Puerto Rico Highway and Transportation Authority

Carbon Reduction Strategy

Carbon Reduction Program (CRP)

PRHTA
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Puerto Rico Facts about Transportation and Carbon Emissions

The Puerto Rico Climate Change Mitigation, Adaptation, and Resilience Act of 2019 recognized how climate change impact the economic development, environment, natural resources, public health, and wellbeing in the island. The act primary purpose is the reduction of climate change vulnerability and greenhouse gas (GHG) emissions. Throughout the eradication of coal-powered electricity generation and conversion to a cleaner transportation system [1].

The initial climate related targets included in the public policy contain the elimination of fossil fuels usage in the power sector by 2050; 10% decrease in power consumption by 2030; 50% reduction in GHG emission by the next 5 years; and the eradication of coal-based energy generation by 2027 [1].

Puerto Rico (PR) have one of the highest cars per square mile indicator in the world, with 146 vehicles per street mile and 4,300 vehicles per square mile according to Global Fleet [2], [3]. The transportation industry in PR is responsible for generating emissions through different modes of transportation such as air travel, marine, off-road and on-road. A network of roads, highways, railways, ports, harbors, and airports supports the transportation system. Off-road transport involves equipment like golf carts, bulldozers, backhoes, cranes, forklifts, and tractors. On the other hand, on-road transport includes the use of gasoline or diesel-powered motor vehicles such as motorcycles, trucks, buses, and cars [3].

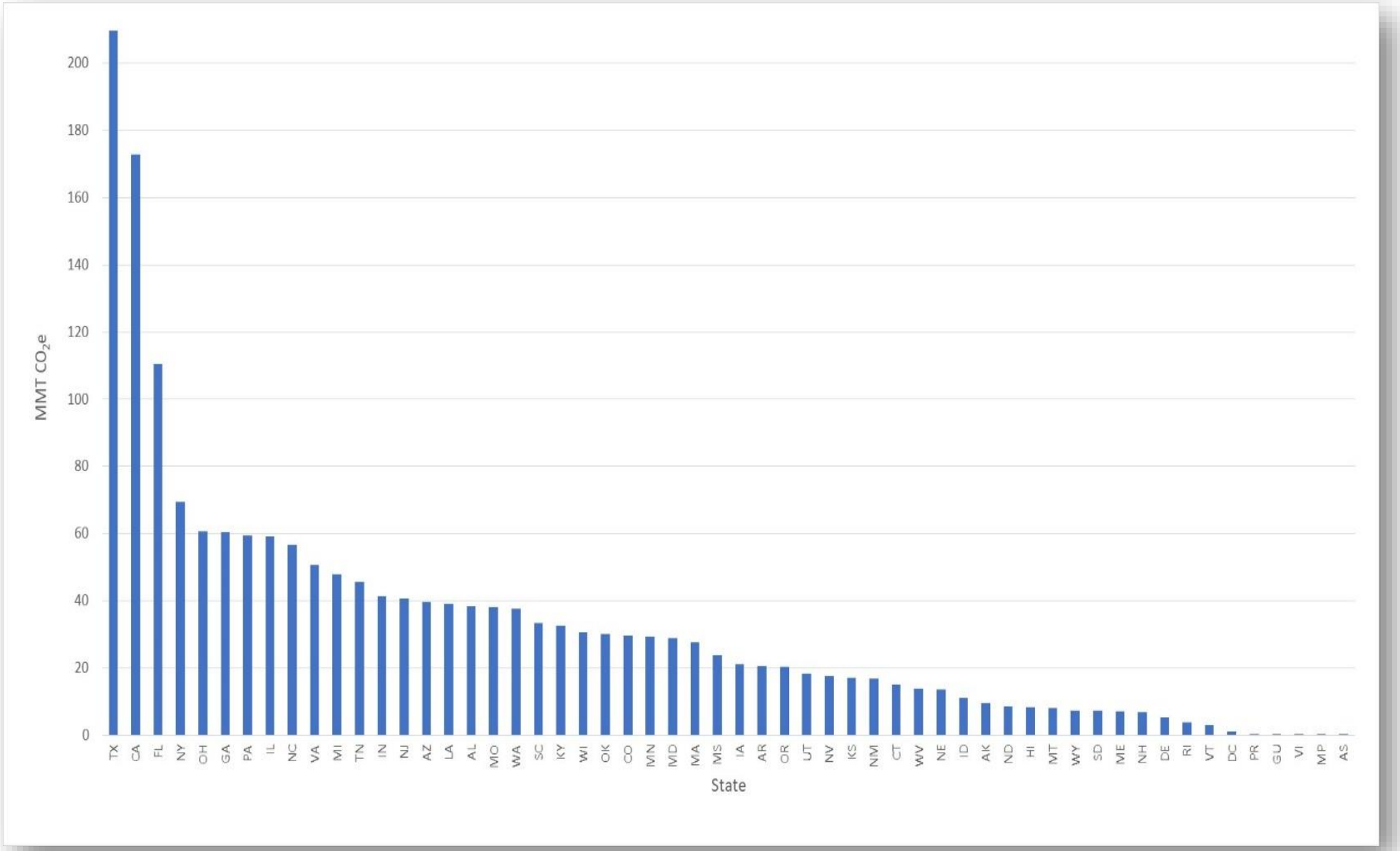
An account of anthropogenic GHG emissions and sinks in the United States (U.S.) (1920-2021) has been gathered by the U.S. government in the Inventory of U.S. GHG Emissions and Sinks report. In the U.S. the most significant GHG produced by human activities is Carbon Dioxide (CO_2), which accounts for 79.4% of total GHG emissions. Fossil fuel combustion, mainly from transportation and power generation, is the primary source of GHG emissions and CO_2. In 2021, top 2 GHG emissions in U.S. came from transportation activities (28.5%) and electric power (25%) [4]. Similarly, in 2021, the top 2 sectors in PR GHG emissions were Power Supply (52%), and Transportation (26%); being CO2 (84%) the largest source [3].

