SOUTH CAROLINA

CARBON REDUCTION STRATEGY

PREPARED FOR:

SCDOT
South Carolina Department of Transportation

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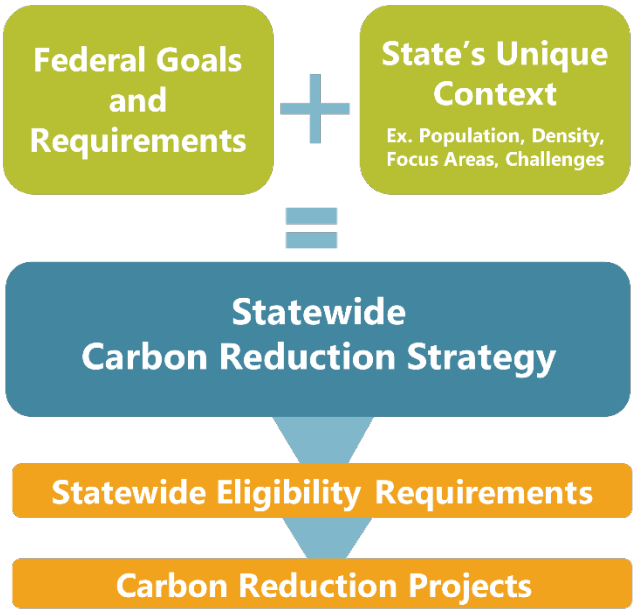
1 INTRODUCTION

The South Carolina Department of Transportation (SCDOT) has developed the South Carolina Carbon Reduction Strategy (CRS) to align with federal requirements to reduce carbon emissions produced by the transportation sector. These requirements were established as part of the Carbon Reduction Program (CRP), authorized by the Bipartisan Infrastructure Law (BIL) adopted in 2021 and codified in 23 U.S.C. 175.

The BIL is a generational investment in our nation's infrastructure, notably our transportation network. The BIL paves the way to prioritize investments in our transportation system that help our communities by updating the condition of streets, highways, trails, and bridges to make them safer; modernizing the transportation network to accommodate all users to foster a more equitable future; and making the transportation sector more sustainable and resilient to climate change. The BIL will accomplish this, in part, through the CRP, and other funding programs like the Bridge Investment Program, the National Electric Vehicle (EV) Charging Program, and the PROTECT Program. This law charges the CRP to combine federal goals and requirements with each state's unique context to fund infrastructure projects that reduce CO2 emissions.



The federal government's goals for the country's transportation system relate to **safety**, **equity**, **climate resiliency**, **a strong workforce**, and **an efficient freight network**. The Federal Highway Administration (FHWA), which has been tasked with apportioning CRP funds for the five-year duration of the program, encourages the use of CRP funds for projects that not only reduce emissions, but also directly advance one or more of these federal goals.

1.1. CRS Requirements

The CRP requires every state to develop a strategy within two years of the BIL enactment, and update that strategy at least every four years thereafter, that does the following:

1) Identifies projects and strategies to support the reduction of transportation emissions.
2) At the State's discretion, quantify the total carbon emissions from the production, transport, and use of materials used in the construction of transportation facilities.
3) Is appropriate to the population density and context of the State, including any MPO designated within the State.

The CRP also allows the CRS to include projects and strategies to:

1) Reduce traffic congestion by facilitating alternatives to single-occupant vehicle trips.
2) 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.
3) Facilitate approaches to construction of transportation assets that result in lower transportation emissions as compared to existing approaches.

In accordance with these federal requirements, the CRS supports statewide efforts to reduce transportation-related carbon emissions through projects and strategies that reflect South Carolina's unique context, values, and goals.

1.2. Expected Funding Levels

CRP funds are available for obligation to State departments of transportation until September 30, 2025. They are available for obligation for three years after the last day of the fiscal year during which the funds are authorized. The estimated annual BIL CRP funding is as follows.

