations already provided in this CRS and others may lead to new CRP project priorities that can be integrated into this CRS and the regional project selection processes.

Strategies aimed at reducing the carbon footprint of PennDOT's buildings, supplies, and employee travel are not addressed in this section. Many of these initiatives are currently being led by the Pennsylvania Department of General Services (DGS) and are being conducted for all state agencies.

The NCHRP Guidebook provides self-assessment worksheets that can assist PennDOT in determining where the agency falls on the GHG engagement spectrum and what additional actions the agency may wish to take to measure and reduce GHG emissions.

Figure 12: Example Strategies to Support Carbon Reduction (NCHRP Guidebook)

PLANNING

- Provide guidance to MPOs to develop regional GHG emissions forecasts, consider GHG impacts of regional long-range plans, and identify GHG mitigation strategies
- Develop a GHG emissions inventory (baseline and forecast)
- Identify goals and target setting for GHG reduction
- Conduct a GHG policy/strategy study or analysis to evaluate strategy benefits/costs
- Develop multi-agency working group to assess strategies
- Consistently include GHG-reducing strategies in long-range, modal, corridor, and subarea plans
- Integrate funding incentives tied to GHG reduction

PROGRAMMING

- Quantify the GHG benefits of the TIP and LRTP projects
- Evaluate the overall program GHG benefits against established goals and targets
- Integrate GHG metrics in the prioritization of projects for the TIP and LRTP
- Enhance project selection process to support identification of cost-effective strategies

PROJECT DEVELOPMENT AND PRELIMINARY DESIGN

- Introduce design elements to improve traffic flow or to support other modes of travel
- Implement operations strategies in the construction phase
- Make GHG impacts (qualitative) a scored variable in the alternatives analysis, e.g., at 30% design
- Analyze impacts of construction and detour routes on GHG emissions
- Include project elements to support alternative fuels
- Specify use of low-carbon or recycled construction materials and equipment
- Implement revegetation/reforestation to support carbon sequestration

ENVIRONMENTAL REVIEW (NEPA)

- Develop standard methods/tools and procedures for quantitative assessment of GHGs associated with major projects, including construction and maintenance, and vehicles using facility
- Create “template” language and procedures for use in qualitative and/or quantitative assessment, decision making, and documentation
- Evaluate GHG emission and social cost evaluations for all project alternatives
- Address GHG benefits and impacts in public involvement
- Identify mitigation strategies to reduce the project’s GHG impacts

FINAL DESIGN AND CONSTRUCTION

- Conduct research to identify the best materials mixes and market sources for GHG reductions
- Develop standard specifications that reduce GHGs and reflect material availability
- Communicate with material providers regarding desired changes in material preferences
- Encourage reuse of deconstructed or locally-sourced materials
- Specify low-carbon fuels and newer engines with provisions for equipment idling
- Introduce electrically powered vehicles and equipment, as technology is ready
- Minimize delays and VMT for detour routes and construction staging
- Ensure contractors have a ready supply of recycled materials
- Ensure that any reuse agreements are followed if the facility elements are not damaged
- Allow longer cure times for concrete

SYSTEMS MANAGEMENT AND OPERATIONS

- Identify GHG reduction as a goal or objective for TSM&O (e.g., in agency strategic plan, TSM&O workplan, or congestion management plan)
- Estimate program-wide GHG reductions for TSM&O
- Apply simple quantitative methods to estimate GHG reduction from TSM&O projects (e.g., speed-based emission factors)
- Implement new/additional TSM&O strategies that reduce GHG emissions
- Work with external partners to develop and implement GHG reducing TSM&O (e.g., transit agencies and municipalities for bus operations and multimodal information)
- Implement strategies to simultaneously manage traffic operations and demand

