U.S. Department of Transportation

State Carbon Reduction Strategies:

A View from Across the Country

April 2024*

***Updated January 2025**

This document and all of the state carbon reduction strategies are available at:
https://www.transportation.gov/priorities/climate-and-sustainability/carbon-reduction-program

Sources for front cover images from left to right, top to bottom: Bicyclists and light rail train - Maryland Carbon Reduction Strategy, rural main street - Pixabay, electric car charging - Pixabay, electric truck charging - Pixabay, people on train - photo taken by DOT employee, complete street – Albuquerque City Council website, traffic monitoring – Texas Carbon Reduction Strategy, pavement preservation – Hawaii Carbon Reduction Strategy.

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Executive Summary

The Bipartisan Infrastructure Law (BIL) offers an unprecedented opportunity to reduce climate pollution from transportation by providing funding specifically for doing so and by requiring states to develop State Carbon Reduction Strategies (CRSs). Strategies are to support efforts to reduce carbon dioxide emissions from on-road highway sources and must be developed in consultation with metropolitan planning organizations (MPOs) in the state. Strategies were due November 15, 2023, and must be updated every four years. States took different approaches, based on their unique circumstances, geographies, and contexts. Some built on decades of greenhouse gas (GHG) analysis and state legislative commitments to GHG targets. Others were just embarking on this area of work. Most states thought strategically about how to align transportation funding in general, not just Carbon Reduction Program (CRP) funding, towards GHG reduction as one of a set of strategic goals.

This report highlights a broad range of notable practices from a variety of states. The table below summarizes how many of the CRSs included different elements or approaches. This information is expanded upon in subsequent sections of this report to provide helpful information to state departments of transportation (DOTs) and their stakeholders. As states move forward with implementing and updating their plans, they will benefit from learning from each other.

Category of CRS Element	Type of CRS Element	# of States
State Legislation and Executive Orders	CRS discusses state legislation or executive orders relevant to transportation decarbonization	20
Strategy Types Included	Electric Vehicle Charging	46
	Clean Energy Uses of Highway Right-of-Way	14
	Public Transportation	45
	Freight Mode Shift	10
	Active Transportation	49
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1. Introduction

The Bipartisan Infrastructure Law (BIL) established the Carbon Reduction Program (CRP), which provides $6.4 billion in formula funding over five years for states to develop carbon reduction strategies and for projects to reduce carbon dioxide emissions from on-road sources. Under this program, BIL requires each state, in consultation with metropolitan planning organizations (MPOs), to develop a State Carbon Reduction Strategy (CRS) to support efforts to reduce transportation carbon dioxide emissions and identify projects and strategies to reduce these emissions. These Strategies were due by November 15, 2023, and must be updated at least once every four years. The state CRSs offer insight into how transportation agencies across the country are thinking about greenhouse gas (GHG) emissions reduction. Transportation sector carbon dioxide emissions represent approximately 30 percent of U.S. GHG emissions, the most of any sector.[1] Because many transportation decisions are made at the state and local levels, state DOTs and their partners have an opportunity to take action towards reducing emissions. As states work to implement and plan for updating their CRSs, they can look to each other for ideas and inspiration.

This report summarizes noteworthy practices from all 51 submitted state CRSs.[2] It has been updated to include the results of a comprehensive analysis that quantified how many states used particular practices. It has also been updated to include additional notable practices.

Notable practices covered in this report include approaches to developing a carbon reduction strategy, analysis methods, process decisions, and implementation methods. They also include specific projects and program areas that align with the strategies in the U.S. National Blueprint for Transportation Decarbonization: increasing convenience, improving efficiency, and transitioning to clean mobility options. For each notable practice, this report describes its significance, how it can help reduce transportation sector GHG emissions, examples of states that are pursuing this approach, and resources that states can review to learn more about how to implement this approach.

[1] https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

[2] 49 states, the District of Columbia, and Puerto Rico submitted carbon reduction strategies. Florida did not submit a carbon reduction strategy. All of the submitted strategies are compiled on the USDOT website, at https://www.transportation.gov/priorities/climate-and-sustainability/carbon-reduction-program.

Carbon Reduction Strategy Requirements
23 U.S.C. 175(d)(2)

The carbon reduction strategy of a State shall-

(A) support efforts to reduce transportation emissions;*

(B) identify projects and strategies to reduce transportation emissions, which may include projects and strategies for safe, reliable, and cost-effective options-

(i) to reduce traffic congestion by facilitating the use of alternatives to single-occupant vehicle trips, including public transportation facilities, pedestrian facilities, bicycle facilities, and shared or pooled vehicle trips within the State or an area served by the applicable metropolitan planning organization, if any;

(ii) to facilitate the use of vehicles or modes of travel that result in lower transportation emissions per person-mile traveled as compared to existing vehicles and modes; and

(iii) to facilitate approaches to the construction of transportation assets that result in lower transportation emissions as compared to existing approaches;

(C) support the reduction of transportation emissions of the State;

(D) at the discretion of the State, quantify the total carbon emissions from the production, transport, and use of materials used in the construction of transportation facilities within the State; and

(E) be appropriate to the population density and context of the State, including any metropolitan planning organization designated within the State.

*23 US 175 (a)(2) defines transportation emissions as carbon dioxide emissions from on-road highway sources of those emissions within a State.

2. Common Approaches and Context

Common Approaches

State departments of transportation (DOTs) pursued a range of approaches to develop a CRS that met their needs, whether they had already done a significant amount of work on transportation decarbonization or were just getting started. Some of the varied ways that states approached the requirement to develop a CRS included:

- ***Referencing, building on, or feeding into existing state plans and policies***, including climate change-specific documents and broader transportation planning documents like long-range transportation plans. For example, New York plans to incorporate the CRS into its upcoming State Long-Range Transportation Plan, a practice that FHWA's guidance encourages.[3] California, which has done a significant amount of work on GHG emissions reduction to date, used its CRS to reference existing work and describe how CRP funds can be leveraged towards meeting existing priorities.
- ***As a motivator for the development of the DOT's first plan for reducing GHG emissions.*** For example, the CRS is Arkansas DOT's first documented strategy for reducing carbon emissions. Absent the requirement for a CRS, some DOTs may not have developed a specific strategy for reducing transportation GHG emissions.
- ***As a way to publicly document how CRP funds will be used.*** For example, the Massachusetts CRS describes how CRP funding will be allocated to existing programs and initiatives that reduce emissions. The CRS was published as an appendix to the Statewide Transportation Improvement Program, and Massachusetts DOT anticipates updating the CRS on an annual basis to summarize their programming of CRP funds.
- **Taking a holistic approach**. Given the broad statutory direction for CRSs to support the reduction of transportation emissions, FHWA encourages states to be holistic in their approach, including strategies that they may fund and carry out using the full range of programs and funding sources available, not only CRP. Thirty-five states took this more holistic approach.
- ***To set baselines and track progress towards GHG emissions reduction over time.*** For example, Michigan's CRS includes analysis to establish baselines for each of the main transportation sources of carbon emissions (vehicles driving on the system, capital projects, and maintenance activities). This will allow Michigan DOT to quantify the emissions reductions from these sources as part of their CRS update in four years.
- ***To prioritize among strategies to reduce emissions.*** Several states prioritized strategies that had the most emissions reduction potential or were most cost-effective (e.g., dollars per ton of carbon dioxide (CO_2) reduced). For example, New Jersey's CRS includes an estimate of the CO_2 reduction expected from different project types. Other states prioritized strategies based on other factors, such as feasibility, rural/urban needs, or MPO priorities.
- ***As part of efforts to implement state level laws or executive orders.*** Twenty CRSs discussed laws or executive orders in their state to reduce GHG emissions. Some states have laws that align with U.S. goals of 50 percent GHG emissions reduction by 2030 and net zero emissions by

[3] https://www.fhwa.dot.gov/environment/sustainability/energy/policy/crp_guidance.pdf

2050. Other states have laws specifying goals or targets related to renewable energy usage or electric vehicle deployment. States with existing state-level mandates tended to have more elements in their CRS that would enable success in reaching goals, such as high impact strategies, quantitative analysis, project prioritization, discussion of progress towards goals, and integration with a broad range of GHG reduction policies and programs beyond the CRP.

- **To serve as a resource for MPOs to identify types of projects and programs that reduce GHG emissions.** For example, Georgia's CRS includes a "menu of strategies" for Georgia DOT, MPOs, and other stakeholders to select from. Strategies are not prioritized in the CRS but are evaluated qualitatively on a set of metrics including equity, GHG reduction potential, resilience, and air quality.

Strategies in Context

All the CRSs identified a broad range of strategies for reducing emissions. States often described how these strategies could be implemented in their state-specific context.

Figure 1. Children ride bicycles along the Grand Island Connector Trail in Grand Island, Nebraska. Source: Schemmer

For instance, Nebraska described what multimodal transportation could look like in their context:

Multimodal transportation can include a range of modes that can work together to provide attractive, affordable, and convenient options other than relying on a vehicle for every trip. Multimodal transportation is also about improving the quality of life and livelihood throughout neighborhoods and communities. From the elementary student riding her bike to school on Grand Island's extensive trail network, to a worker in South Sioux City using NDOT's vanpool service to commute, and to Nebraska's larger urban centers leveraging transit infrastructure to promote economic development, there are many benefits and reasons to promote multimodal transportation. - Nebraska Carbon Reduction Strategy, page 68.