Fiscal Year	Funding
2022	**$1.234 Billion**
2023	**$1.258 Billion**
2024	**$1.283 Billion**
2025	**$1.309 Billion**
2026	**$1.335 Billion**

South Carolina's total CRP apportionment is valued at roughly **$112.76 million** total for the five years of the program. Of the total apportionment, 35% of the CRP funds may be obligated in any area of the State and 65% of the CRP funds must be allocated to projects in the following areas.

- Urbanized areas with a population of more than 200,000
- Urbanized areas with a population of 50,000 to 200,000

- Urbanized areas with a population of 5,000 to 49,999
- Other areas of the State with a population of less than 5,000

In addition, if all eligibility requirements and applicable local matches for each program are met, CRP funds can be leveraged with other eligible USDOT funding for projects that support the reduction of transportation emissions, including CMAQ, STGB, HSIP, SS4A, and others.

2 SOUTH CAROLINA CARBON REDUCTION STRATEGY

In alignment with the federal guidelines, SCDOT has identified the following four overarching categories of transportation strategies and project types that will support carbon reduction in South Carolina.

These four categories are detailed herein and generally consist of transportation technology-related strategies. These strategies that use technological solutions to improve roadway operations through improved traffic control methods, information sharing, and data analytics among other improvements. These strategy categories are complementary and can be applied throughout the state on a variety of projects and applications.

It should be noted that SCDOT is developing South Carolina's first Statewide Transportation Systems Management and Operations (TSMO) Master Plan, and that the recommendations from the CRS and TSMO Master Plan complement each other.

2.1 Statewide Interstate ITS

This strategy includes deploying intelligent transportation systems (ITS) on the entire interstate system to effectively monitor and manage system performance in urban and rural areas. ITS includes capital improvements, such as fiber, cameras, dynamic message signs, and other related infrastructure. These systems can include spot improvements and systematic improvements and range from low-cost to high-cost strategies. ITS implementation maximizes existing capacity, reducing the carbon footprint of the roadway network. ITS typically involves strategies that improve the existing roadway network, rather than upgrading roadway infrastructure to add more physical capacity.

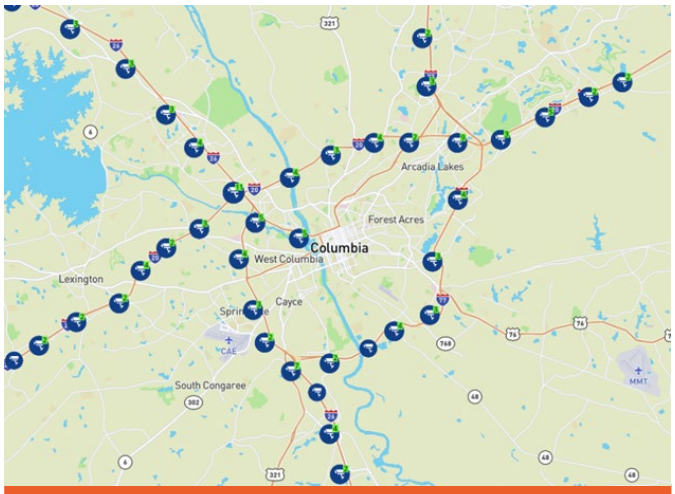
South Carolina's key priorities for Statewide ITS include the following.

- Completing the deployment of the statewide fiber and camera systems along interstate corridors.
- Systematically replacing aging overhead dynamic message signs (DMS) and strategically advancing new DMS.
- Replacing portable DMS acting as permanent DMS with fixed DMS.