U.S. produced 6,340.2 million metric tons of CO_2 equivalent (MMT CO_2e) in GHG emissions in 2021. These emissions have decreased by 2.3% between 1990 and 2021 [4]. On the other hand, in 2019, PR emitted 33.4 MMT CO_2e, while in 2021, the emissions increased to 34.3 MMT CO_2e [3]. Transportation emission in the U.S. were 1,809.5 MMT CO_2e in 2021 [4]; meanwhile in PR, this sector is responsible for 9.5 MMT CO_2e [3].

Predictions of future emissions trends indicate that emissions are expected to decrease from 2022 to 2041 assuming renewable electric generation replacement, closure of the coal-fired power plant and trends of decreasing population. If existing socio-economic expectations, policies, and laws remain unchanged, emissions will decrease by 28% over 20 years, falling from 34.3 MMT CO_2e in 2021 to 24.7 MMT CO_2e in 2041. This reduction in emissions will lead to PR's GHG emission levels reaching their mandated target of 50% of 2005 levels in 2035 (10 years later that the required 2025 target) [3].

Figure 1: MMT CO2 by State and Territories, shows MMT CO_2e emissions by U.S. states and territories for the transportation sector. Top 3 states with the highest GHG emissions in the transportation sector are TX, CA, FL. In comparison with other states, PR is in place 52nd. [5]

Figure 1: MMT CO2 by State and Territories



Source: Analysis from EPA Consolidated GHG Data for All States Y2023

Carbon Reduction Pillars for Puerto Rico

As part of the 2050 Multimodal Long-Range Transportation Plan for Puerto Rico (2050 MLRTP) [6], it is recognized the importance and its benefits of reducing carbon emission related to the transportation. This planning tool defined goals and objectives that aim into reducing carbon emissions.