California, as a large, geographically diverse state, embraced a decentralized approach:

Working with [Metropolitan Planning Organization] MPO and [Regional Transportation Planning Agency] RTPA partners to develop transportation strategies ensures that projects are diverse enough to the meet the unique conditions across California and effectively reduce transportation carbon emissions. - California Carbon Reduction Strategy, page 5.

California provides examples of strategies in the context of different areas of the state. One example is the Bakersfield High Speed Rail Station Area Vision:

The California High Speed Rail Authority is working with the cities with planned high speed rail stations to develop plans for multimodal connections into the station. Bakersfield's vision includes dense land

uses, active transportation connections, and local transit connections that will make the rail line more attractive and reduce carbon emissions. - California Carbon Reduction Strategy, page 15.

Figure 2. Bakersfield High Speed Rail Station Area Vision.

California's strategy also recognizes that their need for zero emission vehicles, active transportation, and rail and transit investment exceeds available funds. The strategy then highlights roadway pricing (tolled roads and lanes) as an effective tool to simultaneously improve efficiency, reduce vehicle miles traveled (VMT), and generate revenue for low-carbon travel options such as public transportation. Spending a relatively modest level of federal funding on converting existing lanes to toll lanes harnesses larger revenues that can be used to deliver public transportation projects that would not have been possible without the additional revenue.

Washington state's strategy incorporates work at the state level to increase housing density to both improve affordability and reduce VMT:

Washington State recognizes the importance of housing development patterns in addressing transportation GHG emissions. Increasing housing density typically reduces travel distance and makes alternatives to driving alone more viable. - Washington State Carbon Reduction Strategy, page 27.

Several bills to address housing needs, improve housing affordability, and increase housing density were passed during Washington State's 2023 legislative session. These include laws to increase middle housing in areas traditionally dedicated to single-family detached housing, ease barriers to the construction and use of accessory dwelling units, exempt buildings with 12 or fewer units that are no more than two stories from the definition of multiunit residential building, and exempt all housing projects within cities from the State Environmental Policy Act if the project is consistent with all development regulations.

Figure 3. Washington's Carbon Reduction Strategy includes state efforts to enable development of multi-family housing to help meet both affordability and climate goals. Source: Washington State Department of Commerce.

Georgia referred to its economic development goals around electric vehicle manufacturing and deployment:

Georgia's Carbon Reduction Strategy is consistent with the state's existing priorities and mission to "deliver a transportation system focused on innovation, safety, sustainability, and mobility." Georgia's Governor Brian Kemp has set a goal to become the electric mobility capital of the nation. Georgia is already leading the Southeastern U.S. in electric vehicle share. – Georgia Carbon Reduction Strategy, page 8.

Figure 2. Electric vehicle charging. Source:Pixabay.

The Texas Carbon Reduction Strategy includes a focus on advanced technologies to improve traffic flow and operations. It includes the installation of vehicle-to-infrastructure (V2I) technology on key freight corridors to improve communication and traffic flow along the highway network. The technology upgrade aims to improve the safety and efficiency of current systems and reduce transportation emissions. Texas provides "a detailed list of projects from their 2024 Unified Transportation Program (UTP) that are eligible for Carbon Reduction Program funding, even though only a portion will be funded through the program, demonstrating TxDOT's commitment to comprehensively targeting federal funds to address transportation emissions." - Texas Carbon Reduction Strategy, page 22.

Figure 3. Advanced Technologies for traffic monitoring and management. Source: TxDOT

3. Methodology to Develop and Implement Carbon Reduction Strategies

Public Engagement and MPO Coordination

Many states implemented a robust public involvement process in the development of their CRSs. For example, some states worked directly with community groups for all or part of their public engagement, allowing for direct discussion with stakeholders during dedicated meetings. Nevada used social media advertisements to promote a survey and video on the website landing page, resulting in over 500 responses. Indiana had a 45-day public comment period, and their strategy included a public comment summary. Tennessee developed a public online dashboard to convey information on how Carbon Reduction Program funds are being used across the state.

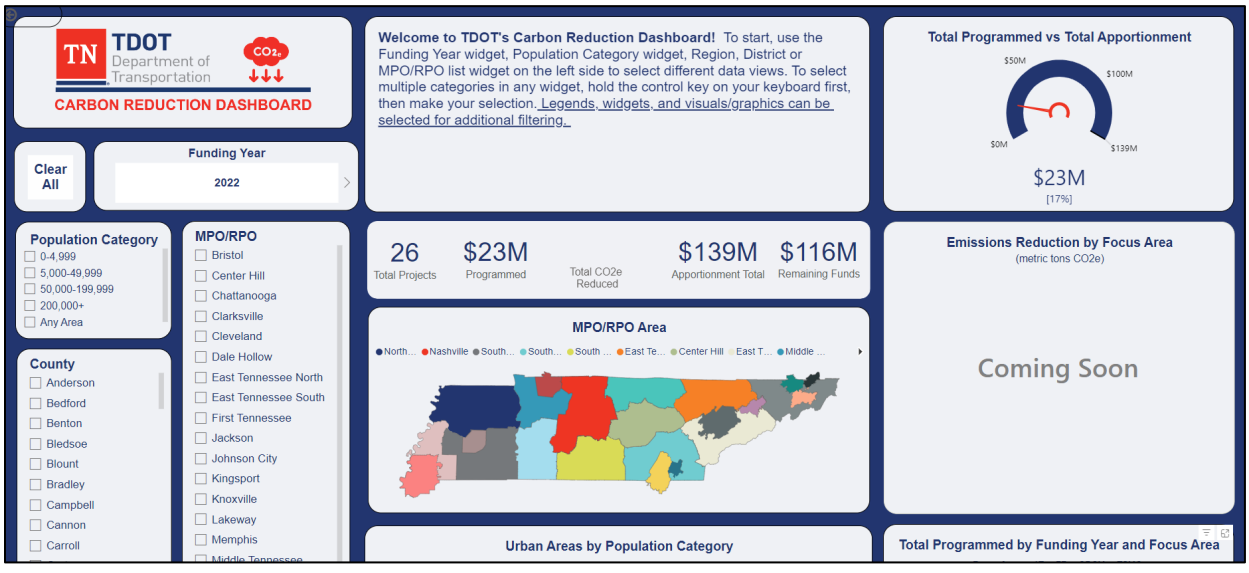


Figure 4: Tennessee DOT Carbon Reduction Dashboard

States were required to develop their CRS in consultation with MPOs, and states pursued varied approaches to doing so. Louisiana presented its CRS to its MPOs and summarized the subsequent discussion in an appendix, while Idaho took input from MPO questionnaires and multiple meetings, which guided both state and regional strategies included in their CRS. Georgia and Arkansas both individually engaged their MPOs, and Georgia also presented at the Georgia Association of Metropolitan Planning Organizations.

Notable Examples

Alaska: Alaska created an ArcGIS StoryMap – a web tool which visualizes geospatial data and allows interaction or exploration on computers and mobile devices – to gain public input on its CRS. Through this medium, Alaska explained the CRS process, highlighted the relevance of the plan, and directed users to a comment portal and survey.

Public Engagement Table at Minnesota's Minneapolis Open Streets event (Source: Minnesota Carbon Reduction Strategy, p. 89)

Minnesota: Minnesota conducted significant public engagement prior to developing its CRS. Virtual/online activities included developing a CRS website, public online survey, online community roundtable, self-paced virtual public forum, and social media posts. In-person activities included "pop up" events in communities throughout the state including the Minnesota State Fair and live public forums.

Mississippi: Mississippi DOT met with the state's four MPOs five times throughout the development of the CRS at predetermined times, in order to receive feedback at each stage. The CRS summarizes the content and feedback received at each of the MPO meetings. One of the meetings included interactive polling to help Mississippi DOT refine its strategies.

Washington: Washington State DOT (WSDOT) ensured that disadvantaged communities had adequate resources to participate in decisions about how to reduce GHG in their communities:

The 2023 Transportation Budget includes $3 million for WSDOT to develop and implement a community outreach, education, and technical assistance program. This program will support overburdened communities and their partners in developing community-centered CRSs that make meaningful community impacts and help gain access to available funding to implement these strategies, where applicable. The legislation allows WSDOT to provide appropriate compensation to members of overburdened communities who provide solicited community participation and input needed by WSDOT to implement and administer the program. – Washington State Carbon Reduction Strategy, page 28.