LAND USE AND SMART GROWTH

- Collaborate with local governments and stakeholders to align transportation projects with local land use and growth plans, ensuring infrastructure supports desired growth patterns
- Promote and support developments centered around transit hubs
- Support compact, mixed-use developments which reduce the need for long commutes and car dependency
- Partner with environmental agencies and local communities to preserve green spaces, creating buffer zones that prevent urban sprawl and maintain natural ecosystems
- Advocate for the design of streets that cater to all users—cars, cyclists, pedestrians, and transit riders
- Facilitate community workshops and feedback sessions on future land use and transportation projects, ensuring the community's needs and aspirations are taken into account
- Work with MPOs/RPOs to provide resources and training on smart growth principles, ensuring local planners and policymakers have the knowledge and tools needed
- Explore funding mechanisms or grant programs that can be offered to local municipalities that adopt smart growth principles in their planning
- Utilize GIS and other tools to map and analyze current land use patterns, forecast growth, and identify areas optimal for transit-oriented and compact development

8 ACTION PLAN FOR ADDRESSING CARBON REDUCTION

The state CRS provides a comprehensive overview of PennDOT's ongoing efforts in line with the CRP objectives. It encompasses the identification and prioritization of projects eligible for CRP funding, monitoring and reporting of GHG emissions, and an appraisal of other PennDOT initiatives that align with carbon reduction goals. The CRS also highlights a range of actions and initiatives needed to advance each of these topic areas.

This section consolidates these actions to offer PennDOT and its supporting MPOs/RPOs a roadmap to streamline CRP processes. The action plan is dynamic, with periodic reviews and improvements based on feedback from the CRP workgroup. Some action steps may be added or removed based on future coordination. For clarity, the action plan is segmented into two tables: one centered on the CRP and another emphasizing broader PennDOT organizational strategies. A relative priority level has been assigned to strategies with 1 being the highest priority level and 3 being the lowest priority level. Although priority levels are assigned, the lowest priority does not signify a lack of importance; it merely indicates that it may be addressed at a later date compared to higher-priority items.

Action Plan: CRP Activities and Procedures

ACTION STEP	LEAD AGENCY	PRODUCT
PRIORITY LEVEL 1		
Coordinate with FHWA on assembling questions and answers related to CRP eligibility	• PennDOT CPDM • FHWA-PA	CRP FAQ Document (Updated Periodically)
Evaluate the GCC TEA-CART and FHWA's Database for Air Quality and Noice Analysis (DANA) software tools and applicability to MPO/RPO activities	• PennDOT CPDM • GCC • MPOs/RPOs	Develop an online resource directory with tools; Evaluate training sessions for MPOs/RPOs
Develop regional CRP project selection processes	• MPOs/RPOs	Document process in TIP & LRTP documentation or regional CRS
Develop CRP project selection template spreadsheet	• PennDOT CPDM	Excel template on CPDM SharePoint site as resource
Update of CRS to integrate Regional CRS(s)	• PennDOT CPDM • Relevant MPOs/RPOs	Revise CRS and work with FHWA on requirements
CRP Workgroup & Planning Partner meetings to evaluate state CRS and CRP practices, tools and resources	• PennDOT CPDM • MPOs/RPOs	Recommendations for improvements or additional resources

