U.S. Department of Transportation

State Carbon Reduction Strategies:

A View from Across the Country

April 2024

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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.

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 carbon reduction strategies. 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. Almost all states thought strategically about how to align transportation funding in general, not just Carbon Reduction Program funding, towards GHG reduction as one of a set of strategic goals.

Notable practices from various states can be informative for others as they implement and revise their strategies. Here we highlight notable practices on developing strategies to match state context, engaging the public, developing GHG inventories, analyzing GHG reduction strategies, integrating analysis into decision-making, implementing strategies, and monitoring. We provide examples from many different states.

Strategies in Context

All the states identified a broad range of strategies, including clean vehicles and fuels; efficient operations; and convenient transportation options such as walking, biking, and public transportation, to reduce reliance on single occupancy vehicle trips. 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 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 the 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 identified 87 different strategies or project types that align with their goals for reducing emissions. Georgia also identified co-benefits for each of the strategies. The information was presented to enable MPOs within the state to select project types for funding. Georgia also notes that:

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

Public Involvement

Many states implemented a robust public involvement process in the development of their Carbon Reduction Strategies.

For example, 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.

Minnesota presented information at venues across the state, conducted public surveys, and provided extensive documentation of their public engagement process.

Washington State 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 carbon reduction strategies 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.

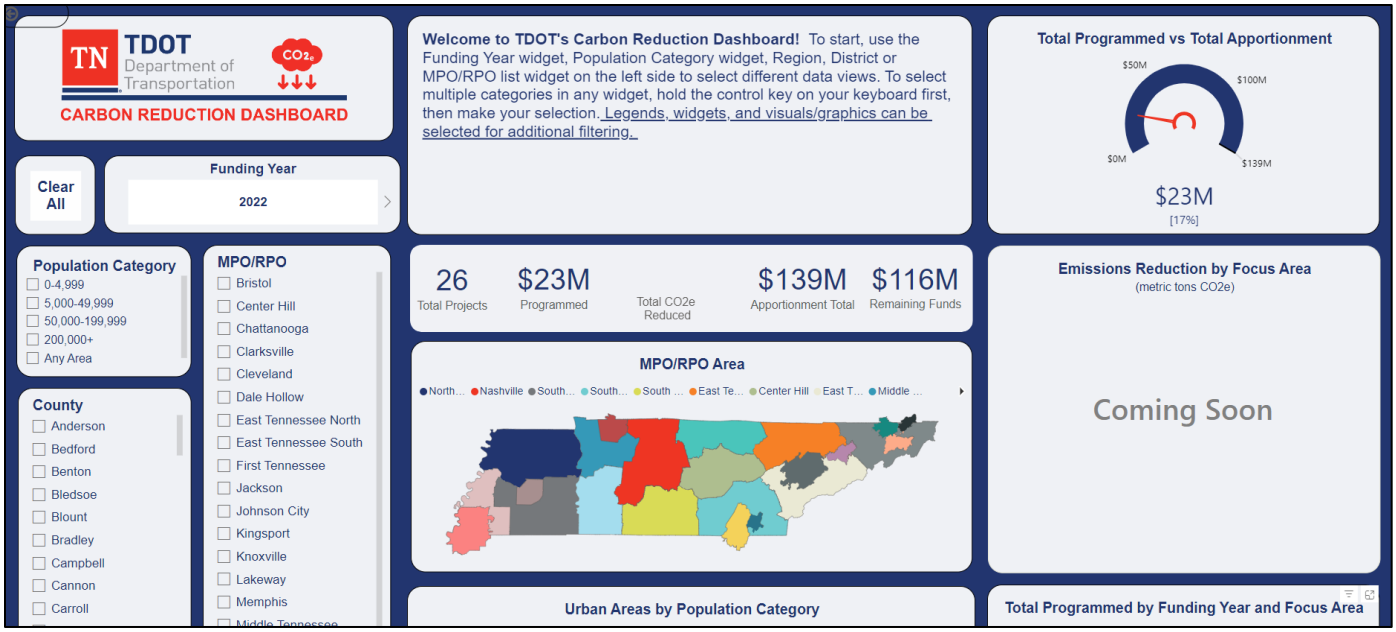

Figure 4: Tennessee DOT Carbon Reduction Dashboard

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.

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.