Additional Resources

- Promising Practices for Meaningful Public Involvement in Transportation Decision-Making Document

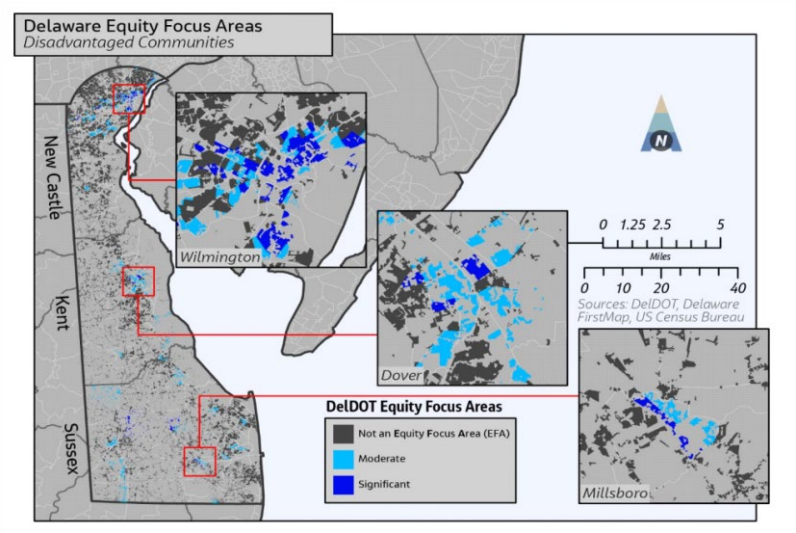
Equity Considerations

Twenty-nine CRSs specifically discussed equity. A number of these plans, including Connecticut, the District of Columbia, Delaware, Georgia, Michigan, Minnesota, and Nevada, used equity considerations as a prioritization factor when selecting among or prioritizing strategies. Other states committed to analyzing the equity impacts of projects and programs included in the CRS. For example, Maryland plans to display CRP investments geographically to be able to track the distribution of funding to disadvantaged communities.

Notable Examples

Alabama: Alabama plans to use maps to analyze equity impacts from projects receiving CRP funding across a number of demographics, including age, vehicle access, limited English proficiency, race/ethnicity, income, and disability. Alabama included these statewide maps as an appendix to its CRS.

Delaware: Delaware considered disadvantaged community locations and regional equity goals as factors for prioritizing projects for CRP funds. To do this, Delaware DOT developed an Equity Analysis Tool that incorporates census and residential land use data to identify neighborhood block groups where the department should focus its attention.



Delaware mapped "Equity Focus Areas" to identify areas to focus attention and allow Delaware DOT to confirm that disadvantaged communities will experience the benefits of CRP-funded projects (Source: Delaware Carbon Reduction Strategy, p. 25)

Additional Resources

- Climate and Economic Justice Screening Tool (CEJST)
- USDOT Equitable Transportation Community (ETC) Explorer

Rural Considerations

CRSs were required to be appropriate to the population density and context of the state. To this end, many (28) CRSs discussed considerations related to rural areas specifically. A number of these plans discussed rural elements/considerations for specific projects and programs, such as transit, micromobility, trails, and electric vehicle (EV) charging. New York discussed the need for different

strategies in rural and urban areas, while Kentucky included an example of a rural and an urban project for each of the strategies included in the plan.

Several states did targeted outreach to rural governments in the development of the CRS. For example, Georgia conducted outreach to Regional Commissions to capture input from rural areas, and Missouri held stakeholder meetings with Regional Planning Commissions representing rural parts of the state.

Notable Examples

North Carolina: North Carolina DOT asked Regional Planning Organizations in rural areas to select and rank CRP-eligible projects in a way that met the region's needs and planning priorities. In the CRS, NCDOT included tables of CRP spending by mode for MPOs (urban areas) and RPOs (rural areas). RPO projects were more likely to be highway projects, while MPO projects were more likely to be transit and bike/ped projects.

Mode	CRP Only Funds	Percentage of CRP Funds
Pedestrian	$486,806	2.1%
Highway	$5,419,739	22.9%
Transit	$8,746,708	37.0%
Bicycle/ Pedestrian	$8,853,000	37.5%
EV Infrastructure	$132,000	0.5%
Total	**$23,638,253**	**100.0%**

Mode	CRP Only Funds	Percentage of CRP Funds
Pedestrian	$4,595,652	15.4%
Highway	$14,911,189	50.0%
Transit	$3,920,000	13.1%
Bicycle/ Pedestrian	$6,414,734	21.5%
EV Infrastructure	$-	0.0%
Total	**$29,841,575**	**100.0%**

North Carolina's CRS includes a summary of CRP projects approved in 2023 by mode for MPOs (left) and RPOs (right), illustrating differing project types funded for urban and rural areas.

Additional Resources

- USDOT Rural Opportunities to Use Transportation for Economic Success (ROUTES) Program

Inventories and Trends

Many states presented inventories and trends regarding the primary sources of their greenhouse gas emissions. States often relied on the Environmental Protection Agency's (EPA's) Inventory of U.S. Greenhouse Gas Emissions and Sinks, which includes a Data Explorer that breaks down data for each state and allows users to create customized charts, examine trends over time, and download data.

For example, Kentucky provided charts and maps detailing the sources of emissions, comparing transportation to other sectors, and framing the state in the national context. Montana provided a multi-modal presentation of sources of emissions in the state, including rail and air emissions in addition to highway emissions. Vermont Agency of Transportation (VTrans) established baseline and future emission projections against which to evaluate strategy selection.

Table 1: Montana On-Road Mobile Source Emissions. Montana Carbon Reduction Strategy.

Vehicle Type	Metric Tons of CO_2
Motorcycle	44,771
Passenger Car	1,141,115
Passenger Truck	3,435,119
Motor Home	26,129
School Bus	56,944
Transit Bus	16,962
Intercity Bus	48,208
Refuse Truck	2,127
Light Commercial Truck	442,852
Single Unit Short-haul Truck	413,740
Single Unit Long-haul Truck	68,960
Combination Short-haul Truck	1,015,106
Combination Long-haul Truck	1,152,909
TOTAL CO_2 EMISSIONS (ON-ROAD SOURCES)	**7,864,942**

Source: USEPA, 2020 NEI, Released 2023.

GHG Performance Measures and Targets

Setting performance measures or targets associated with GHG emissions reduction can help states track progress over time and ensure that investments align with state goals. At least 20 states have existing targets for GHG emissions reduction set at the executive or legislative level that they incorporated into their CRS.

A few states included new performance measures or targets in their CRS, while others identified progress toward developing, or an outstanding need to develop, GHG targets. Performance measures included GHG emissions, EV adoption, carbon intensity of transportation fuels, and VMT per capita. Rhode Island developed scenarios based on estimates of EV adoption with a focus on reaching net-zero emissions while Nevada explored performance measures like percent adoption of renewable fuels and carbon intensity of transportation fuels. Oregon pulled their performance metrics from their existing statewide goals of a 20 percent household VMT per capita reduction and 77 percent reduction in CO_2e per mile.

Notable Examples

Minnesota: Performance measures included in Minnesota's CRS are drawn from Minnesota DOT's (MnDOT) Statewide Multimodal Transportation Plan and include GHG emissions from the transportation sector, zero emission vehicles registered and sold in Minnesota, and VMT per capita. For each performance measure, the plan includes specific targets in 5-year increments from 2025 to 2040. For example, by 2040 Minnesota aims to reduce GHG emissions by 8.0 million metric tons CO_2e, or 80 percent from 2005 levels.

Delaware: Delaware DOT identified metrics to monitor and track as part of its CRS implementation. These metrics include transportation-related emissions, number of registered EVs, transit ridership and access, and VMT reduction. While Delaware DOT has not set specific targets associated with these metrics, it will use them to evaluate CRP investments and adjust their prioritization process if needed.

Additional Resources

- Integrating GHG Assessment and Reduction Targets in Transportation Planning
- A Performance-Based Approach to Addressing Greenhouse Gas Emissions through Transportation Planning

Analyzing GHG Reduction Strategies

Analyzing the emissions reduction potential of specific projects and strategies can help states prioritize limited funding for projects that will have the largest impact on reducing emissions. Thirteen states evaluated or discussed plans to evaluate the emissions impact of specific projects. These approaches varied from detailed modeling of all or most strategies to citing studies about the impact of similar projects. Many states expressed interest in developing quantitative analyses or metrics in the future.

Of the states that developed emissions projections and analyses, approaches and data sources were extremely varied. Some states used state-level data and developed their own emissions estimation tools, while others extrapolated from national data sources. Some states calculated only up-front carbon emission reductions of infrastructure, and some addressed reduction in VMT associated with their strategies. Some states expressed impacts on a qualitative, "low" to "high" scale. While a number of states relied on consultant support, others used in-house expertise.

States generally used a combination of Environmental Protection Agency (EPA), Energy Information Administration (EIA), and USDOT data and tools to analyze expected emissions from their strategies. Among the most popular were FHWA's Congestion Mitigation and Air Quality Improvement (CMAQ) Program Emissions Calculator Toolkit and the EPA MOtor Vehicle Emission Simulator (MOVES) model. Some states, especially those with existing and robust climate metrics, used state-created calculators and tools to analyze emissions. For example, Oregon and Minnesota built custom tools to estimate carbon emissions and the potential for reduction by using local and statewide data. Several states, including Idaho and Vermont, used the TEA-CART tool developed by the Georgetown Climate Center to estimate GHG emissions. Colorado used its activity-based statewide travel demand model paired with EPA's MOVES emissions model to estimate impacts of GHG reduction strategies.