Benefits

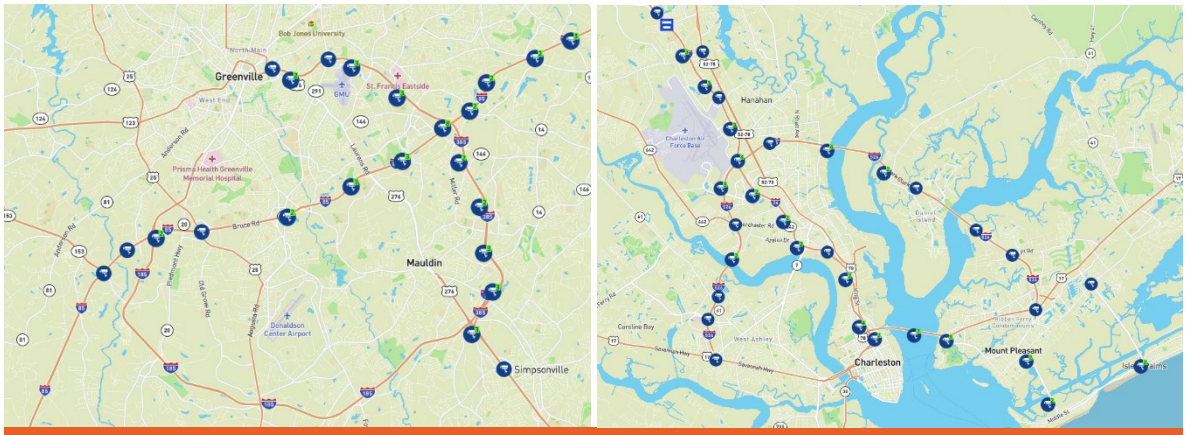
ITS communication networks are the foundation for connected TSMO strategy deployments. Expanding and maintaining a secure, robust ITS network will greatly increase the ability for SCDOT to leverage TSMO solutions to increase sustainability – including carbon reduction, mobility, and safety.

Expanding SCDOT's communications network supports the transportation management goals of SCDOT. SCDOT is planning to leverage past investments and expand the network with new builds. SCDOT and local agencies can collaborate on future expansions of the communications infrastructure



Existing SCDOT Interstate Camera Network in Columbia

to optimize resources to provide reliability and redundancy while increasing coverage and capacity.



Existing SCDOT Interstate Camera Networks in Greenville and Charleston

2.2 Traffic Management Center Modernization

This strategy includes providing modern facilities for existing traffic management centers (TMCs) for current and planned operations. TMCs are a headquarters for monitoring an area's roadway network. These directly impact the carbon footprint by reducing delay caused by slowed or stalled traffic due to an incident. Having access to the roadway network via traffic camera provides operators with the ability to dispatch assistance vehicles in an expedited manner and alert impacted motorists of existing hazards, alternative routes, and expected delays. SCDOT operates five TMCs, including the Statewide TMC in Columbia and regional TMCs in Charleston, Greenville, Myrtle Beach, and Rock Hill. Several municipalities and counties operate their own TMCs.

South Carolina's key priorities for TMC modernization include the following.

- Replace the existing Myrtle Beach TMC with a modern TMC.
- Evaluate the Charleston TMC for expansion and/or additional facilities to support increased systems management and potential operational requirements from implementation of the Lowcountry Bus Rapid Transit system.
- Expand the Statewide TMC to provide additional space and resources to expand statewide seven-day, 24-hour operations.

Benefits

Investments in TMC facilities provide reliability and resiliency in agencies' ability to provide active traffic management. This investment increases efficiency in day-to-day operations, functionality to support multiagency integration, and heightened agility in integrating emerging technologies. TMC facilities are connected with the Statewide ITS network and support increased sustainability – including carbon reduction, mobility, and safety.

TMC expansion and modernization provides opportunities for operators to communicate quickly and effectively with roadway users. This reduces carbon-emitting congestion and delay by providing users with alternate roadways and delay information so incidents can be avoided. It also promotes quick deployment of assistance vehicles to reduce delay caused by the time between incident and assistance arrival.

Like any physical building, TMC facilities can experience challenges as they continue to age and maintenance costs rise, requiring significant investments to upgrade or replace. SCDOT should invest in modernizing their facilities and equipment (i.e., workstations, video wall, building facility). Additionally, this investment should prepare for future traffic management needs to future proof the defined facility upgrades.