The following table presents the 2050 MLRTP goals and objectives that are directly attached to reduce carbon emission.

Table 1: 2050 MLRTP Carbon Emission related Goals and Objectives

Goal B: Focus on the Environment's Sustainable Development	
Objective B.1	To promote transportation infrastructure that preserves balanced ecosystems minimizing adverse impacts to the Island's natural environment by conceding a preponderant weight to rehabilitation and improvement of existing infrastructure alternatives.
Objective B.2	Reduce greenhouse gas emission, energy consumption, and carbon footprint emittance; promote "smart growth", livable communities and improve air quality by implementing sustainable strategies and environmental management methodologies.
Objective B.4	Improve alternative modes of transportation and travel demand strategies by implementing and improving pedestrian access, bike lanes, public transportation plan, recharge ports of electric vehicles, among other environmentally sustainable alternatives, that reduce motorized vehicles dependency and enhance alternative modes of transportation.

Based on these goals and objectives, the following, are the pillars of the **Carbon Reduction Strategy (CRS) addressing strategies to develop and promote Electric Vehicle (EV) Infrastructure, Non-motorized & Micromobility, and Public Transit.**

EV Infrastructure

The Authority is strongly committed to implement initiatives to promote a cleaner transportation system. With that in mind the Authority presented two rounds of nominations for Alternative Fuel Corridors in the Islands. Said nominations were approved by the FHWA allowing to develop the Puerto Rico Electric Vehicle Infrastructure Deployment Plan [7] under the National Electric Vehicle Infrastructure (NEVI) formula program.

Puerto Rico Electric Vehicle (EV) Infrastructure Deployment Plan

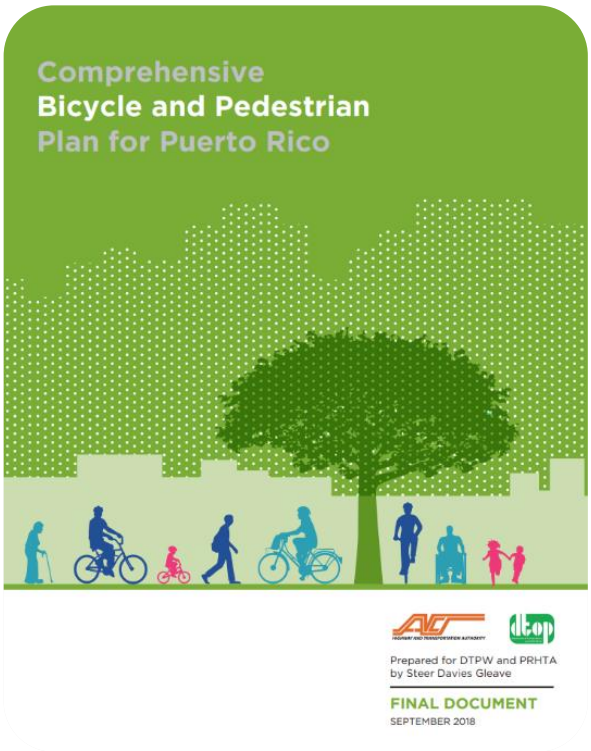
Local government efforts, over the past decade, have been promoting a transition from traditional fuel technologies to more efficient and environmentally friendly alternatives. As the grantee of the NEVI formula funds from the Federal Highway Administration (FHWA), PRHTA developed the EV Infrastructure Deployment Plan where it is established the framework of EV charging infrastructure along the major corridors in the island. The main objectives of the Plan are:

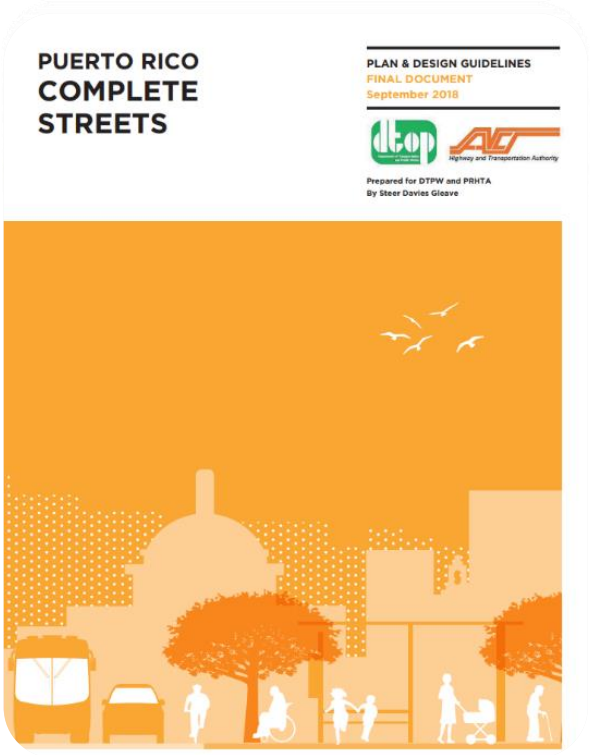
- Provide guidelines to coordinate the federal, state, and municipal government initiatives to provide equitable adoption of EV's while developing groundwork and framework to manage current challenges.
- Integrating infrastructure in our transportation system to improve the quality of life of our communities by reducing transportation related greenhouse gas emissions.
- Integrating EV infrastructure that will provide confidence and flexibility for drivers to travel long distances.
- Improve and/or provide public access to EV charging facilities.
- Increase the number/inventory of EV in Puerto Rico by encouraging drivers to invest on an EV.
- Enable the transition to clean transportation to achieve current transportation and climate goals.

This Plan is being updated in an annual basis to assure compliance with the FHWA guidelines and requirements.

Non- Motorized & Micromobility Mode

As part of its responsibilities of developing and implementing comprehensive transportation public policy, the PRHTA's Strategic Planning Office prepared the Comprehensive Bicycle and Pedestrian Plan [8] as well the Complete Street Plan & Design Guidelines [9]. Both documents serve as planning tools that seek to integrate non-motorized modes and micromobility in a safe and environmentally friendly way as a transportation alternative to the private car.





Comprehensive Bicycle and Pedestrian Plan

Considering that roads and streets should no longer be exclusive for cars, streets are now recycled, reused, and shared with the rest of the modes. Thus, this document has been prepared to improve the mobility and access conditions, create a more livable urban environments and more efficient transportation system.

The Plan focused on eight main goals and benefits (referred as 6E's+2) as focus areas. One of these focus areas or goals specifically addresses the reduction of carbon emissions under the fifth "E" goal of Environment as follows:

Environment: the goals is to reduce energy consumption, vehicular congestion and environmental pollution through increased walking and cycling.

This will result in a reduction of GHG emissions by increasing the biking and physical activity, as well as a reduction of vehicle travel and its associated environmental impacts.

Complete Street Plan & Design Guidelines

PRHTA adopted a Complete Street policy through the Law Number 201 of December 2010 which also created the Complete Street Commission. In respond to a report prepared in 2012 by the Complete Street Commission, this planning and design tool was prepared with the following main objectives: to guide the state and local efforts to improve access and mobility conditions

and develop new facilities to improve the quality of life; improve and/or provide pedestrian and bicycle access to public transportation system and public spaces; and, provide safe and affordable access for people of all ages and abilities. This Plan and Design Guidelines also has focus areas where goals and objectives were defined. The following focus area of Health and Environment specifically addresses the reduction of carbon emissions:

Health and Environment: Improve physical and mental health by promoting and increase in non-pollutant activities through accessibility interventions. The objectives are:

- Increase safe access to active modes to support healthier lifestyle.
- Increase socialization opportunities, and
- **Reduce CO emissions.**

Micromobility

2050 MLRTP incorporated Micromobility as an emerging transportation mode in the island. Micromobility is referred as “any small, low-speed, human or electric powered transportation device” as defined by the FHWA. Within the main urban centers of the San Juan Metropolitan Areas there has been a slightly increase of electric-powered transportations devices. More specifically, “electric-powered micromobility vehicles started gaining popularity when the first shared micromobility company started operating in 2019”.

