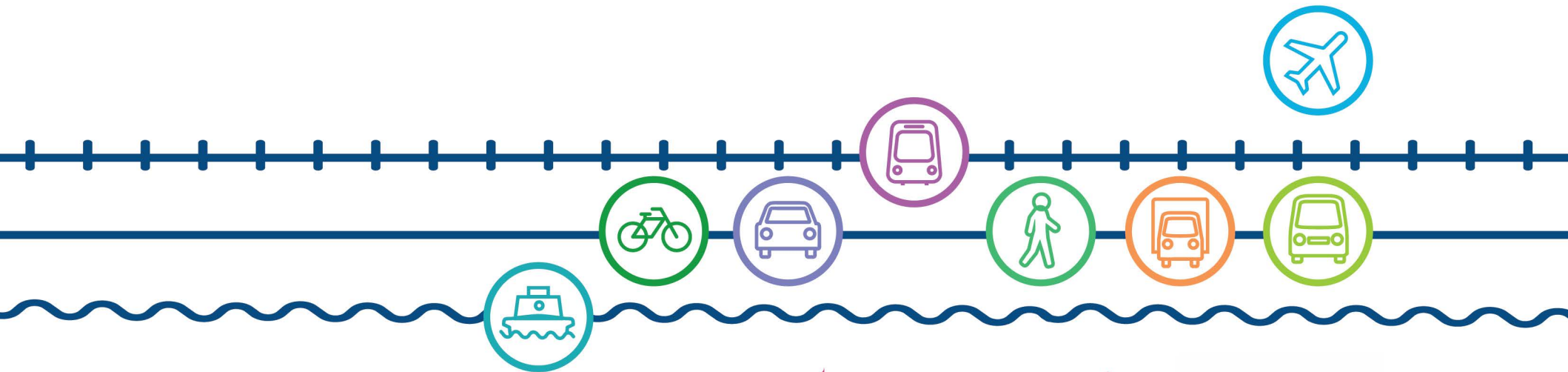


2050

Puerto Rico Multimodal Long Range Transportation Plan





1

Island-Wide

What is the Plan?

The 2050 Puerto Rico Multimodal Long Range Transportation Plan (MLRTP) is an essential element of the transportation planning process and the key document identifying desired outcomes and priorities for transportation investments in Puerto Rico.

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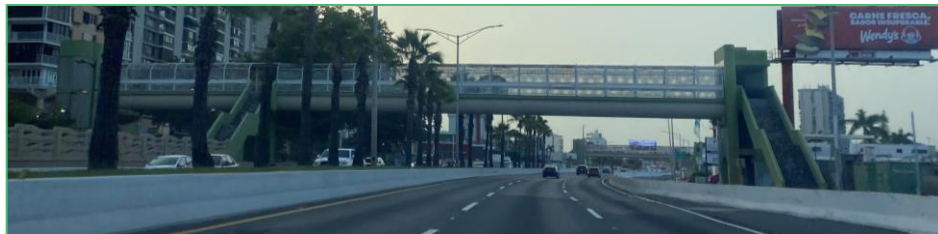
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Why is the Plan Needed?

The **2050 MLRTP** is a central and unifying document that summarizes goals, objectives, and performance measures. In the same way, it assesses current system performance, inventories future challenges and analyses needs. It also proposes investment strategies to be funded over the next 27 years.

It aims to improve the performance of the transportation in Puerto Rico and move towards those goals.

In alignment with the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, and Fixing America’s Surface Transportation (FAST) Act, the planning process in Puerto Rico has strived to be a comprehensive framework for making transportation investment decisions in the Transportation Management Areas (TMA) and Island-wide. Currently the 2050 MLRTP is ruled under the Bipartisan Infrastructure Law (BIL). The Department of Transportation and Public Works (DTPW) is the designated Metropolitan Planning Organization¹ (MPO) for all urbanized areas and Island-wide. As such, it is ultimately responsible for the compliance with the U.S. Department of Transportation (DOT) statutory requirements under the FAST-Act, and with the Rule Makings and Policy Guidance of the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA).



Source: Steer, 2023

Once the 2050 MLRTP is approved by the PRMPO and the Public Policy Committees, it will establish the planning framework for all transportation projects (including all modes) for Puerto Rico. The MPO Regions² consider the two-large population TMAs: San Juan and Aguadilla; and the five (5) smaller Transportation Planning Regions (TPR) comprising nine (9) other Urbanized Areas (UA) with lower population, as set below:

- Aguadilla Transportation Management Area (Aguadilla TMA)
- San Juan Transportation Management Area (San Juan TMA)
- Transportation Planning Regions (TPRs)

Table 1.1: Municipalities within Other Urbanized Areas Classification and Under the TPRs

TPR	Municipalities within Other Urbanized Areas
East Region	Fajardo Urbanized Area
North Region	Arecibo Urbanized Area Florida-Barceloneta Urbanized Area
Southeast Region	Guayama Urbanized Area
South Region	Ponce Urbanized Area Juana Díaz Urbanized Area Yauco Urbanized Area
Southwest Region	Mayagüez Urbanized Area San Germán-Cabo Rojo Urbanized Area

Source: PRHTA, 2021

1. Metropolitan Planning Organization means the policy board of an organization created and designated to carry out the metropolitan transportation planning process, according to regulations (23 C.F.R. §450.104).
 2. The definition of the MPO Regions is as established by the PRHTA. It is important to note that due to the recent data published for the 2020 Census related to population, the configuration of the Regions could be modified, as it is one of the factors considered to define the Regions.

What is Included in the Plan?

The Puerto Rico DTPW, acting as the PRMPO, elaborated the 2050 MLRTP consisting of two (2) documents for the Transportation Management Areas (TMAs) of San Juan and Aguadilla. Also, one (1) document for the Island-wide Transportation Plan, and one (1) document for Other Urbanized Regions of less than 200,000 inhabitants (includes the five (5) TPRs as required by Federal Regulations) (23 U.S.C. 134 and 135; 42 U.S.C. 7410 et. seq.; 49 U.S.C. 5303 and 5304). This document represents the **Island-wide 2050 MLRTP**.

Table 1.2 shows the resources related to the framework from which the process for the development of revision for this Multimodal Long-Range Transportation Plan is based on.

Table 1.2: Resources Supporting Long-Range Statewide and Metropolitan Transportation Plans

Resource	Description
23 C.F.R. 450	Planning Assistance and Standards
U.S. Code Title 49 Chapter 53	Transit
FTA Circular 8100.1D	Program Guidance for Metropolitan Planning and State Planning and Research Program Grants
Bipartisan Infrastructure Law Fact Sheet	Metropolitan, Statewide, and Non-Metropolitan Planning Metropolitan Planning

Source: Steer, 2023

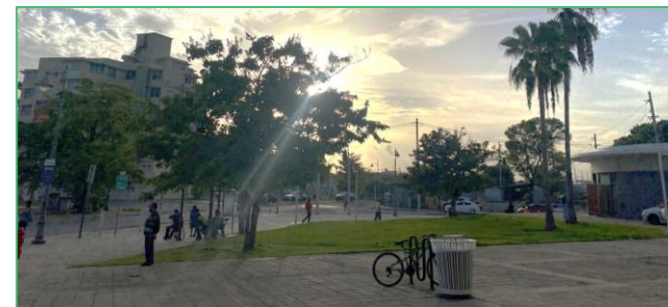
How the Plan will be Used?

The 2050 MLRTP is the guiding document for future investments in roads, transit services, bicycle and pedestrian facilities and related transportation services within Puerto Rico.

The Plan presents challenges and opportunities in infrastructure investments, transit, complete streets, and bicycle and pedestrian along a long-range period. This 2050 MLRTP follows a performance-based planning process according to Federal Regulations with multimillion dollar investments until FY2050. It has a firm commitment with national goals of reducing fatalities, an unprecedented emphasis on pavement and bridges preservation and rehabilitation to upgrade conditions, improve freight mobility, and reduce congestion. Moreover, the 2050 MLRTP foresees reducing congestion by improving public transit services and accessible facilities to most needed populations and with functional diversity.

Who is Responsible for The Plan?

The **Metropolitan Planning Organization (MPO)** is the regional organization responsible for transportation planning in Puerto Rico. In our case, PRHTA is the entity, within the DTPW, responsible for facilitating the transportation planning process for the Plan with effective public participation and outreach processes.



Source: Steer, 2023

Organizational Context

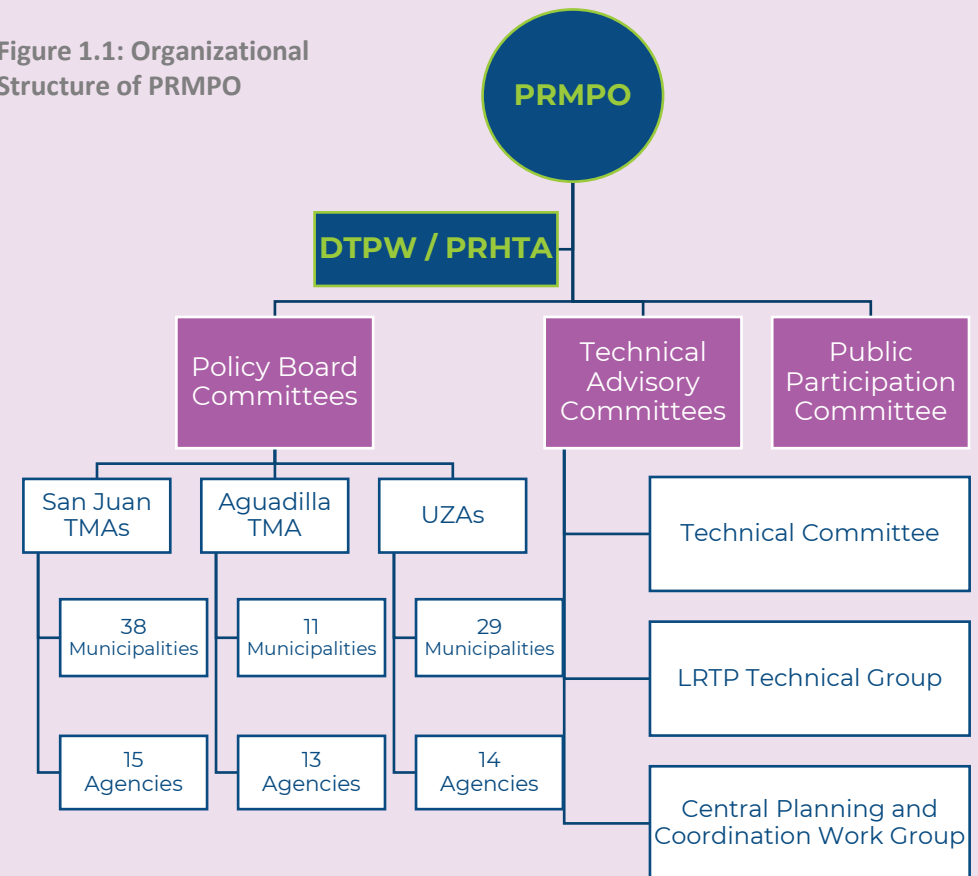
Puerto Rico Metropolitan Planning Organization (PRMPO)

The PRMPO is structured through three (3) Public Policy Committees representing the Aguadilla and San Juan TMAs, and Other Urbanized Areas Under 200,000 Population (UZA). Decisions are made by the Public Policy Committees regarding the projects and capital investments that will be using federal funds allocated for Puerto Rico's mass transit and highways as well as the vision, goals and objectives defined in the Plans. The members of the Public Policy Committees are comprised of the mayors of the municipalities and representatives of governmental agencies.

The PRMPO has a centralized structure to facilitate the administration and the metropolitan planning activities³. The Secretary of the DTPW is the president of the PRMPO. In coordination with other members, the Secretary promotes the development of an effective, integrated, and safe transportation system that enables economic growth and improves the well-being of its citizens.

The PRHTA is the grantee that receives the funding distributed by the Department of Transportation through the Federal Highways Administration and the Federal Transit Administration.

Figure 1.1: Organizational Structure of PRMPO



Source: Rules and Operating Procedures of Puerto Rico Metropolitan Planning Organization, 2018

2

Disclaimer

The information presented and analyzed was developed mainly using the U.S. Census Bureau's American Community Survey 5-year estimates from the years analyzed, normally from 2016 to 2021. The COVID-19 pandemic had an impact on the quality of the data collected during 2020, compared to other years as the Census Bureau was forced to suspend data collection operations, especially in-person visits, and switch entirely to survey questionnaires that were not fully returned. This generates a smaller sample size and consequently a larger margin of error and less reliable data for the 2020 information. Therefore, this report needs to consider this data limitation for 2020.

Island-Wide

About Our Home

This chapter aims to provide a brief description of Puerto Rico's socioeconomic characteristics to provide a better understanding of how the transportation sector is developed on the Island. The chapter is divided into six (6) main sections. The first describes the location and the geographical distribution of land, transportation authorities, and general elements about the territory. The second section describes and discusses sociodemographic data that is relevant to the Multimodal Long Range Transportation Plan (MLRTP). The third section describes the economy of Puerto Rico, especially regarding its Gross Domestic Product (GDP), the main industries that compose this indicator, and the behavior of employment. The fourth section describes two events that have impacted people's livelihoods and consequently, the way in which transportation patterns behave in Puerto Rico: COVID-19 and the recent earthquakes. The fifth section depicts the land-use, and environmental sensitivity areas in Puerto Rico. Finally, the sixth section shows the projections regarding Population and Employment.

Our Region: Location

Puerto Rico is a Caribbean Island that borders the Atlantic Ocean to the North and the Caribbean Sea to the South. It is located in the Caribbean Sea, east of the Dominican Republic, west of the Virgin Islands, and to the southeast of Florida. It constitutes the smallest of the Greater Antilles and is composed of an archipelago formed by the Main Island of Puerto Rico and several small islands: Vieques, Culebra, Mona, and numerous islets.

Figure 2.2 in the next page represents the location of Puerto Rico in the Caribbean.

Transportation Management in Puerto Rico

Puerto Rico territory is mainly divided into 78 municipalities which are further divided into two (2) Transportation Management Areas (TMA) and five (5) Transportation Planning Regions (TPR). This totals seven (7) Transportation Regions under the Puerto Rico Metropolitan Planning Organization (MPO), which include:

TMA

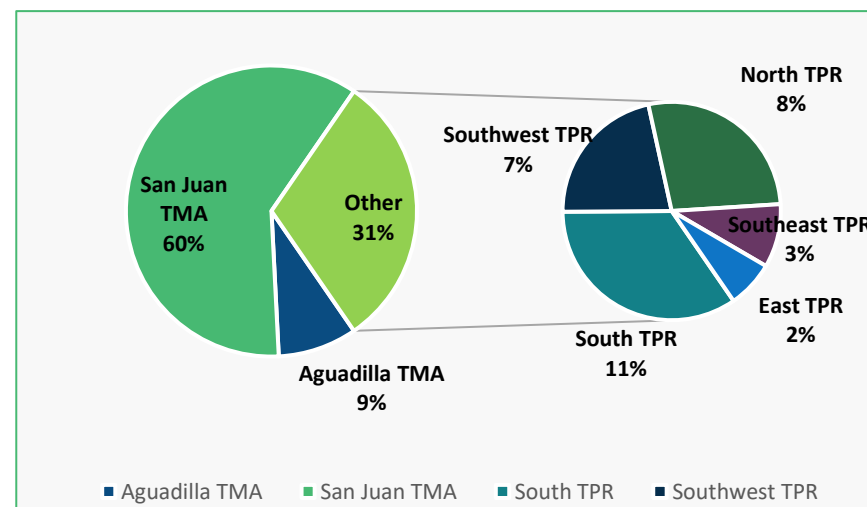
- San Juan; and
- Aguadilla

TPRs

- North (NTPR);
- East (ETPR);
- South (STPR);
- Southeast (SETPR); and
- Southwest (SWTPR).

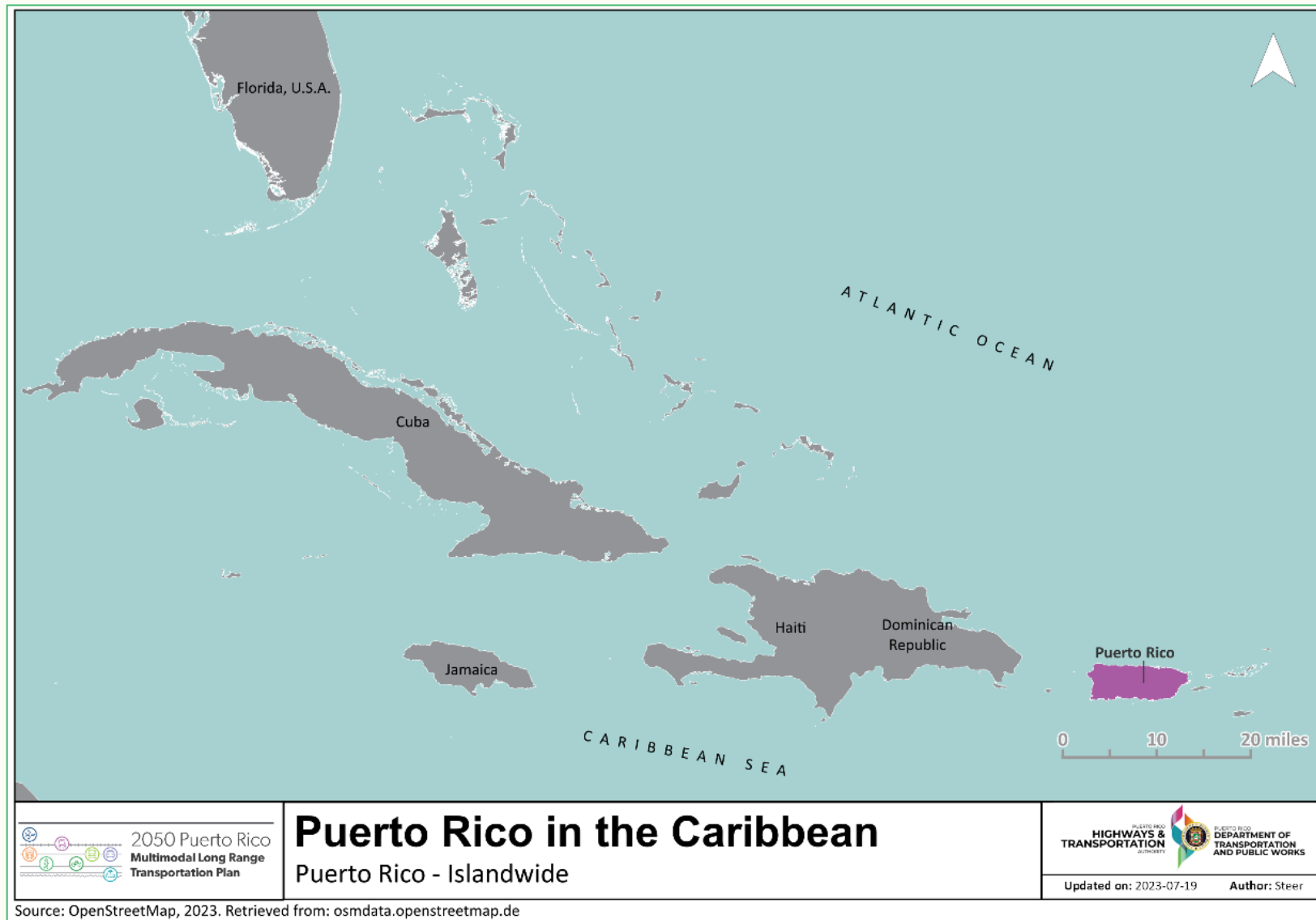
Figure 2.1 shows the distribution of the population by the TMAs and TPRs. That graphic highlights that the San Juan TMA hosts the largest share of residents, consisting of 60% of the population, Aguadilla is the second largest region with 9% of the population, and the Urban Zone Areas are composed by 5 TPRs consisting of 31% of the population among all.

Figure 2.1: Puerto Rico Population Distribution by Transportation Management Areas and Transportation Planning Regions 2021



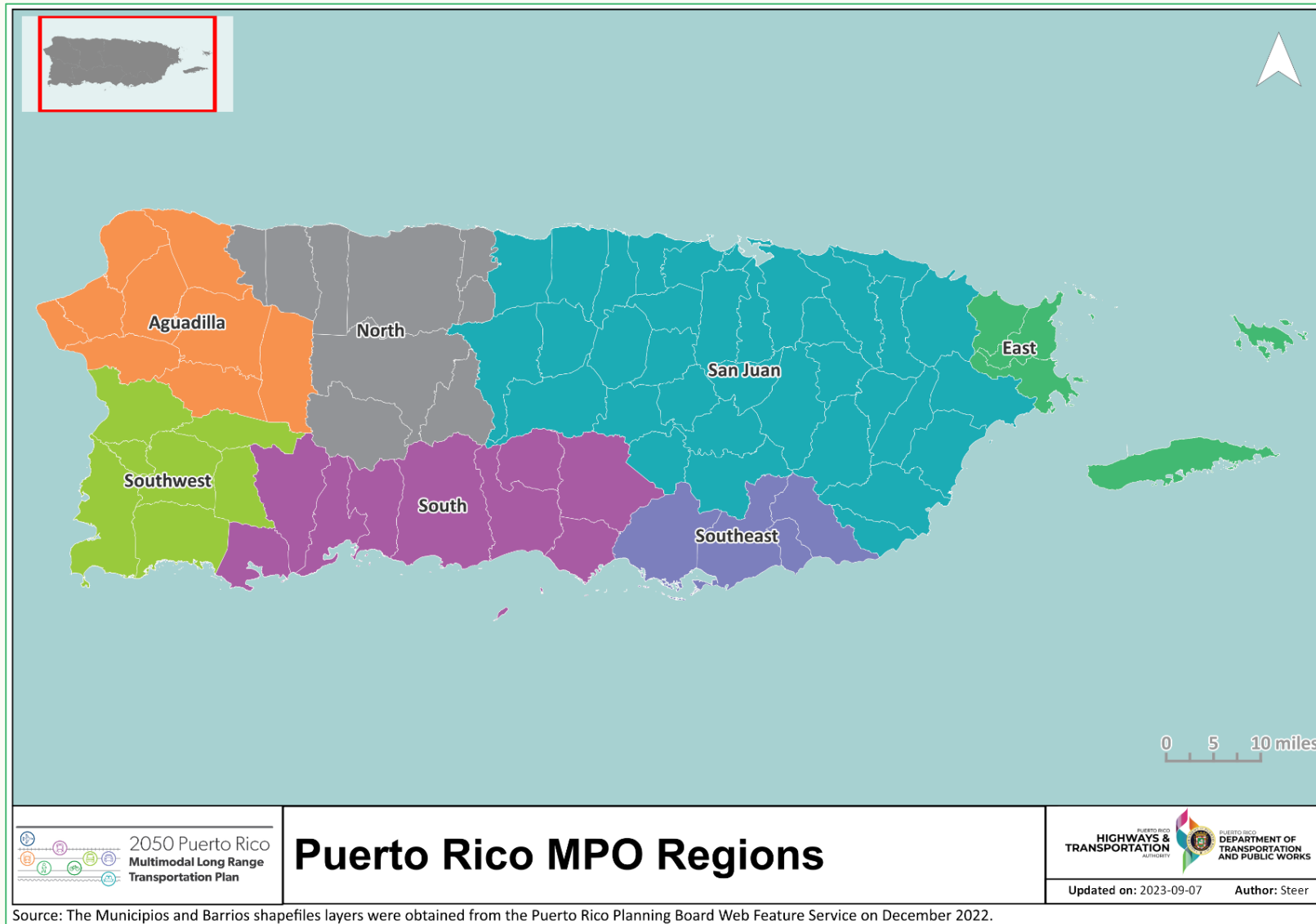
Source: U.S. Census Bureau, American Community Survey 2017-2021 5-Year Estimates

Figure 2.2: Puerto Rico Location



As shown in Figure 2.3, there are two (2) TMAs and five (5) TPRs, totalling seven (7) Transportation Regions under the Puerto Rico Metropolitan Planning Organization (MPO).

Figure 2.3: Transportation Management Areas and Transportation Planning Regions in Puerto Rico 2021



Source: The Municipios and Barrios shapefiles layers were obtained from the Puerto Rico Planning Board Web Feature Service on December 2022.

The San Juan TMA has the most complex highway system including major principal arterials and expressways and most of the toll roads within its jurisdiction. It also manages the most complex transit system on the Island having a combination of the only rail system and a state-managed bus network. The San Juan TMA is also the main point of entrance of goods in Puerto Rico as well as air/cruise passengers' arrivals/departures. The San Juan TMA is also the largest region in Puerto Rico, with 60% of the population, 33% of land coverage as well as being the largest employer with 65%⁴ of formal employment.

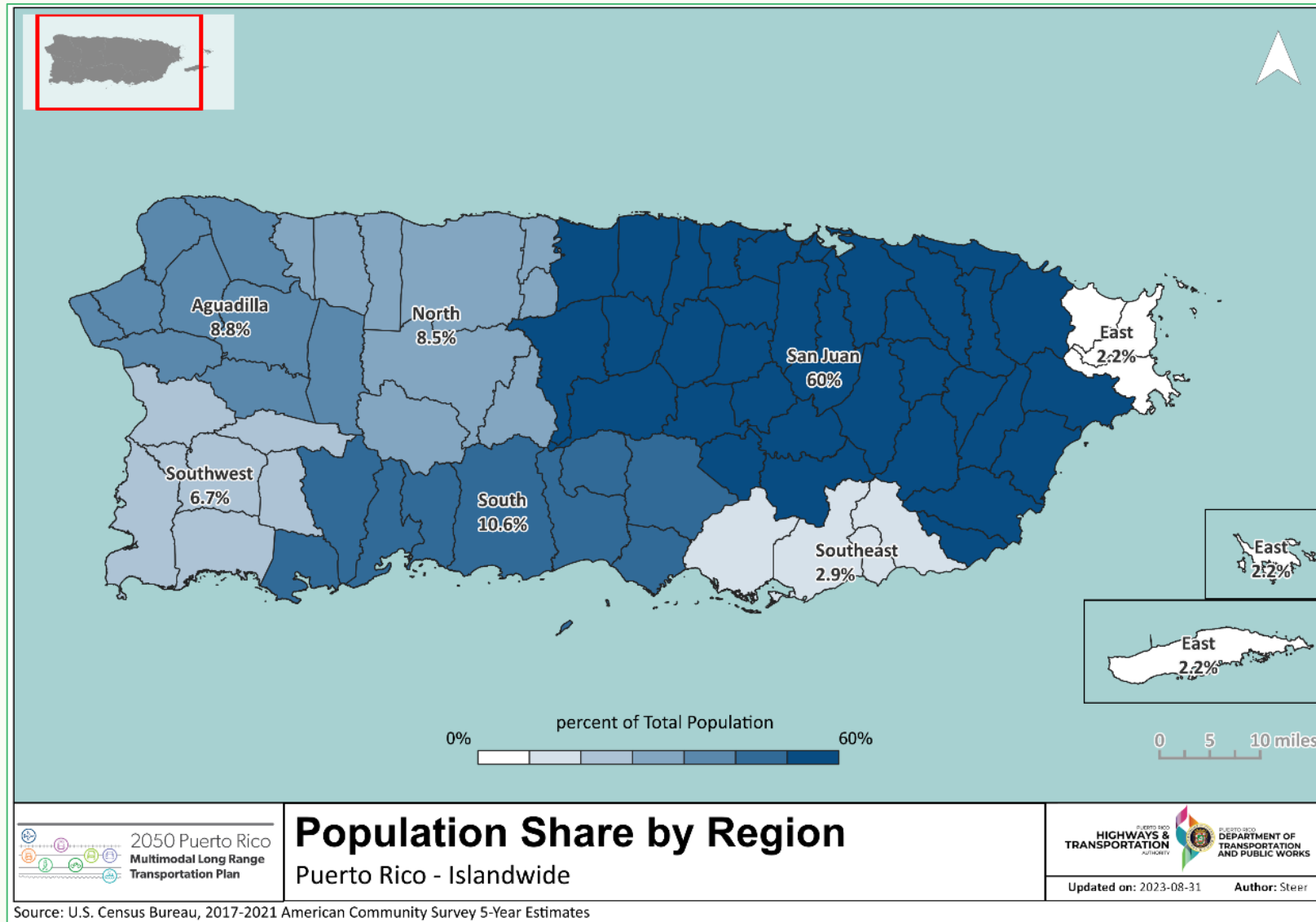
The maps on page 10 and page 11 show differences between regions. The largest regions (South TPR, North TPR, and Aguadilla TMA) in terms of population and land coverage are also the ones with the largest share of formal employment, after San Juan TMA. On the other hand, Southwest TPR, Southeast TPR, and East TPR, only comprise around 20% of land coverage and 12% of the population, and their share of formal employment is only around 10%.

Figure 2.4 and Figure 2.5 show how the population and employment trends are distributed geographically on the Island.



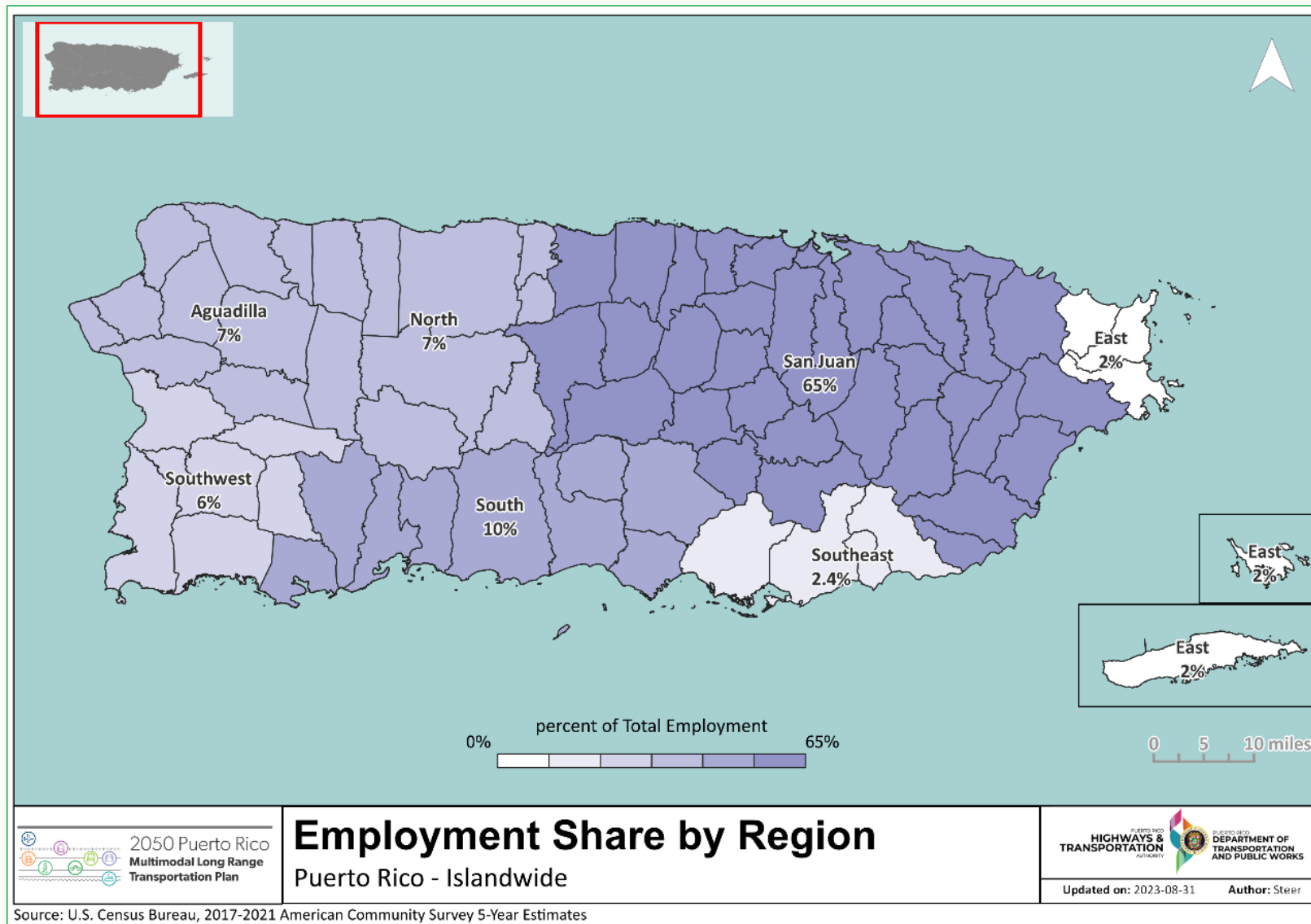
Source: Steer, 2023

Figure 2.4: Population Share in Puerto Rico Regions



Source: U.S. Census Bureau, 2017-2021 American Community Survey 5-Year Estimates

Figure 2.5: Employment in Puerto Rico Regions



Source: U.S. Census Bureau, 2017-2021 American Community Survey 5-Year Estimates

Our People: Sociodemographic Data

Current and historical sociodemographic data will allow for a better understanding of the people in terms of where they live, their age, household size, among other elements. Developing a disaggregated analysis by sex, race, and age allows a more holistic approach to understanding Puerto Rico's population and their livelihoods, as well as their potential needs to improve their quality of life.