The SCDOT Statewide TMC in Columbia

2.3 Statewide Transportation Systems ITS

A focus on Statewide Transportation Systems ITS includes expanding ITS network and technology on the statewide non-interstate roadway system to effectively monitor and manage system performance. Specific attention will focus on evacuation routes and completing integration of state-maintained and locally-maintained signal systems so that centralized management of signal systems can be achieved across South Carolina. This strategy focuses on non-interstate roadways, and therefore focus will be primarily on signalized roadways. Key steps within this strategy include:

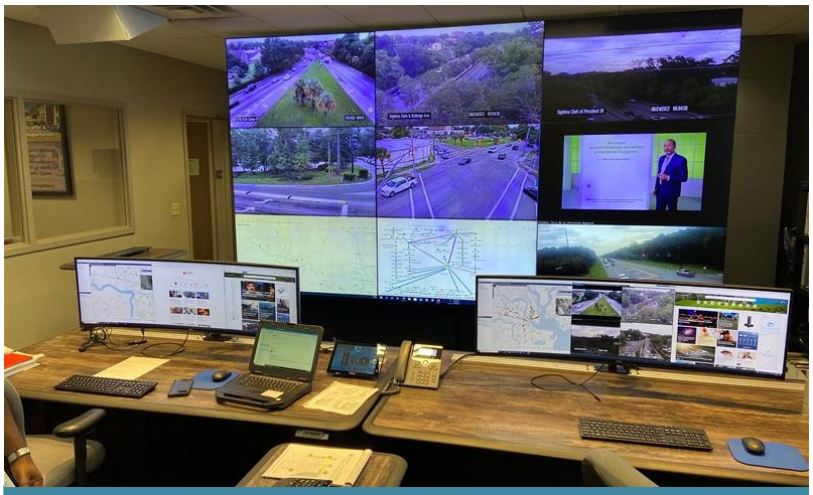
- Ensuring SCDOT signals maintained by municipalities are networked via SCDOT's standard colocation architecture to ensure both municipal and SCDOT offices have access as well as to ensure corridors spanning multiple jurisdictions can be operated cohesively. Initial focus will be to complete efforts in Myrtle Beach, North Charleston, and Beaufort County, in addition to evacuation routes. Existing Colocation architecture may be expanded as directed by SCDOT.
- Expanding deployment of statewide fiber and wireless connections, cameras, DMS, and other ITS devices throughout the road network.
- Upgrading ITS network devices that have reached their manufacturer's end of support in order to ensure network security risks are minimized.

Upgrading and expanding ITS on the statewide transportation network leads to a reduction in carbon emissions through improving signal timing and upgrading access to signal timing. Corridor management strategies to expand statewide fiber and wireless connections, cameras, DMS, and other ITS devices throughout the road network reduce delay and can provide roadway users with information leading to decisions to reduce delay and congestion.

Benefits

ITS communication networks are the foundation for connected TSMO strategy deployments. Expanding and maintaining a secure, robust ITS network will greatly increase the ability for SCDOT to leverage TSMO solutions to increase sustainability – including carbon reduction, mobility, and safety.

Expanding SCDOT's communications network supports the transportation management goals of SCDOT. SCDOT is planning to leverage past investments and expand the network with new builds. SCDOT and local agencies can collaborate on future expansions of the communications infrastructure to optimize resources to provide reliability and redundancy while increasing coverage and capacity. This expansion will enable other carbon reduction-related strategies, including active traffic management, transit signal priority, integrated corridor management, ramp metering, and other technology strategies that require corridor performance monitoring and connectivity.



The City of Charleston TMC

2.4 Signal Performance Improvements

Improve the performance on key transportation system corridors by optimizing existing capacity and operations. During the development of SCDOT's Statewide TSMO Master Plan, signal performance improvements were identified as the number one priority the project stakeholders would prioritize in their roles for addressing transportation issues. These improvements will also make a great impact in reducing transportation carbon emissions. Projects will be selected based on corridors demonstrating the highest levels of delay in congestion in urban and rural settings. A primary goal of this strategy to implement projects quickly around the state and to apply the funding to multiple projects in the respective planning areas, not having the funds being apply to one, large-scale project.