Vermont Agency of Transportation (VTrans) established baseline and future emission projections against which to evaluate strategy selection.

Analyzing GHG Reduction Strategies Quantitatively

A minority of states analyzed the potential GHG reduction impact of strategies quantitatively. Those that did relied on combinations of USDOT supported GHG analysis tools, consultant support, and in-house expertise.

Minnesota's Carbon Reduction Strategy 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.

For its carbon reduction strategy, 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 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.

Colorado used its activity-based statewide travel demand model paired with EPA's MOVES emissions model to estimate impacts of GHG reduction strategies.

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

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 Carbon Reduction Strategy 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.

Life Cycle Emissions

Some states explored how their construction practices and the lifecycle emissions of vehicles, fuels, and electricity generation for electric vehicles impact their state's emissions.

Connecticut used FHWA's Infrastructure Carbon Estimator tool to analyze life cycle emissions from a $245 million project to relocate an interchange and widen a section of I-91.

Virginia identified strategies and plans that focus on reducing emissions from materials for construction and maintenance.

Colorado identified state laws tied to the carbon reduction strategy. The "Buy Clean Colorado Act" directs CDOT to establish policies that reduce GHG emissions over time by accounting for and limiting the global warming potential (GWP) of key construction materials in state-funded building and transportation projects. CDOT must collect Environmental Product Declarations (EPDs), which provide quantified environmental data using predetermined parameters and are third-party verified. By January 1, 2025, CDOT must establish a policy with GWP limits for each eligible material. The goal is to encourage manufacturers of construction projects to reduce their GHG emissions and ultimately require architects, engineers, and contractors to specify greener construction materials where those materials are practical and economical.

Michigan included extensive information on construction and maintenance emissions associated with capital project development for a variety of projects. For instance, Michigan estimated the GHG emissions that would be produced from manufacturing road construction materials such as cement and steel, from transporting materials, and from operating construction equipment.

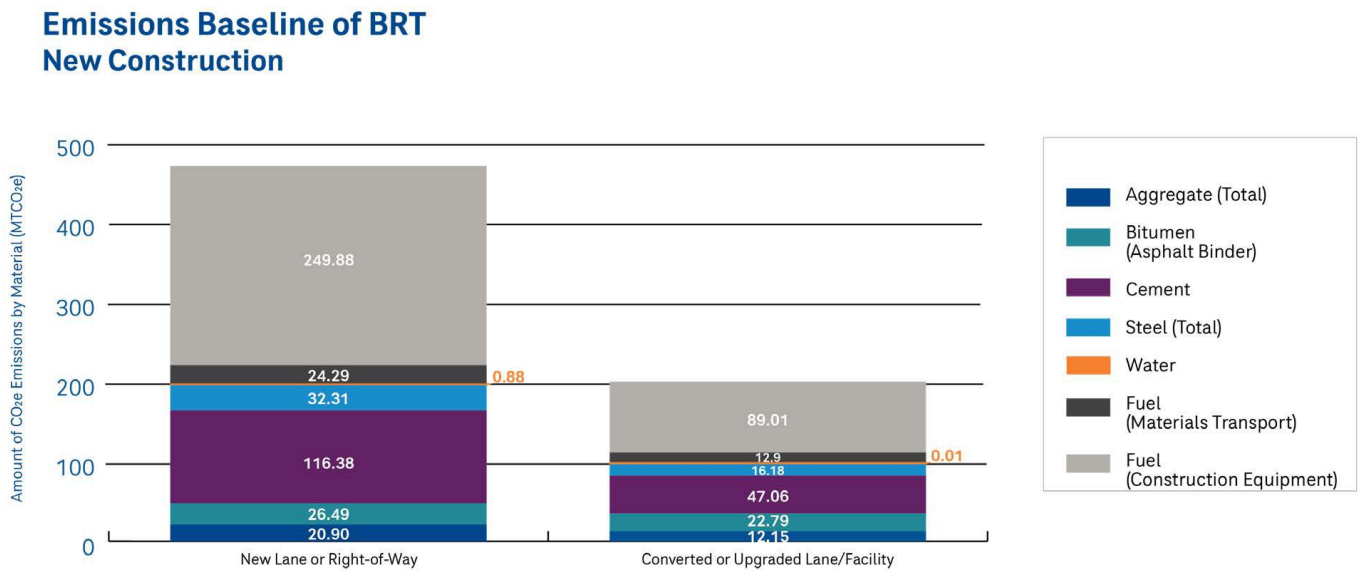

Figure 6. Emissions from construction of Bus Rapid Transit using a new lane vs. converting an existing lane. Michigan Carbon Reduction Strategy, page 12.