Micromobility is seen as another mode of transportation that helps to reduce carbon emission since people can travel short distance with more efficient vehicles rather than use a car.

Transit

Another important component of the transportation system that is directly related to reduce the amount of carbon emission is Public Transit. The Puerto Rico Integrated Transit Authority (PRITA) [10] is the governmental entity under the Department of Transportation and Public Works (DTPW) responsible of implementing the public policy for planning, management, and operation of the public transit services in the island. PRITA administers multimodal modes of transportation in the island including metropolitan bus services, Urban Train, and Ferry Services.

Transit system in Puerto Rico

a. Metropolitan Bus Authority - Bus services
    i. Currently the bus network is comprised of 32 routes that allow to connect people within the metropolitan area serving the following municipalities: Bayamón, Carolina, Cataño, Guaynabo, Levittown (Toa Baja),

Loíza, San Juan, Trujillo Alto and Caguas. The mission of the Bus Network is to provide movement and connection to the passengers.

ii. Paratransit system is a complementary system to the Bus network. It provides transportation to people with disabilities that cannot board a regular bus. This service is provided up to three-quarters (3/4) of a mile beyond the areas through the bus network runs.

b. Urban train service

i. *Tren Urbano* is the only train system in Puerto Rico. An economic, fast, and ecological way of travel with 16 stations distributed within the Municipalities of Bayamón, Guaynabo and San Juan. Offer its services all days of the year between 5:30am and 11:30pm. Most of the stations are located near/or exactly at important landmarks such as main education centers, sport centers, hospitals, agencies, recreational areas, among others. *Tren Urbano* mission is to provide a mass transportation system that promote social and economic development.

c. Ferry services

i. Through the Maritime Transportation Authority, the Ferry services has a fleet of passengers and cargo vessels with routes from Ceiba Terminal to Vieques and Culebra and from Cataño to Old San Juan.

ii. Ceiba to Vieques and Culebra allows access to the residents of the Islands to supermarkets, medical services, educational services, among others within the main Island. In the other side, the service from Cataño to Old San Juan not only represent a mode of transportation but also a cultural symbol to the residents of Cataño.

Authority's Improvement Strategies

PRITA has been one of the main key stakeholders of the planning process and the 2050 MLRTP includes the five transit strategies that aim to improve the services:

- Improve, rehabilitate, and preserve the infrastructure of the transit network.
- Enhance the transit network at the regional, metropolitan, and rural level.
- Increase the efficiency, effectiveness, and reliability of the transit system.
- Improve transit accessibility and equity.
- **Strengthen mobility to support the environment and the economy**.

Strategy

The different planning tools previously described represent the public policy to achieve a better, integrated and environmentally friendly transportation system. Carbon reduction emissions are part of said transportation policies and are implicit and explicit within said planning tools in a comprehensive approach not as an isolated component. The previous section pretended to highlight carbon reduction emission, with that in mind the following represents the Carbon Reduction Strategy (CRS):

Identify and implement projects included as part of the 3 CRS' pillars by developing; EV Infrastructure, Non-motorized & Micromobility and Public Transit. This includes elaborating monitoring tools to measure and document the reduction of carbon emissions from transportation system.

Projects identified in 2050 LRMTP by CRS' Pillars

The following includes a list of projects that are going to be of implemented within the different planning documents previously discussed. Important to note that the 2050 MLRTP contains a broader list of projects to be implemented within the 27 upcoming years. The following list highlights the projects that fall under the Carbon Reduction Pillars (EV Infrastructure, Non-motorized & Micromobility and Transit) that have a direct impact on reducing carbon emissions. The list doesn't follow any particular order and will be updated as more projects are identified across the time.