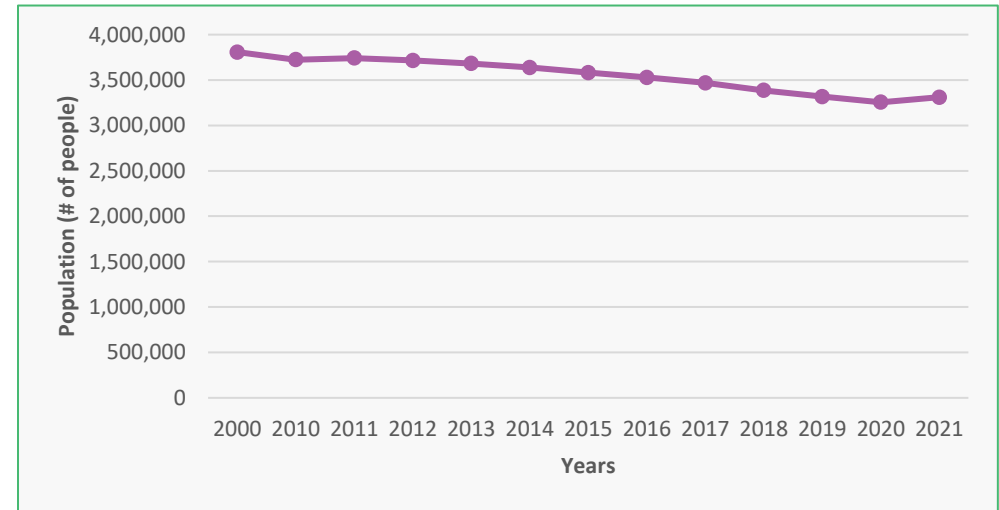
Population

In general terms, the population in Puerto Rico has presented the following trends:

- Since the year 2000, the population on the Island has shown a decreasing trend, which intensified in 2010 up until 2020 with an overall decrease of 14.3% percent change as shown in Figure 2.6.
- From 2010 to 2020 there was an overall population decrease within the Island's municipalities with 77 municipalities losing population from -0.4% to -29.3%, Culebra being the municipality with the highest loss. Only the Municipality of Gurabo gained population with a 6.5% increase.
- Between 2020 and 2021, there was a general population increase that represented a 1.7% change. This was due to a mix of population losses and gains within the municipalities.
- Forty-five (45) municipalities gained population: 0.2% in Comerío and 10.5% in Lares, two (2) municipalities had no population changes (Hormigueros and Luquillo), and thirty-one (31) municipalities decreased their population: -0.2% in Guayanilla and -12.4% in Gurabo.

Currently, the municipalities with the largest population, as of 2021, are San Juan, Ponce, Caguas, Carolina and Bayamón, as shown in Figure 2.7.

Figure 2.6: Puerto Rico Historic Population 2000-2021

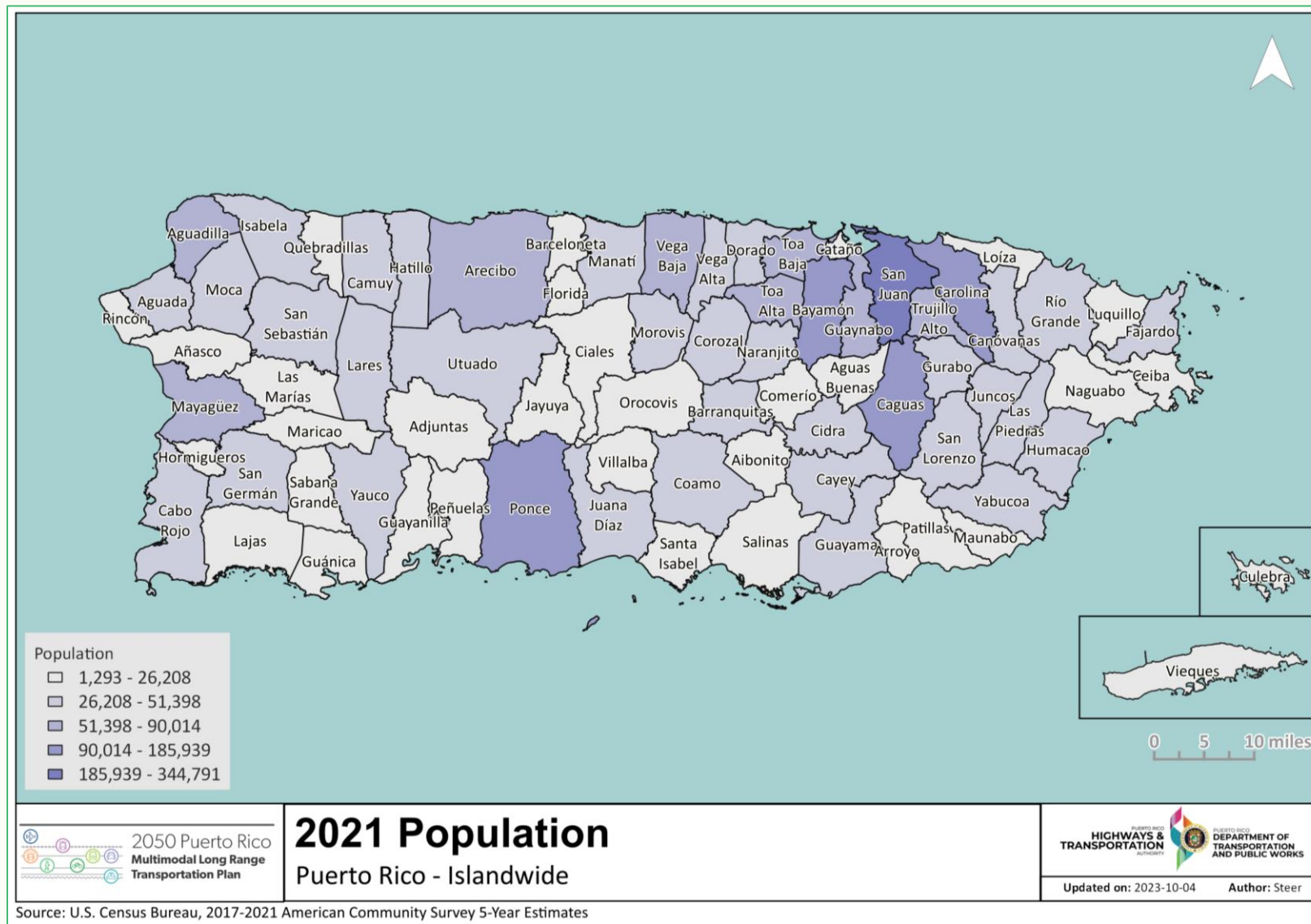


Source: U.S. Census Bureau, 2010 to 2021 American Community Survey 5-Year Estimates



Source: Steer, 2023

Figure 2.7: Puerto Rico Population 2021

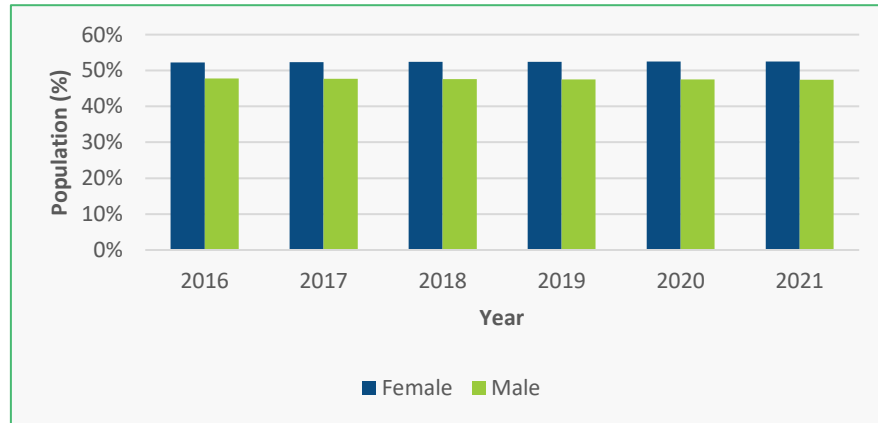


Source: U.S. Census Bureau, 2017-2021 American Community Survey 5-Year Estimates

Sex

Public policies and strategies need to have differentiated approaches for all genders and sexes. To do so, it is important to disaggregate data as much as possible so that all population groups are identified. This is why, the MLRTP identifies female and male population in Puerto Rico. Figure 2.8 shows the share of the female and male populations. Since 2016, the distribution between females and males has been relatively similar, but the female population has been slightly larger through this period.

Figure 2.8: Puerto Rico Population Distributed by Sex 2016-2021



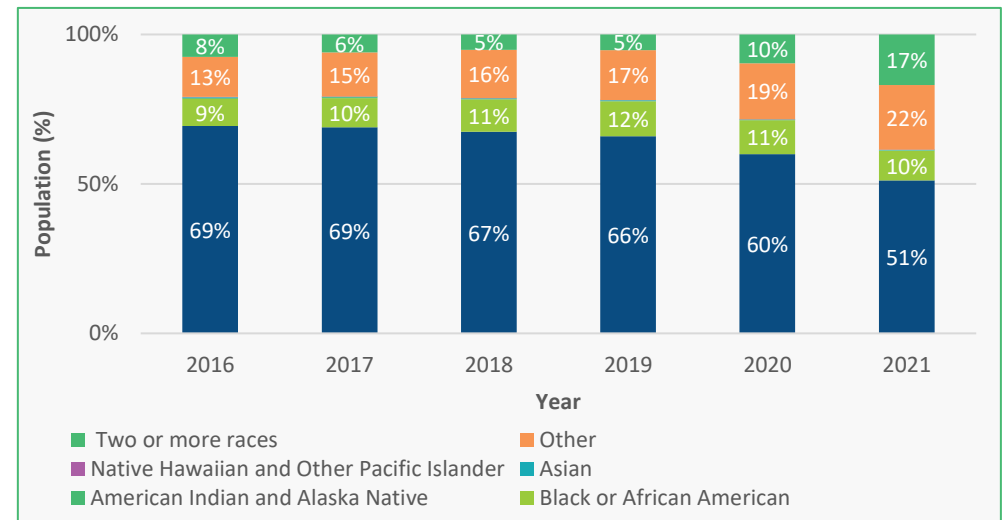
Source: U.S. Census Bureau, 2016 to 2021 American Community Survey 5-year Estimates

Race

The Island of Puerto Rico has been a point of entry to the Caribbean and America in general. This means there is a great number of mixed races. Figure 2.9 shows the races with which people recognize themselves over the years which has been stable during this period. Puerto Rico has a majority of the population that recognize themselves as White population, followed by “Other” and Black or African American.

Most people in Puerto Rico identify themselves with only one race, as shown in Figure 2.9. Nevertheless, the number of people who recognize themselves with only one race has been decreasing since 2016, when 92.5% of the population identified themselves with only one race, while in 2021, this percentage dropped to 83% when at least 17% declared to be identified with more than one race.

Figure 2.9: Race Identification in Puerto Rico 2016-2021



Source: U.S. Census Bureau, 2016 to 2021 American Community Survey 5-year Estimates

Age Distribution

It is particularly important to look at population’s age since there has been an aging trend in Puerto Rico for the last couple of years. In 2020 there were approximately 660,000 people in Puerto Rico considered as elderly (65 and older), which represented 20% of the Island’s inhabitants.

The median age for 2021 is 43.1 years old, as stated by the ACS 5-year estimates. Figure 2.10 shows that the median age for the last 5 years has been increasing and tends to go upwards, confirming the aging trend mentioned.

Figure 2.10: Median Age in Puerto Rico Per Year

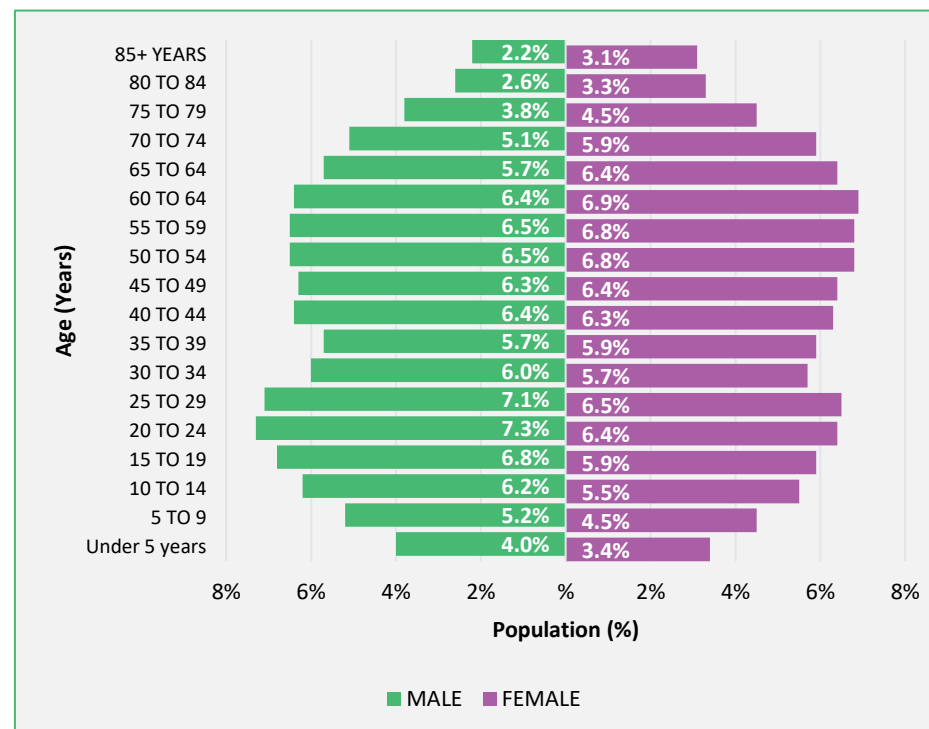


Source: U.S. Census Bureau, 2016 to 2021 American Community Survey 5-year Estimates

The median age varies among municipalities as shown in Figure 2.11. The municipalities with the highest median age are Hormigueros (48.1 yrs.), Rincón (47.7 years.), and Lajas (47.0 years.) all of them concentrated on the west and southwest of the Island. The municipalities with the lowest median age are Barranquitas (30.8 years.), Naguabo (39.4 years.), and Juncos (39.7 years.).

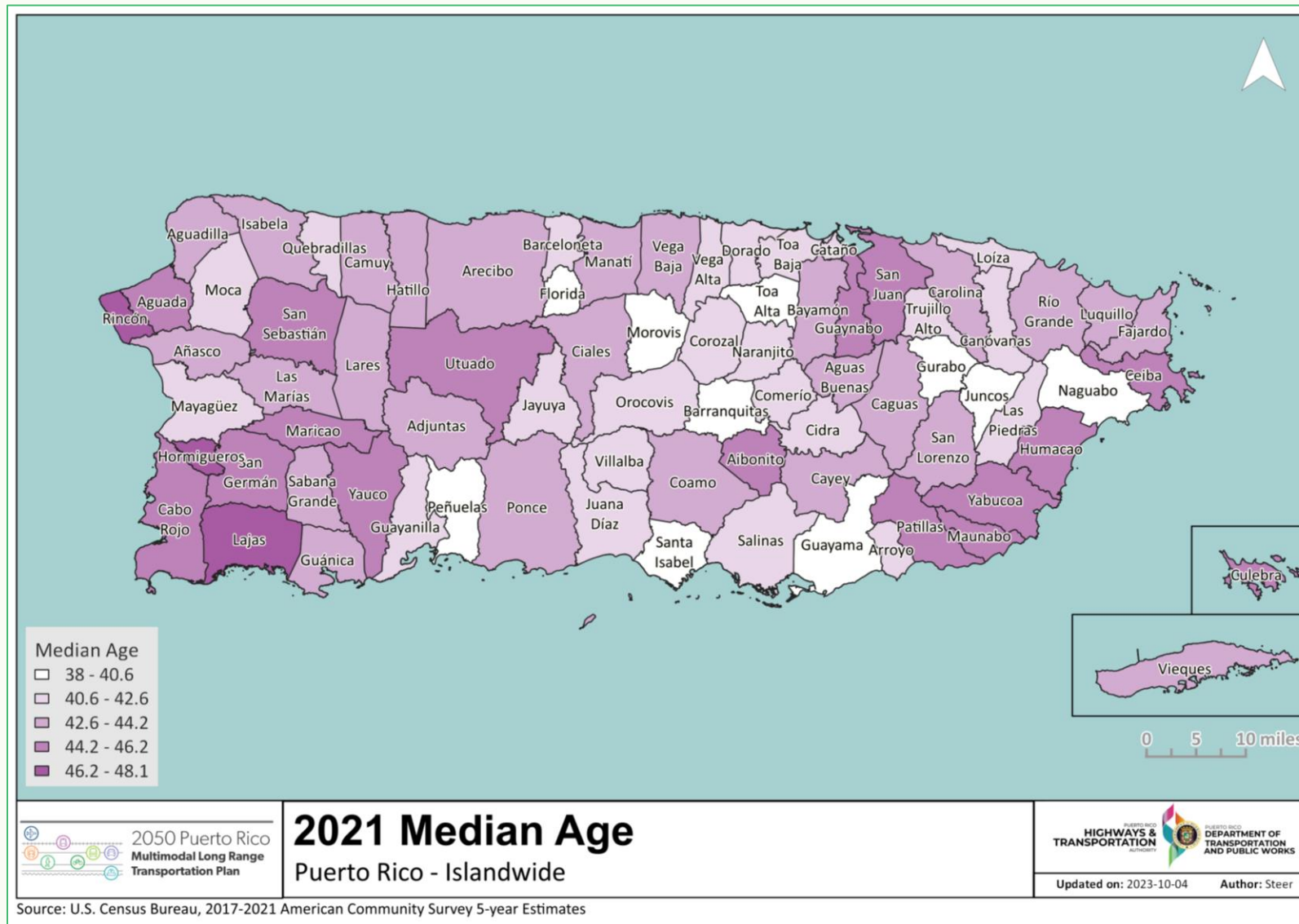
By the year 2021, the population of individuals 65 years and over was estimated at 706,925 people, which represents 21% of the total residents. Figure 2.11 shows the largest population share is around 20 to 24 years old and 25 to 29 years old. Even if the largest population group is from 20 to 24 years old, the population pyramid shows a negative growth trend as there is a distribution trend towards older ages, rather than younger adults and children.

Figure 2.11: Puerto Rico Age Distribution 2021



Source: U.S. Census Bureau, 2016 to 2021 American Community Survey 5-year Estimates

Figure 2.12: Puerto Rico Median Age Per Municipality



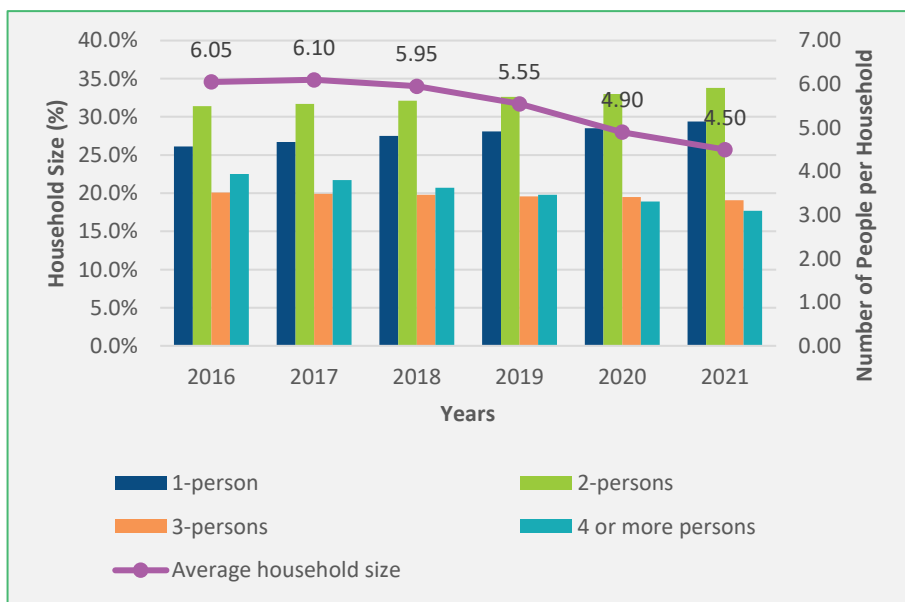
Housing

A household is defined by the Census as all the people who occupy a housing unit. Housing arrangements help outline people’s livelihoods, their quality of live and living patterns. Household size also gives information about the type of goods and services that families consume and that will require in the short and longer term.

Household size

Puerto Rico’s average household size in 2021 was approximately of 4.5 people as shown in Figure 2.13. There has been a decreasing trend compared to 2016 when the average household size was 6.05 people. The graph also shows that 1-person and 2-persons households have been increasing while 3-persons and 4+ persons households have been decreasing over this period.

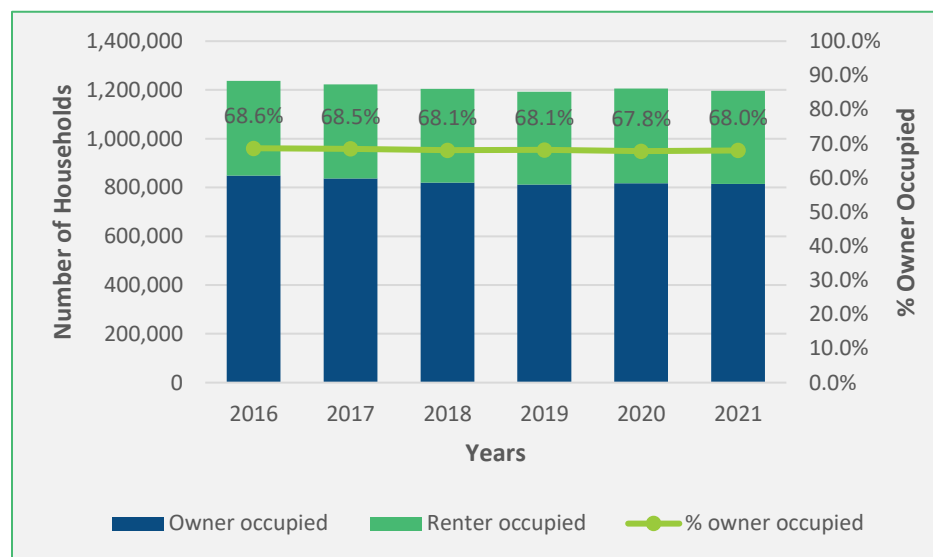
Figure 2.13: Puerto Rico Average Household Size and Number of People Per Household 2016-2021



Source: U.S. Census Bureau, 2016 to 2021 American Community Survey 5-year Estimates

Similar to household size, the number of occupied house units in Puerto Rico has been decreasing over the last couple of years. Figure 2.14 shows the tenancy profile in Puerto Rico. The Island had 1,196,790 occupied housing units in 2021, of which 68% were occupied by their homeowners. Island-wide, the percentage of household owners (homeownership rate) has been stable from 2016 to 2021, staying around 68%.

Figure 2.14: Puerto Rico Number of Housing Units and their Tenancy Profile 2016-2021

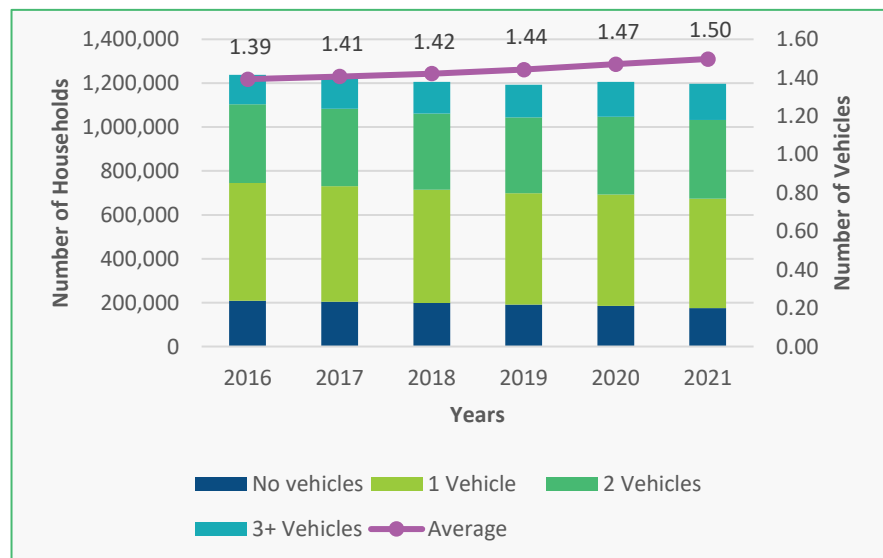


Source: U.S. Census Bureau, 2016 to 2021 American Community Survey 5-year Estimates

Vehicles per Household

Knowing the average number of vehicles per household can help analyse people’s commuting patterns and their propensity to use public transport or other sustainable modes of transportation. As shown in Figure 2.15, in Puerto Rico, almost all households have one (1) or two (2) vehicles and a very low percentage of them have three (3) or more vehicles. Nevertheless, the average number of vehicles has been increasing from 2016 (1.39 vehicles per household) to 2021, where each household had an average of 1.50 vehicles.

Figure 2.15: Number of Vehicles Per Household 2016-2021



Source: U.S. Census Bureau, 2016 to 2021 American Community Survey 5-year Estimates

Median Household Income

The median household income is one of the best indicators of how the economy in a region is behaving. This indicator, compared with the cost of living will also help infer how the spending patterns of families and individuals will be on basic goods and services, considering that the type of expenses will depend on the income available. Puerto Rico’s median household income has been increasing, from \$19,606 in 2016 to \$21,967 in 2021. The increase in median household income is a good economic indicator for the Island and for each region, as households are now able to spend more in goods and services. Nevertheless, this indicator should be analysed with caution and compared to the cost of living in a particular region to verify if people’s purchasing capacity has effectively increased.

Figure 2.16: Median Household Income 2016-2021 (current dollars)

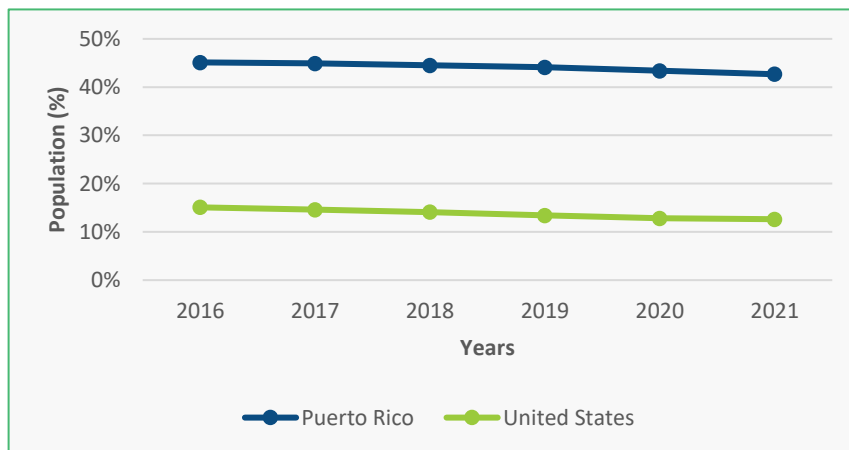


Source: U.S. Census Bureau, 2016 to 2021 American Community Survey 5-year Estimates

Poverty

The poverty levels in Puerto Rico have been decreasing since 2016. Figure 2.17 shows the population that is below the poverty threshold established by the U.S. Census Bureau each year according to household size and related children under 18 years. The data from Figure 2.17 shows that Puerto Rico's population under the poverty levels was around 45% on 2016 and 43% for 2021. On the contrary, United States' population below poverty levels was only 15% on 2015 and decreased to 12% on 2021.

Figure 2.17: Poverty Levels in Puerto Rico and U.S. 2016-2021



Source: U.S. Census Bureau, 2016 to 2021 American Community Survey 5-year Estimates

Our Economy: Gross Domestic Product (GDP)

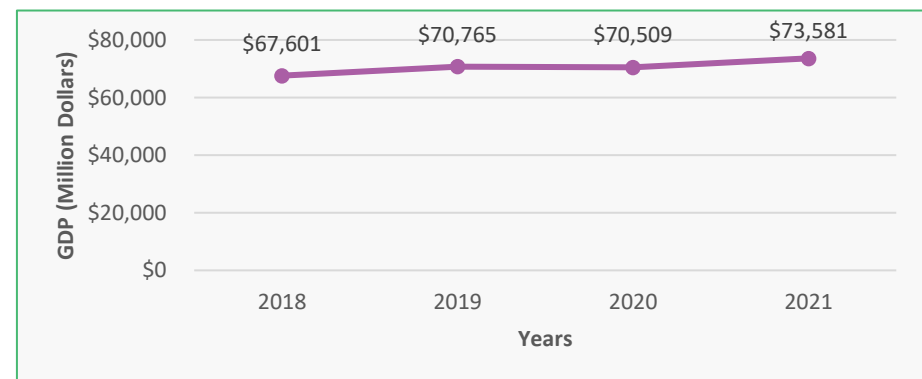
In terms of the Economy, it is important to review the historical data to understand the different trends in the Island. Economic performance has a big impact on sociodemographic trends in a specific region and can help forecast how different services will be provided in the short-, middle- and long-term. The GDP and employment trends will be discussed in this section.

Gross Domestic Product

GDP is the world's most widely used macroeconomic indicator that reflects economic movement, as it is the most comprehensive measure of an economy's output of goods and services in a year.

Over the last couple of years, GDP in Puerto Rico has had a general tendency to increase since 2018, as shown in Figure 2.18. At current prices for 2018 GDP was \$67 billion, which continued to increase in 2019, a slight decrease in 2020, and then a final increase in 2021.

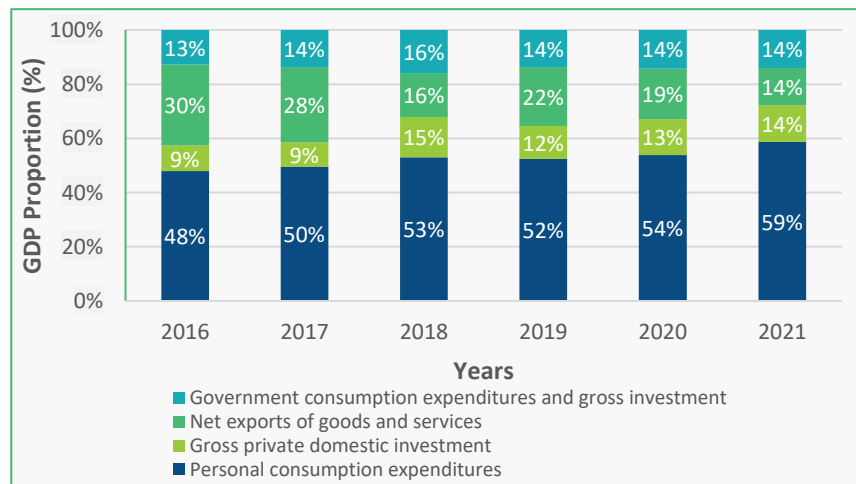
Figure 2.18: Puerto Rico GDP 2018-2021 in Millions of Current Dollars



Source: Economic Report to the Governor 2016 and 2021, Planning Board. The graph uses the data from 2018-2021.

GDP is composed of i) personal consumption expenditures, ii) gross private domestic investment iii) net exports of goods and services, and iv) government consumption expenditures and gross investment. As Figure 2.19 shows, more than 50% of GDP is composed by the consumption of goods and services (shown by the series “personal consumption expenditures” in blue), which has been increasing throughout the years. In the same way, both net exports and government investment have been decreasing the share of GDP composition from 2016 to 2021.