Integrating analysis into decision-making

Oregon DOT (ODOT) is using GHG analysis to drive transportation planning and funding decisions. Oregon's Carbon Reduction Strategy 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 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 Statewide Transportation Improvement Program (STIP). This has resulted in shifting funding towards projects with GHG reductions, such as public transportation, active transportation, and electrification. The Oregon Carbon Reduction Strategy 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.

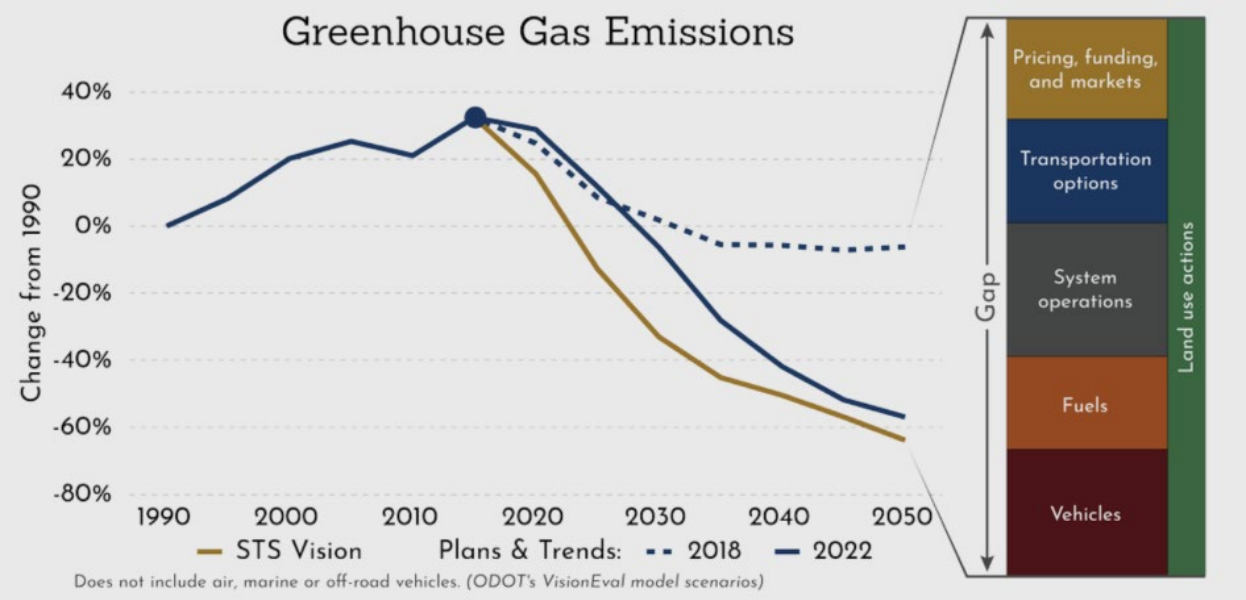

Figure 7. Oregon transportation GHG emissions. The 2022 Plan (solid blue) gets Oregon much closer to its targets (gold line) than the previous plan (dashed line).

Implementing Strategies, Monitoring, and Improvements

Many of the state strategies described criteria and processes for deciding how to spend funds and 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).

Connecticut developed a process that could be used to prioritize CRP funding. Connecticut 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 identified clear goals and objectives for the state's strategy 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 Carbon Reduction Strategy. 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 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 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.

Conclusion

On this first round of implementing a new requirement under the Bipartisan Infrastructure Law to develop state carbon reduction strategies, the fifty states took a variety of approaches. States both complied with the statutory requirements and did so in ways that would be helpful to them in planning and programming transportation funding to meet multiple goals, including GHG reduction. States tailored their approaches and strategies to their circumstances and geographies. An area of growth for future strategies is to develop quantitative analyses of potential GHG reductions from policies and projects. A handful states did this, providing helpful examples for their counterparts in other states. BIL requires that states update their Carbon Reduction Strategies at least every four years. As states move forward with implementing and updating their plans, they will benefit from learning from each other.