- Funding will be allocated to fund the on-going Traffic Signal Operations and/or the Traffic Signal and Systems on-call contracts. These contracts provide consultant services to retime traffic signals, update signal plans, and perform other signal analysis with the goal of improving traffic flow and reducing congestion. In the future, signal performance measures would enable the Traffic Signal Operations contract to monitor corridor performance and make adjustments as needed without the need to set up a new project each time.
- In urban areas, the District Traffic Engineers (DTE) and local planning organizations will work together to identify a prioritized list of signal improvement projects based on congestion/delay data.
- In rural areas, the DTEs will identify a prioritized list of signal improvement projects using the same congestion/delay data.
- Mitigation strategies shall emphasize using existing corridor space and right-of-way. The priority of project types shall include:
    - Signal retiming and optimization
    - Signal replacement for demand management
    - Turn lane improvements in right-of-way
    - Access management control and consolidation

The primary project types reduce delay caused by poor or outdated signal timing, and corresponding improvements that improve capacity on South Carolina roadways. This reduces carbon emissions by reducing time vehicles are idling at traffic signals on the main line or side street. Access management control and

consolidation reduces carbon emissions by maintaining progression between signals and reducing delay at driveways.

Benefits

Proving to provide one of the highest rates of return on investment, traffic signal performance improvements provide significant sustainability – including carbon reduction, mobility, and safety benefits.

- **Reduce Carbon Emissions**
- **Reduce Congestion and Travel Times**
- **Improve Safety**
- **Maximize Efficiency of the Existing Roadway Network**
- **Improve Air Quality**
- **Reduce Aggressive Driving Behavior**
- **Postpone or Eliminate the Need to Construct Additional Road Capacity**

Traffic signal timing programs can be implemented for long corridors with numerous traffic signals or for a single, isolated intersection. Coordination between traffic signals can be achieved through time-based signal timings plans; responsive plans that implement timing plans based upon prevailing traffic conditions; and adaptive traffic signal timing that adjusts signal timing based upon real-time detection data. Effective system operations require dedicated communication with the traffic signals, regular maintenance of all traffic signal equipment, and frequent performance monitoring of the signal system operations.

Traffic Signal Timing Implementation

2.5. MPO Coordination

On October 5, 2023, SCDOT held a virtual meeting between agency staff and metropolitan planning organizations (MPO) in South Carolina to discuss South Carolina's CRP. In attendance for the virtual meeting were SCDOT's offices of Planning, Traffic Engineering, Operations, Project Delivery, and the following MPOs.

- Anderson/Clemson Area Transportation Study (ACATS)
- Augusta Regional Transportation Study (ARTS)
- Charleston Area Transportation Study (CHATS)
- Columbia Area Transportation Study (COATS)
- Grand Strand Area Transportation Study (GSATS)
- Greenville-Pickens Area Transportation Study (GPATS)
- Lowcountry Area Transportation Study (LATS)
- Spartanburg Area Transportation Study (SPATS)
- Sumter Area Transportation Study (SUATS)

The virtual meeting consisted of SCDOT presenting an overview of South Carolina's CRP, including FHWA's guidance, a discussion of the CRP funding allocation by area in the State, South Carolina's CRS of signal performance improvements, and the next steps of the CRS. SCDOT provided an overview of the Regional Mobility GIS (ReGIS) tool that was developed to identify corridors in the respective planning areas in need of signal performance improvements by highlighting their measured delay from 2019 probe data. SCDOT asked the MPOs to assist in the identification, scoping, and prioritization of signal performance improvement projects, including potentially presenting the CRS projects at their next respective technical review committee meetings for comments. SCDOT Planning will be in close coordination with the MPOs as the specific projects are developed.

3 CARBON REDUCTION STRATEGY TOOLBOX

Carbon reduction encompasses a wide cross-section of strategies to reduce environmental impacts of the transportation sector. South Carolina's CRS focuses on Transportation Technology solutions for carbon reduction. Additional carbon reduction categories and strategies are described herein and represent potential opportunities for South Carolina to consider in the future. The additional strategies are broken into the following categories.