Figure 2.19: GDP Composition 2016-2021

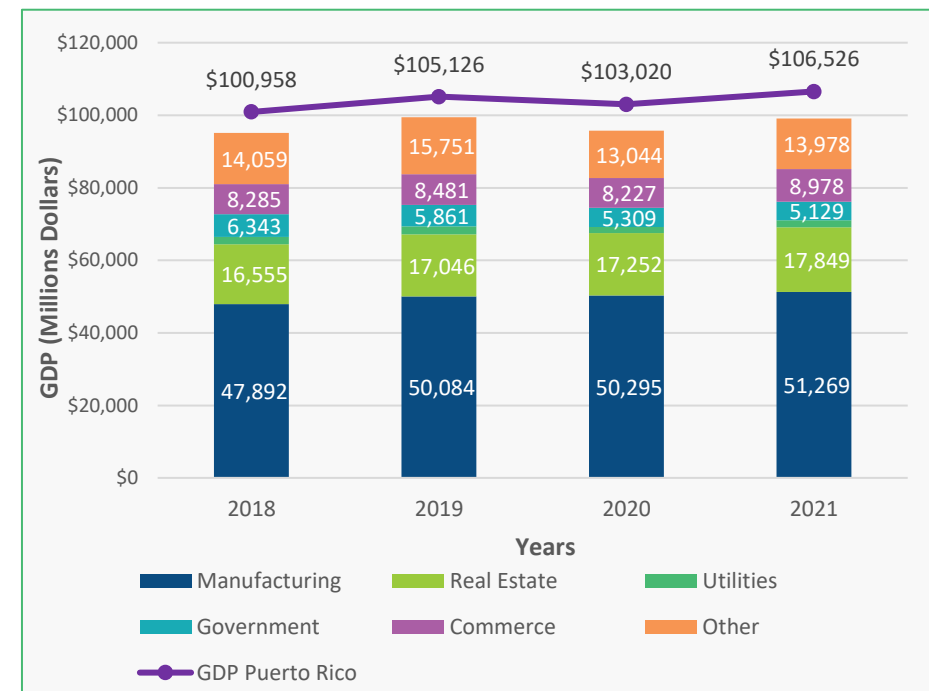


Source: Bureau of Economic Analysis, 2023

From the goods and services consumed, the five industries that have a larger share of GDP are manufacturing, real estate, utilities, commerce, and government expenditures. In general, all industries increased in line with GDP, specially manufacturing, that corresponds to 48.1% of the industrial sector in the Island.

In nominal terms, GDP totaled \$106,526 million in 2021, reflecting an increase of \$3,505 million or 3.4% compared to \$103,020 million in 2020, as shown in Figure 2.20.

Figure 2.20: Puerto Rico GDP 2018-2021 in Millions of Current Dollars



Source: Economic Report to the Governor 2016 and 2021, Planning Board. The graph uses the data from 2018-2021.

Agriculture, specifically, used to constitute the most significant source of economic activity of the Island. Bananas, coffee, oranges, roots, tobacco, and tubers constituted the main crops cultivated in the Island. However, in the 1960s the government geared the local economy toward a manufacturing and petrochemical industry, to improve the extreme poverty levels of the population⁵. This resulted in a constant and prolonged reduction of the agricultural output while benefiting the establishment of new manufacturing facilities. Until this date, it keeps being the case, since the manufacturing and large industrial sector constitutes a 48% of GDP.

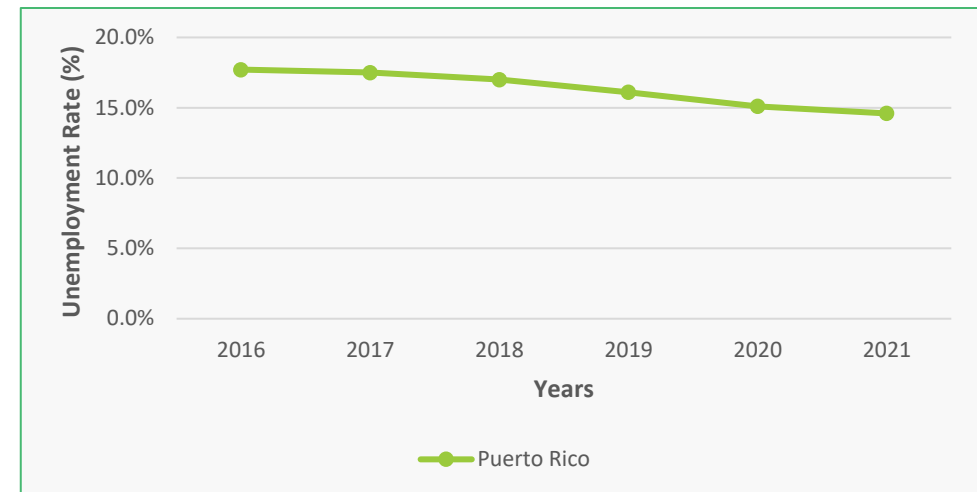
Nevertheless, a slow return of the agriculture industry is being observed, but this time with the advantage of modern agricultural practices, such as hydroponics, which help to maximize the use of available lands. As per data from the University of Puerto Rico in Mayagüez⁶, the Island imports more than 80% of the food that is consumed. Bananas, coffee, plantains, mangos, and other high value specialty items such as mushrooms, lettuce, and tomatoes are currently the most consumed agricultural products. In addition, dairy production and other livestock products provide other streams of agricultural income, especially in the north-northwestern area of the Island.

Employment

According to the U.S. Census Bureau, American Community Survey for 2021, Puerto Rico had a labor force of 44.3%. There has been an Island-wide increasing trend in employment statistics, and a decreasing trend in unemployment rates from 2016 to 2021, as shown in Figure 2.21.

The general trend in the Island is also the case for employment in the different regions and municipalities. In general, employment has increased while unemployment has decreased. The most notable increase in employment is reflected in the municipality of Aguas Buenas (38.6%) and the most notable decrease happened in the Municipality of Vieques (-30%). This is outlined in more detail in the 2050 MLRTP's Regional documents of the San Juan TMA, Aguadilla TMA, and the Other Urbanized Areas. The same documents outline that, regarding unemployment rate, the most notable increase is reflected in the Municipality of Las Marías (142.9%) and the most notable decrease in the Municipality of Maricao (-78.9%).

Figure 2.21: Puerto Rico Unemployment Rate 2016-2021



Source: U.S. Census Bureau, American Community Survey 2016 to 2021 5-Year Estimates

Figures 2.22 and 2.23 show the employed population and unemployment rate for 2021 in each municipality.

5. Ruiz Toro, Juan (n.d). Puerto Rico's Operation Bootstrap. Modern Latin America Chapter 12. Strategies for Economic Development. Providence: Oxford University Press. Retrieved from: <https://library.brown.edu/create/modernlatinamerica/chapters/chapter-12-strategies-for-economic-developmen/puerto-ricos-operation-bootstrap/#:~:text=By%201967%2C%20it%20estimated%20that,in%20less%20than%20twenty%20years.> On September, 2023.

6. Mariam Ludim Rosa. 2020. La vulnerable seguridad alimentaria de la isla.

Figure 2.22: Puerto Rico Employment 2021

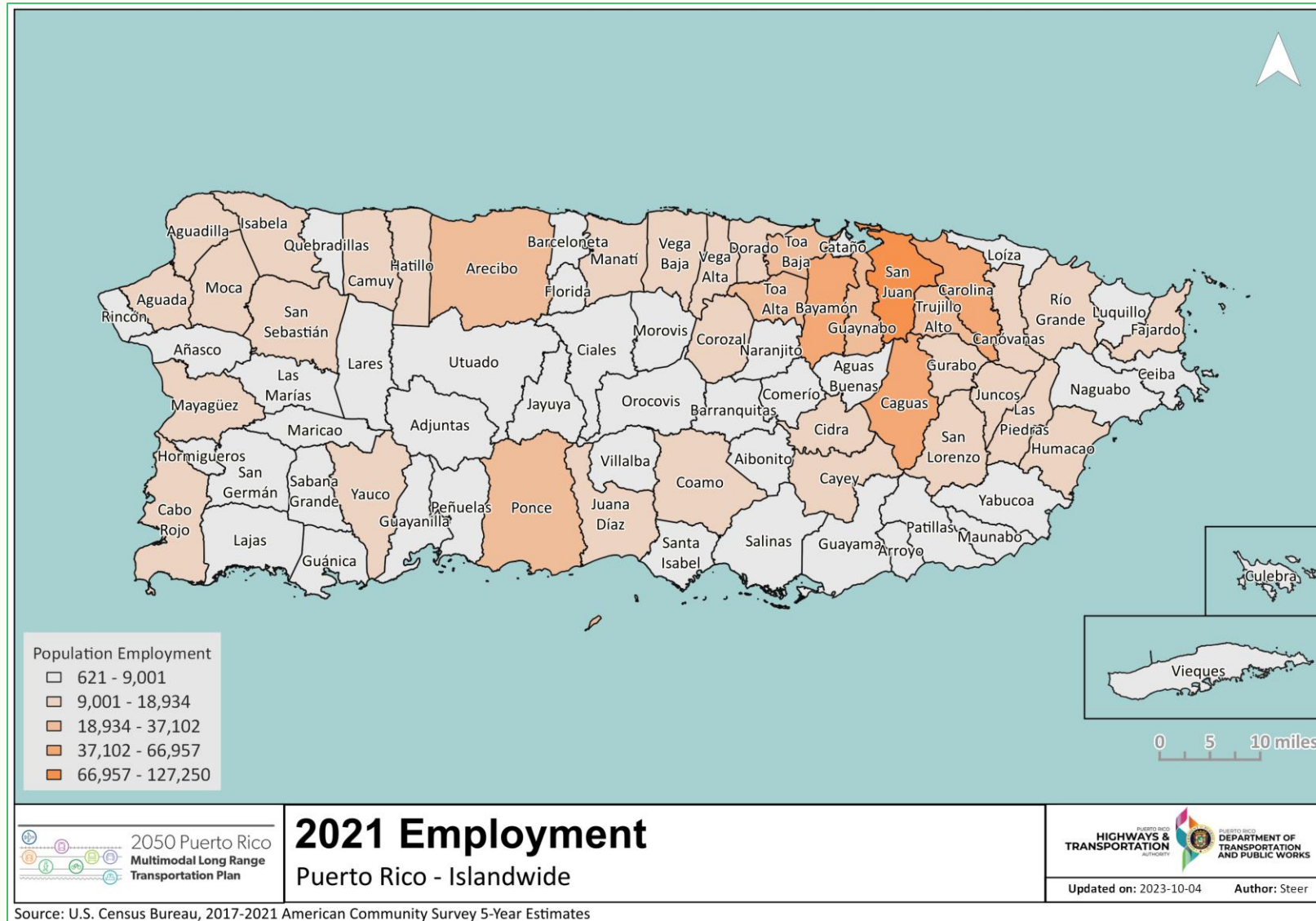
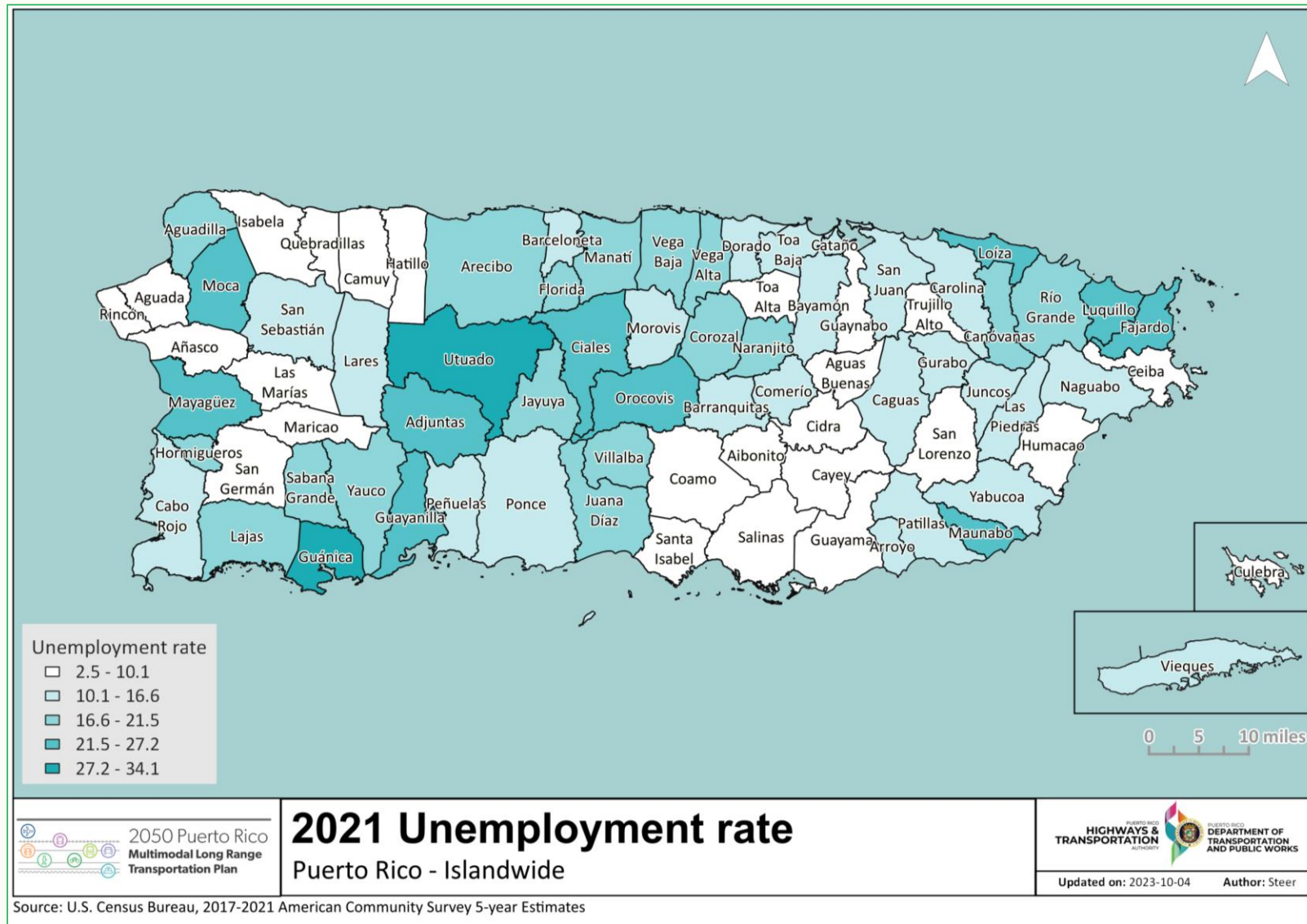


Figure 2.23: Puerto Rico Unemployment Rate 2021

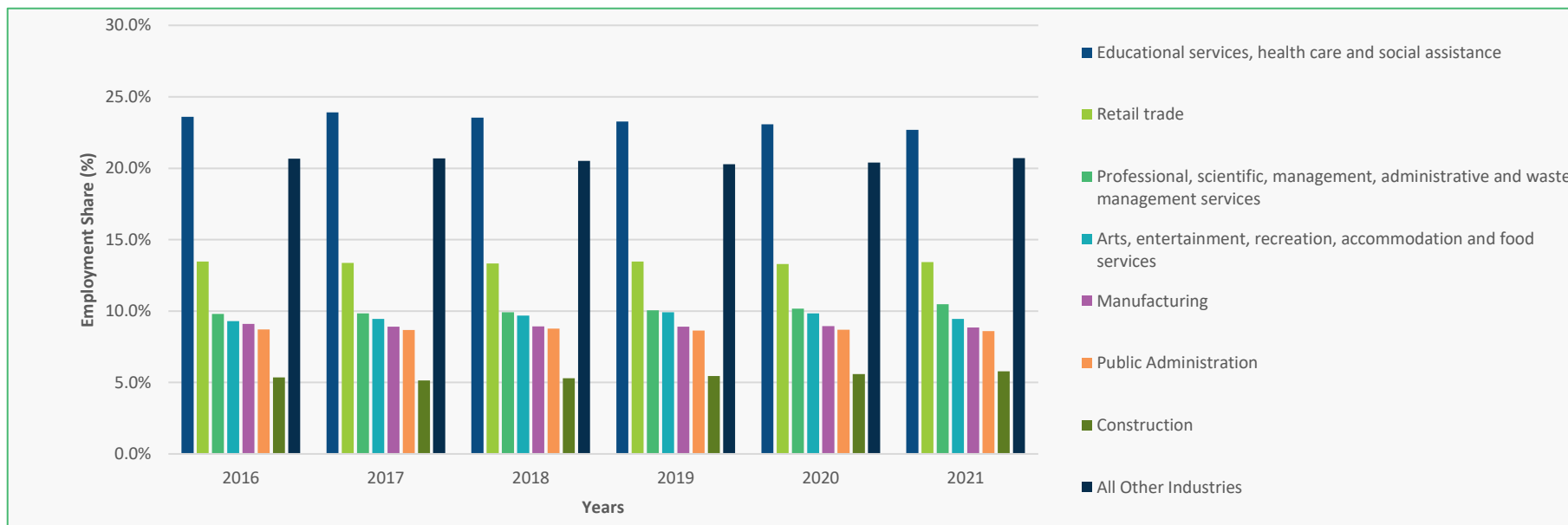


As shown in Figure 2.24 two (2) main industries generate around 36% of employment in the Island, these are: Educational services, health care and social assistance; and Retail Trade. These two industries are followed by Professional, scientific, management, administrative, and waste management industry; Arts, entertainment, recreation, accommodations, and food services; and Manufacturing.

As it was discussed, agriculture used to be the industry that generated the largest share of the GDP, as well as employment. Nevertheless, as of 2021, it is one of the smallest industries, generating the lowest share of employment (1.3%)⁷.

The share of employment among industries also varies on each region. As shown in Figure 2.25 each region generates employment in different industries. The five biggest employers are within the industries of: Educational services, health care and social assistance; Retail trade; Manufacturing; Public administration; and Arts, entertainment, recreation, accommodation and food services. The differences between regions responds to the geographic location of different industries. On the San Juan TMA there is more variety in terms of employment share, which is explained mainly by the size of this region and its heterogeneity. On the East TPR the industry is related to food and accommodation services due to the touristic interest, while at the Southwest-South TPR is predominant the manufacturing based on the number of factories located in the area.

Figure 2.24: Puerto Rico Employment Share Per Industry 2021

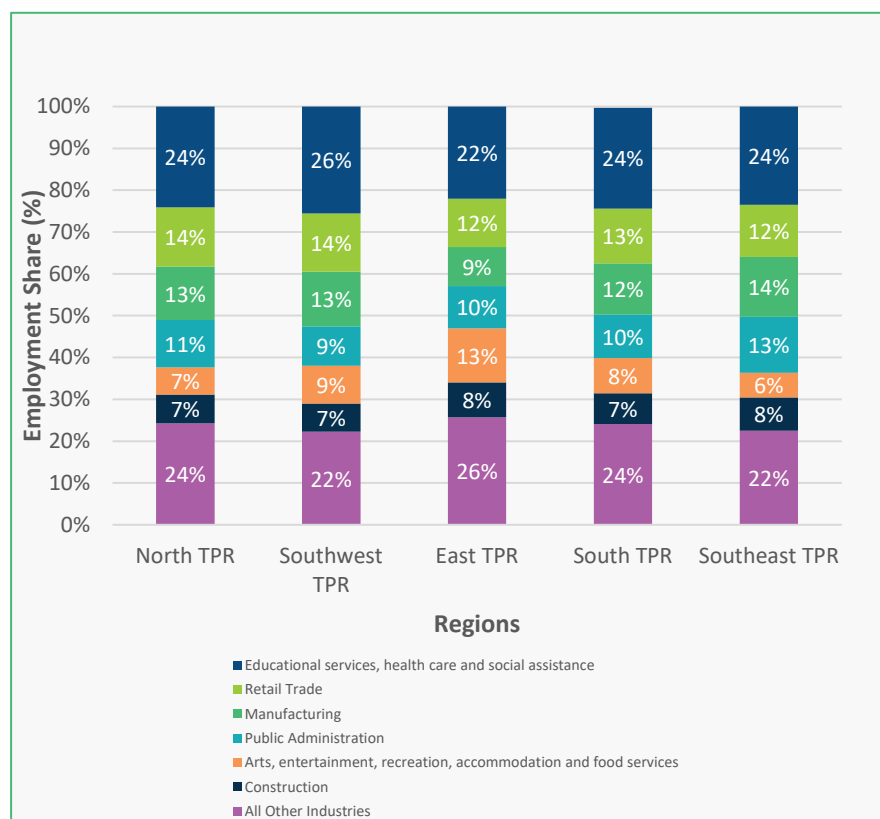


Source: U.S. Census Bureau, American Community Survey 2016 to 2021 5-Year Estimates

7. This number is very small to be shown in the graph. It is included as part of "Other".

In general, all industries have a predominance of educational services, health care and social assistance, followed by retail trade. The graph shows the biggest industries in terms of employment share, and then groups all other industries that are very small as “All Other”⁸.

Figure 2.25: Employment by Industry in Puerto Rico MPO Regions



Source: U.S. Census Bureau, American Community Survey 2016 to 2021 5-Year Estimates

Situations Affecting our Home

Due to the geographical location of Puerto Rico, the Island has been affected by major natural disasters, mainly hurricanes and earthquakes. Hurricane Irma and María in 2017 had a big impact in the Island's socio economic and demographic situations and were one of the main causes for Puerto Rico's current economic crisis represented by still high unemployment poverty rates. Then the earthquake swarm at the end of 2019 and beginning of 2020 created a more vulnerable situation for Puerto Ricans, followed by the COVID-19 pandemic. This chapter aims to describe the effects of certain natural events that explain the situations affecting the socio-demographics in the Island, specifically the earthquake swarm and the COVID-19 pandemic during 2020.

Natural Disasters

Puerto Rico lies in a tectonically active region where earthquakes have occurred for centuries. Earthquakes and tsunamis in Puerto Rico and adjacent islands are primarily driven by the convergence of the North American tectonic plate with the Caribbean tectonic plate, the section of the Earth's crust on which the islands are located. The rate these plates come together is about twenty millimetres a year. Puerto Rico's rocky island crust and its surrounding seafloor are located between the two tectonic plates mentioned before. The two plaques may move abruptly to relieve the stress, causing earthquakes⁹.

After being hit by two hurricanes, María, and Irma in 2017, Puerto Rico was struck by an earthquake swarm (11 earthquakes magnitude 5 or greater) at the end of 2019 and the beginning of 2020¹⁰. This led Governor Wanda Vázquez to declare a state of emergency on January 7, 2020, to allocate funding to mitigate the effects of the earthquake. About 33 municipalities were part of the declaration of the state of emergency¹¹.

8. All Other Industries includes: Agriculture, forestry, fishing hunting, and mining; Wholesale Trade; Transportation, warehousing, and utilities; Information; Finance, insurance, real estate, rental and leasing; Professional, scientific, management, administrative and waste management services; Other services, except public administration

9. U.S. Geological Survey. 2020. As Aftershocks Continue in Puerto Rico, USGS Supports Quake Recovery. Retrieved from <https://www.usgs.gov/news/aftershocks-continue-puerto-rico-usgs-supports-quake-recovery>.

10. Center for Disaster Philanthropy (December 2020). Puerto Rico Earthquakes. Retrieved from: <https://disasterphilanthropy.org/disasters/puerto-rico-earthquakes/>.

11. Oficina Central de Recuperación, reconstrucción y Resiliencia – COR3 (n.d). Respuesta a los Terremotos. Retrieved from <https://recovery.pr.gov/es/respuesta-a-los-terremotos> on September 26, 2023.

After the event, about 3,000 homes were destroyed and 5,000 people had to refuge in public centers¹². Public infrastructure was also impacted as it left residents on the Island without water and power for about a week. The earthquake also generated landslides that damaged roads and public transportation. Three (3) regions (West, South, and Central) suffered the biggest infrastructure impacts in terms of roads, bridges, schools, and general properties that were damaged. Nevertheless, the whole Island suffered major electric and water shortages¹³. As of 2023, there are still various schools that have not been completely repaired or updated to comply with seismic standards.

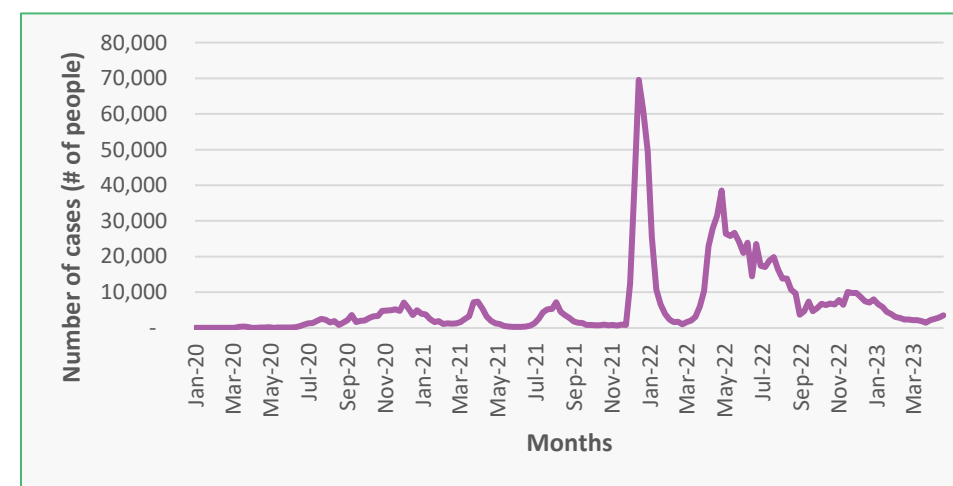
The United States Federal Government, through FEMA, allocated more than \$104 million dollars for disaster assistance to help fuel the recovery of Puerto Rico residents and businesses that suffered damage from the earthquake swarm¹⁴.

COVID-19

Months after the earthquake swarm, the COVID-19 virus appeared in the international scene. The COVID-19 pandemic affected Puerto Rico in similar ways as it did to other regions and countries around the world. In March 2020, Puerto Rico's administration declared the state of emergency due to the arrival of the virus to the Island¹⁵. The state of emergency included measures such as temperature check of all persons at all ports of entry, social distancing guidelines, lockdowns, quarantine, and curfews, some of the strictest and longest in the United States¹⁶.

At the beginning of these measures, Puerto Rico recorded a small number of cases and had no reported deaths, which was better compared to other jurisdictions. Figure 2.26 shows the number of weekly cases reported in Puerto Rico until May 2023, when the COVID-19 was finalized as a public health emergency in the United States. As it shows, there was a peak of cases around January 2022 and that number declined in the later months.

Figure 2.26: Weekly New COVID-19 Cases in Puerto Rico



Source: Center for Disease Control and Prevention (CDC) COVID-19 Response

12. Agencia EFE (January, 2020). Cerca de 5,000 refugiados a casi una semana del terremoto del 7 de enero. Primera hora. Retrieved from: <https://www.primerahora.com/noticias/puerto-rico/notas/cerca-de-5000-refugiados-a-casi-una-semana-del-terremoto-del-7-de-enero/>.

13. Anónimo (January, 2020). Terremoto en Puerto Rico: Aprendiendo de las comunidades y apoyando su labor. Migrant Clinician. Retrieved from: <https://www.migrantclinician.org/es/blog/2020/ene/terremoto-en-puerto-rico-aprendiendo-de-las-comunidades-y-apoyando-su-labor.html>.

14. FEMA (March, 2021) La asistencia federal por desastre para los terremotos de Puerto Rico supera los \$104 millones. Retrieved from: <https://www.fema.gov/es/press-release/20210318/federal-disaster-assistance-puerto-rico-earthquakes-tops-104-million>.

15. Atilés Osoria, Jose (2021). The COVID-19 Pandemic in Puerto Rico: Exceptionality, Corruption and State-Corporate Crimes. State Crime Journal, 2021, Vol. 10, No. 1, pp. 104-125. Retrieved from: <https://www.jstor.org/stable/10.13169/statecrime.10.1.0104>

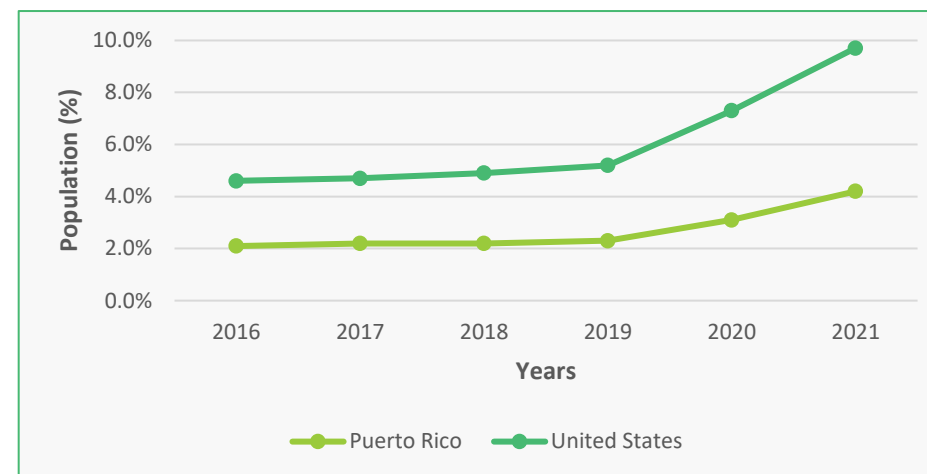
16. Perez Semanaz, Sofia (November, 2020). The Impact of the Covid-19 Pandemic in Puerto Rico. American University Washington. Retrieved from: <https://www.american.edu/cas/news/catalyst/covid-19-in-puerto-rico.cfm#:~:text=Puerto%20Rico%20has%20been%20hit,Ricans%20applied%20for%20unemployment%20benefits.>

Some of the reasons why the virus did not widespread in the Island at the same rate as in other territories had to do with several measures and behaviors adopted by Puerto Ricans. Some of these reasons are:

- Health care administrators in Puerto Rico are used to doing more with limited resources. In this case, Puerto Rico was provided with equal health care funding from the U.S. government which provided more resources that were executed in the most efficient way¹⁷.
- The health care administrators in Puerto Rico are trained in public health which allowed them to manage health care facilities with a public health mindset that would provide the best results¹⁸.
- The discussion around vaccines and masks was not politicized and were perceived as the fastest way to return to normal life¹⁹.
- Poor urban infrastructure, lack of good and connected public transport and urban sprawl were a strength during the pandemic. For example, residents prefer driving as their mode of transportation, which facilitated physical distancing²⁰. Nevertheless, it was also a weakness for the people that did not have any other option than public transit, which exposed them more to the virus.
- Effective working from home arrangements from different companies, as it was suggested on Executive Orders and international guidelines. This increase is in line with the trends in the U.S.

Figure 2.27 shows the increase in the patterns of working from home. From 2016 to 2019 the percentage of people working from home did not exceed 2.5%. During 2020 this percentage increased to 3.1% and then 4.2% in 2021. This increase is in line with the trends in the U.S.

Figure 2.27: Working from Home Puerto Rico and U.S. 2016-2021



Source: U.S. Census Bureau, American Community Survey 2016 to 2021 5-Year Estimates and 2010-2016 5-Year Estimates

17. Bathija, P. & Resnick, J. (2022). Digging into the Reasons for Puerto Ricos's Successful COVID-19 Response. American Hospital Association. Retrieved from: <https://www.aha.org/news/blog/2022-07-22-digging-reasons-puerto-ricos-successful-covid-19-response>.

18. Bathija, P. & Resnick, J. (2022). Digging into the Reasons for Puerto Ricos's Successful COVID-19 Response. American Hospital Association. Retrieved from: <https://www.aha.org/news/blog/2022-07-22-digging-reasons-puerto-ricos-successful-covid-19-response>.

19. Bathija, P. & Resnick, J. (2022). Digging into the Reasons for Puerto Ricos's Successful COVID-19 Response. American Hospital Association. Retrieved from: <https://www.aha.org/news/blog/2022-07-22-digging-reasons-puerto-ricos-successful-covid-19-response>.

20. Perez Semanaz, Sofia (November, 2020). The Impact of the Covid-19 Pandemic in Puerto Rico. American University Washington. Retrieved from: <https://www.american.edu/cas/news/catalyst/covid-19-in-puerto-rico.cfm#:~:text=Puerto%20Rico%20has%20been%20hit,Ricans%20applied%20for%20unemployment%20benefits>.

Considering that many companies and jobs have shifted towards a hybrid scheme, the percentage of population working from home might increase. This will most probably modify the travel patterns from and to work in the next couple of years.