Notable Examples

New Jersey: New Jersey estimated the emissions reduction potential of sample projects in four areas: electric vehicles, public transportation and active modes, efficient roadway operations, and efficient construction and maintenance. In an appendix to the CRS, New Jersey details their

Example Project	Potential Reduction (MT CO2/year)
Installation of 1 public level 2 charging station	10
Installation of 1 public DCFC charging station	50
Replace 10 delivery and vocational trucks with electric trucks	70
Replace 10 diesel-powered nonroad equipment with electric equipment	316
Replace 10 diesel buses with electric buses	420
Replace 10 heavy-duty drayage trucks with zero-emissions trucks	480
Install off-board power systems for 50 truck parking spaces	1,200

New Jersey's CRS included analysis of potential emissions reduction from specific strategies. The table above details emissions reduction from projects relating to electric vehicles. (Source: New Jersey Carbon Reduction Strategy, p. 12).

methodology, which includes drawing upon publicly available tools such as EPA MOVES, AFLEET, and the FHWA CMAQ Toolkit.

Montana: Montana used a qualitative rating system (low/medium/high) to define the maximum potential effectiveness of each strategy in terms of its ability to reduce transportation carbon emissions in Montana. This allowed Montana DOT to compare the effectiveness of different strategies without detailed modeling to estimate the emissions impact of specific projects. Montana based these ratings on comparative emissions in other states and available research, including the 2022 Transportation Research Board study, *Reducing Greenhouse Gas Emissions: A Guide for State DOTs*.[4]

Montana evaluated the emissions reduction benefit of each strategy using a high/medium/low qualitative rating scale. For example, Montana rated supporting the use of electric vehicles as "Medium-high" effectiveness. (Source: Montana Carbon Reduction Strategy, p. 53)

Minnesota: Minnesota DOT's CRS includes information on quantitative methodologies the state and its MPOs use to estimate emissions impacts of projects. Minnesota DOT (MnDOT) developed the Minnesota Carbon Emission Tool (CET), which is available on the MnDOT Carbon Reduction Program website. The CET is a spreadsheet tool based off a series of carbon emissions calculator tools and includes state specific parameters to make it most useful to MnDOT and its partners. It includes calculations for carbon emissions benefits of electrification projects (installing electric vehicle charging infrastructure and transitioning transit, school bus, and other public fleets to electric and zero emission vehicles), travel options (improving bicycle and pedestrian networks, expanding micromobility programs, improving street connectivity, implementing Bus Rapid Transit systems, expanding transit and intercity rail service), and low carbon infrastructure and system management (constructing roundabouts and left turn lanes to improve traffic flow, synchronizing traffic signals, renewable energy projects in highway right of way or on transit stations, rest stops, parking, or other facilities). MnDOT and Minnesota MPOs use the cost effectiveness of carbon emissions calculations that the CET provides in selecting projects to receive funding from the Carbon Reduction Program. They also consider co-benefits such as equity, safety, access, and health during project selection. Minnesota also uses the MICE 2.1 tool (which is currently undergoing an update), based off of FHWA's Infrastructure Carbon Estimator, for estimating life cycle emissions from the materials, construction, maintenance, and usage of roadways.

Vermont: For its CRS, Vermont developed a baseline forecast, evaluated the impact of its capital program on emissions, and analyzed the GHG reduction potential of various strategies:

The VTrans consultant team created a spreadsheet tool referred to as the VTrans GHG Sketch Tool. The tool accepts inputs of key baseline parameters (e.g., vehicle-miles of travel, electrification, vehicle efficiency, transit service and fuel consumption) to develop baseline forecasts. The tool also accepts summary data on VTrans capital program projects. The tool includes calculation methods to develop

[4] http://crp.trb.org/nchrpwebresource1/2-0greenhouse-gas-basics/

planning-level estimates of GHG reductions associated with different types of projects that are or could be included in the capital program, including transit service, bicycle and pedestrian improvements, traffic operations, travel demand management (TDM), and electrification infrastructure. The tool was an early version of the Transportation Efficiency And Carbon Reduction Tool (TEA-CART) developed by Cambridge Systematics for the Georgetown Climate Center in 2023 and made available starting in July 2023 as a pilot program for state evaluation and use. – Vermont Carbon Reduction Strategy, page 17.

Massachusetts: Massachusetts had already been requiring GHG analysis of projects to be considered for inclusion in its Statewide Transportation Improvement Program (STIP). As such, Massachusetts integrated its CRS into its STIP. Massachusetts requires MassDOT and MPOs in the state to use the CMAQ Toolkit developed by FHWA to quantify GHG emissions impacts of projects.

Figure 5. Vermont analyzed the impacts of transit service expansion.

Massachusetts incorporated information about upcoming projects alongside data from their STIP to draw conclusions about the potential decreases in total statewide CO_2 emissions. The CRS estimates that once programmed, "MassDOT's annual CRP apportionment…will reduce emissions by approximately 1,200-12,000 metric tons of CO_2, assuming all projects funded are additional" (p. 505).

Indiana: Indiana DOT (INDOT) analyzed the carbon reduction potential of specific projects included in the STIP or proposed by MPOs for CRP funds. INDOT assessed each project with a five-point qualitative (low – high) scale of carbon reduction potential. The rating considered the project type, project scale, and road type, and was informed by state and federal reports on emissions reduction. INDOT found that high-reduction projects are those that would result in large-scale electrification or large-scale modal shift; these types of projects had not yet been proposed for funding. Proposed projects rating "medium" include district-wide bicycle and pedestrian initiatives.[5]

Additional Resources

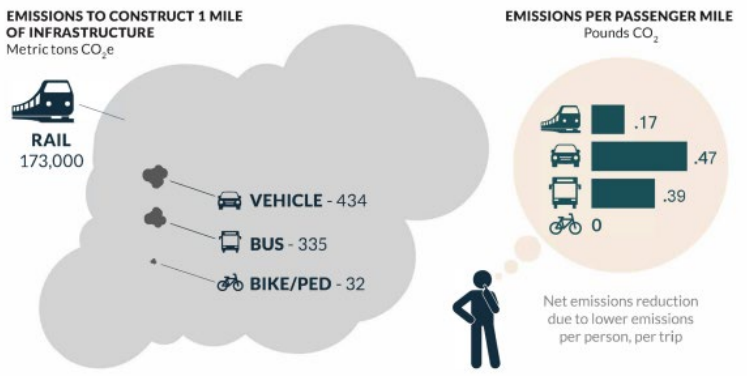
- USDOT Greenhouse Gas Analysis Resources and Tools
- CMAQ Emissions Calculator Toolkit
- Energy Emissions Reduction and Policy Analysis Tool (EERPAT)

[5] FHWA Carbon Reduction Strategies: From Planning to Implementation, Webinar 2 (October 17, 2024). https://www.fhwa.dot.gov/environment/crp/resources/

Life Cycle Emissions

The transportation sector depends on supporting processes that produce additional GHG emissions beyond tailpipe emissions from fuel combustion. These lifecycle emissions include the production and distribution of fuel, manufacture of vehicles, and construction and maintenance of transportation infrastructure. As part of their CRS, BIL encourages states, at their discretion, to "quantify the total carbon emissions from the production, transport, and use of materials used in the construction of transportation facilities within the State."[6]

Only six states analyzed lifecycle emissions as part of their CRS. These states generally focused on the emissions associated with building and maintaining roadways. The embodied carbon of pavement materials used for roadways and the pollution caused by construction vehicles featured in several plans, indicating interest in reducing the emissions associated with current construction practices. Michigan, Connecticut, and Rhode Island used the FHWA Infrastructure Carbon Estimator tool to estimate lifecycle emissions.



Michigan included a graphic illustrating that the rail infrastructure has the highest emissions associated with construction but produces fewer emissions per person per trip than other modes. (Source: Michigan Carbon Reduction Strategy, p. 13).

Some states discussed strategies to reduce life cycle emissions even if they did not quantify them. Virginia identified strategies and plans that focus on reducing emissions from materials for construction and maintenance.

Notable Examples

Ohio: Ohio's baseline emissions calculation included emissions from vehicle use (i.e. tailpipe emissions) as well as emissions associated with material use and construction activities from constructing one lane mile of different facility types (roadway, rail, bus rapid transit, and bicycle and pedestrian facilities). The analysis found that steel and cement construction materials and equipment fuel use are dominant sources of carbon emissions for capital projects, but that tailpipe emissions present the largest opportunity for reduction of carbon emissions overall.

Michigan: Michigan analyzed the emissions associated with various types of construction projects and materials using FHWA's Infrastructure Carbon Estimator tool. The analysis found that when considering both tailpipe and lifecycle emissions per passenger mile, single-occupancy vehicles are the highest emitting mode of transportation, followed by bus rapid transit, commuter rail, and biking/walking. The carbon emissions associated with construction are substantially below tailpipe emissions from using the

[6] 23 U.S.C. 175(d)(2)(D)

roadway. Michigan also analyzed the life cycle emissions impacts of two options for bus rapid transit (BRT) construction.