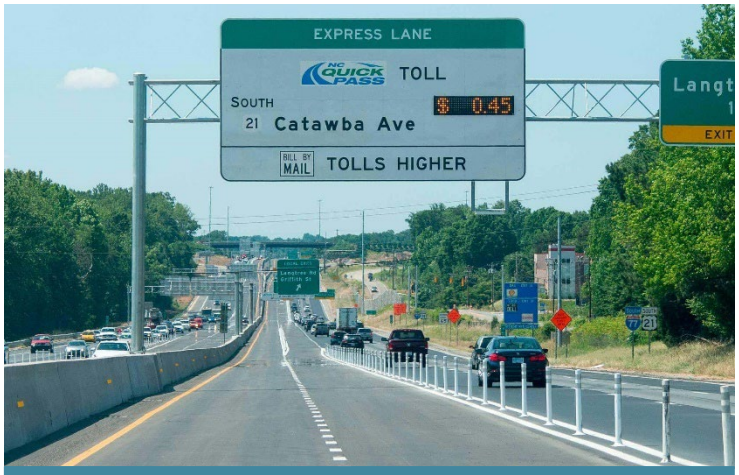
- **Congestion Management/Mitigation**
- **Active Transportation and VMT Reduction**
- **Energy Efficient and Green Construction Processes**

3.1. Congestion Management

Congestion management is the use of strategies that promote the mitigation and reduction of congestion and delay on roadways.

Managed Lanes

Managed lanes are separated from general-purpose lanes for the purpose of increasing the capacity of the system by allowing certain travelers access to the lanes. Examples include high-occupancy vehicle (HOV) lanes, high-occupancy toll (HOT) lanes, or bus-only or truck-only lanes. Without expanding the physical roadway, managed lanes are a potential solution to increased usage that involves smart technology and associated costs, including updating signage, tolling infrastructure and driver enforcement.



I-77 Managed Lanes in Charlotte, North Carolina

Parking Fees/Parking Restrictions

Imposing parking fees or parking restrictions in heavily congested areas can discourage trips made by car, reducing demand on roadways. Reducing vehicular trips by creating or increasing parking fees disincentivizes driving, and therefore reduces emissions. Users could opt to use an alternate form of transportation or carpool to diminish or avoid the parking fees imposed. In South Carolina, the City of Greenville offers varied parking rates depending on location and time-of-day.

Access to Transit/Alternate Modes

Access to transit/alternate modes is both a primary and complementary strategy; it is successful on its own, however it is also tied to many other strategies. Supporting land uses that make it easier to access transit or travel via alternate modes (e.g., biking, walking) can support reductions in trips taken by car. Infrastructure that supports alternate modes, including transit stations with bike storage, pedestrian accommodations connecting commercial and residential, and dedicated bicycle facilities, can promote non-vehicular trips.

Commute Trip Reduction

Programs or initiatives that support single-occupancy vehicle trip reduction, such as carpooling, shuttle systems, or work-from-home programs are part of a commute trip reduction strategy. Employers benefit from non-vehicular trips as it reduces the cost of parking and therefore participation in these programs is beneficial for both employee and employer. In South Carolina, Central Midlands Transit's *COMET* has implemented a vanpooling program for the Columbia area, https://catchthecometsc.gov/programs-services/vanpool/, and BCDCOG's *Lowcountry Go* program offers a vanpooling program for the Charleston area, https://bcdcog.com/vanpool/.

3.2. Active Transportation

Active Transportation strategies reduce carbon emissions by promoting alternative modes of travel to vehicles.

Pedestrian & Bicycle Facilities

Pedestrian facilities make traveling as a pedestrian safe and accessible, and include sidewalks, greenways and trails, crosswalks, curb ramps, pedestrian overpasses, etc. Walking is an active alternative to driving and reduces carbon emissions from vehicular travel. Bicycle facilities, including separated bicycle lanes, greenways and trails, bicycle crossing signals, and bicycle overpasses make traveling as a cyclist safe and accessible. Bicycling is an active alternative to driving and reduces carbon emissions. Separation between bicycle and vehicle accommodations and connectivity must be prioritized.