Table 2: List of Projects by Carbon Reduction Strategic Pillars

ID	Project	Description	CR Pillar	Location (based on the MPO Regions)	Agency	Year
1.	**Zero-emission Transit Plan**	Research, development, and deployment plan of cleaner, more efficient public transit vehicles to scale up the electrification program to meet its zero-emission targets.	Transit	San Juan TMA	PRITA	2026
2.	**Rehabilitation of the Mosquito terminal and ticketing area in Vieques.**	New Route to Vieques - "Short Route" from Ceiba to Mosquito. Rehabilitation of the Mosquito Terminal and Ticketing Area.	Transit	East region	PRITA	2024
3.	**Improvement of pedestrian and bicycle access/facilities around train stations. Phase 1**	Design and construction of pedestrian and bicycle access improvements on station. Four phases	Transit Non-motorized	San Juan TMA	PRITA	2025
4.	**Improvement of pedestrian and bicycle access/facilities around train stations. Phase 2**	Design and construction of pedestrian and bicycle access improvements on station. Four phases	Transit Non-motorized	San Juan TMA	PRITA	2026
5.	**Improvement of pedestrian and bicycle access/facilities around train stations. Phase 3**	Design and construction of pedestrian and bicycle access improvements on station. Four phases	Transit Non-motorized	San Juan TMA	PRITA	2027
6.	**Improvement of pedestrian and bicycle access/facilities around train stations. Phase 4**	Design and construction of pedestrian and bicycle access improvements on station. Four phases	Transit Non-motorized	San Juan TMA	PRITA	2028
7.	**Improvement of pedestrian and bicycle access/facilities around bus stations. Phase 1**	Design and construction of pedestrian and bicycle access improvements on terminals	Transit Non-motorized	San Juan TMA	PRITA	2025
8.	**Improvement of pedestrian and bicycle access/facilities around bus stations. Phase 2**	Design and construction of pedestrian and bicycle access improvements on terminals	Transit Non-motorized	San Juan TMA	PRITA	2026

ID	Project	Description	CR Pillar	Location (based on the MPO Regions)	Agency	Year
9.	**Improvement of pedestrian and bicycle access/facilities around bus stations. Phase 3**	Design and construction of pedestrian and bicycle access improvements on terminals	Transit Non-motorized	San Juan TMA	PRITA	2027
10.	**Improvement of pedestrian and bicycle access/facilities around bus stations. Phase 4**	Design and construction of pedestrian and bicycle access improvements on terminals	Transit Non-motorized	San Juan TMA	PRITA	2028
11.	**Analysis for the extension of exclusive bus lanes in the San Juan Metro Zone**	New dedicated bus lane to reduce congestion impacts, improve on-time performance, and expand transit ridership in the main corridors of the San Juan Metro Zone	Transit	San Juan TMA	PRITA	2025
12.	**Transit Vehicle Signal Priority & Preemption system. Phase 1**	Traffic signals equipped with technology to prioritize transit vehicles and allow emergency vehicles to request preemption at intersections and bypass stopped vehicles or congestion.	Transit	San Juan TMA	PRITA	2025
13.	**Transit Vehicle Signal Priority & Preemption system. Phase 2**	Traffic signals equipped with technology to prioritize transit vehicles and allow emergency vehicles to request preemption at intersections and bypass stopped vehicles or congestion.	Transit	San Juan TMA	PRITA	2025
14.	**Transit Vehicle Signal Priority & Preemption system. Phase 3**	Traffic signals equipped with technology to prioritize transit vehicles and allow emergency vehicles to request preemption at intersections and bypass stopped vehicles or congestion.	Transit	San Juan TMA	PRITA	2025