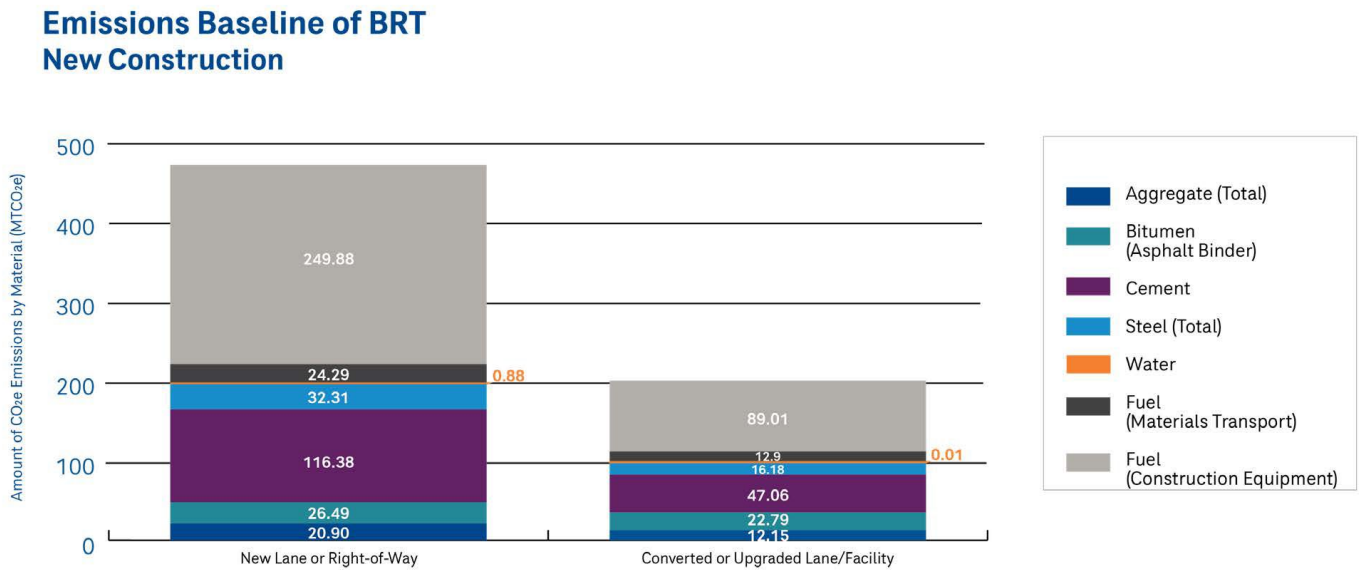


Figure 6. Emissions from construction of Bus Rapid Transit using a new lane vs. converting an existing lane. Michigan Carbon Reduction Strategy, page 12.

Additional Resources

- FHWA Infrastructure Carbon Estimator (ICE)
- FHWA Sustainable Pavements Program

Project Prioritization and Implementation

States took a variety of approaches to project prioritization. Approaches included working with MPOs on project prioritization, ranking strategies based on how they reduced emissions and addressed other state priorities such as equity or geographic diversity, and allocating funding to existing projects programmed in a STIP or existing state programs to reduce GHG emissions.

Taking emissions reduction into account when prioritizing projects for implementation can help ensure that limited funding is allocated to projects that are most likely to reduce emissions and meet other state goals. Approximately 12 states prioritized projects in their CRS in order of the greatest impact to emissions reduction. Many of the state strategies listed projects that have received Carbon Reduction Program funds. For instance, Virginia notes that by late 2023, 34 projects had received funding via the Carbon Reduction Program, 76% of which fall under the transportation choice category (e.g. public transportation, bicycle and pedestrian improvements) and 24% (8) of which are congestion management projects (e.g. ride matching, park and ride).

Notable Examples

Oregon: Oregon DOT (ODOT) is using GHG analysis to drive transportation planning and funding decisions. Oregon's CRS builds off the extensive analysis the state conducted for its Statewide Transportation Strategy: A 2050 Vision for Greenhouse Gas Emissions Reduction. Oregon DOT used VisionEval, a modeling tool developed through an FHWA pooled fund study, to estimate the gap between the State's GHG reduction target and projected GHG emissions from existing policies. Oregon then modeled various scenarios combining different policies for reducing emissions. Oregon found that they would need to both reduce growth in vehicle miles traveled and clean up each vehicle mile. Oregon included public transportation funding, bike/walk networks, demand management, system operations, pricing, electric vehicle charging infrastructure, and transitioning vehicle fleets as ODOT strategies. ODOT also includes strategies other agencies within the state control, such as land use development patterns and adopting the Advanced Clean Car/Truck Standards, which are both key to GHG reduction.

Oregon's selection criteria for CRP projects gave the most weight to climate benefits but also included other priorities like local support, equity, innovation, and project readiness (Source: FHWA Carbon Reduction Strategies: From Planning to Implementation, Webinar 2)

Oregon used the GHG analysis in developing its 2022 long range transportation plan. Figure 7 shows how Oregon's 2022 transportation plan (blue line) gets Oregon much closer to its targets (gold line) than the previous plan. Oregon also incorporates GHG analysis into selection of projects through the STIP. This has resulted in shifting funding towards projects with GHG reductions, such as public transportation, active transportation, and electrification. The Oregon CRS links broad strategies to specific programs and projects. Projects to receive Carbon Reduction Program funds in Oregon must support one or more of the priority areas identified in the strategy.

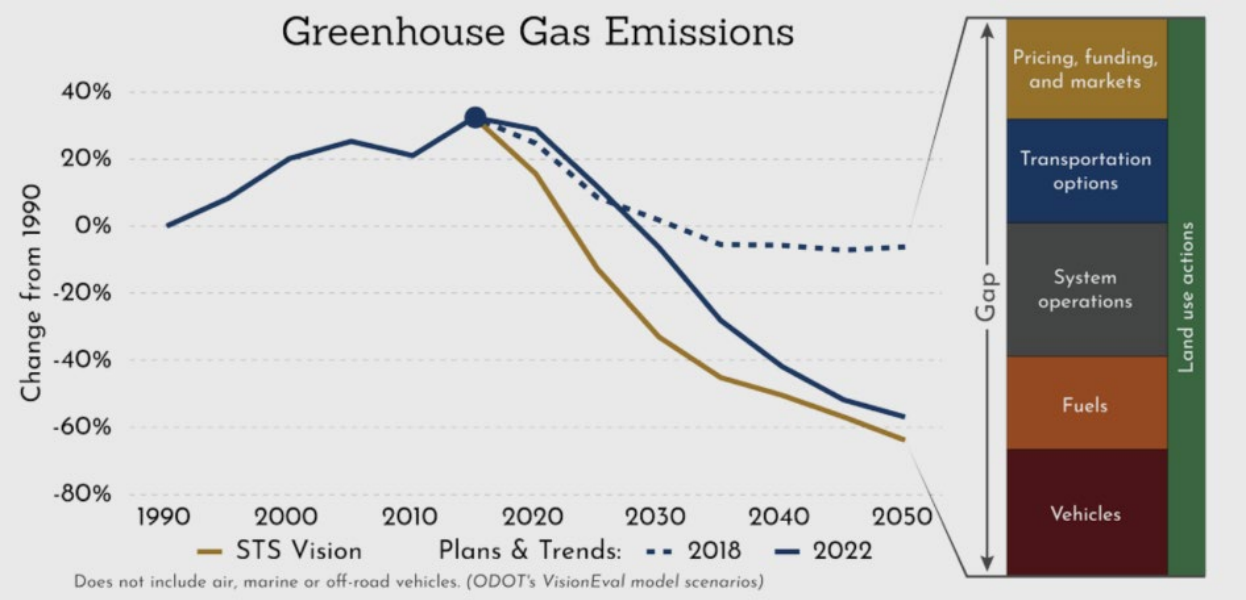


Figure 7. Oregon transportation GHG emissions. The 2022 Plan (solid blue) gets Oregon much closer to its targets (gold line) than the previous plan (dashed line).

Maryland: Maryland's prioritization process for CRP funds considered several factors including consistency with other state transportation plans, increasing connectivity of the bicycle and pedestrian network, eligibility under CRP flex funding, and anticipated carbon reduction benefit. Maryland also plans to add additional factors for its second round of project selection, including estimated carbon reduction benefit and return on investment, equity considerations, priority for Maryland DOT and MPOs, and community support, among others.

Connecticut: Connecticut's CRS analyzes strategies for reducing GHG by rating them against a number of weighted factors to determine which strategies to further explore for Carbon Reduction Program funding.

Montana: Montana DOT identified clear goals and objectives for their CRS within their planning framework and clearly identified overarching strategies with projects to support those efforts. They also identified implementation next steps for their plan. Montana's strategy notes that as projects and actions are implemented, it will be important to evaluate their effectiveness and update assumptions used in the CRS. Future evaluation efforts could include data collection and inventory, database development and management, state and local carbon emissions modeling, and collaboration with partner agencies.