The Spanish Moss Trail in Beaufort County and Swamp Rabbit Trail in Greenville County

Public Transit

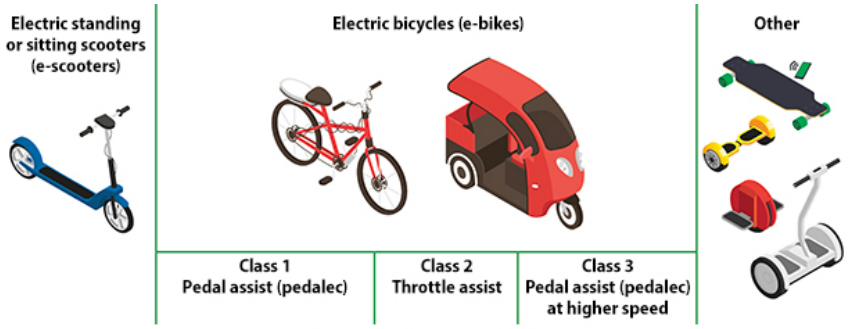
Public transit is a strategy used to reduce vehicular trips. The provision of and investment in mass transit leads to more efficient operations and higher ridership. Public transit includes heavy rail, light rail, buses, and bus rapid transit (BRT). Transit usage is paired with other strategies, including commute trip reduction and access to transit/alternative modes.

First-Mile/Last-Mile Connectivity

This strategy provisions infrastructure specifically designed to support travel of transit riders at the beginning or end of individual transit trips, such as safe and easy-to-access bicycle/pedestrian routes, well-lit sidewalks, and wayfinding signage.

Micromobility Support

Micromobility support includes programs and infrastructure to support the use of lightweight vehicles, such as e-bikes and scooters as well as regulations to maintain safety and management of these uses in the right-of-way. Micromobility can supplement public transit by making the first-mile/last-mile connection between people's homes and transit facilities. Micromobility systems can be offered as a bike-share or scooter-share program, which can be incorporated with a municipality's transit or transportation program.



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Examples of Powered Micromobility Devices according to the Pedestrian and Bicycle Information Center (PBIC)

3.3. Energy Efficient and Green Construction Processes

Energy efficiency strategies encompass a range of programs and alternatives that are cleaner than traditional methods.

Electric Vehicles & Infrastructure

Electric Vehicles (EV), which produce zero tailpipe emissions and can be powered by clean, renewable energy instead of gasoline or diesel fuel, and Electric Vehicle Infrastructure, including charging stations, are an important part of carbon reduction. The BIL establishes a National Electric Vehicle Infrastructure Formula Program to provide funding to States to strategically deploy EV charging infrastructure and to establish an interconnected network to facilitate data collection, access, and reliability.

Use of Recycled Materials

The use of recycled materials, such as crushed concrete and reclaimed asphalt pavement in pavement materials, can reduce waste and save costs. Reusing materials previously used in roadway construction or alternative industries is a primary way to reduce the carbon emissions associated with the new production of roadway materials.

EV Charging Station

Energy-Efficient Pavement Production

This strategy includes replacing hot-mix asphalt with warm-mix asphalt and use of bio-binders to reduce costs and energy consumption. The use of warm-mix instead of hot-mix can allow the mix to be transported longer distances, and less energy is needed to heat the mix to its desired temperature. This leads to less energy consumption throughout the entire pavement production process.

Ecosystem Management

Ecosystem Management includes performance-based management requirements to assess and appropriately mitigate impacts to the natural ecosystem and habitats. Natural solutions such as wetland restoration and reforestation are included in this category.

Stormwater Management

Stormwater Management is a strategy related to roadway design that involves properly controlling stormwater runoff and instituting appropriate erosion control measures. Using eco-friendly stormwater management techniques including vegetate swales, constructed ponds, tree boxes, and bioretention can slow the development of greenhouse gases.

Low- and Zero-Emission Construction Equipment

Using low-emission and zero-emission construction equipment decreases the fossil fuel energy consumed during construction and maintenance of roadway facilities. Steps in this process include prioritizing specific equipment types and certifying equipment that emit less carbon. Purchasing this equipment as existing equipment is phased out is an economical way to slowly incorporate low- and zero-emission construction equipment.