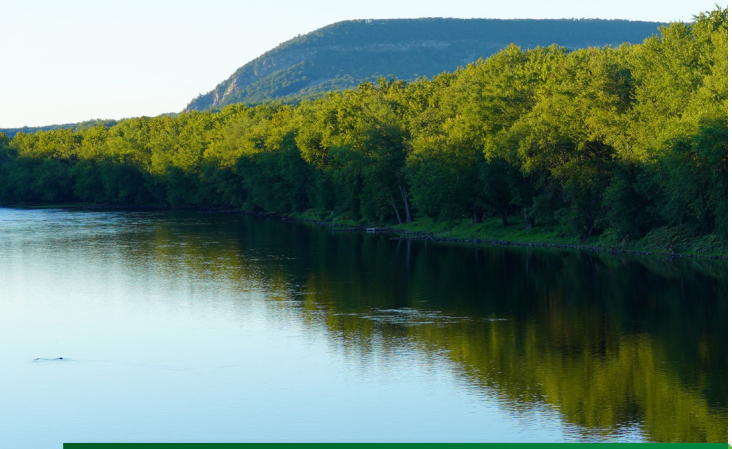
ACTION STEP	LEAD AGENCY	PRODUCT
Evaluate toolbox of strategies related to low carbon materials	• PennDOT BOD/ Maintenance	Strategy recommendations and methods for application of CRP funding
PRIORITY LEVEL 2		
Provide additional tools or guidance to support equity criteria for project selection	• PennDOT CPDM	Provide additional mapping in ONEMAP using statewide EJ data or USDOT equity layers
Identify completed local CAPs in Pennsylvania	• MPOs/RPOs	Provide lists to CPDM for inclusion in CRS updates
Create a repository of case studies to highlight successful applications of CRP project identification and selection	• PennDOT CPDM • MPOs/RPOs • Districts	Highlight brochure of project selection and identification processes or management practices for funded projects
Evaluate strategy cost-effectiveness based on new tools and research	• PennDOT CPDM • MPOs/RPOs	Update to CRS priority strategy section
Evaluate methods for producing transportation statewide and regional GHG emission inventories	• PennDOT CPDM • MPOs/RPOs	Tools and data to support analyses
PRIORITY LEVEL 3		
Evaluate potential GHG impacts of TIP, 12-yr Program, EV adoption, or other scenarios	• PennDOT CPDM • MPOs/RPOs	Integrate scenario analysis into CRS update
Establish transportation GHG reduction goals or targets	• PennDOT CPDM • MPOs/RPOs	Integrate goals and targets into the CRS update
Provide resources for managing EV infrastructure projects	• PennDOT Policy • PennDOT CPDM • Districts • Select MPOs	Checklist/Handbook for distribution to Districts and MPOs/ RPOs; Possible presentations
Identify methods for reporting GHG emissions for state or regions	• PennDOT CPDM • MPOs/RPOs	Identify existing reports, dashboards or websites for reporting GHG inventories

Action Plan: Additional Carbon Reduction Initiatives (Building on Section 7)

ACTION STEP	LEAD AGENCY	PRODUCT
PRIORITY LEVEL 1		
Establish a collaborative PennDOT workgroup among planning, design, maintenance, and operations staff. Share current initiatives and future strategies for reducing GHG emissions	• PennDOT CPDM	Document highlighting current and future strategy initiatives among each discipline
Conduct review of PennDOT and other state DOT GHG reduction strategies and activities to gain insights on applicable and effective strategies for implementation across DOT operations	• PennDOT CPDM • FHWA	Strategy Toolbox refinement
PRIORITY LEVEL 2		
Conduct organization self-assessments following protocols and tools provided in NCHRP Guidebook	• Each PennDOT Bureau	Self-assessment checklist spreadsheets and forms (NCHRP Guidebook)
Forge partnerships with appropriate state, regional, and local agencies to augment GHG reduction efforts and gain from pooled knowledge and resources	• PennDOT CPDM • DEP • MPOs/RPOs • FHWA • Others - TBD	Periodic Meetings – Can be coordinated with CRP workgroup
PRIORITY LEVEL 3		
Formulate a comprehensive GHG reduction policy offering clear guidelines for all PennDOT Bureaus	• PennDOT Policy Office	Policy memorandum