Iowa: Iowa DOT's CRS notes that integrating the strategies and projects into the overall planning and programming process will be one of the first implementation steps for the Carbon reduction Strategy. Iowa also identified the following potential process improvements:

- Developing more localized GHG inventories, such as at the MPO or municipal level.
- Quantifying the carbon emissions from the production, transport, and use of materials in the construction of transportation facilities.
- Developing benefit/cost analysis for emission reduction projects.

- Integrating emission reduction considerations in project prioritization processes.
- Developing performance evaluation frameworks to gauge the impact of emission reduction efforts.

Additional Resources

- Integrating GHG Assessment and Reduction Targets in Transportation Planning
- Handbook for Estimating Transportation Greenhouse Gases for Integration into the Planning Process
- Performance-Based Approach to Addressing Greenhouse Gas Emissions through Transportation Planning

4. Content in Carbon Reduction Strategies

Electric and Alternative Fuel Vehicles and Charging Infrastructure

Electric vehicles (EVs) are a key component of reducing transportation-sector emissions, as they have no tailpipe emissions and are more efficient than internal combustion engine vehicles. Readily available charging infrastructure for EVs can incentivize their adoption, as drivers will be able to reliably charge their vehicles when and where they need to.

Source: Joint Office of Energy and Transportation

In recognition of the importance of EVs as an emissions reduction strategy, nearly every CRS (46) included a discussion of expanding EV charging infrastructure. Most referenced existing EV plans or programs underway through the federal National Electric Vehicle Infrastructure (NEVI) program, or existing state plans or programs. Notable CRSs built off related plans and programs and highlighted additional efforts, such as providing charging infrastructure in communities and charging for medium/heavy-duty vehicles.

Several states referenced “lead by example” plans to expand charging infrastructure at state-owned facilities like transit station parking lots and DOT offices. Others described converting state vehicle fleets – including cars, trucks, and transit vehicles – to EVs. For example, New York put a timeline on their conversion, committing to a 100 percent zero emission vehicle state vehicle fleet by 2040. Some states, such as Alabama, Arizona, Georgia, included rebate programs and incentives for purchasing or operating EVs and alternative fuel vehicles.

Beyond electric passenger vehicles, many states described electric and alternative fuel vehicles and infrastructure for other modes, including medium- and heavy-duty vehicles, aircraft, marine vehicles, and even e-bikes. States including Alaska, Arizona, Colorado, and Illinois described the need to retrofit truck engines to improve fuel efficiency and reduce emissions. Kentucky identified hydrogen-powered

truck refueling infrastructure as a strategy to encourage shippers to convert to hydrogen-powered trucks.

Notable Examples

Hawaii's plans to replace light-duty vehicles in the DOT's fleet with EVs (Source: Hawaii Carbon Reduction Strategy, p. 13)

Hawaii: In 2020, the Hawaii DOT obtained a 10-year service contract to replace light duty vehicles in its fleet with EVs. The contract allows Hawaii DOT and other state and county agencies to obtain EVs and charging infrastructure as a service on a per mile cost basis, reducing the upfront costs of electrifying fleet vehicles and reducing fuel and maintenance costs.

Alaska: Alaska's plan includes fostering the development of alternative and renewable fuel manufacturing in the transportation sector. It emphasizes the creation and support of facilities for producing hydrogen, natural gas, propane, alcohols (e.g., ethanol, methanol, butanol), and oils derived from vegetables or waste. By investing in the manufacturing infrastructure for these fuels, the strategy aims to not only facilitate their integration into transportation systems but also to establish a sustainable and self-reliant fuel supply chain within the sector. The strategy also extends to marine transportation electrification and supports aviation and rail sector pilot projects.

Minnesota: Minnesota included a significant discussion of multimodal electrification efforts, including expanding public EV charging infrastructure for light-duty vehicles, providing EV charging infrastructure grants for school districts, installing charging infrastructure for transit buses, and implementing public/private partnerships for charging infrastructure for medium- and heavy-duty freight vehicles. Minnesota is encouraging the purchase or lease of EVs, including for transit and school buses, public fleets, and e-bikes, and conducting outreach and education about EVs for residents.

Colorado: Colorado has a comprehensive and multimodal strategy around electric and alternative fuel vehicles and infrastructure. Programs include a grant program to help school districts electrify their buses and tax incentives for EVs and e-bikes. Beyond surface transportation, the state is conducting an Alternatively Powered Aircraft Airport Infrastructure Study to plan for new types of aircraft propulsion infrastructure at publicly owned airports.

Connecticut: Connecticut is planning to install e-bike charging facilities in transit garages, as well as enhanced security lockers at transit stations to encourage the use of e-bikes and to help safely charge and store them. This program would be geared towards both transit employees and transit riders.

Additional Resources

- Joint Office of Energy and Transportation
- State EV Infrastructure Deployment Plans

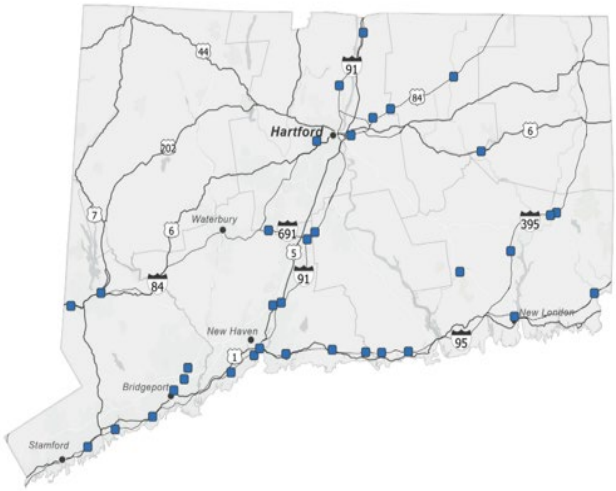
Climate Uses of Transportation Rights-of-Way

Installing renewable energy in the highway right-of-way (ROW) can help states offset their electricity generation with renewable sources and generate an additional revenue source from state DOT-owned land. FHWA's Carbon Reduction Program Guidance describes how CRP funds can be used for renewable energy generation and carbon sequestration in the ROW.

Fourteen CRSs included using the highway ROWs for climate-friendly strategies like development of solar arrays and wind turbines, geothermal energy, or carbon sequestration. Minnesota described deploying renewable energy on lands and facilities operated by transportation agencies, such as transit stations and maintenance facilities. Montana identified development of geothermal energy technologies as a potential use of its highway ROW. Illinois, Ohio, Texas, Kentucky, and New Mexico discussed planting trees and/or managing vegetation in their ROW as a method of carbon sequestration. Alaska described utilizing geological formations for carbon sequestration and Alaska's forests for carbon capture, while integrating sustainable energy into the transportation infrastructure.

Notable Examples

Connecticut: Connecticut has been pursuing solar energy development at its facilities and has signed solar power purchase agreements for two locations. Building on this work, Connecticut DOT (CTDOT) examined the potential to implement solar by assessing the feasibility of its ROW to include solar photovoltaic (PV) installations. CTDOT developed criteria to establish a list of suitable PV sites within its ROW and developed an ArcGIS tool to map potential sites that are within the limits of CTDOT ROW but outside of agreed upon exclusion areas (such as those with natural resources significance).



CTDOT map of potential solar energy sites along its ROWs (Source: Connecticut Carbon Reduction Strategy, p. 31)

Georgia: Georgia discussed using state-owned land and leveraging facilities or areas that receive a lot of direct sunlight for renewable energy generation. This could include installing solar PV in interchange cloverleafs or along the highway ROW, as well as on transit stations, parking lots, and buildings. Georgia DOT described co-benefits of using state ROW and buildings for renewable energy development, including providing zero-carbon electricity, avoiding power production in more vulnerable or valuable locations, and providing construction and maintenance jobs.

Additional Resources

- USDOT Clean Energy Use of Right of Way webpage
- FHWA Guidance: State DOTs Leveraging Alternative Uses of the Highway Right-of-Way

Efficient Freight Transportation

GHG emissions from freight transportation across all modes represents 31 percent of total transportation emissions, and freight emissions are growing faster than passenger vehicle emissions. The majority of these freight emissions (72 percent) come from trucking.[7]

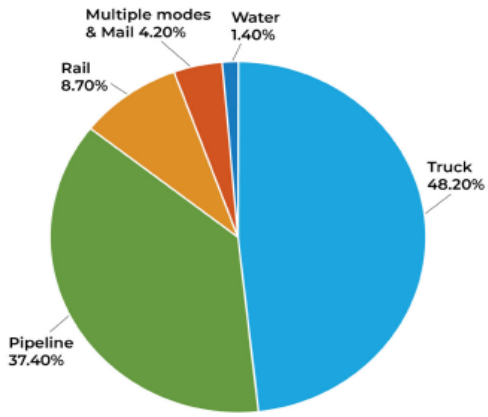
While many states focused solely on passenger transportation, 34 CRSs discussed freight transportation in some capacity. Some states, including Mississippi and New Jersey, included analysis of freight trends and how they are affecting GHG emissions in the state. Arkansas included data on freight transportation trends, including freight transportation tonnage by mode. Several states, including Alabama and Nebraska, noted that the CRS was informed by the state's freight plan. Michigan's CRS recommends development of a freight-specific carbon reduction action plan.