Puerto Rico had been on an economic recession since 2010, which was increased by hurricanes, earthquakes and finally, the COVID -19 pandemic²¹. The decline on GNP, Gross National Product (GNP), employment rates and general population decline are the visible consequences of the economic crisis in the Island²². Even so, Puerto Rico's Economic Activity Index decreased from 122.1 in February 2020 to 110.1 in June 2020²³, more than 30,000 jobs were lost and around 1,400 businesses closed²⁴. This has led experts to say that Puerto Rico's GNP will not be expected to grow in over the next five years²⁵.

The latter more critical, considering the population in Puerto Rico is declining and aging, due in great part to the migration of people to mainland U.S. This situation leaves the Island with less population capable of working, which is translated in a productivity loss. Covid-19 as well as natural disasters occurring in the Island (hurricanes and earthquakes) have increased the occurrence of this migration out of the Island²⁶.

Our Environment: Land Use, Environmental Sensitive Area, and Natural Hazards

Land Use

Development and Urbanization

Puerto Rico's population has been on a steady decline during the past 20 years following economic recessions and as an effect of the hurricanes and earthquakes that have impacted the islands.

The U.S. Census Bureau publishes the urban areas based on the population and housing unit criteria from census blocks. This methodology has varied between decades. The changes in the urban areas are presented by overlapping the zones on the maps. From 2010 to 2020, the urban population from Puerto Rico has reduced by -13.6% of urban population, but also the percentage of urban population reduced to 91.9% of the total population from 93.8% in 2010. This shows that not only is the general population decreasing, but mainly the urban population, as defined by the U.S. Census Bureau. Figure 2.28 to Figure 2.30 show the urban areas in Puerto Rico from the year 2000 to the 2020.

21. Government of Puerto Rico. Department of Labor and Human Resources (n.d.) Puerto Rico Economic Analysis Report 2020-2021. Retrieved from:

[https://www.dol.gov/sites/dolgov/files/eta/Performance/pdfs/annual_economic_reports/2021/PR%20Economic%20Analysis%20Report%20FY%202020-2021%20\(00000002\)%20en%20pdf.pdf](https://www.dol.gov/sites/dolgov/files/eta/Performance/pdfs/annual_economic_reports/2021/PR%20Economic%20Analysis%20Report%20FY%202020-2021%20(00000002)%20en%20pdf.pdf).

22. Cheatham, A. & Roy, D. (2022). Puerto Rico: A U.S. Territory in Crisis. Council on Foreign Relations. Retrieved from: <https://www.cfr.org/background/puerto-rico-us-territory-crisis>.

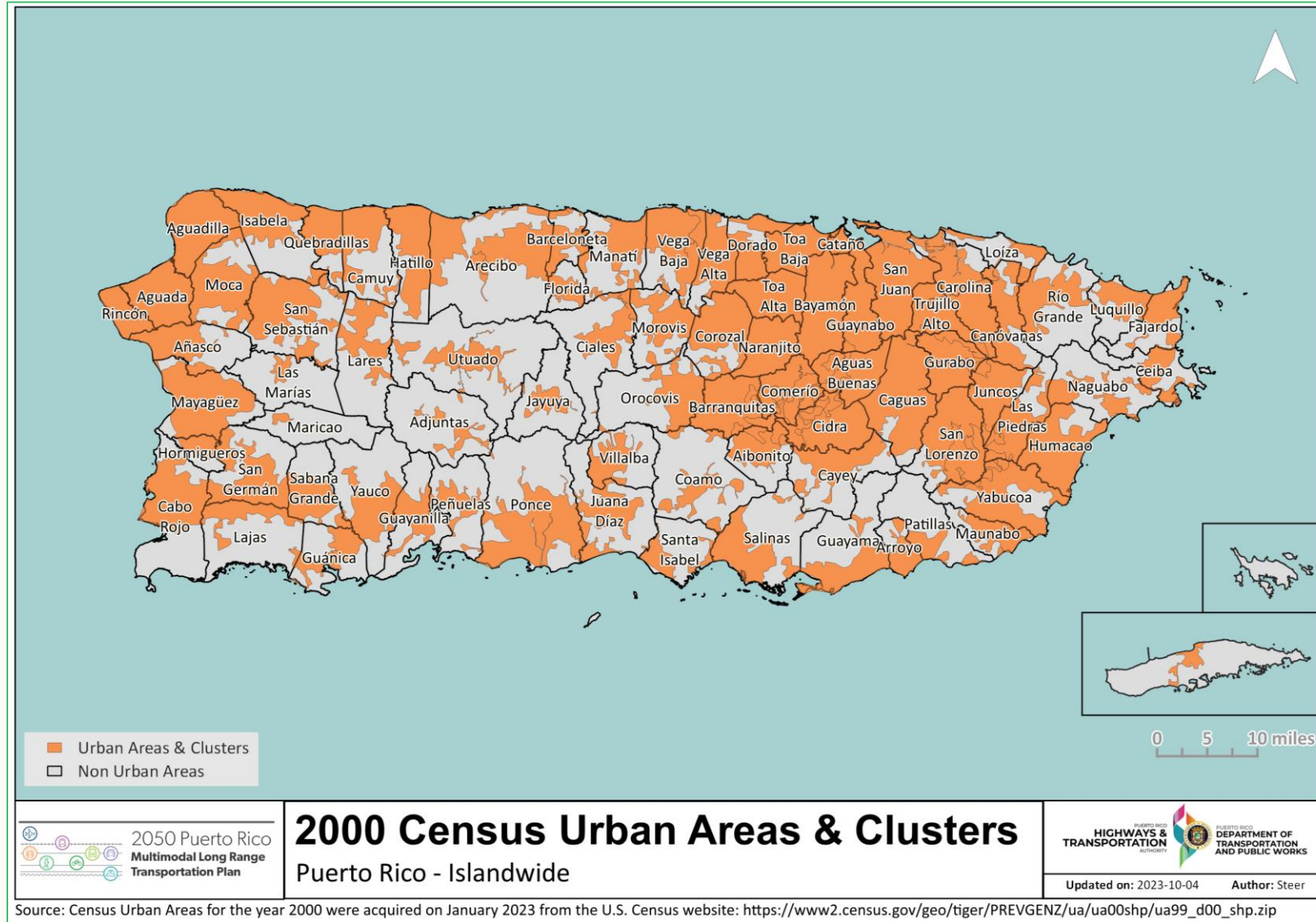
23. Marxuach, Sergio (September 2021). The Threefold Challenge to the Puerto Rican Economy. Center for a New Economy. Retrieved from: <https://www.cfr.org/background/puerto-rico-us-territory-crisis>.

24. Associated Press (May 2021) Puerto Rico Groans Under COVID Pandemic as Health, Economy Suffer. VOA News. Retrieved from: https://www.voanews.com/a/usa_puerto-rico-groans-under-covid-pandemic-health-economy-suffer/6205345.html.

25. Hernandez-Padilla, JA & Mendez-Piñero MI. (September 2020). Economic Impact of the COVID-19 Pandemic in Puerto Rico. Proceedings of the 9th Annual World Conference of the Society for Industrial and Systems Engineering, 2020 SISE Virtual Conference. Retrieved from: <http://ieworldconference.org/content/SISE2020/Papers/Hernandez-Padilla.pdf>.

26. Cheatham, A. & Roy, D. (2022). Puerto Rico: A U.S. Territory in Crisis. Council on Foreign Relations. Retrieved from: <https://www.cfr.org/background/puerto-rico-us-territory-crisis>.

Figure 2.28: Puerto Rico 2000 Urban Areas and Clusters



Land Use Patterns

Growth and urban development resulted historically in urban sprawl in the region and across the Island. Town centers were developed with the purpose of concentrate housing, jobs, businesses, and services for its population. This dynamic changed from urban centers to suburban developments which had significant impacts on the Island's land use patterns.

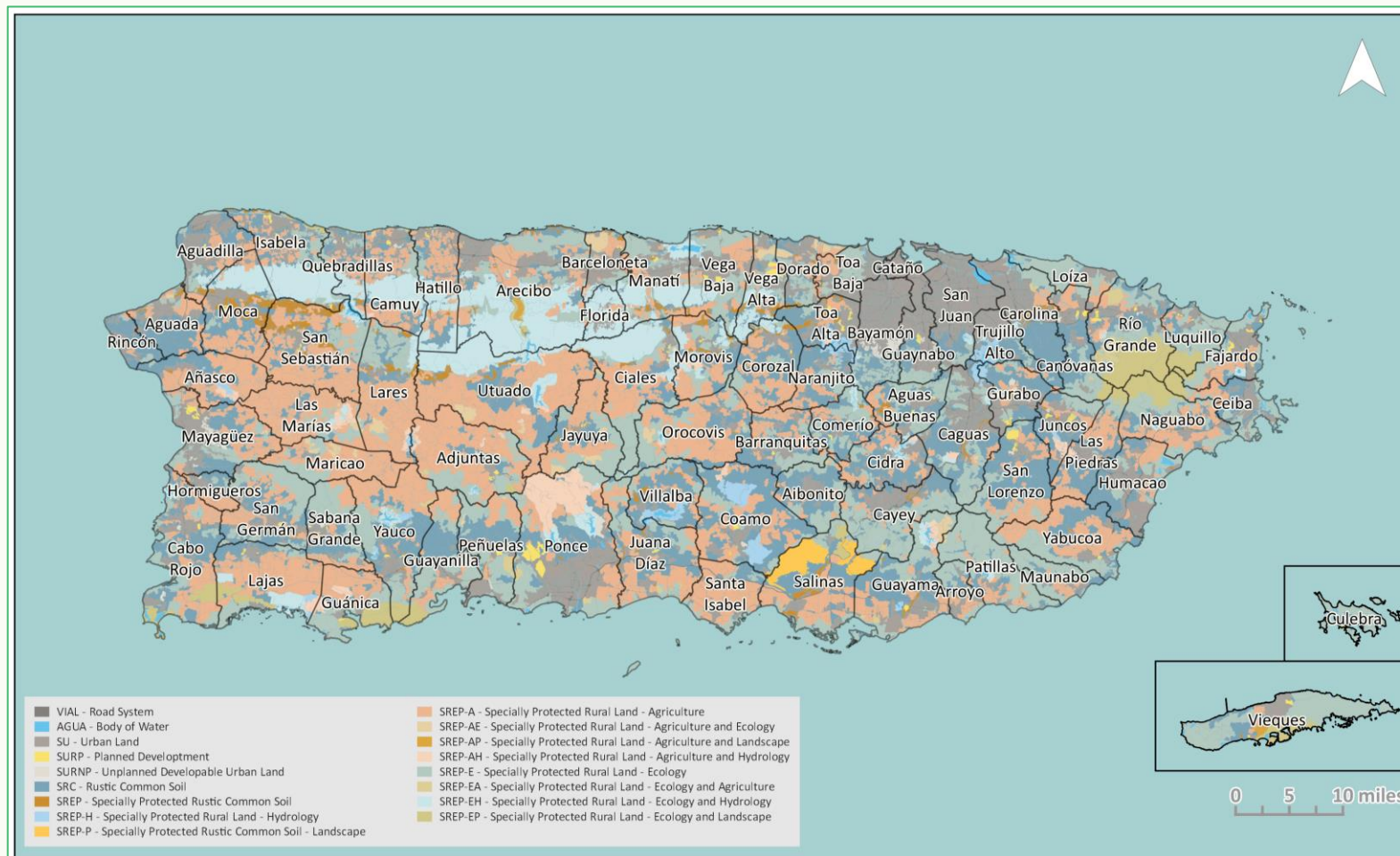
It is important to mention that the Puerto Rico Planning Board approved the first Land Use Plan for Puerto Rico in 2015 with the objective of establishing the public policy on the management of land use that allows to maximize the potential of the Puerto Rican soil within a framework that guarantees the protection of natural resources and sustainable development. It is the framework that guides the public policy on land use for Puerto Rico.

As that Land Use Plan for Puerto Rico hasn't been updated since the approval, we could use as reference the information available on the past version of this document, the 2045 LRTP.



Source: Steer, 2023

Figure 2.31: Puerto Rico Land Uses



2050 Puerto Rico
Multimodal Long Range
Transportation Plan

Land Use

Puerto Rico - Islandwide

Updated on: 2023-10-04 Author: Steer

Source: Land Use layer provided by Puerto Rico Highway and Transportation Authority (ACT by its spanish acronym), the shapefile layer was created by the Puerto Rico Planning Board and was adopted on November 19, 2015.

Environmental Sensitivity Area

Puerto Rico covers a small land area with great diversity of natural resources and ecosystems. These features are a direct consequence of the sharp differences in ground elevations observed between the coastal plains and the central mountainous part of the Island. This variability in the topography, establishes the conditions for a variable rainfall pattern observed between the different regions, which in turn provides adequate conditions for biodiversity and different landscapes. The location of Puerto Rico within a tropical zone of the Caribbean Sea, in conjunction with its geologic characteristics, has resulted in the development and evolution of environmental resources of its own. In terms of physiography, the Island can be divided into three distinct physiographic provinces, which are:

- The Upland province
- The Northern Karst province
- The Coastal Plains province

Each exhibits a combination of tropical marine climate, temperature, topography, and rainfall conditions that have resulted in the development of biological and natural resources that are unique for each Region.

Coastal Plains

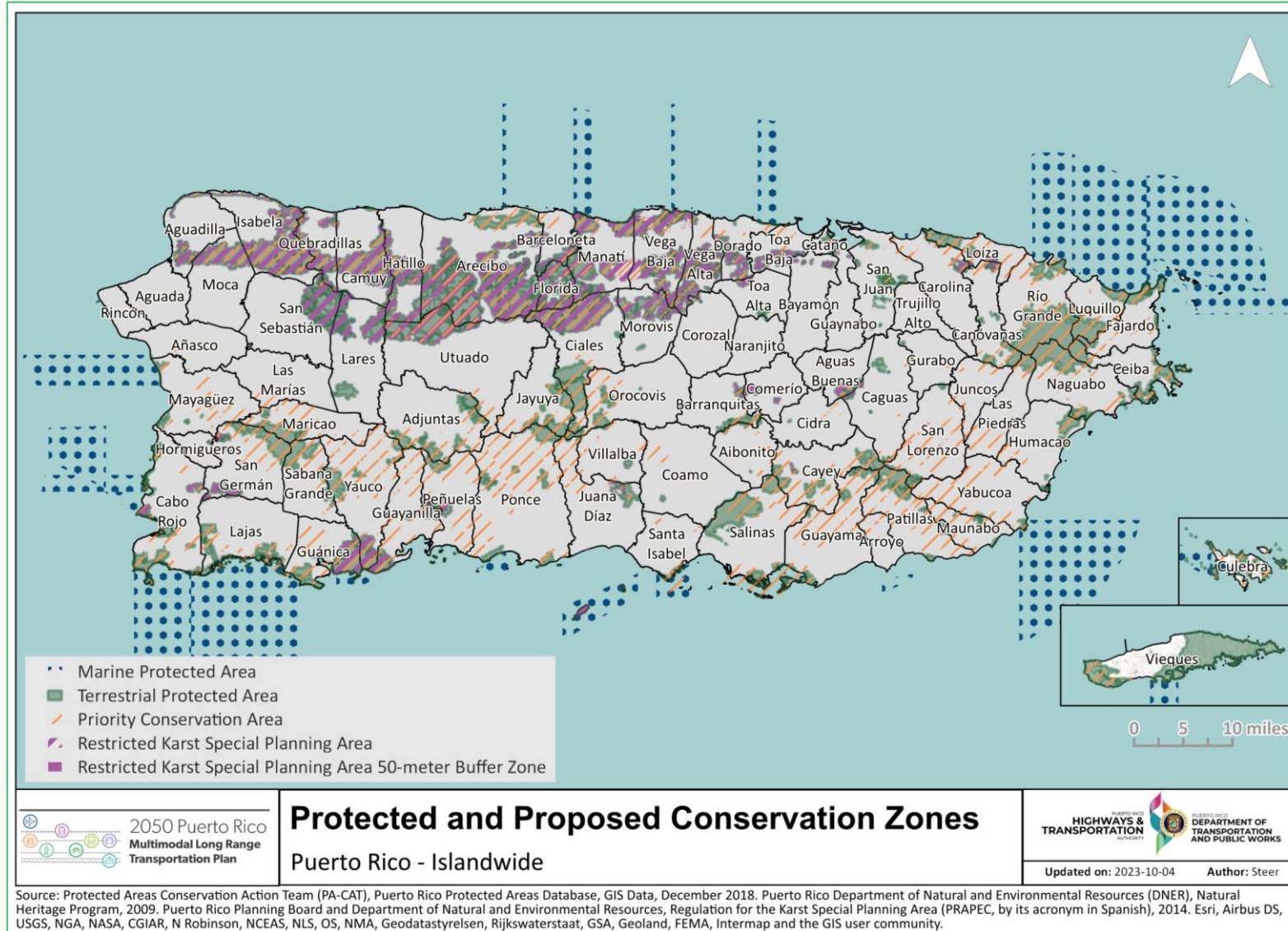
The second most common physiographic province of Puerto Rico is composed by the alluvial coastal plains that get formed from the erosion of the interior mountainous. Therefore, it shows mostly low elevations and are made up by sediments. The north plains extend from the northwestern corner of the Island up to the Río Grande de Loíza, in the northeastern corner, while the south plans extend from Ponce to Guayama. The north coastal plains band has a maximum width of 14 miles²⁷, while the south band extends to a maximum of approximately eight miles. Across these areas is possible to find environmental resources such as agricultural valleys, beaches, dry forest reserves, lagoons, mangrove forests, and wetlands.

Close to the coastal plains band, a significant and regulatorily protected karst system²⁸ is found, as shown in Figure 2.32. This area is formed by limestone rocks and is characterized by large-scale processes of breaking down and dissolution of rock.

27. U.S. Geological Survey. 1996. Atlas of Groundwater Resources in Puerto Rico and the U.S. Virgin Islands, Report 94-4198.

28. More information about the Karst or karstic formation in this region can be found in the 2045 Long Range Transportation for Puerto Rico.

Figure 2.32: Puerto Rico Protected and Proposed Conservation Zones



Mountains

The mountainous interior of Puerto Rico and its offshore islands are composed mainly of a mixture of volcanic and sedimentary rocks. It covers approximately a 60% of its entire surface. The Central Mountains range (Cordillera Central) is the main mountain range in Puerto Rico and crosses the island from west to east and divides the island into northern and southern coastal plains. It runs eastward from Maricao, in the west to Aibonito, in the central eastern region of Puerto Rico and on to the outskirts of the Sierra de Cayey. Sierra de Cayey is an extension of Cordillera Central that begins in the town of Cayey and runs eastwardly to Humacao. The Sierra de Cayey "extension" branches out into two lower ranges: Sierra Guardarraya and Cuchillas de Panduras which run eastward to Yabucoa and Patillas respectively.

There is an additional Cordillera Central eastern branch, Sierra de Luquillo, which runs northeastwardly from Gurabo to Fajardo and includes several high peaks, including Toro Hill, at 3,524 ft. (1,074 m), El Yunque at 3,494 ft. (1,065 m) and El Pico Oeste at 3,446 ft. (1,056 m). El Yunque forest is the only Tropical Forest Reserve under the jurisdiction of the U.S. Forest Service.

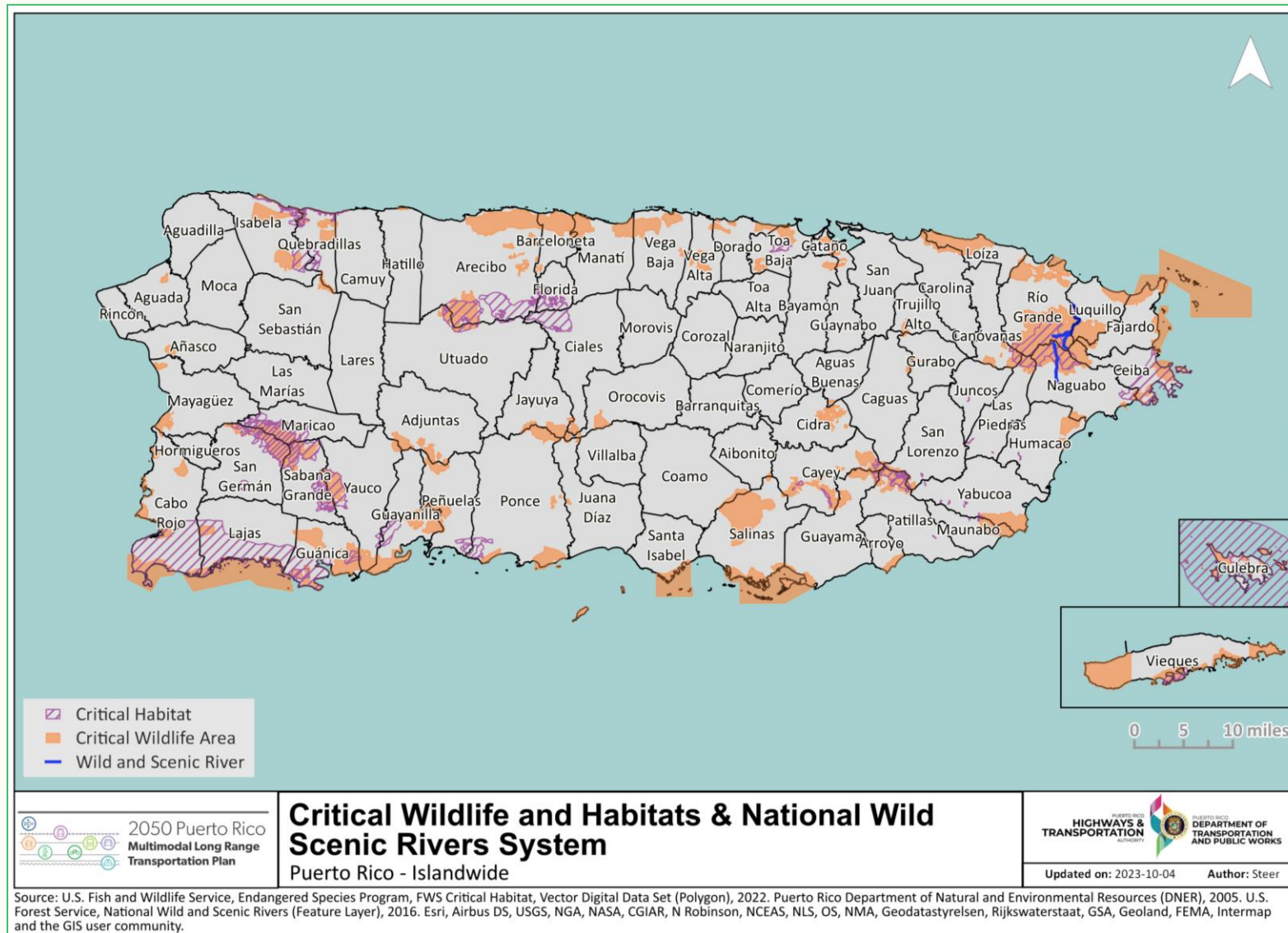
Important environmental resources located within this Region are agricultural lands, caves, extensive forestland, landslide prone slope areas, and springs. Extensive tropical vegetation and fauna are observed in most of the rural areas of this Region. These natural assets from the mountainous interior of Puerto Rico, as well as other assets like scenic, archaeological, cultural recreational and historic can be enjoyed by users of the Panoramic Route, which crosses the Island from west to east along the Central Mountain range.

Forest and Wildlife Preserves

The mountainous ranges of Puerto Rico with their abundant rainfall and exuberant flora and fauna species host several state forests reserves. Perhaps, the most known as El Yunque Caribbean National Forest that comprises approximately 28,000 acres of land and is nested in the Sierra de Luquillo Mountain range. It is the only tropical rainforest in US territory to be administered by the U.S. Forest Service. However, it is an area under preservation since 1876, when the Spanish crown set it aside for preservation. Even with this government protection, the area is being pressured in the past by attempts from private entities to develop nearby areas. These development efforts which may have resulted in negative impacts to the protected species that live within the forest efforts have been controlled by both the local and federal government agencies with the establishment of special zoning and planning requirement applicable to projects in municipalities that surround this forest.

In contrast to the mountainous forest system, the Guánica Dry Forest and the Cabo Rojo Wildlife Refuge are examples of important reserves located in the southwest corner of the Island, in south coastal plains. Many of these are protected areas under the Protected Areas Conservation Action Team (PA-CAT) or proposed for conservation by the Department of Natural and Environmental Resources through the Priority Conservation Areas. Some examples are Tres Picachos Commonwealth Forest, Rio Camuy Cave System, Caguana Indigenous Ceremonial Park, Vieques National Wildlife Refuge, among other protected areas.

Figure 2.33: Puerto Rico Critical Wildlife and Habitats & National Wild Scenic River Systems



Water Resources

Puerto Rico has a vast variety of water resources which are an important part of the Island's natural resources, including creeks, rivers, wetlands²⁹, lagoons, and groundwater, etc. Artificial reservoirs have also been developed to produce energy, to serve as water supply for consumption, flood control and recreation. Most of these sites have a biodiversity of fauna and flora as well as ecological importance.

These important resources are protected by local and federal regulations. Identifying these water bodies is essential, and databases such as the United States Fish and Wildlife Service's National Wetlands (USFWS) Inventory and the National Wild and Scenic Rivers System provide a visual representation of them (Figure 2.34).

Natural Hazards

The island of Puerto Rico is subject to numerous threats from natural hazards, including hurricanes, landslides, earthquakes, coastal and inland flooding, and freshwater scarcity, among others³⁰. These hazards must be taken into consideration when planning, designing, or constructing projects to prepare, mitigate, and adapt to these risks.

Hurricanes

Hurricanes are one of the most frequent natural hazards that Caribbean islands are prone to encounter. The frequency of storms and their intensity could increase with climate change³¹. Tropical storms and hurricanes have become more intense during the past 20 years. Although warming oceans provide these storms with more potential energy, scientists are not sure whether the recent intensification reflects a long-term trend. Nevertheless, hurricane wind speeds and rainfall rates are likely to increase as the climate continues to warm³².

These natural systems can also induce erosion, collision, flooding, and over wash in the transportation infrastructure. Hurricanes impacts are certainly an important consideration as they affect the island's natural resources such as coral reefs, coastal flooding, water resources, and ecosystems as well as direct or indirect effects on the economy, infrastructure, and people's health and safety.

Earthquakes

Puerto Rico lies in a tectonically active region where earthquakes have occurred for centuries. Earthquakes and tsunamis in Puerto Rico and adjacent islands are primarily driven by the convergence of the North American tectonic plate with the Caribbean tectonic plate, the section of the Earth's crust on which the islands are located. The rate these plates come together is about twenty millimetres a year. Puerto Rico's rocky island crust and its surrounding seafloor are squeezed between these tectonic plates. The rocks are naturally full of fractures and faults. Some of these faults may move abruptly to relieve the stress, causing earthquakes³³.

29. According to the U.S. EPA, wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season.

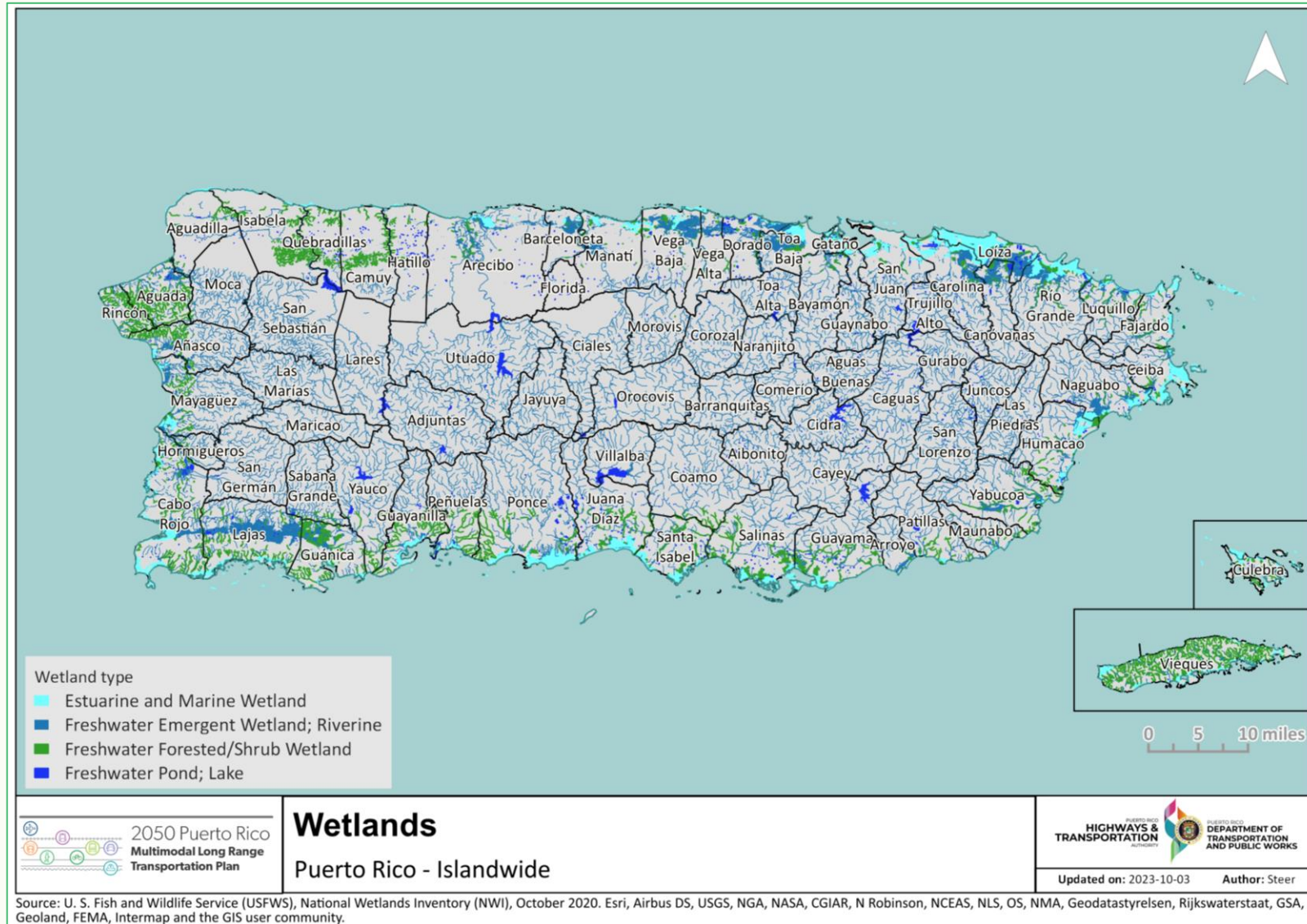
30. U.S. Geological Survey. Puerto Rico Natural Hazards. [usgs.gov](https://www.usgs.gov)

31. U.S. Geological Survey. Puerto Rico Natural Hazards: Hurricanes. [usgs.gov](https://www.usgs.gov)

32. Environmental Protection Agency. 2016. What Climate Change Means for Puerto Rico.

33. U.S. Geological Survey. 2020. As Aftershocks Continue in Puerto Rico, USGS Supports Quake Recovery. Retrieved from <https://www.usgs.gov/news/aftershocks-continue-puerto-rico-usgs-supports-quake-recovery>

Figure 2.34: Puerto Rico Water Resources



Landslides

Landslides are defined as a downward movement of earth, rock and organic material affected by gravity and influenced by the shape of the landform³⁴. Landslides can be observed in three (3) forms:

- **Rockfall:** downward movement of rock and/or soil that detach from steep or cliffs.
- **Flow:** Rapid displacement in which rock and/or soil combine with water to form a mixture that flows downslope.
- **Slide:** Detachment of rock and/or earth that usually occurs slowly along a surface.

Hurricanes like Maria and more recently Fiona has triggered thousands of landslides in Puerto Rico, affecting critical infrastructure across the island, disrupting roads, and dislodging houses from their foundations. Particularly hurricane Maria triggered over seventy thousand landslides. A data release produced by the USGS presents geospatial data describing the concentration of landslides generated by Hurricane María in Puerto Rico³⁵. The USGS used post-hurricane satellite and aerial imagery collected between September 26, 2017, and October 8, 2017, to visually estimate the concentration of landslides over nearly the whole territory. As shown in Figure 2.35, USGS Estimated Concentration of Landslides after Hurricanes Passage in September 2017 over Puerto Rico. Landslides are concentrated along the Central Mountain Range, coinciding to a large extent with the Panoramic Route and corresponding access roads.