ID	Project	Description	CR Pillar	Location (based on the MPO Regions)	Agency	Year
15.	**Transit Vehicle Signal Priority & Preemption system. Phase 4**	Traffic signals equipped with technology to prioritize transit vehicles and allow emergency vehicles to request preemption at intersections and bypass stopped vehicles or congestion.	Transit	San Juan TMA	PRITA	2025
16.	**Study of energy alternatives with solar panels in the facilities of the Train**	Assessment of energy alternatives for the Train using existent ROW and Infrastructure	Transit	San Juan TMA	PRITA	2028
17.	**Complete Streets Project Toa Alta**	Improvements to Boulevard Toa Alta Heights PR-828/PR-829	Non-Motorized	San Juan TMA	PRHTA	TBD
18.	**Complete Street Project Vega Alta**	Improvements to PR-686, PR-687, PR-692, Feliza Rincon Ave.	Non-Motorized	San Juan TMA	PRHTA	TBD
19.	**EV Charger stations**	Following the requirements of the NEVI formula program EV charger stations will be located across the AFC (PR-22, PR-52 & PR-2)	EV Infrastructure	San Juan TMA, Aguadilla TMA, Southwest Region, South Region	PRHTA	2026
20.	**Roadway geometric and pedestrian improvement PR-176 and PR-1 Improvements**	San Juan	Non-Motorized	San Juan TMA	PRHTA	2024*

* Bid Announcement scheduled by first quarter in 2024.

There are other types of projects that not necessarily falls under the Carbon Reduction Pillars, that also contribute to reduce carbon emission. Some of these are primarily focused on reducing congestions and improving safety but at the end have an impact on reducing carbon emissions. The following is a list highlighting some of the highway projects under the congestion management program reducing carbon emissions which will be updated as more projects are identified. These are also included in the 2050 MLRTP:

Table 3: List of other projects – Congestion Management Program

ID	Project	Location	MPO Region
1.	Construction of Interchange at PR-199/PR-845	San Juan-Trujillo Alto	San Juan TMA
2.	PR-2, PR-108 and PR-2 Interchanges (La Vita Project) Improvements to the intersection incorporating Completes Street measures	Mayaguez	Southwest Region
3.	Urban Interchange at PR-2 & PR-114	Mayaguez	Southwest Region
4.	Reversible Dynamic Toll Flyover Int. PR-2 and PR-22 (Kennedy – De Diego Expressway new peak period access)	San Juan	San Juan TMA
5.	Congestion Managed Lane – Phase 4: PR-52/PR-30 intersection improvement.	Caguas	San Juan TMA
6.	Congestion Managed Lane – Phase 5: PR-30 – San Juan Reversible lane using barrier systems on PR-30.	Caguas	San Juan TMA
7.	PR-52 Operational Improvements from Juana Díaz to Ponce (Phases 1A and 1B)	Juana Díaz – Ponce	South Region
8.	Higuillar Avenue Feasibility study for construction of the Higuillar avenue from its intersection with Efron Ave. and PR-696 to its intersection with the existing interchange between PR-694 & PR-22.	Dorado	San Juan TMA
9.	Overpass intersections at PR-18 on interchange PR-17 and PR-22	San Juan	San Juan TMA
10.	Expressway conversion of PR-3 – Strategic Intersections in PR-3 -Rio Grande to Fajardo	Río Grande	San Juan TMA
11.	Expressway conversion of PR-2 – Strategic Intersections in PR-2 Between PR-459; PR-107; Luis Canela Stadium Intersection; PR-4002; PR-1107 and PR-111 intersections (AC-240001)	Aguadilla	Aguadilla TMA
12.	AC-200248 PR-2 Expressway conversion of PR-2 at PR-347 intersection	Hormigueros	Southwest Region
13.	Improvements at PR-28 & PR-165 Underpass diamond conventional arrangement alternate	Guaynabo	San Juan TMA

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