Many plans focused on strategies to reduce emissions from trucking, such as truck parking and truck stop electrification, medium- and heavy-duty vehicle charging, port electrification, and operational efficiency improvements. Ten CRSs discussed strategies to increase the amount of freight transported on more efficient modes, including investments in rail and maritime transportation. For example, Idaho discussed investing in rail and barges, Maryland included a strategy to modernize freight rail infrastructure and port access, and South Dakota discussed investments in rail infrastructure for freight. The District of Columbia was unique in including a discussion of last-mile delivery with a pilot program for food delivery using cargo and e-bikes.

Notable Examples

Oklahoma: Oklahoma included a significant discussion of freight transportation and freight mode shift. In particular, the plan describes encouraging increased use of the McClellan-Kerr Arkansas River Navigation System (MKARNS), which connects Oklahoma to the Lower Mississippi River, to increase maritime goods transport and reduce dependency on trucking. Oklahoma also discussed operational efficiency improvements to reduce emissions from trucking and implementing other multimodal freight strategies identified in the 2023-2030 Oklahoma Freight Transportation Plan.

Figure 13: Oklahoma Freight Tons by Mode (2017)



Source: Oklahoma Freight Transportation Plan (2023)

Oklahoma's CRS includes data on freight transportation by mode (Source: Oklahoma Carbon Reduction Strategy, p. 17).

Wisconsin: Wisconsin included specific freight rail transportation projects to support an increase in railroad tonnage in the coming decades. These include the Muskego Yard Freight Rail Bypass Project to update and reconfigure existing rail and yard facilities in Milwaukee to improve the efficiency of both freight and passenger rail service, and an intermodal

[7] https://www.bts.gov/browse-statistical-products-and-data/freight-facts-and-figures/us-greenhouse-gas-emissions-domestic

freight feasibility study between north-central and western Wisconsin and the Twin Cities metropolitan region in partnership with Minnesota.

Additional Resources

- USDOT Office of Multimodal Freight Infrastructure and Policy
- Efficient Transportation: An Action Plan for Energy and Emissions Innovation

Public Transportation

Public transportation generally has lower emissions per passenger mile than trips made by personal vehicle. Improving and expanding public transportation can help encourage shifts towards this more efficient mode, thereby reducing overall transportation-sector emissions. Nearly all (45) CRSs addressed public transportation in some way. Transit-related strategies included bus rapid transit, expanded transit service, transit station improvements, and intermodal connections/mobility hubs.

A handful of states, including Arizona, Colorado, Kansas, and Michigan, considered the mode shift potential and associated emissions reduction from investing in public transit. Illinois quantified the estimated GHG reduction from an example project to expand Chicago Transit Authority service by one additional mile (615 metric tons CO_2/year).

Increasing funding for public transportation was also an area of focus in some plans. Hawaii included a commitment to transfer $20 million annually in CRP funds to county transit agencies through fiscal year 2026.

Several states discussed increasing the use of rail and bus service for intercity transportation. For example, Alaska discussed how the state encourages the use of Alaska Railroad for passenger services. Wisconsin described passenger rail infrastructure improvements, including support for Amtrak that runs through the state, improvements to signals and infrastructure, and station improvements. Utah plans to focus on train travel expansion through regional and commuter rail service.

Notable Examples

Michigan: Michigan included a strategy to "encourage modal shift from personal vehicle usage to shared mobility and public transit" (p. 16). The plan quantifies the change in carbon emissions resulting from this strategy, stating that for bus service, "Diverting gas-fueled [internal combustion engine] vehicles to increase bus ridership by 0.1% per year is projected to result in a statewide GHG reduction of 170.8 metric tons CO_2e/year" (p. 32). This analysis accounts for both the emissions saved from diverting personal vehicle trips and the emissions created by additional bus service.

Downtown Long Beach Metro Station in California (Source: Walter Cicchetti/Adobe Stock)

Colorado: Colorado described the importance of increasing transit options to reducing VMT. The plan focuses on expanded transit service to connect Denver and the Front Range to other parts of the state. In particular, Colorado plans to expand the state-owned and operated interregional bus system and is planning for the development of a Front Range passenger rail system.

Additional Resources

- FTA Transit Greenhouse Gas (GHG) Programmatic Assessment and Emissions Estimator
- USDOT Climate Strategies that Work Playbook: Public Transit Expansion, Bus Rapid Transit, Intercity Bus, and Intercity Passenger Rail

Operational Efficiency Improvements

Improving and optimizing transportation system operations can lead to emissions reductions due to reduced distances traveled, idling, and congestion. The majority of CRSs included strategies to improve the operational efficiency of the transportation system. These include Intelligent Transportation System (ITS) strategies, such as traffic signal improvements or incident management. Several of these strategies focused on freight efficiency. For example, Texas's plan includes dynamic freight routing system upgrades and intermodal facility construction, while Montana's includes freight efficiency strategies like route optimization, increased freight capacity, and consolidation centers.

Anumber of plans included energy efficient lighting as a strategy, aligning with an eligible project category under the CRP program. Many plans, including Delaware, Georgia, Kansas, Arizona, and Idaho, also included truck stop electrification and anti-idling strategies.

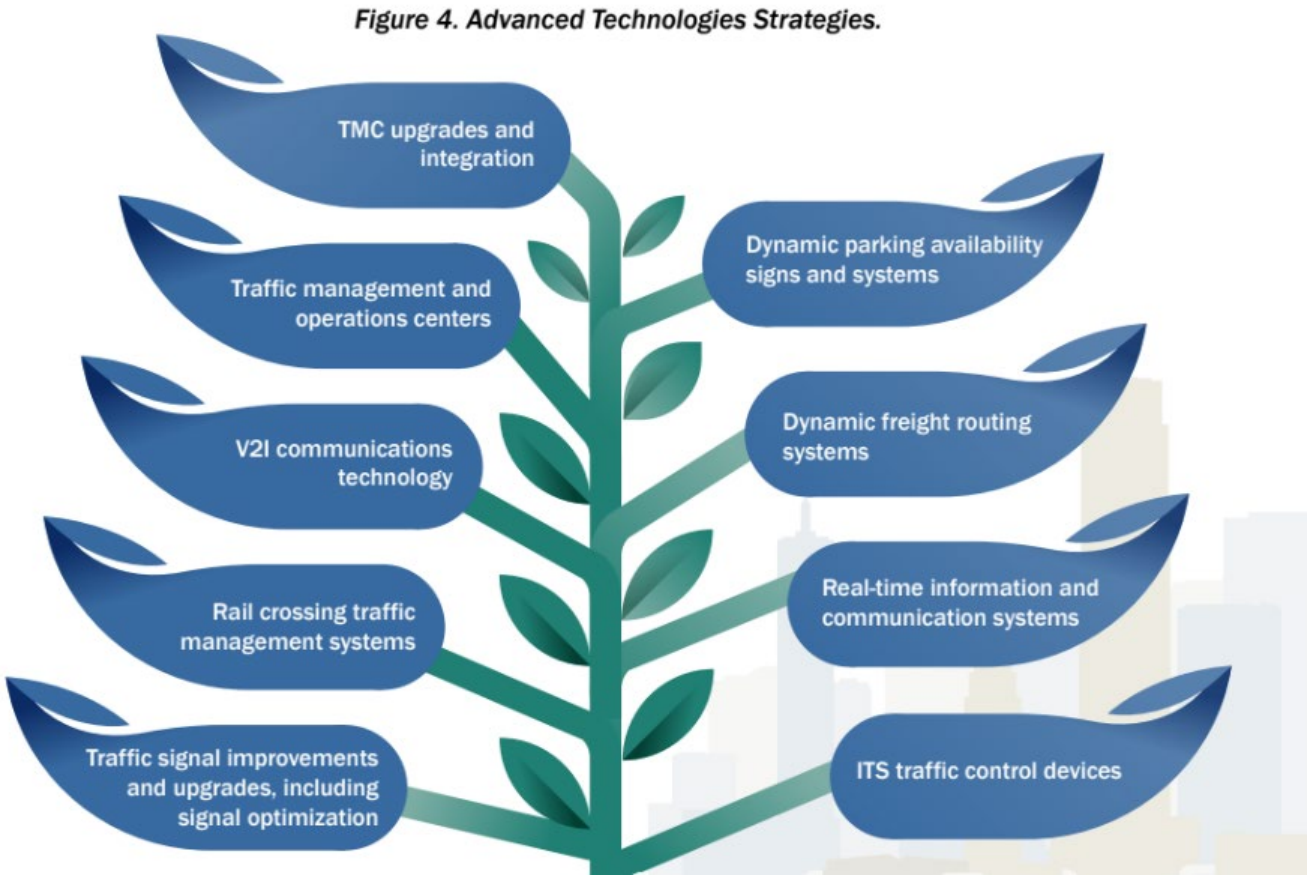
Notable Examples

Texas: Texas's CRS includes a category of actions related to advanced technologies, including ITS and traffic monitoring technologies and communications systems to improve traffic flow and operations. Specific actions include traffic management center upgrades, signal optimization, dynamic freight routing, and dynamic parking availability signs and systems.