Flooding

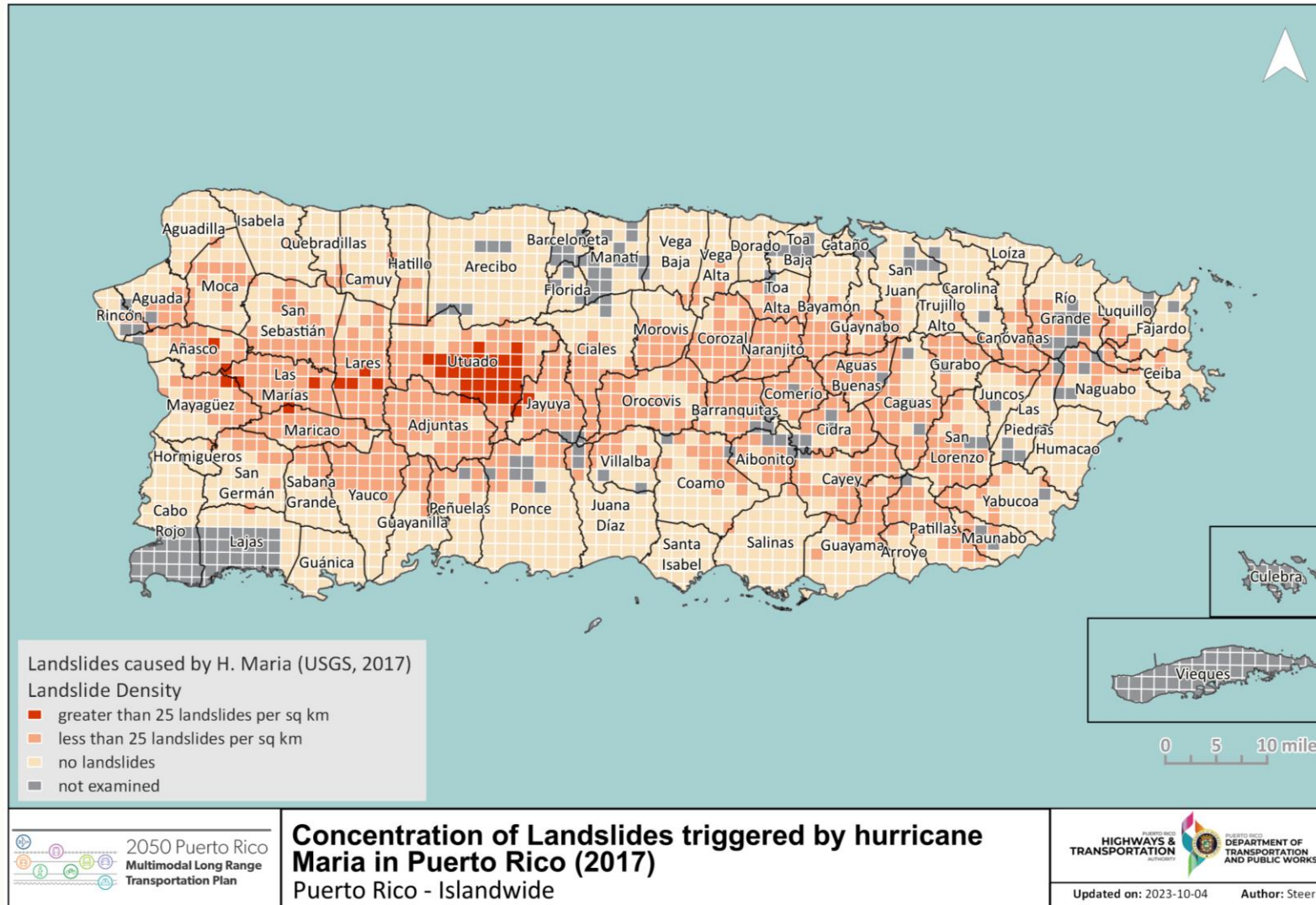
Flooding is when water overflows onto land or coast that were normally dry and is one of the most common natural-weather events. Flooding can happen during heavy rains, when rivers overflow, when ocean waves come on the shore, among other events. Flooding may be only a few inches of water, or it may cover a house to the rooftop. Floods that happen very quickly are called flash floods. Floods can cause power outages, disrupt transportation, damage buildings, and trigger landslides³⁶. Natural events affecting Puerto Rico led to coastal and inland flooding. As a result, flood zones maps have been developed in the last couple of years (starting on 2019) by the Federal Emergency Management Office (FEMA) to help identify areas prone to flooding and prepare for effects. Areas sensitive or susceptible to flooding in Puerto Rico are shown in Figure 2.36.

34. Puerto Rico Landslide Guide. 2020. (colorado.edu)2

35. Bessette, E. K., Coe, J. A., Godt, J. W., Kean, J. W., Rengers, F. K., Schulz, W. H., Baum, R. L., Jones, E. S., & Staley, D. M. (2017). October 25, 2017: Map data showing concentration of landslides caused by hurricane Maria in Puerto Rico. United State Geological Survey.

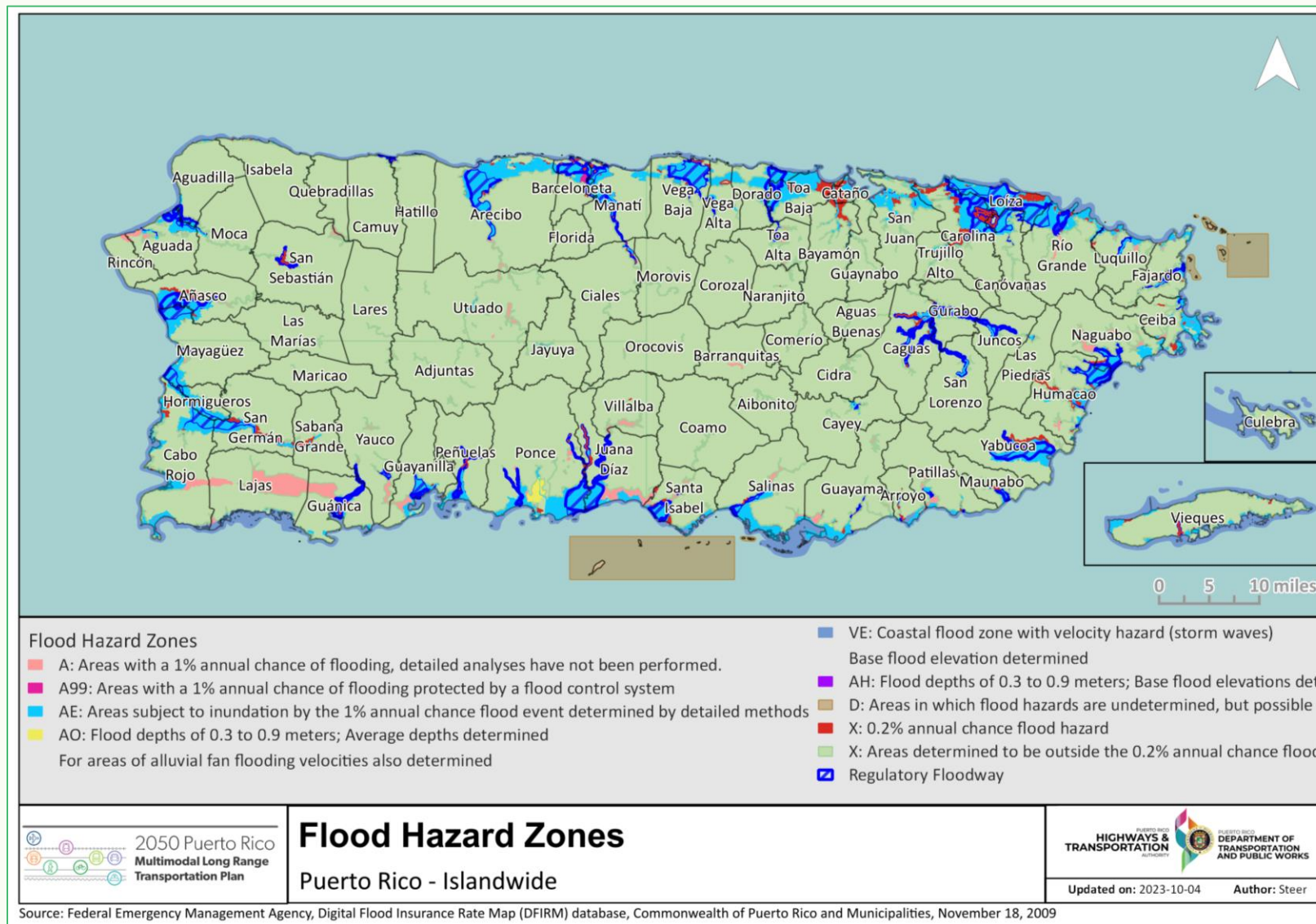
36. Federal Emergency Management Agency. Puerto Rico Flood Map.

Figure 2.35: Landslides Zones in Puerto Rico



Source: Bessette-Kirton, E.K., Coe, J.A., Godt, J.W., Kean, J.W., Rengers, F.K., Schulz, W.H., Baum, R.L., Jones, E.S., and Staley, D.M., 2017, Map data showing concentration of landslides caused by Hurricane Maria in Puerto Rico: U.S. Geological Survey data release, <https://doi.org/10.5066/F7JD4VRF>.

Figure 2.36: Flood Hazard Zones in Puerto Rico



Source: Federal Emergency Management Agency, Digital Flood Insurance Rate Map (DFIRM) database, Commonwealth of Puerto Rico and Municipalities, November 18, 2009

Climate Change

Puerto Rico's climate is changing. The Commonwealth has warmed by more than one degree Fahrenheit since the mid-20th century, and the surrounding waters have warmed by two degrees since 1901. The sea is rising about an inch every 15 years, and heavy rainstorms are becoming more severe. In the coming decades, rising temperatures are likely to increase storm damages, significantly harm coral reefs, and increase the frequency of unpleasantly hot days³⁷. Climate change impacts all of Puerto Rico's natural resources, and therefore the Puerto Rico Climate Change Mitigation, Adaptation, and Resilience Law (Law No. 33 of 2019) was implemented. Some of the most affected resources are:

Water Resources: Although heavy rainstorms may become more common, total rainfall is likely to decrease in the Caribbean region. Warmer temperatures also reduce the amount of water available because they increase the rate at which water evaporates (or transpires) into the air from soils, plants, and surface waters. With less rain and drier soils, the island may face an increased risk of drought.

- **Coral Reefs and Ocean Acidification:** Warming waters are likely to harm most coral reefs. The widespread loss of coral is due to warming and increasing acidity of coastal waters.
- **Ecosystems:** Warmer temperatures and changes in rainfall could expand, shrink, or shift the ranges of various plants and animals in Puerto Rico's forests, depending on the conditions that each species requires.
- **Agriculture:** Higher temperatures are likely to interfere with agricultural productivity in Puerto Rico as it affects soils, livestock, and water resources.

- **Infrastructure:** Heavy rainstorms and flooding may affect the infrastructure in the Island preventing it from providing the desired services³⁸. For example, the services in terms of public transit may be affected, as well the delivery of goods in the Island.

Under Law 33 of 2019, mentioned above, every project in Puerto Rico must be resilient by considering all natural hazards and to proactively address climate-related risks. Nature-based solutions are sustainable planning, design, environmental management, and engineering practices that weave natural features or processes into the built environment to promote adaptation and resilience³⁹.

37. Environmental Protection Agency. 2016. What Climate Change Means for Puerto Rico.

38. Puerto Rico Climate Change Council (PRCC). 2022. Puerto Rico's State of the Climate 2014-2021: Assessing Puerto Rico's Social-Ecological Vulnerabilities in a Changing Climate. Puerto Rico Coastal Zone Management Program, Department of Natural and Environmental Resources, NOAA Office of Ocean and Coastal Resource Management. San Juan, PR.

39. Federal Emergency Management Agency. 2021. Building Community Resilience with Nature-Based Solutions.

Our Future: Growth

This chapter was built based on the information from the U.S. Census Bureau 2010, 2020 Decennial Redistricting Data for the population analysis and from the Local Area Unemployment Statistics 2010-2022 for the employment analysis.

The population forecasts used as a reference the projected rate of population change published by the United Nations Data Portal in 2022 by the Population Division. The population and employment changes are all calculated as a percent change between the years mentioned. Whenever another calculation is being made it will be clarified.

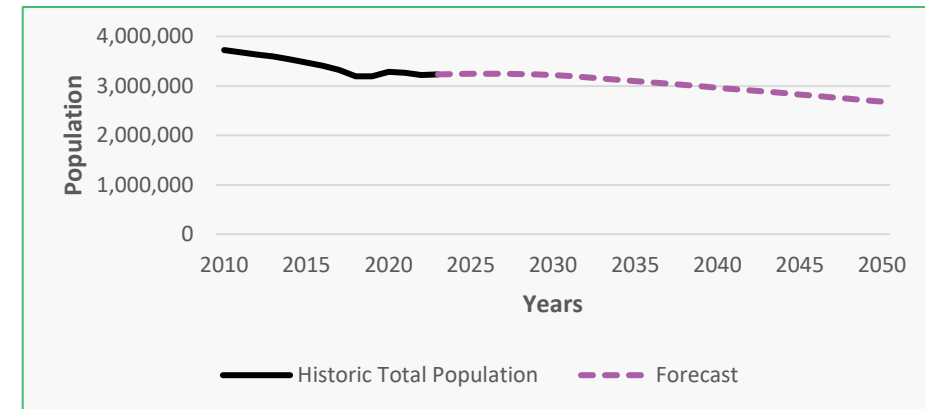
The employment forecasts were developed by applying a historic rate of growth for the first three years of the projection to account for recent growth in employment. This process considers the federal funds for economic recovery after the Hurricane Maria and the COVID-19 pandemic. These forecasts estimate that after the next 3 years the population aging will have a stronger influence over employment rate and will result in a long-term reduction.

Population Growth

Puerto Rico population as of 2022 is around 3,000,000 people, which is distributed in the different region above, but mostly in Aguadilla TMA and San Juan TMA. Nevertheless, over the last decade Puerto Rico has seen a population decrease due to factors such as natural disasters, COVID-19 pandemic and general economic downfall in the Island.

As shown in Figure 2.37 the population forecast estimates that there will continue to be a population decrease in 2050 where it will reach around 2,600,000 people.

Figure 2.37: Puerto Rico Population Forecast 2050

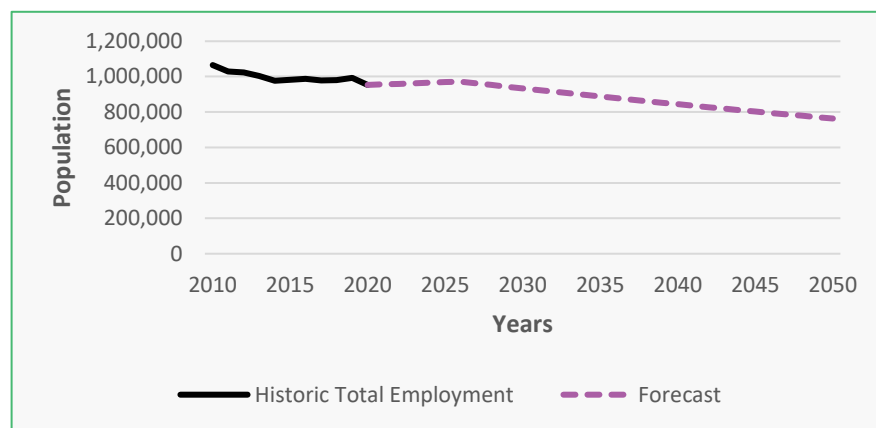


Source: U.S. Census Bureau, UN Population Division Data & Advantage Estimates

Employment Growth

Employment in Puerto Rico has shown a decrease in the last decade, but not as pronounced as with the decrease in population. The employment has been decreasing due greatly to the pandemic, the hurricanes and earthquakes in the Island. The Federal Government has provided economic incentives that have helped the Island reduce the impact of these events in the economy and in the employment situation. Nevertheless, in the next 30 years, employment forecast estimate a decrease until 2050, reaching to 760,000.

Figure 2.38: Puerto Rico Employment Forecast 2050



Source: U.S. Census Bureau, UN Population Division Data & Advantage Estimates

Our Challenges and Opportunities

Safety

Even when there was a reduction of fatalities from 2016 to 2020 there are some issues like alcohol-impaired driving and pedestrian fatalities that have represented a large proportion of traffic fatalities in Puerto Rico (two-thirds of total traffic fatalities). Road users' behavior is the biggest problem and the hardest to change. See Highway Safety Plan⁴⁰ for more details.

Aging Infrastructure

The pavement and bridges in the Puerto Rico NHS are below National averages, nonetheless, the percentages of Poor NHS bridge area and Poor interstate lane miles have decrease significantly in recent years. The PRHTA is forecasted to meet its interstate pavement objectives within 10 years while maintaining its NHS bridges that are presently better than the target standards⁴¹. For more information see the Puerto Rico Transportation Assets Management Plan.

Traffic Congestion

Puerto Rico has more vehicle miles travel than any other smaller state in the U.S., with 13,762 millions of VMT⁴². The average commute time to work on the Island is 27.1 minutes, which is longer than average US commute time at 26.9 minutes. Additionally, data indicates that about 3.5% of the workforce in Puerto Rico have commutes exceeding 90 minutes⁴³. Addressing congestion requires adding programs and policies that attend this issue, public transit, active transportation, parking, and carpooling. See the Multimodal Long Range Plan Travel Survey and TDM Report for more details.

40. Puerto Rico Traffic Safety Commission (2021). Puerto Rico Highway Safety Plan FY2022. Retrieved directly from <https://www.nhtsa.gov/sites/nhtsa.gov/files/2021-10/PR%20FFY2022%20HSP-Final%20Revision%2008052021.pdf> on September 26, 2023.

41. Puerto Rico Highways and Transportation Authority (2022). Puerto Rico Transportation Asset Management Plan 2032. Retrieved directly from <https://act.dtop.pr.gov/wp-content/uploads/2023/04/2022-12-29-BIL-Compliant-TAMP-2032.pdf> on September 26, 2023

42. Data USA (n.d) Data USA: Puerto Rico. Retrieved directly from: <https://datausa.io/profile/geo/puerto-rico#housing> on September 26, 2023.

43. Data USA (n.d) Data USA: Puerto Rico. Retrieved directly from: <https://datausa.io/profile/geo/puerto-rico#housing> on September 26, 2023

Shared Mobility

Shared Mobility applications, which connect automobiles and passengers, as well as e-scooters and e-bicycles, can provide less priced, more flexible, and on-demand transportation options, which can impact vehicle ownership trends. This emerging trend needs the adoption of new regulations to ensure riders safety and to govern the design and operation of these services.

Active Transportation and Micromobility

Enhanced bicycle connections, safer streets and active transportation overall provide a variety of advantages and transportation options. Walking and cycling provide possibilities to enhance physically and mental health by increasing movement and spending time outside, also helps to reduce obesity, among other health problems. By removing barriers caused by a vehicle, people become more in touch with their communities. It also benefits low-income and minority populations, since people in those communities are less likely to possess a private car, and hazardous streets may make active transportation difficult⁴⁴.

Climate Change and Extreme Weather

Climate change and extreme weather events are always a constant challenge to the transportation infrastructure. The Island of Puerto Rico is yearly threatened by the possibility of hurricanes, extreme flooding, and earthquakes. The environmental effects created by these threats requires a system that is more resilient to these trends. See the “Ley de Mitigación, Adaptación y Resiliencia al Cambio Climático de Puerto Rico”, Law 33, May 22, 2019.

Energy Transformation and Electric Vehicles

Energy transformation including the transition to electric vehicles and all the infrastructure required. In Puerto Rico there is a low number of Electric Vehicle (EV) ownership, reaching a little over 3,000 vehicles. Currently the PRHTA is working to advance the National Electric Vehicle Infrastructure (NEVI) Program. At this time, the PR-2, PR-52, and PR-22 has been designated as alternative fuel corridors, these corridors were submitted as "corridor pending"⁴⁵.

The electric infrastructure was severely damaged after the hurricanes Irma and María. Even when LUMA Energy⁴⁶ has plans to reconstruct and update the power grid, it is estimated that it will take years to be completed. Because of this it is important to strategize in those first years of the EV infrastructure deployments. Refer to the Puerto Rico Electric Vehicle Infrastructure Deployment Plan under the National Electric Vehicle Infrastructure Formula Program for more details.

Connected Vehicles and ITS Technologies

Connected cars and Intelligent Transportation System (ITS) are new technologies that, via their capabilities and performance, will encourage a decrease in accidents. The adoption of connected vehicles in Puerto Rico is not as advanced as that of ITS technologies. However, because these technologies are part of the Puerto Rico Regional ITS Architecture, the Puerto Rico Highway Safety Improvement Program (HSIP) will assist their development⁴⁷. See Highway Safety Improvement Program for more details.

Public Transportation Challenges

PRITA is a newer organization that is still in its early stages. The organizational structure still has gaps in terms of assets transferring and responsibilities for PRITA to have full ownership of the agency.

The culture in Puerto Rico is that we travel by car, and each house has more than one car. The challenge how to persuade individuals to switch modes and view public transportation as a viable option for everyone.

44. U.S. Department of Transportation (2015). Active Transportation. Retrieved from <https://www.transportation.gov/mission/health/active-transportation> on September 26, 2023

45. As defined by the Puerto Rico Electric Vehicle (EV) Infrastructure Deployment Plan under the National Electric Vehicle Infrastructure (NEVI) Formula Program a corridor pending indicates that a corridor lacks adequate alternative fuel infrastructure to accommodate alternative fuel vehicles.

46. Power company responsible for power distribution and power transmission in Puerto Rico

47. State DOT (2022). Highway Safety Improvement Program. 2022 Annual Report. Retrieved from <https://highways.dot.gov/sites/fhwa.dot.gov/files/2023-08/PR-HSIP-2022.pdf> on September 26, 2023

3

Island-Wide

About

Our Transportation System

This chapter aims to briefly describe Puerto Rico's current transportation conditions and characteristics, to better understand how the transportation sector has developed at Island-wide. The chapter is divided into six (6) main sections. The first one describes active transport which includes bicycle and pedestrian modes of transport. The second one describes the different transit options offered at the regions and their organizational structure. The third one describes the roadway system in the region. The fourth and fifth sections describe the airports and seaports in the Region. The sixth section describes freight's actual conditions and its components in the Island.

In recent years, transportation alternatives have become crucial in terms of economic development, environmental preservation, and health considerations. Worldwide tendencies are directing their focus to (1) a less motor vehicle use mindset, (2) encouraging bicycle-pedestrian modes of transportation, and (3) combining available transportation alternatives.

The Puerto Rico Department of Transportation and Public Works (DTPW) and the Highway and Transportation Authority (PRHTA) have adopted goals and objectives to plan and develop a multi-modal transportation system.

This multi-modal transportation system integrates all transportation modes to improve the mobility and access conditions. It also aims to create a more liveable urban environment and a more efficient transportation system, including the use of non-motorized modes.

Active Transport

Bicycle and Pedestrian

The Comprehensive Bicycle and Pedestrian Plan for Puerto Rico was adopted by the Public Policy Committee of the Puerto Rico Metropolitan Planning Organizations (MPO) on September 18, 2018. It was developed as the policy document to guide state and local efforts to improve access and mobility conditions. This plan was developed by the DTPW and the PRHTA.

Said policy document is set to guide state and local efforts to improve access and mobility conditions and develop new pedestrian and cyclist facilities. The plan sets out as part of their objectives: i) to promote and increase the use of cycling and walking as alternative modes of transportation, and ii) to enable the physical integration of urban centers through a cycling and walking network that improves accessibility. The plan evaluates the existing conditions for both the pedestrian and cycling infrastructure.

The plan aims, among other things, at developing new pedestrian and cyclist facilities to improve the quality of life of our communities. Figure 3.1 shows the Island-wide proposed long-term cyclist conceptual network for 2050 based on the Comprehensive Bicycle and Pedestrian Plan for Puerto Rico. This map is based on the proposed interventions based on the plan and each regional section will describe the existing infrastructure. It considers the roads that are primarily used for these activities as well as the extensive deployment of new infrastructure in regions with low levels of bicycle and pedestrian activity.

For more details on the bicycle and pedestrian paths and facilities available, please refer to the Comprehensive Bicycle and Pedestrian Plan for Puerto Rico (see Appendix “Comprehensive Bicycle and Pedestrian Plan for Puerto Rico”). The detailed list of the most used roads used for walking and cycling in the territory will be presented in the regional documents.

As part of the plan, pedestrian conditions in all regions were evaluated. Puerto Rico, in general, scored 35 out of a possible 100, indicating problems with the Island-wide sidewalk infrastructure. The pedestrian evaluation considered nine (9) categories: pedestrian facilities, conflicts with pedestrian facilities, crosswalks, maintenance, path size, buffer, accessibility, aesthetics, and shade. The main issues that impact this score are sidewalk accessibility, illegal parking, lack of sidewalk continuity, and many sidewalk obstacles (trees, signage, lighting poles, amongst others).

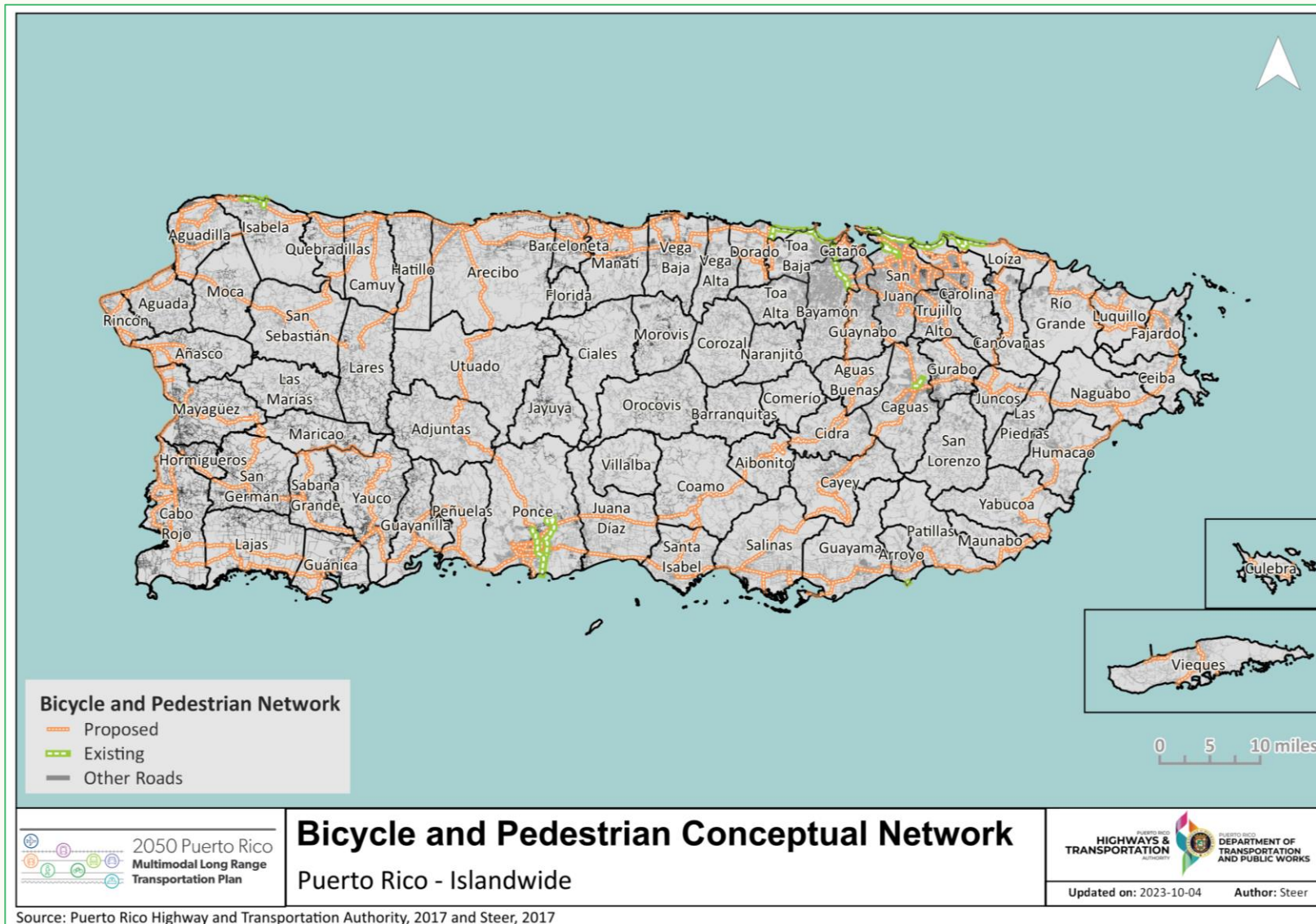
The plan proposes generalized improvements that should be implemented throughout Puerto Rico. These are improvements that can be implemented with limited resources, as they are interventions that can be part of a larger investment. The improvements should consider the Design Standards presented in the policy.

For bicycle conditions, the plan developed a Bicycle Infrastructure Facilities Evaluation that considers the following elements: bicycle facilities, safety, conflicts, maintenance, speed limit, traffic volume, space available, aesthetics, and shade. There are twelve (12) cycling facilities that are in four (4) of the seven (7) MPO regions, and nine (9) of those are in the San Juan TMA.

The Plan also evaluated the Cycling Potential Index (CPI) to provide an objective, evidence-based method of assessing the underlying potential for cycling in a specific location. It considered hilliness, socio-demographics, and trip length. In general, the places with the highest potential for cycling are around the coast and in the Metropolitan Areas of major municipalities.

Cycling occurs through cycling facilities, on the roads, and on Mountain Bike paths. Mountain bike is a professional sport regulated by the cycling federation and is supported by professional and amateur advocates.

Figure 3.1: Puerto Rico Bicycle and Pedestrian Conceptual Network 2050



Source: Puerto Rico Highway and Transportation Authority, 2017 and Steer, 2017

Micromobility

Micromobility is defined by the FHWA as “any small, low-speed, human-, or electric-powered transportation device.”⁴⁸ Micromobility vehicles can include bicycles, scooters, skateboards, and any alternative that falls within the aforementioned parameters.

Micromobility modes are preferred for trips with short distances ranging up to 10 km⁴⁹. These distances can be reached by electric-powered micromobility vehicles with speeds up to 45 km/h (28 mph).

In Puerto Rico, electric-powered micromobility vehicles started gaining popularity when the first shared micromobility company started operating in 2019. Since then, private, and shared micromobility has seen an increase in urban area users. Despite lacking official metrics on private micromobility users, their presence in urban settings can be distinguished by identifying vehicles without branding.

Shared micromobility can be described as the operational model consisting in the short-term rental of micromobility vehicles. These can be placed in strategic zones where users can pay to unlock them through a mobile application, use them, and lock them at their destination. These systems can have docking stations to park the vehicles (mainly bicycles or scooters), or they can have self-locking vehicles that do not require docks. In Puerto Rico, the current systems operate with dockless vehicles that are placed in activity zones and are monitored by GPS and sensors.

Currently there are two (2) shared micromobility providers and three (3) systems operating in Puerto Rico. One provider offers shared electric-powered scooters (e-scooters) and e-bicycles, and one only offers e-scooters. Due to the short-distance nature of micromobility operations, the service areas are reduced and focus on urban zones within multiple municipalities.

Five (5) municipalities Island-wide have shared micromobility services in one or more of their urban areas. These municipalities are San Juan, Guaynabo, Mayagüez, San Germán, and Lajas, as shown in Figure 3.2. Of these municipalities, San Juan has the most urban zones served, and is the only municipality served by both providers.

This has become a competitive transportation alternative for city dwellers, visitors, and tourists, which use it for errands. In 2022, there were an estimated 730,000 miles travelled by shared scooters and bicycles, as reported by one of the shared system operators, which estimates an 80% market share in the shared micromobility market⁵⁰. Nevertheless, this new transportation mode has some negative aspects to its implementation. Some people might see them as a threat to pedestrians and bikes given the higher speeds it can reach in the sidewalks and bike lanes. There have been reports of vehicle misuse by shared vehicle users including obstruction of sidewalks and riding on sidewalks⁵¹ and expressways⁵² during the first years of operation.

Micromobility, shared and private, has yet to be fully considered in existing legislation and the current transportation regulatory framework of the Puerto Rico Vehicle and Traffic Act. Currently, the only legislation with validity that limits the usage of e-scooters comes from the Autonomous Municipality of San Juan’s Executive Order MSJ-034 from 2021⁵³. It explicitly prohibits the usage of scooters⁵⁴ in roads, sidewalks and other public spaces in the Old San Juan Historic District. Failure to comply with this disposition is punishable by fines of \$250 or \$500, depending on the severity level of the incident. It is also important to note that from March to May of 2021 the Municipality of San Juan had recorded “Twenty-four (24) complaints related to the misuse of the vehicles in the Old San Juan and Santurce areas” of San Juan.