9

CONCLUSION AND SUMMARY

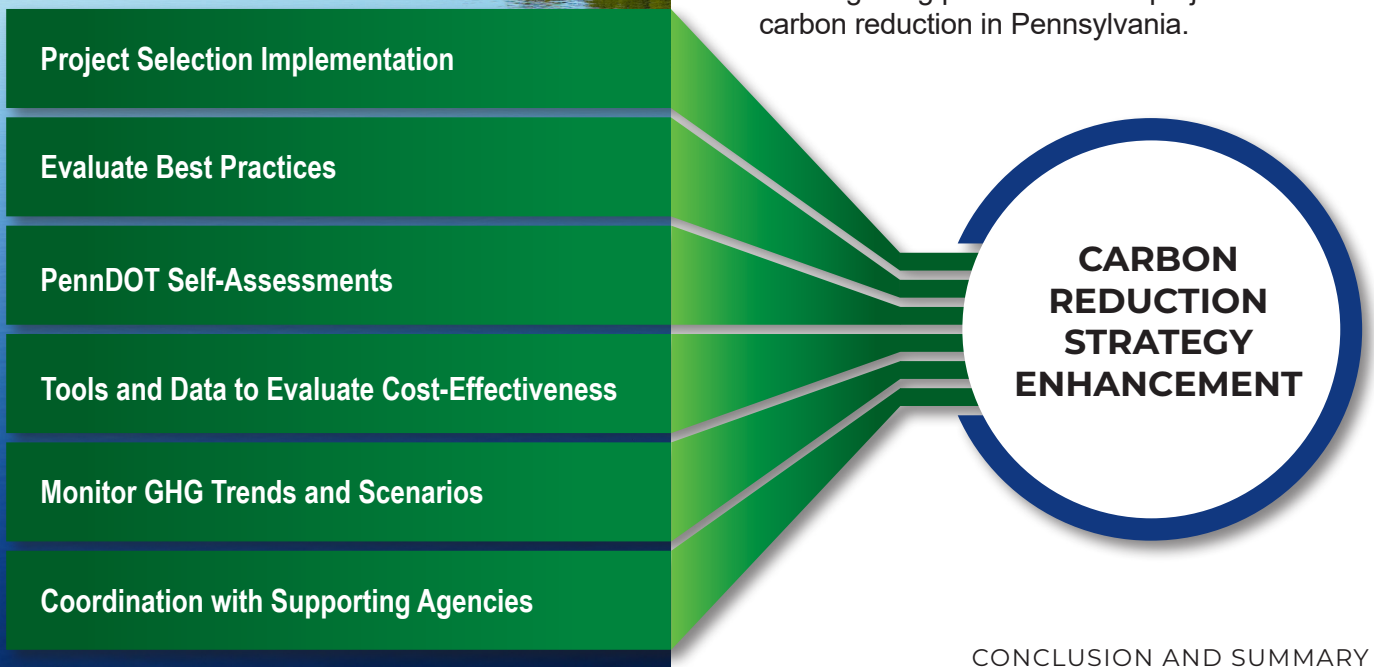


In conclusion, PennDOT's Carbon Reduction Strategy serves as a dynamic and vital tool in Pennsylvania's fight against climate change, supporting decision-making processes within the organization, as well as facilitating coordinated efforts with MPOs/RPOs across the state. By offering a robust and flexible framework, the CRS allows PennDOT and MPOs/RPOs to navigate and address the evolving challenges of GHG reduction.

The CRS will be updated periodically, but not less than every four years (per federal requirements), to document completed strategies, monitor trends in the transportation sector's GHG emissions, and ensure alignment with the Commonwealth's overarching climate goals. PennDOT's continued collaboration with various state programs, such as CMAQ and NEVI, as well as with the DEP's climate action plan, will further strengthen the CRS's effectiveness and reach.

PennDOT will also continue to monitor how Districts and MPOs/RPOs are using the CRS including best practices in developing project identification and selection processes. Continued coordination with the CRP workgroup will provide valuable insights and recommendations for improving the CRS and related resources moving forward. In addition, expanding coordination across other state departments can help reduce barriers and identify gaps.

At the heart of PennDOT's CRS is the Department's commitment to inclusive stakeholder involvement. We recognize that continuous engagement within the Department and among stakeholders is fundamental to successfully implementing our CRS action plan, and for integrating procedures and projects that advance carbon reduction in Pennsylvania.



NOVEMBER 2023

PENNSYLVANIA CARBON REDUCTION STRATEGY (CRS)

In Support of the Federal Carbon Reduction Program (CRP)

pennsylvania
DEPARTMENT OF TRANSPORTATION

IN CONSULTATION WITH PENNSYLVANIA METROPOLITAN AND RURAL PLANNING ORGANIZATIONS (MPOS/RPOS)