District of Columbia: The District of Columbia included a strategy around education and enforcement of its engine idling regulations. DC will measure successful implementation of this strategy with two metrics: number of 311 idling vehicle reports and number of schools with idle reduction policies.

Additional Resources

- FHWA Office of Operations
- USDOT Freight Logistics Optimization Works (FLOW)



Operational efficiency strategies included in Texas's CRS (Source: Texas Carbon Reduction Strategy, p. 21)

Land Use Planning and Zoning

Compact cities and towns with a mix of commercial, residential, and civic uses close to each other can reduce the distances that people need to drive and make active modes of transportation and transit more viable. States and localities can craft local regulations and zoning policies to encourage more housing supply in walkable, transit-oriented areas.[8]

Sixteen CRSs considered the relationship between land use and transportation and the impact of land use on transportation GHG emissions. While land use is beyond the direct authority of a state DOT, they can influence decision-making through working with other state agencies and with local and regional governments. Land use focused strategies that could be included in a CRS include using DOT-owned land for transit-oriented development or collaborating with local jurisdictions on incorporating transportation considerations into broader planning efforts. Indiana's CRS says they will consider the growth of urban areas in their transportation planning. Mississippi's CRS called for additional transit-oriented development and increasing the amount of space available for active modes of transportation.

Notable Examples

New Mexico: New Mexico outlined how MPOs and the state DOT could work together to meet development goals that also support lower-emission transit. The plan states, "Changing land use development and transportation patterns in New Mexico is challenging but necessary to achieve climate goals" (p. 5). New Mexico DOT outlines strategies that local jurisdictions can use to achieve land use and transportation development patterns that support carbon reduction, such as integrating smart growth principles into planning and policy, adopting form-based codes, and implementing transit-oriented development incentives.

Downtown Concord, New Hampshire includes a mix of housing and other destinations in close proximity (Source: Adobe Stock)

Washington: Washington focused on land use by identifying collaborations between state agencies and relevant state laws and regulations. Specifically, the CRS highlighted the relationship of development patterns to active and multimodal transportation, recent steps to reduce permitting workloads and increase housing density, and recent legislation to compel VMT consideration in local comprehensive plans.

[8] https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf

Additional Resources

- Convenient Transportation: An Action Plan for Energy and Emissions Innovation
- USDOT Climate Strategies that Work Playbook: Zoning Reforms, Transit-Oriented Development, Coordinated Transportation Planning

Active Transportation

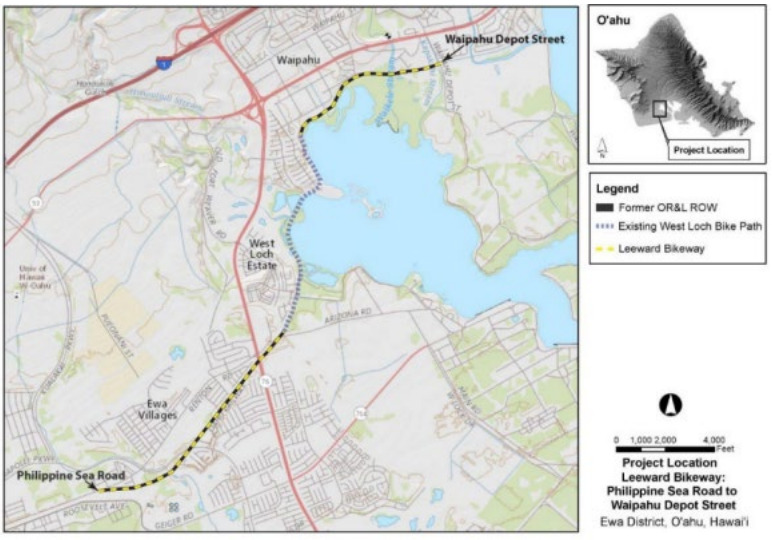
Walking, biking, and rolling, collectively referred to as "active transportation", are zero or near-zero emission forms of transportation that also have numerous benefits for mental and physical health, roadway congestion, and economic development. When active transportation infrastructure is safe, accessible, and inviting, more people will choose to walk and bike.

Active transportation was a feature of nearly every CRS, albeit to differing extents. Many plans identified bike lanes and sidewalks as important investments to encourage a mode shift to active transportation. Georgia highlighted the importance of technology in creating opportunities for active transportation, with a specific focus on expanding micromobility and creating flexibility in loading zones and curbs to improve the spaces for vulnerable road users. Rhode Island plans to resurface existing bike paths; maintaining active transportation infrastructure is a key part of ensuring it is continually utilized. Connecticut is planning to prioritize bike lockers and exploring technologies to allow people to charge their e-bikes at their offices during the day. Washington, DC is funding a pilot program for food delivery via cargo bike in order to shift demand away from delivery by car.

Notable Examples

Iowa: Iowa's plan includes several active transportation strategies, including constructing on- or off-road facilities for bicyclists/pedestrians, complete streets, safe routes to school programs, expanded micromobility options, and electric bicycle incentives. Iowa notes that these strategies will reduce emissions through facilitating non-single occupancy vehicle trips and encouraging modes with lower emissions.

Hawaii: Hawaii included descriptions of several planned bicycle and pedestrian infrastructure projects that will improve safety and encourage the use of active modes. For example, Hawaii DOT plans to complete the Leeward Bikeway project on Oahu. This project, which was 65 percent complete as of November 2023, is a $11.6 million investment to safely connect two existing bike trails.



Hawaii's Proposed Leeward Bikeway on Oahu (Source: Hawaii Carbon Reduction Strategy, p. 10)

Additional Resources

- USDOT Climate Strategies that Work Playbook: Active Transportation
- FHWA Bicycle and Pedestrian Program

Travel Demand Management and Congestion Pricing

Travel Demand Management (TDM) includes a broad range of strategies to maximize traveler choices and reduce single-occupancy vehicle trips. TDM strategies include commuter benefits and carpooling, parking pricing, and providing micromobility and affordable transit options. Another aspect of TDM includes roadway pricing, including tolling and congestion pricing, which allows local communities and states to recapture some of the value associated with road maintenance and construction, while reducing congestion and encouraging people to take shared rides or use transit.

Travel demand management was mentioned in just over half of the CRSs. Many states were interested in the ways that emerging technologies may allow up-to-the-minute updates about traffic and travel time, simplify congestion-based tolling, and help motorists make decisions about their travel based on all available information. Alabama discussed technological innovations including variable speed limits to closely control traffic flow and predict traffic based on motorists' travel patterns. Arkansas described pairing some of these technologies with encouraging carpooling through financial incentives. Many states also incorporated active transportation initiatives into their travel demand management efforts. Another avenue through which DOTs are leveraging technology to make transportation more convenient is curb and parking management software. For example, Georgia is exploring priority parking for carpools and a dynamic parking management system.

Approximately eight CRSs discussed congestion pricing and/or tolling as a travel demand management strategy. For example, Michigan included a strategy around pricing adjustments for vehicle use, including parking rates, congestion pricing, road usage charging, and pay as you go insurance. Oregon's CRS described methods to price roadway systems to balance demand, fund maintenance and operations, and reinvest in transportation choices with considerations for equity. Pennsylvania is focused on how managed lanes reduce idling, driving down the total emissions associated with sitting in traffic by moving traffic more smoothly. States like Louisiana and Kansas are broadly investing in managed lanes, while Alabama, Georgia, Hawaii, Maryland, and other states also highlighted conversion of existing lanes to high-occupancy vehicle (HOV) lanes as a TDM strategy.

Notable Examples

California: California's plan offered a wide range of congestion and demand management tools focused on reducing emissions, estimating that between 27 and 37 percent of the state's transportation emissions could be reduced through their proposed strategies. Caltrans identified tolling, especially on bridges and to access expressways, as one of the most effective ways to achieve this reduction and noted that this strategy is likely to make transit more competitive in cost, as compared to driving.

Additional Resources

- USDOT Climate Strategies that Work Playbook: Road Pricing
- FHWA Transportation Demand Management Resources

5. Conclusion

This review of all state CRSs shows the varied ways in which states are reducing transportation sector emissions as well as differences in how they developed and implemented these required plans. Some strategies, such as electric vehicles, public transit, active transportation, and operational efficiency improvements, were very common and addressed by nearly every state. Others, including using the highway right-of-way for renewable energy and land use planning and zoning, were only discussed by a handful of states.

There was also variation in how states considered the potential impact of their projects and programs on reducing greenhouse gas emissions. Approaches included conducting detailed modeling of all or most strategies, qualitative evaluation, and citing studies about the impact of similar projects. Many states expressed interest in developing quantitative analyses or metrics in the future. Some states used their analysis to prioritize among strategies or to set baselines and track progress over time. A small number of states analyzed lifecycle emissions as part of their CRS, considering emissions from the production and distribution of fuel, manufacture of vehicles, and construction and maintenance of transportation infrastructure alongside tailpipe emissions.

CRSs must be updated at least once every four years, and as states plan for updating their strategies by 2027, they can look at notable practices from their peers for inspiration. Through developing and implementing their CRSs, state DOTs can play a critical role in reducing overall transportation sector emissions.