48. Price, J., Blackshear, D., Blount, W., Jr., & Sandt, L. (2021). Micromobility: A Travel Mode Innovation. *Public Roads*, 85(1). Retrieved from: <https://highways.dot.gov/public-roads/spring-2021/02>.

49. Institute for Transportation & Development Policy. (n.d.) Defining Micromobility. Retrieved from: <https://www.itdp.org/multimedia/defining-micromobility/>

50. Skootel (January 2023) Micromobility in Puerto Rico Impact Report 2022. Provided by Skootel.

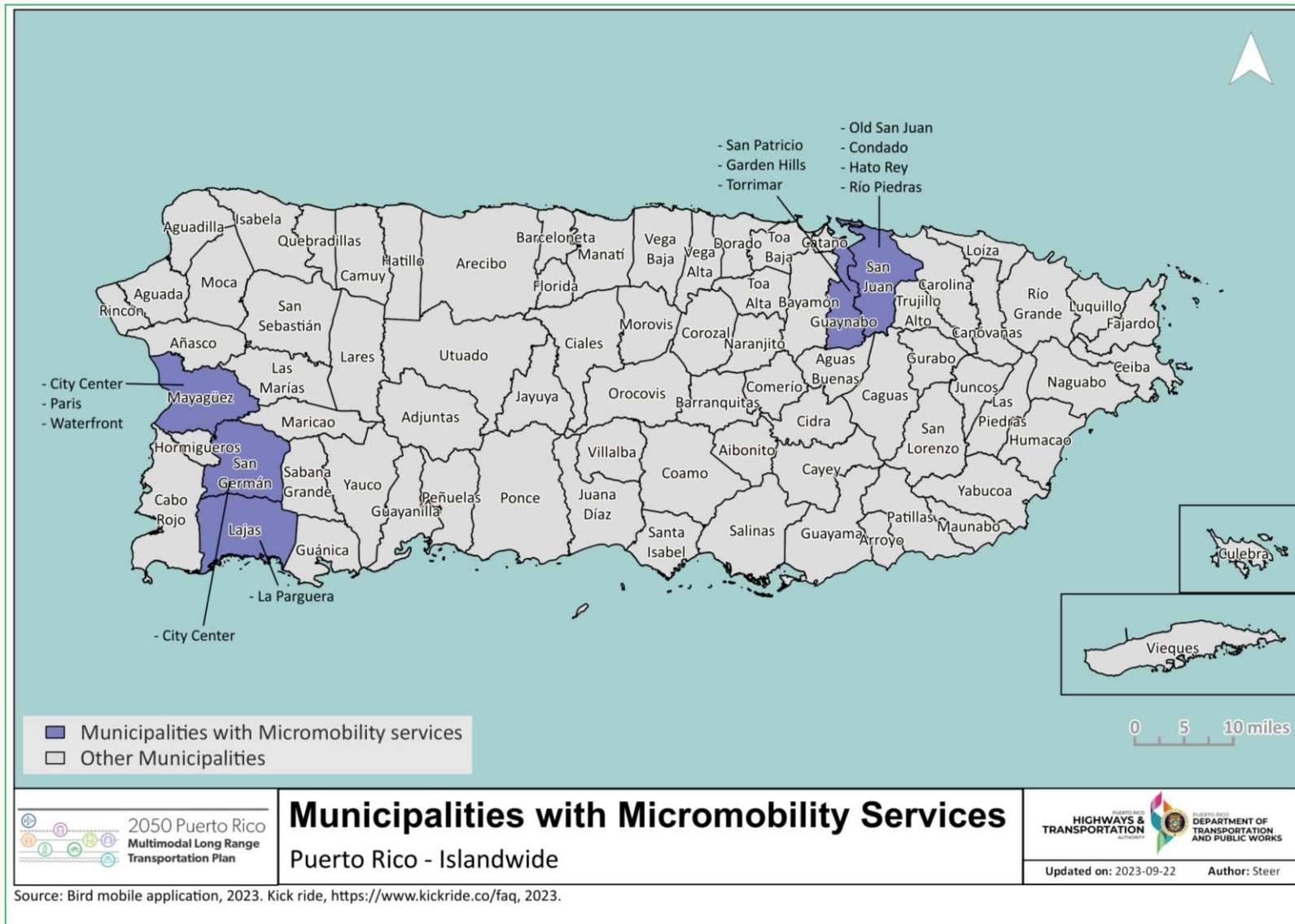
51. Prensa Sin Censura (2021) Sanjuaneros declaran Guerra contra negocio de alquiler de scooters (in Spanish) Retrieved from: <https://prensasincensura.com/2021/03/27/sanjuaneros-declaran-guerra-contra-negocio-de-alquiler-de-scooters/>

52. El Nuevo Día (2021) La empresa Skootel ampliará las restricciones para que sus “scooters” no se puedan utilizar en el expreso Baldorioty de Castro (in Spanish) Retrieved from: <https://www.elnuevodia.com/noticias/locales/notas/la-empresa-skootel-ampliara-las-restricciones-para-que-sus-scooters-no-se-puedan-utilizar-en-el-expreso-baldorioty-de-castro/>

53. Miguel A. Romero Lugo. Executive Order MSJ-034: To ban the use and traffic of scooters in public roads, sidewalks, and other public spaces inside the Old San Juan Historic District; and for other purposes. (May 24, 2021) Retrieved from: <https://legislaturasajuan.pr/biblioteca/ordenes-ejecutivas/2020-2021-2/11742-orden-ejecutiva-msj-034-3/file>

54. Scooters are defined in Executive Order MSJ-034 (May 24, 2021), “vehicles that consist in a footboard mounted on two or four wheels and a steering handle propelled by energy coming from a motor, be it electric or of internal combustion, and that has to be used by one driver standing or sitting down, depending on the model.”

Figure 3.2: Map of the Municipalities with Micromobility Services 2023



Transit

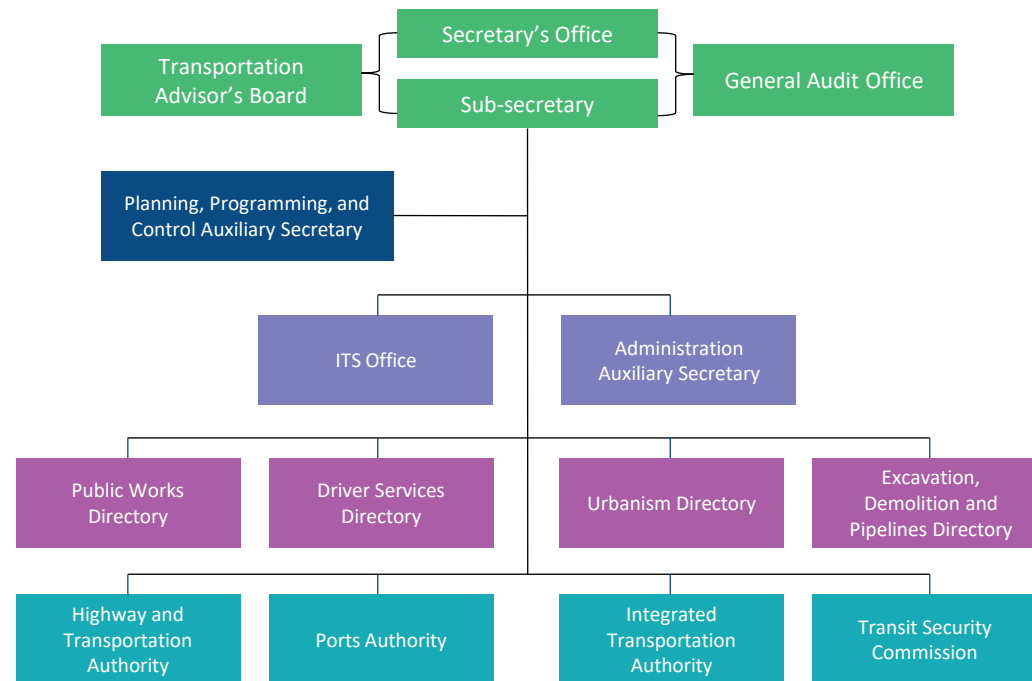
Governmental Structure

Puerto Rico Department of Transportation and Public Works (DTPW)

The DTPW was created by the Constitution of the Commonwealth of Puerto Rico of July 25, 1952 “to develop, conserve, manage and regulate the infrastructure and systems for the transportation of persons, goods and services in a safe, fast, environmentally and citizen-sensitive, durable, efficient and effective manner to promote the integration and economic development of the country and the quality of life of its citizens”⁵⁵. Figure 3.3 shows in detail the Department’s organizational structure.



Figure 3.3: DTPW Organizational Chart (2016)



Source: Modified by Steer from the OGP Organizational Chart from OGP Virtual Library webpage. Government of Puerto Rico (OGP), DTOP-diagrama9-04 (pr.gov), 2016

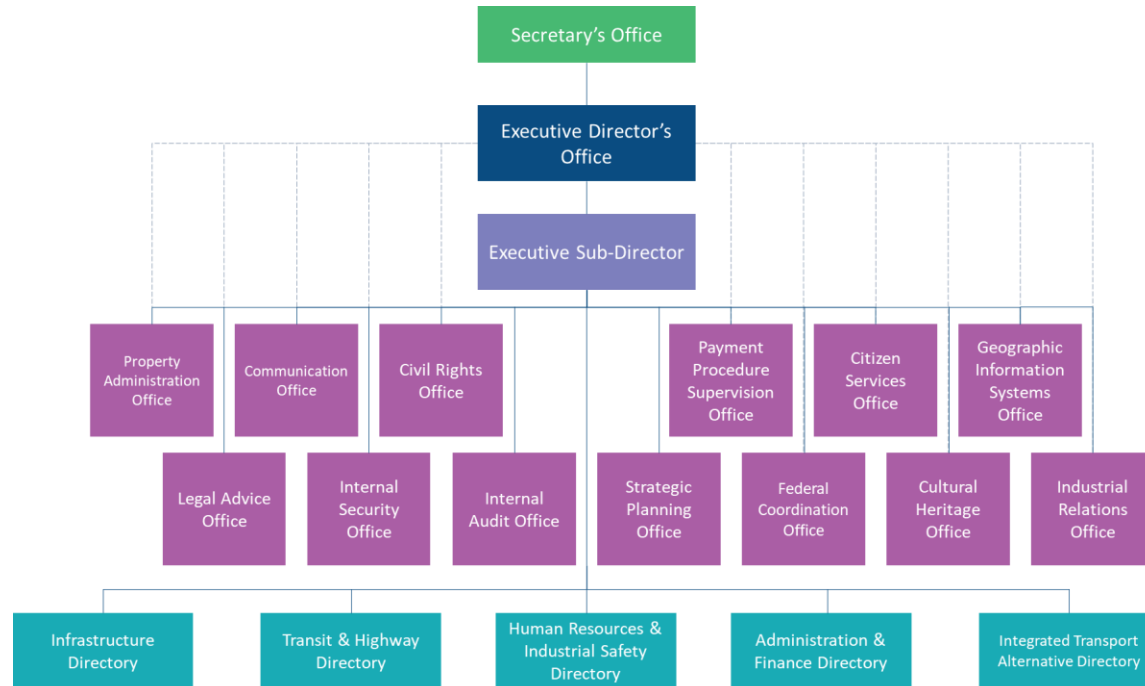
55. Puerto Rico Government Web Page. Retrieved from: <https://www.pr.gov/directorio-de-agencias/departamento-de-transportacion-y-obras-publicas-dtop-5>

Puerto Rico Highway and Transportation Authority (PRHTA)

The PRHTA is a public corporation under the DTPW; and was created through Act. No. 74 of June 23, 1965, as amended. Years later, Act No. 4 of August 24, 1990, authorizes it to sign contracts with private entities for the construction, operation, and maintenance of highways, bridges, avenues, highways and other transit facilities.

Later on, Act No. 1 of March 6, 1991, renames the Highway Authority as Puerto Rico Highway and Transportation Authority. This act enables PRHTA to provide the Puerto Rican citizens with an integrated, efficient, reliable, and safe transportation system that contributes to the development of Puerto Rico’s economy and improves the quality of life. PRHTA organizational chart can be found in Figure 3.4.

Figure 3.4: PRHTA Organizational Chart (2020)



PUERTO RICO
HIGHWAYS & TRANSPORTATION
AUTHORITY



Source: Modify by Steer from the 2020 DTPW Transition Report. Government of Puerto Rico (DTPW), DTOP Informe de Transición 2020.pdf (pr.gov), 2020

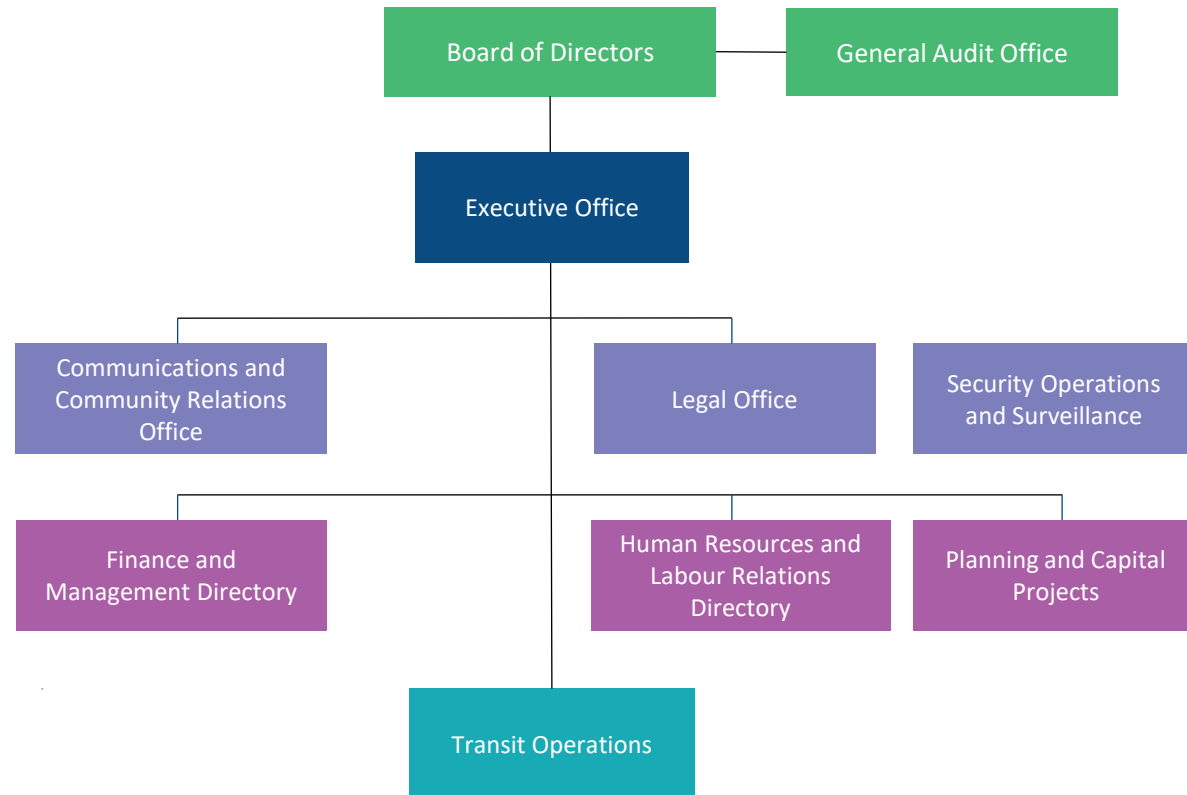
Puerto Rico Integrated Transit Authority (PRITA)

PRITA is created by Law 123-2014 of August 3, 2014, as amended. This law gave the PRHTA powers to transfer to PRITA its operations, assets, rights, obligations, and funds related to Tren Urbano (TU), transit programs operated by the PRHTA. The Law also authorized the fusion of the Metropolitan Bus Authority (Autoridad Metropolitana de Autobuses, AMA) and the Maritime Transportation Authority (MTA).

Its mission is to provide major and better transit facilities to ensure the effective mobility of people and goods; and to promote economic and social growth in areas adjacent to train stations, bus terminals and intermodal or multimodal stations. Figure 3.5 shows PRITA's organizational structure.



Figure 3.5: PRITA Organizational Chart (2016)



Source: Modified by Steer from the OGP Organizational Chart from OGP Virtual Library webpage. Government of Puerto Rico (OGP), Organigramas – All Documents (pr.gov), 2016

Transit Modes

Besides the Tren Urbano, AMA buses and ferry services, there are other services that provide transit in Puerto Rico, which include the Público Services and the Municipal Transit Services (provided by some municipalities in Puerto Rico).

In terms of transit, the San Juan Transportation Management Authority (TMA) is the Region with the most varied transit services provision in Puerto Rico. It includes the only rail system on the Island (TU), as well as the AMA bus routes, Público service, Municipal services, and a route of Ferry service from the MTA from Cataño to San Juan.

In addition to the above, the Aguadilla TMA Region has transit services throughout Públicos and Municipal services. The Other Urbanized Areas Regions have transit services throughout Públicos, Municipal services and two (2) Ferry routes from the MTA from Vieques and Culebra to Ceiba.

Tren Urbano

Tren Urbano is a mass transportation system that connects the municipalities of San Juan, Guaynabo, and Bayamón, running on a 17.52 km (10.7 miles) alignment. It has sixteen (16) stations (elevated, at level and underground), twelve (12) of which are located within the Municipality of San Juan, one (1) is located within the Municipality of Guaynabo and three (3) are located within the Municipality of Bayamón, as shown in Figure 3.6.

San Juan Stations are:

- **Sagrado Corazón:** Located to the south of Santurce ward, between two major Avenues: Juan Ponce de León (PR-25) and Manuel Fernández Juncos (PR-35).
- **Hato Rey:** Located in Hato Rey Norte, specifically in Arterial B Avenue, parallel to Luis Muñoz Rivera Avenue (PR-1), right in the financial district of Hato Rey.
- **Roosevelt:** Located in Hato Rey Norte, at the intersection of Luis Muñoz Rivera Avenue (PR-1) and Franklin Delano Roosevelt Avenue (PR-23).

- **Domenech:** Located in Hato Rey Norte, at Luis Muñoz Rivera Avenue (PR-1) at the intersection with Guayama Street.
- **Piñero:** Located in the Hato Rey Sur ward, between two (2) major Avenues: Ponce de León (PR-25) and Luis Muñoz Rivera (PR-1), north of Jesús T. Piñero Avenue (PR-17).
- **Universidad:** Located in Universidad ward, in Ponce de León Avenue (PR-25) underneath the University of Puerto Rico (UPR) Río Piedras Campus.
- **Río Piedras:** Located in Pueblo ward, at Ponce de León Avenue (PR-25) in the urban center of Río Piedras.
- **Cupey:** Located in El Cinco ward, between Luis Muñoz Rivera Avenue (PR-1) and José “Kiko” Custodio Avenue (PR-21).
- **Centro Médico:** Located in Monacillo Urbano ward, in one of the main entrances of Centro Médico, the biggest and most important hospital conglomerates in Puerto Rico also holding the School of Medicine of the UPR.
- **San Francisco:** Located in Monacillo Urbano ward, intersection of José “Kiko” Custodio (PR-21) with José de Diego Avenue.
- **Las Lomas:** Located in Gobernador Piñero ward, in Street 31 SO.
- **Martínez Nadal:** Located in Gobernador Piñero ward, between Rafael Martínez Nadal Expressway (PR-20) and José “Kiko” Custodio Avenue (PR-21).

Guaynabo Station is:

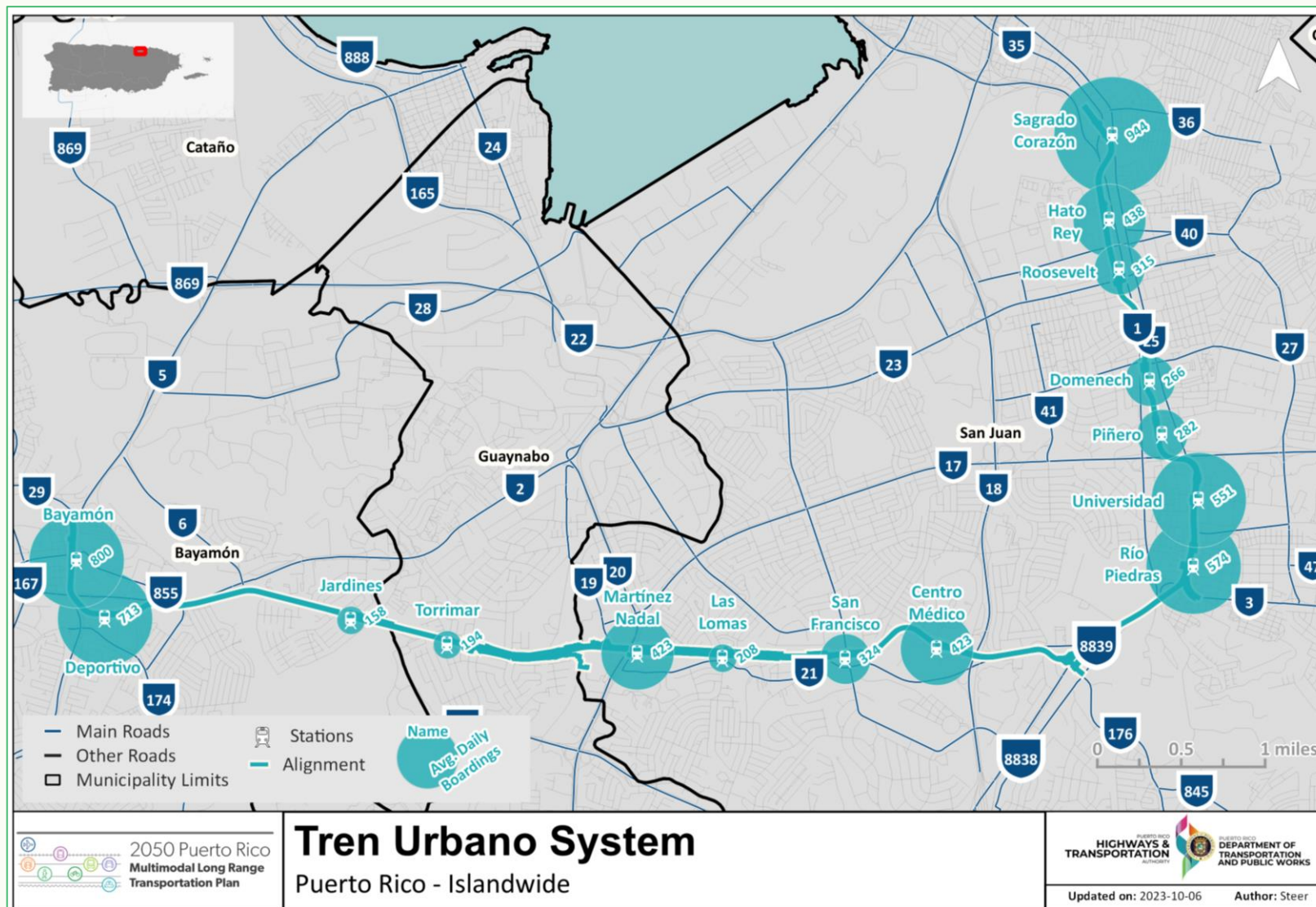
- **Torrimar:** Located in Pueblo Viejo ward between Ramírez de Orellano Avenue and Oviedo Street.

Bayamón Stations are:

- **Jardines:** Located in Juan Sánchez ward, between Marginal North Street and Marginal South Street.
- **Deportivo:** Located in Pueblo ward, within the Onofre Carballeira Sports Complex parallel to PR-2.
- **Bayamón:** Located in Pueblo ward, parallel with Río Hondo Expressway (PR-5) in the intersection with Bobby Capó Avenue.

Figure 3.6 shows the location of the TU stations, and the average daily boarding of each station from March to May 2022.

Figure 3.6: Tren Urbano Alignment



Source: Puerto Rico Integrated Transit Authority (PRITA), 2023

Metropolitan Bus Authority

The AMA transit service offers daily bus transportation in San Juan, Guaynabo, Bayamón, Cataño, Levittown (Toa Baja), Trujillo Alto, Carolina, and Loíza. There are thirty-three (33) bus routes in total; of which twenty-five (25) are operated by AMA, and eight (8) are privately operated by First Transit (which are divided into three (3) categories: Metrobus, TU CONEXION, Metro Urbano).

The AMA Transit service routes are categorized into the following classifications. These classifications haven't changed from what is described in the 2045 LRTP:

- **Express Routes** (starting with an E): Limited number of stops, headways between 10 to 30 minutes in peak periods and route mostly on exclusive lanes or expressways allowing for higher speeds. This category consists of 3 routes: **E-10, E-20, E-40.**
- **Trunk Routes** (starting with a T): Primary routes connecting Tren Urbano stations and transit terminals with headways between 20 and 30 minutes in peak periods. This category consists of ten (10) routes: **T-2, T-3, T-4, T-5, T-6, T-7, T-8, T-9, T-21, T-41.**
- **Circulation Routes** (starting with a C): Short-length routes around Tren Urbano stations or transit terminals operating at headways between 20 and 30 minutes in peak periods. This category consists of seven (7) routes: **C-1, C-22, C-35, C-36, C-43, C-44.**
- **Distribution Routes** (starting with a D): Connector routes between Tren Urbano or transit terminals to sub-urban or rural areas with frequencies between 30 and 90 minutes in peak periods. Some of these routes were intended to be shared with Públicos services. This category consists of ten (10) routes: **D-13, D-15, D-18, D-26, D-27, D-37, D-45, D-53, D-91, D-92.**

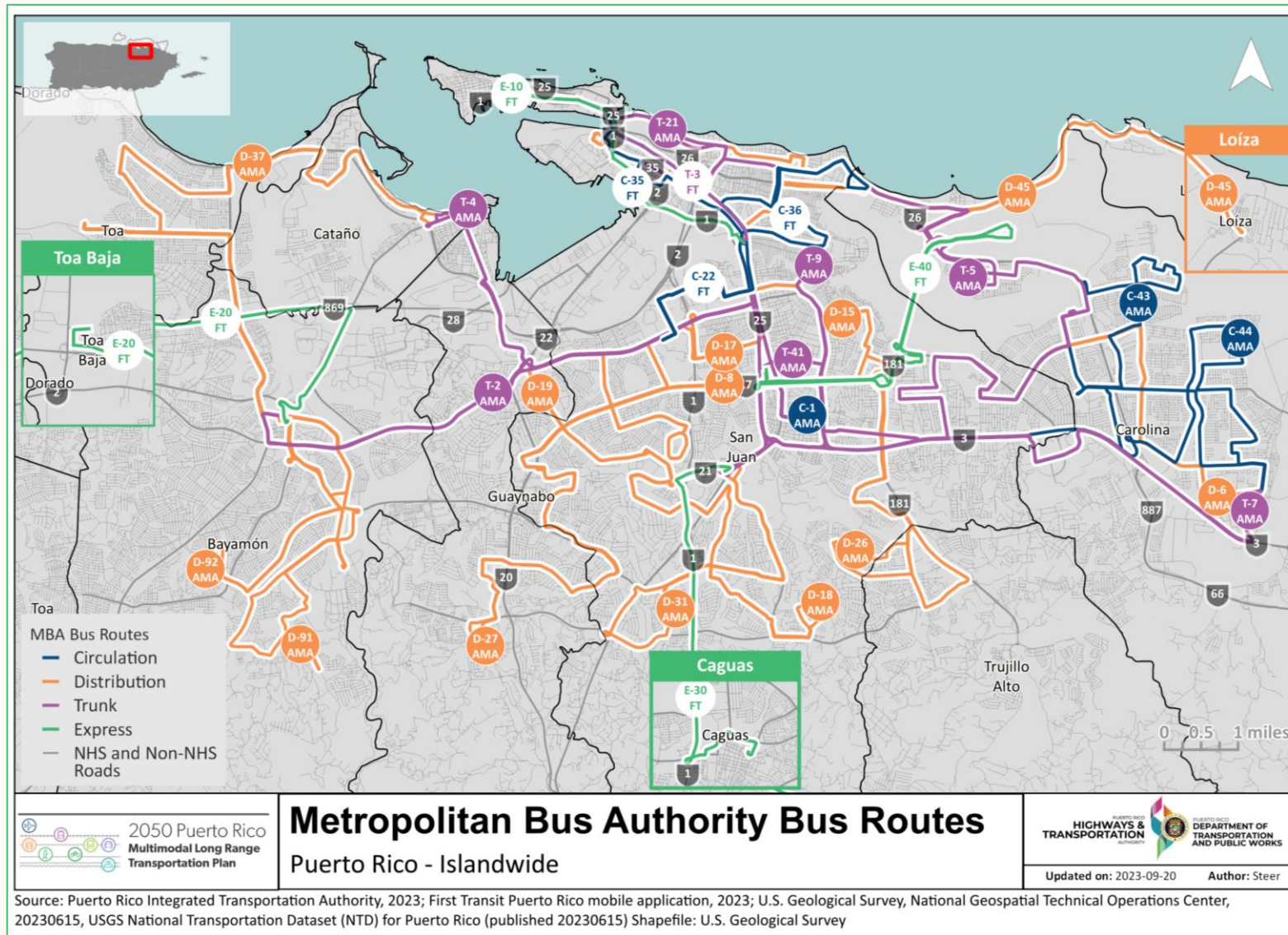
Table 3.1 displays the AMA service divided into four (4) categories and Figure 3.7 shows these routes on a map.

Table 3.1: AMA Transit Service Categories and Routes

Express Routes	Trunk Routes	Circulation Routes	Distribution Routes
E-10 (Metro Bus – First Transit operated)	T-2 (AMA operated)	C-1 (AMA operated)	D-6 (AMA operated)
E-40 (TU Conexión – First Transit operated)	T-3 (Metro Bus – First Transit operated)	C-22 (TU Conexión – First Transit operated)	D-8 (AMA operated)
E-20 (Metro Urbano – First Transit operated)	T-4 (AMA operated)	C-35 (TU Conexión – First Transit operated)	D-15 (AMA operated)
E-30 (Metro Urbano – First Transit operated)	T-5 (AMA operated)	C-36 (TU Conexión – First Transit operated)	D-17 (AMA operated)
	T-7 (AMA operated)	C-43 (AMA operated)	D-18 (AMA operated)
	T-9 (AMA operated)	C-44 (AMA operated)	D-19 (AMA operated)
	T-21 (AMA operated)		D-26 (AMA operated)
	T-41 (AMA operated)		D-27 (AMA operated)
			D-31 (AMA operated)
			D-37 (AMA operated)
			D-6 (AMA operated)
			D-45 (AMA operated)
			D-53 (AMA operated)
			D-91 (AMA operated)
			D-92 (AMA operated)

Source: Government of Puerto Rico, AMA Web Page 2021

Figure 3.7: Puerto Rico AMA Routes



Públicos

Due to the limitation on available data, only Island-wide information is presented.

Públicos are privately owned and operated services regulated under the Transportation and Other Public Services Bureau. Públicos are allowed to operate specific routes but without a specific schedule.

Públicos are operated under individual franchise agreements with fares regulated by route and special insurance requirements. Vehicle capacity varies from eight (8) to twenty-four (24) passengers and the vehicles may be owned or leased by the operator. The service charges a variety of fares and does not have specific stops.

From data obtained from the Reduced Reporting (RR-20) Small Systems Summary of the National Transit Database (NTD), it is quite evident that the Públicos system has had a significant drop in trips made between 2016 and 2018 with an upstream for 2019 and another dropdown from 2020 to 2021. There is reflected a dropdown of 39% meaning more than 3 million fewer trips from 2020 and 2021. This is presented in Figure 3.8.

Also, between 2016 and 2021 there was a reduction of vehicles available for maximum service from 1,971 to 1,620⁵⁶.

Figure 3.9 shows the Públicos routes for Puerto Rico for the year 2022.

Figure 3.8: Annual Unlinked Trips⁵⁷ for Públicos Service in Puerto Rico 2021

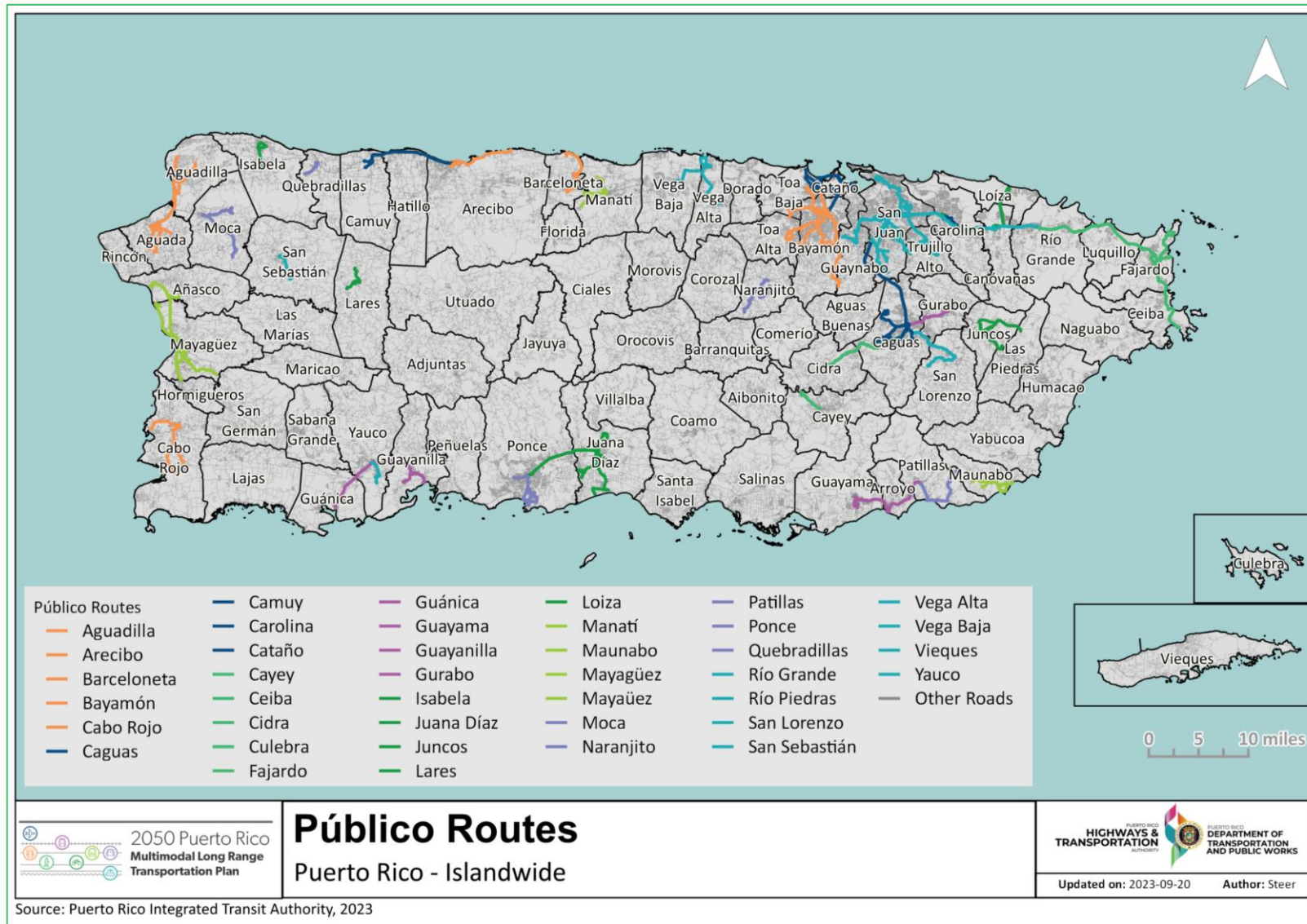


Source: 2021 RR-20 National Transit Database Report, 2022

56. According to the 2021 RR-20 Report. National Transit Database. Federal Transit Administration, 2022.

57. Unlinked Trips are defined by the Federal Transit Administration as "The number of passengers who board public transportation vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination." <https://www.transit.dot.gov/ntd/national-transit-database-ntd-glossary>

Figure 3.9: Públicos Routes for Puerto Rico



2050 Puerto Rico
Multimodal Long Range
Transportation Plan

Público Routes

Puerto Rico - Islandwide

PUERTO RICO
HIGHWAYS & TRANSPORTATION
AUTHORITY

PUERTO RICO
DEPARTMENT OF TRANSPORTATION
AND PUBLIC WORKS

Updated on: 2023-09-20 Author: Steer

Source: Puerto Rico Integrated Transit Authority, 2023

Municipal Transit Services

There is a total of forty-one (41) municipalities offering transit services within the limits of their municipalities.

According to data obtained from the National Transit Database (NTD) for 2021, there are thirty-seven (37) municipalities in Puerto Rico reporting operational transit services for their residents, as of 2021. These municipal transport systems use a variety of vehicles, primarily motor trolleys and transport vans. All the municipal transit systems are free of charge and have fixed routes with pre-defined⁵⁸ stops within the municipal limits.

From 2016 to 2021 there is an increase of seven (7) new municipalities (Añasco, Arroyo, Ciales, Coamo, Jayuya, Patillas, and Vieques) reporting to the NTD and three (3) additional municipalities (Canóvanas, Vega Alta, and Villalba) that appears to be offering service as reported on local news⁵⁹ and municipality's web page⁶⁰.

In 2021 there were a total of approximately 774,343⁶¹ annual unlinked passengers' trips⁶² for the municipal services in Puerto Rico with 725,501 being for the fixed route service⁶³ and 48,842 for the demand response service⁶⁴.

Furthermore, regardless of whether municipal transit services are provided, some municipalities provide paratransit services to the elderly and those with disabilities. Figure 3.10 shows the municipalities within Puerto Rico that provide Transit Services.

Maritime Transportation Authority (MTA)

The MTA is a public corporation that, under Law 123-2014, will be operated under PRITA to control, administer, operate, and maintain the maritime transportation service between Ceiba with Vieques, Culebra and San Juan with Cataño, and Hato Rey (currently inoperable).

Provides maritime transportation services, including passenger and freight movement, for residents and visitors to and from the island municipalities of Vieques and Culebra, as well as Cataño and Old San Juan users. This program has been merged into PRITA as of fiscal year 2015-2016, in compliance with the stipulations of 123-2014 Act⁶⁵.

The service from Ceiba to Vieques is Monday to Friday from 4:30 a.m. until 9:30 p.m. and Saturday to Sunday from 5:00 a.m. until 9:00 p.m. (Figure 3.11). This trip includes passenger and cargo trips in both ways.

From Ceiba to Culebra the service is Monday to Friday from 3:30 a.m. until 9:30 p.m. and Saturday to Sunday from 4:00 a.m. until 9:30 p.m., this trip includes passenger and cargo trips in both ways.

San Juan to Cataño service is Monday to Friday from 5:30 a.m. until 8:45 p.m. and Saturday to Sunday from 7:30 a.m. until 7:30 p.m. (Figure 3.12).

58. In some cases, there are fixed routes with no predefined stops (if a user is waiting anywhere along the established route the driver picks up the passenger – request stop service), especially in rural communities. Also, this has been the case after Hurricane María since some of the infrastructure from stops was destroyed or badly damaged (signage poles, signs, shelters, among others).

59. Metro Puerto Rico. Villalba renueva y expande sistema de transporte gratuito – Metro Puerto Rico, 2022.

60. Municipio de Vega Alta. Página web. Nuevas Rutas Trolley- Transporte Colectivo (pr.gov), 2022.

61. According to the 2021 RR-20 Report. National Transit Database. Federal Transit Administration, 2022.

62. According to the FTA-NTD Glossary, Unlinked passengers' trips (UPT) are the number of passengers who board public transportation vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination. National Transit Database (NTD) Glossary | FTA (dot.gov)

63. According to the FTA-NTD Glossary, Fixed route (FR) services are the services provided on a repetitive, fixed schedule basis along a specific route with vehicles stopping to pick up and deliver passengers to specific locations; each fixed route trip serves the same origins and destinations. National Transit Database (NTD) Glossary | FTA (dot.gov)

64. According to the FTA-NTD Glossary, Demand response services (DR) is a transit mode comprised of passenger cars, vans or small buses operating in response to calls from passengers or their agents to the transit operator, who then dispatches a vehicle to pick up the passengers and transport them to their destinations. National Transit Database (NTD) Glossary | FTA (dot.gov)

65. Puerto Rico Integrated Transit Authority (PRITA). 2021 Approved Budget. Retrieved from: https://presupuesto.pr.gov/Presupuesto_Aprobado2021-2022/Presupuesto_Agencias_pdf/Autoridad%20de%20Transporte%20Integrado%20de%20Puerto%20Rico.pdf on October 2, 2023.

Figure 3.10: Municipalities of Puerto Rico with a Transit System

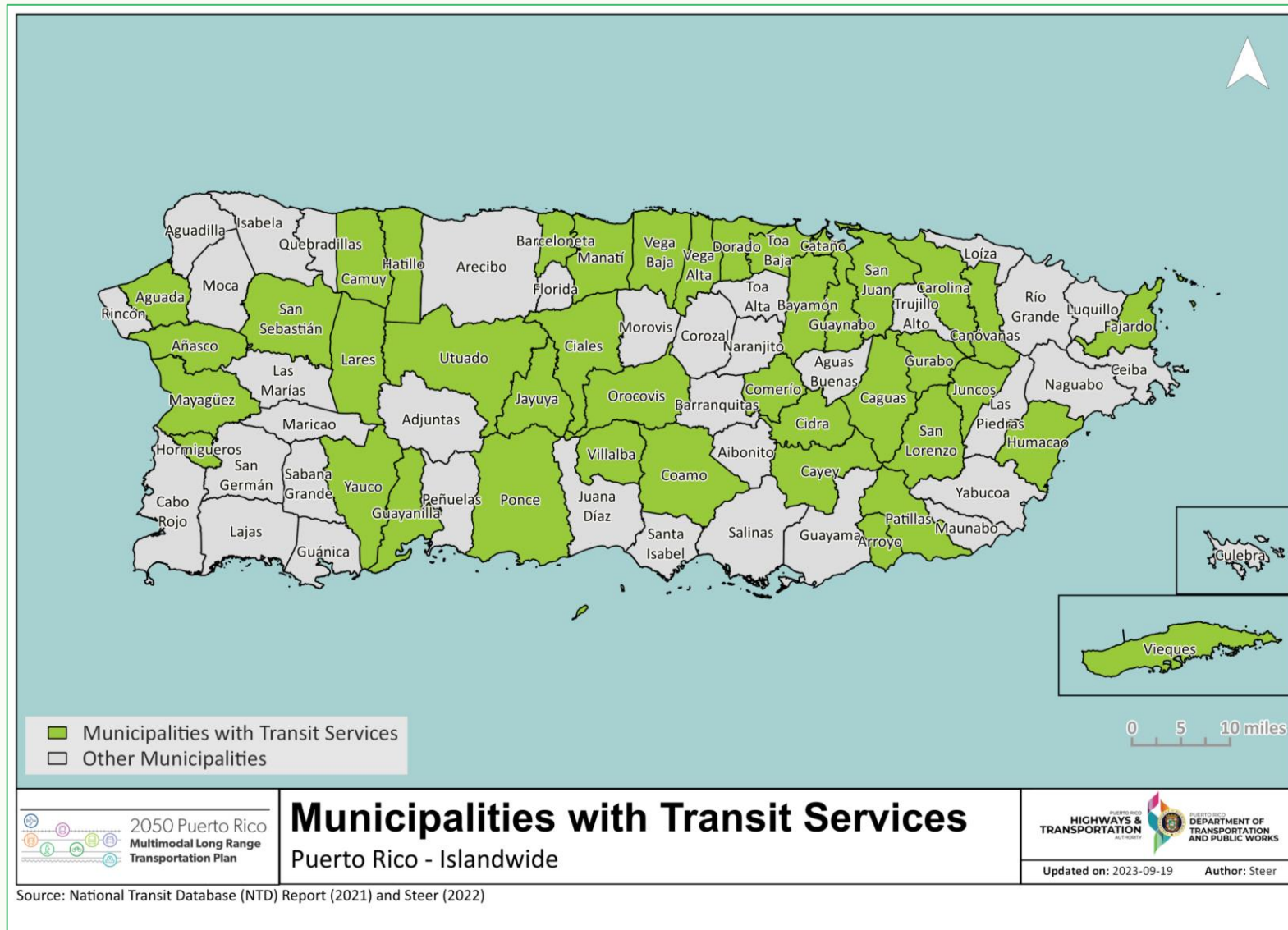
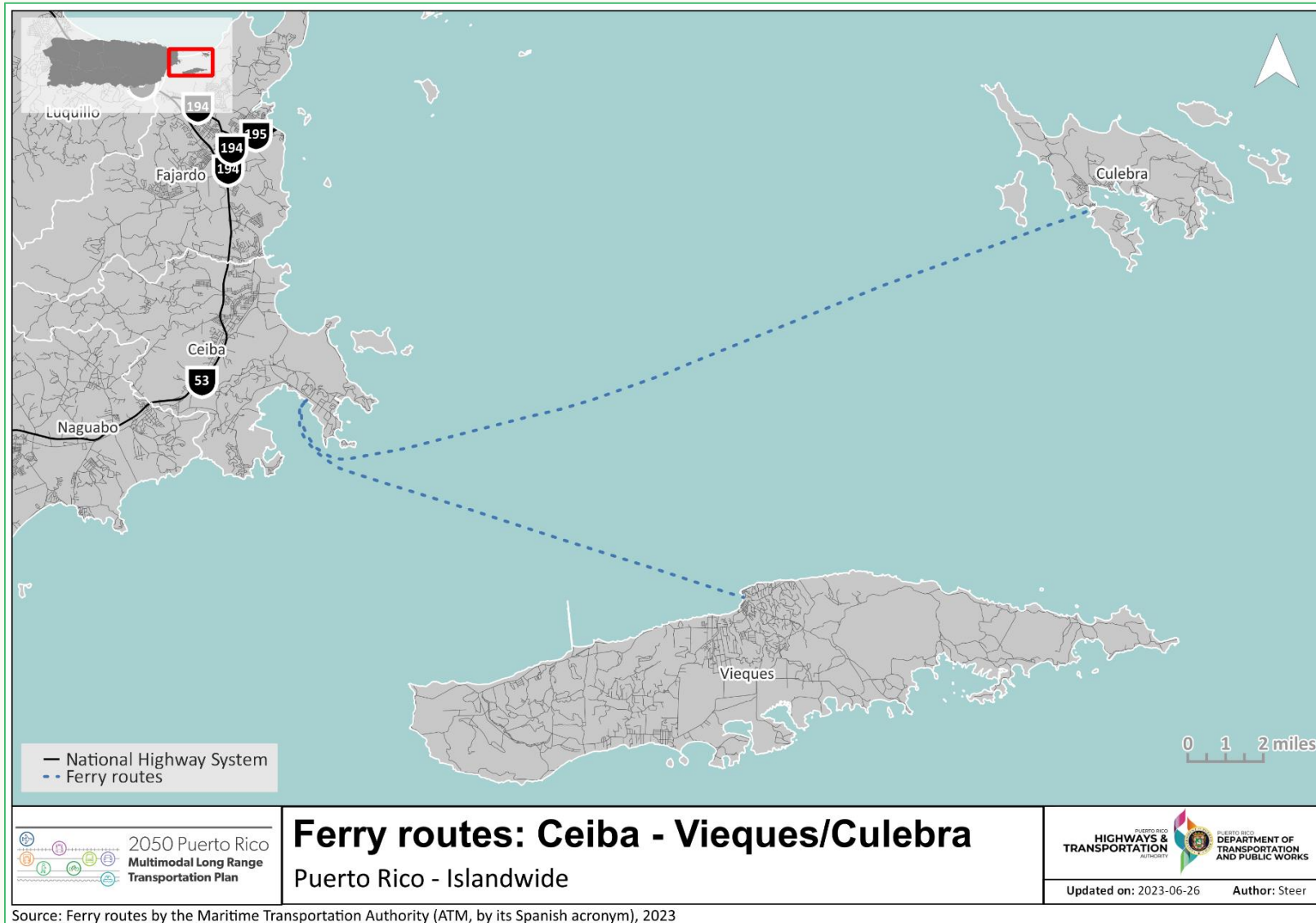
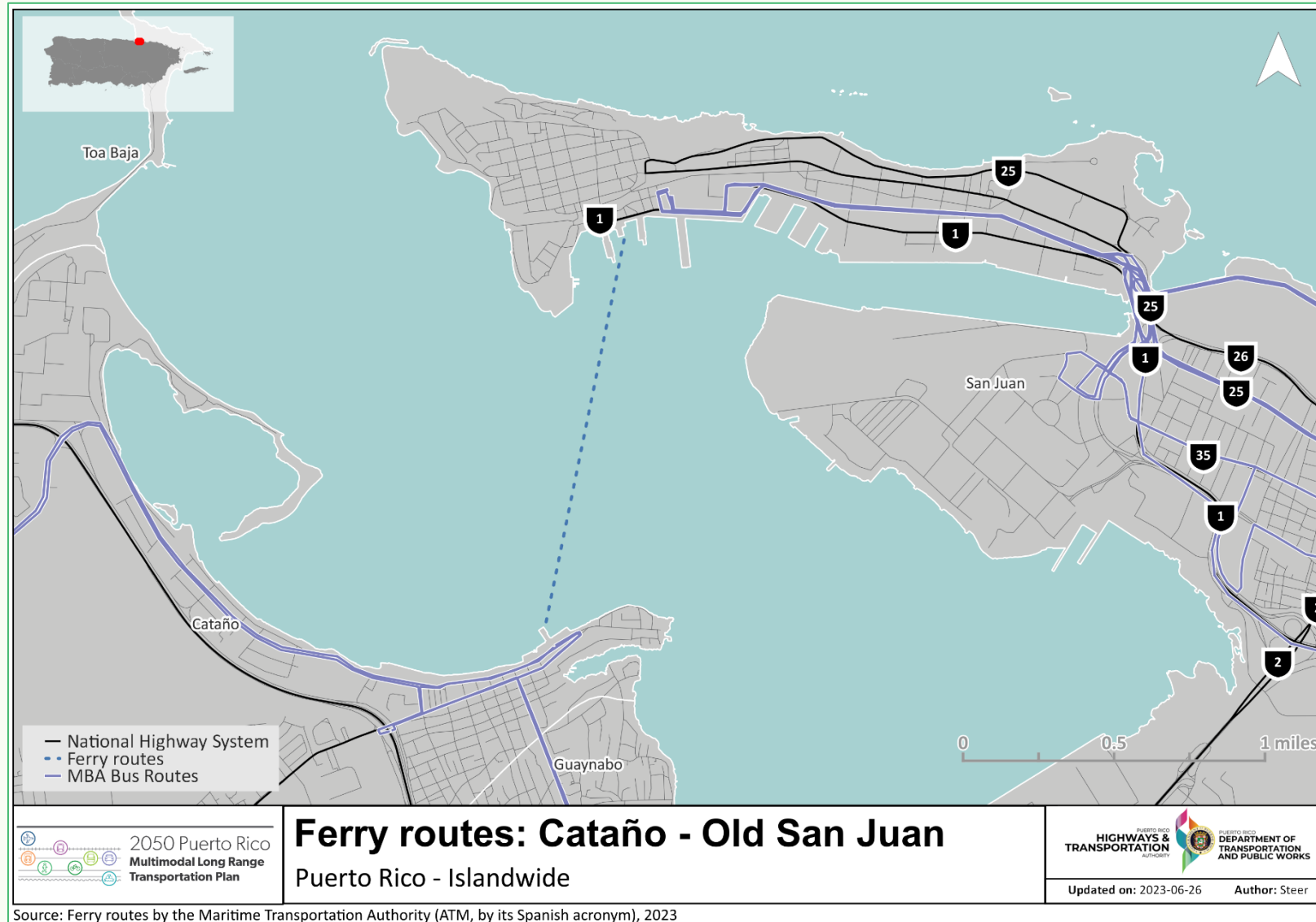


Figure 3.11: Puerto Rico Ferry Routes: Ceiba – Vieques/Culebra



Source: Ferry routes by the Maritime Transportation Authority (ATM, by its Spanish acronym), 2023

Figure 3.12: Puerto Rico Ferry Routes: Cataño – Old San Juan



Source: Ferry routes by the Maritime Transportation Authority (ATM, by its Spanish acronym), 2023

Roadway System

The Puerto Rico roadway network for 2021 has a total of 21,069.89 road miles⁶⁶ as defined by the Highway Performance Monitoring System (HPMS) and the Roadway Information Management System (RIMS) shown in Figure 3.13.

The roadways that are part of the National Highway System (NHS) are classified by the Federal Highway Authority (FHWA). There is a complex non-NHS system within the Island (local system) due to their provision of direct access to adjoining land, they are not intended for use in long distance travel, except at the trip origin or destination⁶⁷. The classification is based on the functionality and is aimed at defining the role of roadways in the overall roadway network. The classification is as follows⁶⁸:

- **Interstate:** Officially designated as part of the Eisenhower Interstate System, these roads are focused on providing the infrastructure for high mobility and long-distance travel.
- **Other Freeways and Expressways:** Designed and built to increase mobility function. The land uses next to these roads are not directly served by them. Access and egress points are limited to on- and off-ramps or a limited number of at-grade intersections. They have directional travel lanes, usually separated by some type of physical barrier.
- **Principal Arterials:** These roads serve main metropolitan centers and some rural areas, offering a high mobility degree. Adjoining land uses can be served directly by them.
- **Minor Arterial:** Provide connectivity to the higher Arterial system and service for trips of moderate length.
- **Major Collector:** Provide more mobility through more travel lanes. These roads tend to have higher annual average traffic volumes and speed limits. They have lower connecting driveway densities, are longer in length, and are spaced at greater intervals than their Minor Collector counterparts.

- **Minor Collector:** Offer less mobility and more access than their Major Collector counterparts. Also, they serve both land access and traffic circulation in lower-density residential and commercial/industrial areas instead of the higher-density service in Major Collectors.

Table 3.2 describes the number of road miles according to the network functional classifications. This table was created based on the Puerto Rico Department of Transportation NHS information layer. The map displays an extensive network of principal arterials and expressways interconnecting the three (3) interstates that form the Eisenhower Interstate System on the Island. A more detailed description of the roadway can be found in the regional documents.

Table 3.2: Roadway System by Functional Classification – Puerto Rico

Functional Classification	Road Miles
Interstate	285.56
Freeways and Expressways	53.14
Principal Arterials	458.60
Major Collector	1,491.44
Minor Arterials	1,221.99
Minor Collector	257.62
Local	17,301.55

Source: Puerto Rico Highway and Transportation Authority, 2022, PRHTA Roads Highway Performance Monitoring System (HPMS) 2022 Log plus RIMS Local Feature Server

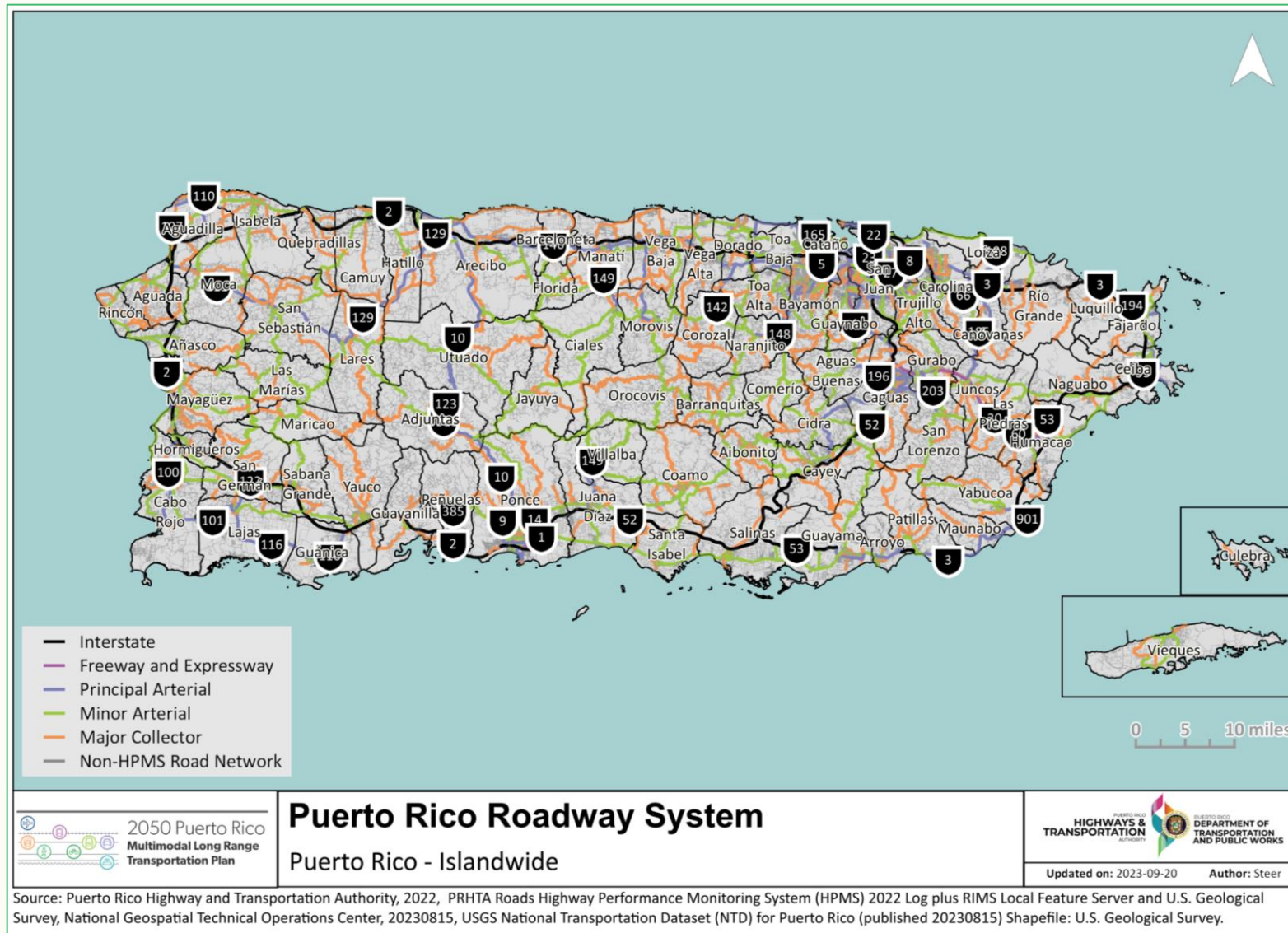
The Puerto Rico roadways map shown in Figure 3.13 illustrate the 2022 road network as it is described on the Highway Performance Monitoring System (HPMS) and Roadway Information Management System (RIMS). The map displays an extensive network of Interstate, Freeways and Expressways, Principal Arterials, Minor Arterial, Major Collector and Minor Collector.

66. These values might defer from those in the TAMP given that the methodology to calculate these values from both systems.

67. U.S. Department of Transportation. Federal Highway Administration. Office of Planning, Environment, and Realty (HEP).

68. Based on the 2045 LRTP (ACT, 2018)

Figure 3.13: Puerto Rico Roadway System



The main roadways shown in Figure 3.13 are described below, according to the Puerto Rico Transportation Asset Management Plan 2032. The main Puerto Rico Interstates (PRI) are composed by other roads that are described below:

PRI-1

- **PR-18:** A north to south 6 km long expressway which runs through the San Juan municipality perpendicular to PR-23 and PR-17 and ending on PR-1 at km 6. It connects PR-22 to PR21, PR-1 and PR-52.
- **PR-52:** Highway PR-52 (Luis A. Ferré Highway), begins at the intersection of PR-18 and PR-1 and runs south and then west for 108.3 km. It connects the municipality of San Juan with the municipalities of Trujillo Alto, Caguas, Cayey within the San Juan TMA. Then, it leads into Salinas, Santa Isabel, Juana Díaz and ends in Ponce in the South Region.

PRI-2

- **PR-2:** The road travels the whole north and west of the Island starting in Santurce (San Juan) intersecting PR-22 at various points along the way. It connects the municipalities of Guaynabo, Bayamón, Toa Baja, Dorado, Vega Alta, Vega Baja and Manatí. The road extends beyond the San Juan Region to Hatillo in the North Region where it takes over PR-22 as Interstate. Then it keeps going west until it reaches Aguadilla, turns south to Mayagüez and Hormigueros and then turns east to Ponce and connects with PR-52. It connects San Juan TMA, North Transportation Planning Region (TPR), Aguadilla TMA, Southwest TPR and South TPR.
- **PR-22:** Also known as José De Diego Expressway, PR-22 is an 83.7 km long highway that originates at PR-26 in San Juan. It extends to the west municipalities traveling through Cataño, Bayamón, Toa Baja, Dorado, Vega Alta, Vega Baja and Manatí eventually reaching Barceloneta, Arecibo and Hatillo.

PRI-3

- **PR-3:** Is a 159.2 km road that originates in San Juan. It runs for 38.8 km towards the East and Southeast TPRs, connecting San Juan, Carolina, Canóvanas, Río Grande, Luquillo, Fajardo, Ceiba, Naguabo, Humacao, Yabucoa, Maunabo, Patillas, Arroyo, Guayama and Salinas. It complies with the characteristics of various classifications, but it is primarily a principal arterial that forms part of the interstate system. It is considered as an interstate from PR-66 intersection in Río Grande to Fajardo and intermittently from Yabucoa to Guayama.
- **PR-26:** Román Baldorioty de Castro Expressway runs for 15.5 km between San Antonio Bridge in San Juan and the start of PR-3 in Carolina. The road has a tangent segment with PR-37 at Cangrejo Arriba Barrio⁶⁹ and exits to PR-187 which leads to Loíza.
- **PR-53:** José Celso Barbosa Highway is a 59.3 km long road that commences in Fajardo and intersects the San Juan Region after exiting Ceiba on the southeast corner. It goes from Naguabo to Yabucoa, where it connects to Maunabo through PR-901. This highway is incomplete and has additional intermittent segments on the municipalities of Salinas, Guayama, Arroyo and Patillas.
- **PR-66:** Roberto Sánchez Vilella Highway, leads east with 14.1 km in length. The road starts at the PR-3 Intersection and extends through Carolina, Canóvanas and ends on PR-3 in Río Grande.

69. Puerto Rico is divided into 78 municipalities, which the Census Bureau treats as similar to counties in the United States for census data presentation purposes. The 902 municipality subdivisions consist of 827 barrios and 75 barrios-pueblo. A barrio-pueblo represents the seat of government of each municipality except Florida, Ponce, and San Juan. The Census Bureau identifies 37 areas in the Caribbean Sea that are not within a municipality subdivision; these areas are not assigned to any municipality subdivision and are not counted in the number of municipality subdivisions. In 23 municipalities, all, or part of 20 barrios-pueblos and 10 barrios are further subdivided into 145 sub-barrios. U.S. Census Bureau. (Based on 2045 LRTP, AT, 2018).

Luis Muñoz Marín Panoramic Route

The Luis Muñoz Martín Panoramic Route is a combination of routes that ran through the central mountain range. This road was declared as a scenic route through Law 71, 1965 and was finished in 1974 and has served the Island as a recreational facility that crosses the territory from East to West.

The DTPW and the PRHTA completed the Update to the Corridor Management Plan for the Luis Muñoz Marín Panoramic Route in 2021 with an allocation of the FHWA State Planning and Research Program. The updated plan includes goals for the preservation of the cultural and scenic values of the Route, as well as for the safety of its users and socio-economic development.

The Panoramic Route provides visitors of all ages diverse opportunities to explore the Island's cultural, historical, natural, scenic, and recreational resources as well as to experience local traditions and the rural way of life⁷⁰.

This route serves as a gateway, connecting the traveler to other regions in a safe and coherent manner, educating the users about its resources. It is also meant to preserve and enhance the natural beauty of the interior of Puerto Rico for residents and visitors, while offering an opportunity of socio-economic development⁷¹.

Figure 3.14 and Table 3.3 show more details about the Panoramic Route. The Route begins in Mayagüez and ends in the Maunabo Municipality. It crosses through the municipalities of Las Marías, Maricao, Sabana Grande, Yauco, Lares, Adjuntas, Ponce, Jayuya, Villalba, Orocovis, Coamo, Barranquitas, Aibonito, Cayey, San Lorenzo, Patillas and Yabucoa. The complete route begins in Mayagüez and ends in the Maunabo municipality.

Table 3.3: Panoramic Route Details (Municipalities and State Roads) – Puerto Rico

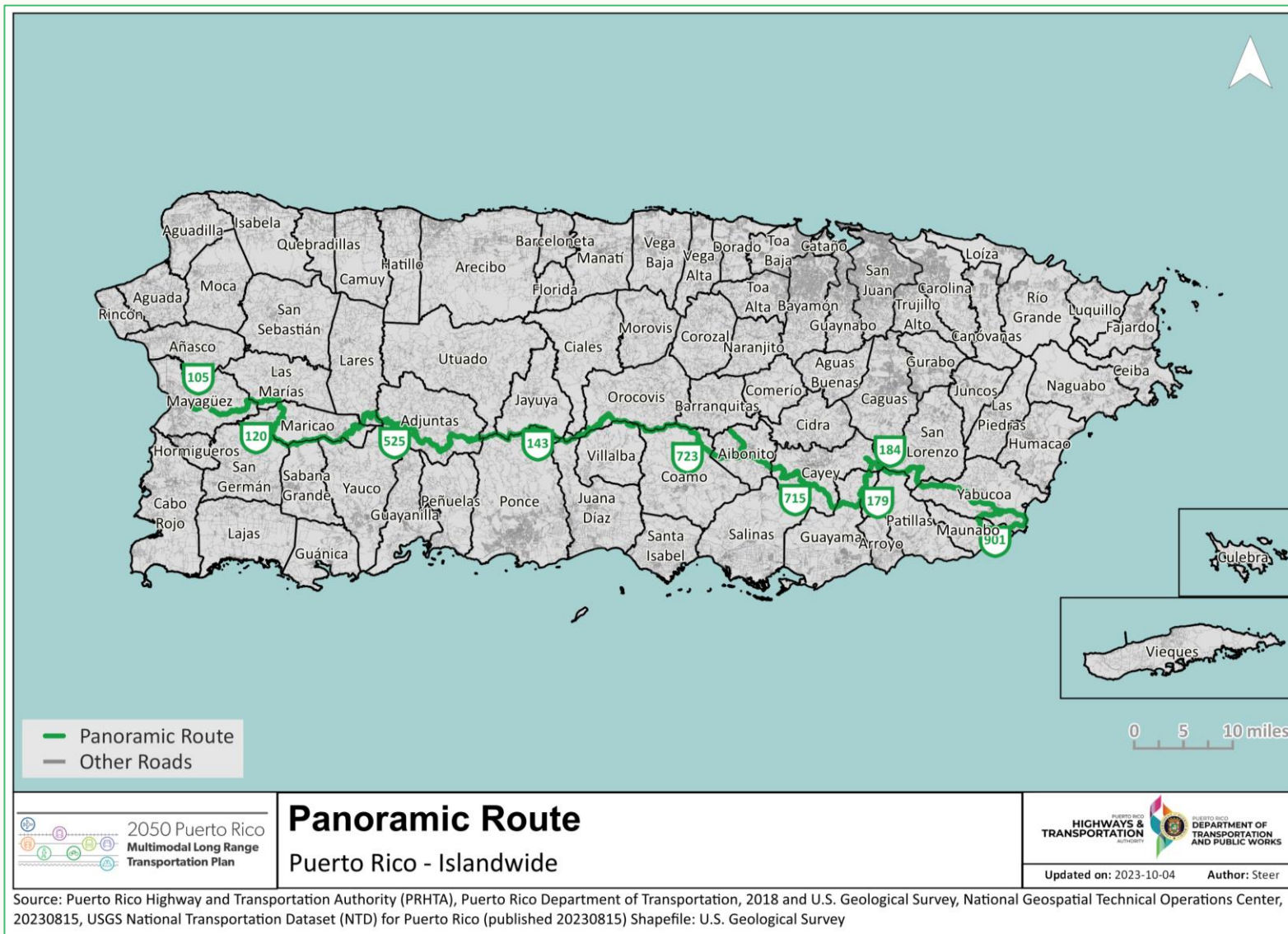
Region	Municipalities	State Roads	Length in km
San Juan	Maunabo	3, 901, 760	11.6
	Yabucoa	3, 182, 181, 901	32
	San Lorenzo	181, 7740	7.3
	Cayey	184, 179, 742, 7741, 741, 15, 715, 1, 7722	29.35
	Aibonito	7722, 722, 7718, 725, 14, 723	20
	Barranquitas	143	2.3
	Orocovis	143	16.7
Southeast	Patillas	7740, 184	3.9
	Guayama	179, 742, 7741	13.3
	Coamo	723, 143	16.2
	Villalba	143	2.3
	Juana Díaz	143	1.2
	Ponce	143	7.6
South	Jayuya	143	6.8
	Adjuntas	143, 123, 518, 131, 525, 135	31.4
	Utuaado	143	3.8
Southwest	Maricao	128, 105, 365, 366, 120	26.8
	Sanaba Grande	366, 120	2.5
	Mayagüez	119, 339, 105	16.6
Aguadilla	Lares	135, 128	8.5
	Las Marías	120, 106	6.7
Total	21	34 State roads	266.85

Source: 2045 LRTP , ACT, 2018

70. Puerto Rico Highway and Transport Authority (2023). Planificación Estratégica. Retrieved from: <https://act.dtop.pr.gov/planificacion-estrategica/> on October 2023.

71. Puerto Rico Highway and Transport Authority (2023). Planificación Estratégica. Retrieved from: <https://act.dtop.pr.gov/planificacion-estrategica/> on October 2023.

Figure 3.14: Luis Muñoz Marín Panoramic Route



Airports

Puerto Rico is an important location and a central focus for tourism and commercial activity. The Island represents a significant site to national air, terrestrial and maritime transportation as it is well known for its natural resources and its potential for development. Therefore, the airports in the Island serve an important purpose in achieving this potential development through the movement of people and goods in the territory.

The Federal Aviation Administration (FAA), through the National Plan of Integrated Airport Systems (NPIAS) identifies the relevant airports in the U.S. territory for planning purposes. There are ten (10) available principal airports included in the National Plan of Integrated Airport Systems (NPIAS):

- Rafael Hernández in Aguadilla (BQN)
- Antonio Nery Juarbe Pol in Arecibo (ABO)
- José Aponte de la Torres in Ceiba (RVR)
- Dr. Hermenegildo Ortiz Quiñones in Humacao (X63)
- Benjamín Rivera Noriega in Culebra (CPX)
- Antonio Rivera Rodríguez in Vieques (VQS)
- Eugenio María de Hostos in Mayagüez (MAZ)
- Mercedita in Ponce (PSE)
- Fernando Luis Ribas Dominicci in San Juan (SIG)
- Luis Muñoz Marín International in San Juan (SJU)

For 2021, there has been a total movement of over 10.5 million passengers within the ten (10) available airports on the Island. Table 3.4 shows the number of passengers in these airports. The details of these airports will be discussed in the regional documents.

The two (2) main airports in the Island, based on the number of passengers they transport each year are the Luis Muñoz Marín International Airport (SJU) in San Juan and the Rafael Hernández Airport (BQN) in Aguadilla. In 2021, including both arriving and departing flights, they served a total of 91,764 and 3,127 flights, respectively.

Table 3.4: Airports Passenger Flow

Airport	2016	2017	2018	2019	2020	2021
Mercedita (Ponce)	231,798	189,143	201,260	218,753	42,528	64,198
Eugenio María de Hostos (Mayagüez)	12,135	15,281	16,123	16,670	10,015	12,744
Benjamín Rivera Noriega (Culebra)	81,614	64,303	41,561	57,748	32,971	70,451
José Aponte de la Torre (Ceiba)	97,037	84,422	57,202	63,252	42,226	75,768
Dr. Hermenegildo Ortiz Quiñones (Humacao)	1,154	1,000	772	490	720	3,624
Antonio Nery Juarbe (Arecibo)	10,139	14,026	11,619	18,248	11,941	21,119
Mercedita (Ponce)	231,798	189,143	201,260	218,753	42,528	64,198
Antonio Rivera Rodríguez (Vieques)	131,980	1804,414	70,374	83,285	48,251	84,929
Fernando Ribas Dominicci (Isla Grande)	50,231	42,896	29,927	36,973	21,995	37,754
Luis Muñoz Marín (San Juan)	9,037,134	8,437,604	8,384,290	9,447,862	4,843,935	9,720,209
Rafael Hernández (Aguadilla)	519,603	498,424	608,352	753,996	149,162	461,227

Source: Ports Authority, Monthly Operational Report FY2018 to FY2021

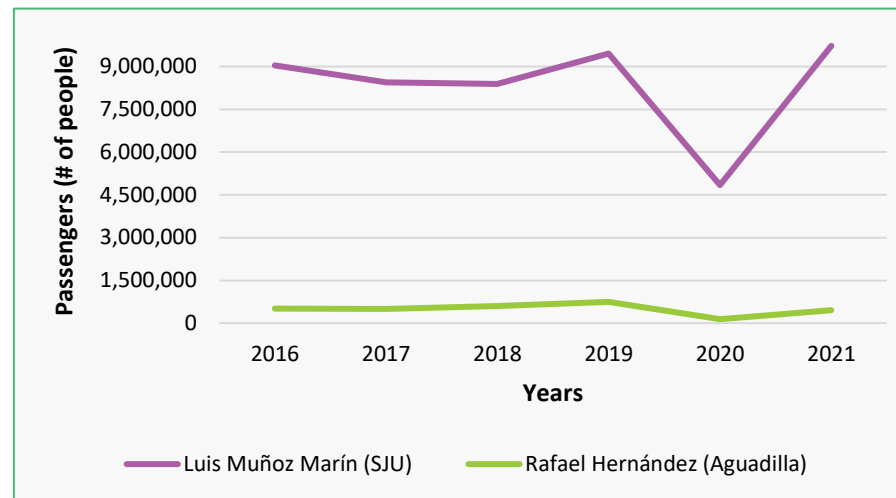
Luis Muñoz Marín International Airport has the largest flow of passengers, making it the most important airport in the Island, as it serves as the main connection with national and international destinations. It is also the only facility operating under a public-private partnership (Aerostar Airport Holdings, LLC).

In 2021, the Luis Muñoz Marín International Airport (SJU) served 4,841,534 arriving passengers and 4,878,675 departing passengers. Also in 2021, the Rafael Hernández Airport (BQN) served the 229,238 arriving passengers and 231,989 departing passengers. The passenger flow from 2016 to 2021 for these two airports can be seen in Figure 3.15.

In 2021, the SJU and BQN airports served 91,540 and 4,565 flights (including departing and arriving), respectively. Figure 3.16 shows the number of flights in the SJU and BQN airports from 2016 to 2021.

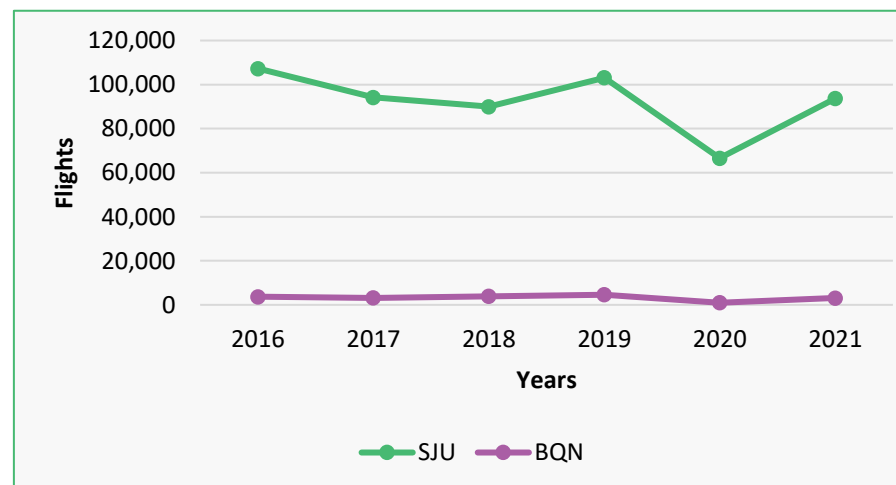
Figure 3.17 shows the location of all airports and seaports in Puerto Rico. Additionally, the data related to cargo from the airports that move cargo can be seen on Figure 3.21.

Figure 3.15: Puerto Rico Passenger Flow for SJU Airport and BQN Airport 2016-2021



Source: Ports Authority, Monthly Operational Report FY2018 -2019 to FY2021-2022

Figure 3.16: Flight Departures and Arrivals for SJU and BQN Airports 2016-2021



Source: Ports Authority, Monthly Operational Report FY2018 -2019 to FY2021-2022

Figure 3.17: Puerto Rico Airports and Seaports



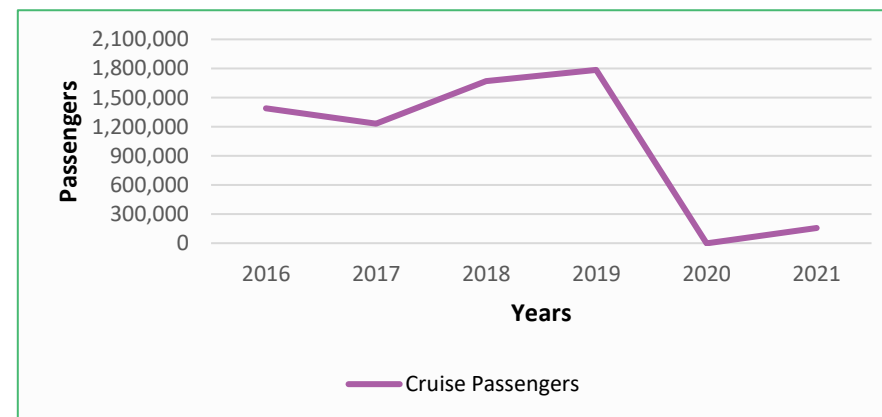
Seaports

Puerto Rico is a principal destination in the Caribbean and an important source for economic activity. It also has the capability of managing maritime transportation due to its geographical location. Various seaports in the Island cover the citizen's needs, provide for cruises' arrival, and promote a platform for cargo management and overall development. Figure 3.17 shows the location of all ports in the Island, these are:

- **San Juan Port:** biggest seaport in the Island. It is composed of various passenger and cargo facilities around the San Juan Bay.
- **Ceiba, Vieques and Culebra Ports:** these ports connect the mainland with the smaller islands, Vieques and Culebra
- **Rafael Cordero Santiago Port:** located in the Municipality of Ponce. It is composed of this main facility and is projected to include complimentary facilities in the future..
- **Mayagüez Port:** it is the third (3rd) ranked facility in the Island in terms of activity. It is located along highways PR-64, PR-341, and PR-3341, which converts it in a multipurpose seaport. It handles various types of cargo and receives weekly visits by ships serving the Dominican Republic. It currently is the only facility in the Island's western coast capable of docking large cruise ships.
- Other important maritime harbors on the Island include:
 - Aguadilla Port;
 - Jobos Harbor Port in Guayama;
 - "El Puerto de la Playa de Guayanilla" in the Municipality of Guayanilla;
 - "El Puerto del Malecón de Guánica" in the Municipality of Guánica; and
 - Arecibo Port.

Regarding passenger numbers, from 2016 to 2017 there was a slight decrease on cruise passengers, while for 2018 and 2019 reflects an increase. During 2020, due to the COVID-19 pandemic, no cruises were offering services to the Island. Nevertheless, in 2021 they resumed operations. Figure 3.18 shows the number of cruise passengers in Puerto Rico from 2016 to 2021.

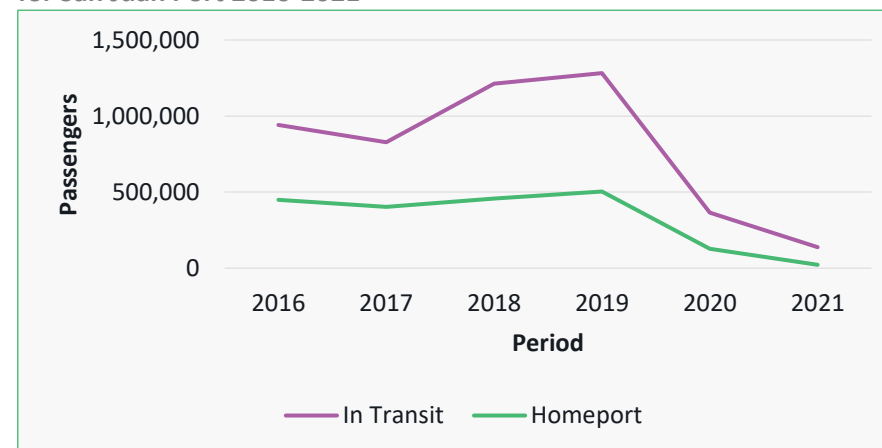
Figure 3.18: Puerto Rico Cruise Passengers for San Juan Port



Source: Ports Authority, Monthly Operational Report FY2018-2019 to FY2022-2023

In 2021, the San Juan Port had 137,272 in transit cruise ships passengers and 21,664 homeport cruise ship passengers. Figure 3.19 shows the flow of passengers both in transit and homeport, in San Juan Port facilities.

Figure 3.19: Puerto Rico in Transit Versus Homeport Cruise Passengers for San Juan Port 2016-2021



Source: Ports Authority, Monthly Operational Report FY2018 to FY2021

Freight Context

Puerto Rico's goods enter and exit the island through seaports and airports, with ten (10) available principal airports⁷² and eleven (11) seaports (see Figure 3.17).

It is important to note that some airports and seaports only serve passengers, with no dedicated service for cargo (discussed in greater detail below). The largest and busiest airport and seaport are both located in the San Juan region: the Luis Muñoz Marín International Airport (SJU) and the Port of San Juan. The US Department of Transportation's 2023 Report on Port Performance revealed that the Port of San Juan ranked 11th in the list of top 25 container ports in the United States by TEU (twenty-foot equivalent unit – an inexact unit of cargo capacity).

Airports

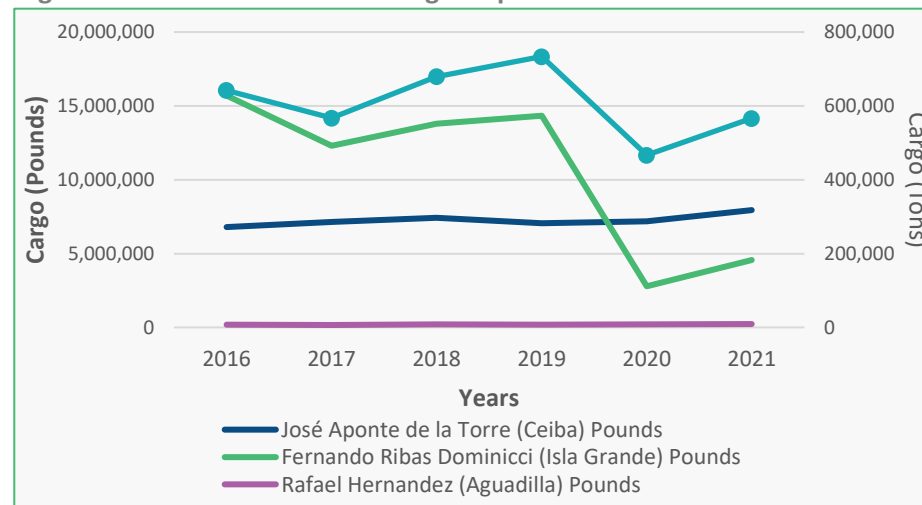
The Luis Muñoz Marín International Airport (SJU) in Carolina (just east of San Juan), and the Rafael Hernández Airport (BQN) in Aguadilla are the highest-ranking airports regarding cargo on the Island⁷³. Both were ranked nationally in the U.S. 34th and 78th, respectively in 2021⁷⁴. This relatively high ranking is an indicator of the key role both airports play as cargo terminals for the Island.

SJU had just over 1.4 billion pounds of landed weight for 2020 and over 1.6 billion pounds for 2021, signifying a 12.7% percent of change in one (1) year. Meanwhile BQN had just over 359,000,000 pounds of landed weight for 2020 and over 427,000,000 for 2021 signifying an 18.9% percent change⁷⁵. Figure 3.21 shows the cargo data for the main cargo airports in Puerto Rico.

(SIG) located in Isla Grande, a sub-district of Santurce in San Juan, is classified as a commercial (small/non-hub facility) by the Federal Aviation Administration's National Plan of Integrated Airport Systems (NPIAS). According to operational reports between the 2016 and 2021, this airport experienced a decrease of 21% in cargo volumes⁷⁶. Figure 3.20 shows the cargo data for the main cargo airports in Puerto Rico.

The other airports on the island only service people, not goods, and have, therefore, not been included in this discussion.

Figure 3.20: Puerto Rico Main Cargo Airports



Source: Ports Authority, Monthly Operational Report FY2018-2019 to FY2022-2023

72. Airports identified are those included in the National Plan of Integrated Airport Systems (NPIAS) for the period of 2023-2027. This National Plan identifies existing and proposed airports that are significant to national air transportation and are, in consequence, eligible to receive Federal grants under the Airport Improvement Program (AIP)³⁵.

73. Aeroweb. Forecast International's Aerospace Portal. Top 100 U.S. Airports in 2021.

74. Aeroweb Forecast International's Aerospace Portal.

75. Definition from Federal Aviation Administration: "Landed weight means the weight of aircraft transporting only cargo in intrastate, interstate, and foreign air transportation. An airport may be both a commercial service and a cargo service airport."

76. Data obtained from Monthly Operational Reports from the Ports Authority FY2018-2019 to FY2022-2023.

Effects of COVID-19 Pandemic in Air Cargo

The COVID-19 pandemic evidenced and amplified the territory's economic and social crisis. The immediate response for the Authorities at the Island resulted in quarantine, curfews, and lockdowns per executive orders, including the shutdown of airports funnelling through Luis Muñoz Marín International Airport. Figure 3.20 shows the cargo data from 2016 to 2020, evidencing the decrease that occurred in 2020 after this shutdown.

Cargo data, reflects a drop from 2016 to 2017 and then comes with a slight increase by 2019. But when it reaches the pandemic year of 2020, it reflects a dramatic decrease in cargo levels for the main airport. The next year it starts to recover slightly, as shown in Figure 3.21.

Seaports

The Port of San Juan is the Island's biggest seaport. It comprises various facilities around the San Juan Bay, which include passenger and cargo facilities.

San Juan, Cataño and Guaynabo are the municipalities surrounding the Port of San Juan, which is property of the Puerto Rico Ports Authority. Major commodities handled at the Port include manufactured products, distillate fuel oil, gasoline, foodstuffs, and kerosene⁷⁷.

The US Department of Transportation's 2023 Report on Port Performance revealed that the Port of San Juan ranked 11th in the list of top 25 container ports in the United States by TEU. From 2016 to 2021, there has been a 12.9% increase in total trade⁷⁸.

Recent statistics noted that by volume of cargo, the Port of San Juan ranked:

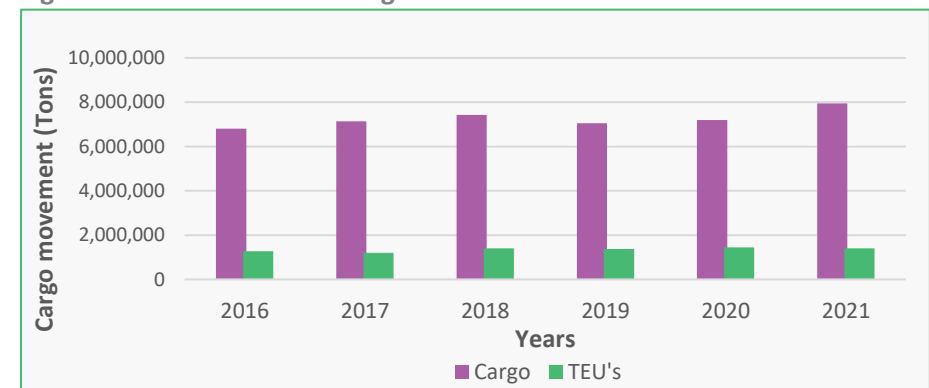
- 24th in exports;
- 12th in imports; and
- 18th in total trade within U.S..

These statistics also show that, by value of cargo, the Port of San Juan ranked:

- 17th in exports;
- 19th in imports; and
- 17th in total trade within U.S.

Figure 3.21 shows the TEU in the San Juan Port from 2016 to 2021. We can note that even though there have been slight increases and decreases between these years, both the levels of cargo and TEU have been similar and denote a general increase up to 2021.

Figure 3.21: San Juan Port Cargo Movement and TEU's



Source: Ports Authority, Monthly Operational Report FY2018to FY2021

77. Port of San Juan Port Performance Freight Statistics Program: Annual Report to Congress 2018.

78. Monthly Operational Reports from Ports Authority Carga y pasajeros aéreos y marítimos | Estadísticas.PR (estadisticas.pr)

The Mayagüez Port (located west of the island) is the third ranked facility on the island in terms of activity. Located along highways PR-64, PR-341 and PR-3341, it is a multipurpose seaport that handles various types of cargo and receives weekly visits by ships serving the Dominican Republic.

The Rafael Cordero Santiago Port of the Americas, in the Municipality of Ponce, is a new megaport under construction. The project aims to convert the current Port of Ponce into a value-added, tax-free, customs-free, international shipping hub.

Other ports that are worth mentioning due to their importance in terms of cargo and movement of goods, include Puerto de la Playa de Guayanilla (located in the south of the island), Puerto del Malecón de Guánica (located in the southwest of the island), and the Fajardo Port (located in the east of the island). The interior of the Island is therefore connected by a ring of ports around its periphery.

The Island's series of earthquakes in 2020 may have exacerbated damage caused by Hurricane María. A study that assessed underlying infrastructure evidenced that earthquake damage at ports had been exacerbated by underlying corrosion of the structure accelerated by increased exposure to sea water during the hurricane⁷⁹. Still, all ports are operating disregarding the effects of hurricanes in the area.

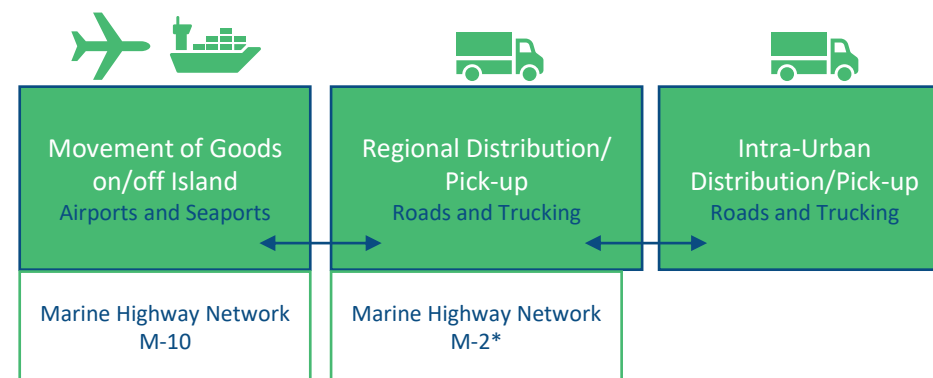
Road Network

With no freight rail on the island, the road network is the primary facilitator for the movement of goods across the regions.

In terms of freight vehicles, goods are moved using a mix of diesel-fueled medium- and heavy-duty trucks⁸⁰. It is assumed that these same trucks are used within smaller urban and local areas, as no light-duty trucks or cars have been confirmed as part of last-mile distribution / pick-up service alternatives (e.g., cargo bikes). Reflecting 2022 data in the 2050 MLRTP, the existing road freight network is presented in Figure 3.23.

The current process for moving goods to, from, and within Puerto Rico is presented in the high-level diagram shown in Figure 3.22.

Figure 3.22: Goods Movement Process to / from / within Puerto Rico



*The extent to which the M-2 network is being utilized is currently unknown.

Source: Steer

79. Frontiers | Case studies of multi-hazard damage: Investigation of the interaction of Hurricane María and the January 2020 earthquake sequence in Puerto Rico (frontiersin.org)

80. Medium trucks are single-unit trucks with two or three axles in FHWA vehicle classifications 5-7. Heavy trucks include all single-trailer and multi-trailer combinations defined in FHWA vehicle classifications 8-13.

The map illustrates how truck traffic increases on the primary interstate highways. Increased traffic can also be observed around ports and industrial zones which is expected but less obvious in minor arterial roads crossing town centers. It shows more concentration of traffic within the metropolitan area, as well as the east and south areas of the Island. Leaving the north and northwest sides of the Island with less concentration of traffic.

Truck Activity Hotspots

Figure 3.25 shows the truck activity hotspots in Puerto Rico indicating sections of the road where traffic is operating at or over the capacity of the road and at the same time being highly used by trucks. These hotspots are largely concentrated on the San Juan central area, the interstate system and other local principal and minor arterials throughout the Island. A more detailed description of the truck activity hotspots can be found in the regional documents.

Traffic Volume

Figure 3.26 shows the traffic volume for 2022 in Puerto Rico. This map displays the road density in terms of circle size and color. The map shows the Average Annual Daily Traffic (AADT), being green the one with the lowest value and red with the highest values. As other maps show, there is a higher traffic volume close to metropolitan areas, city centers and the coast. The interior of the Island has a lower AADT that is reflected in less population and economic activity.



Source: Steer, 2023

Figure 3.23: Existing Road Freight Network (Regional)

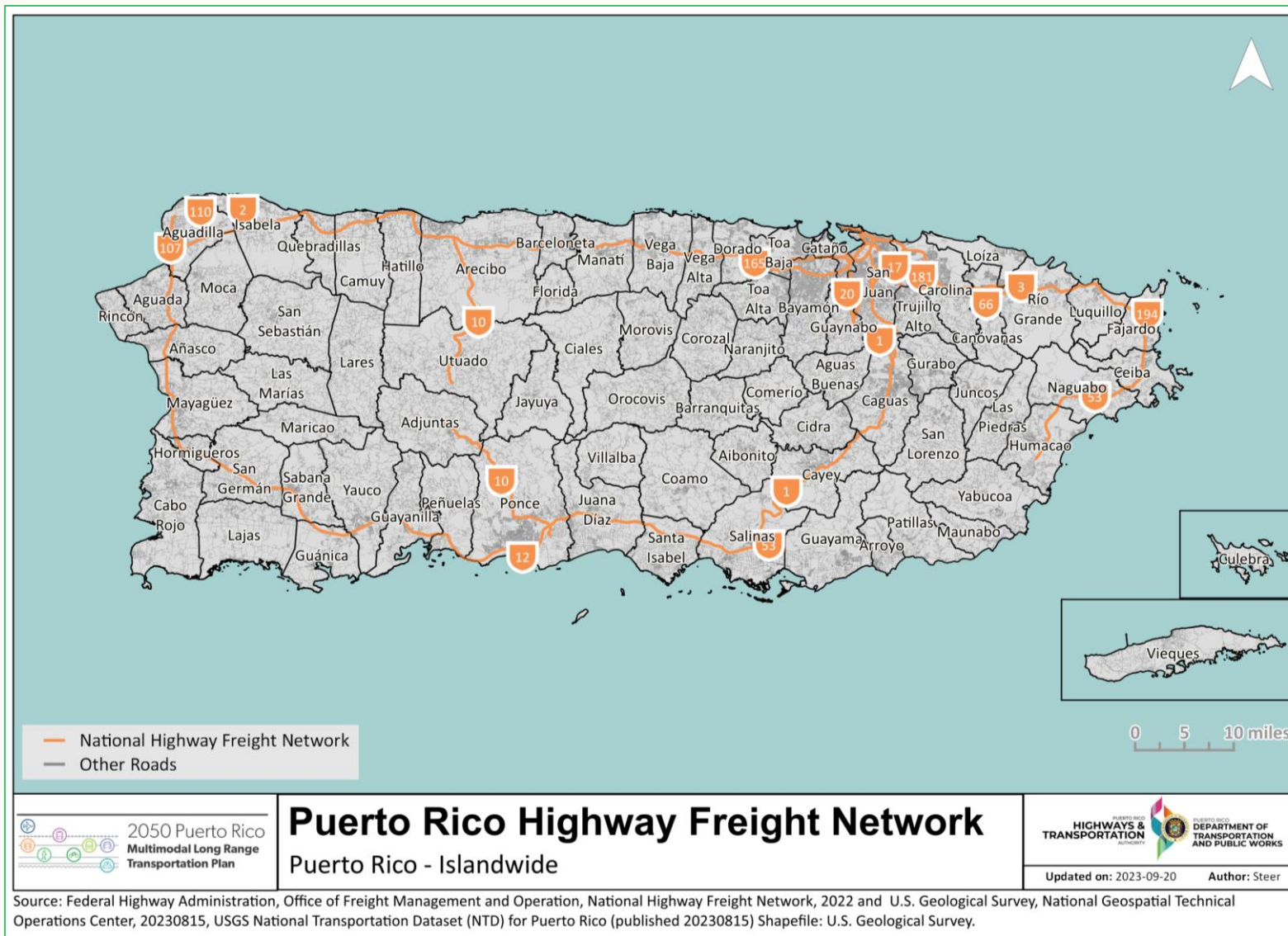


Figure 3.24: Existing Truck Activity in Puerto Rico

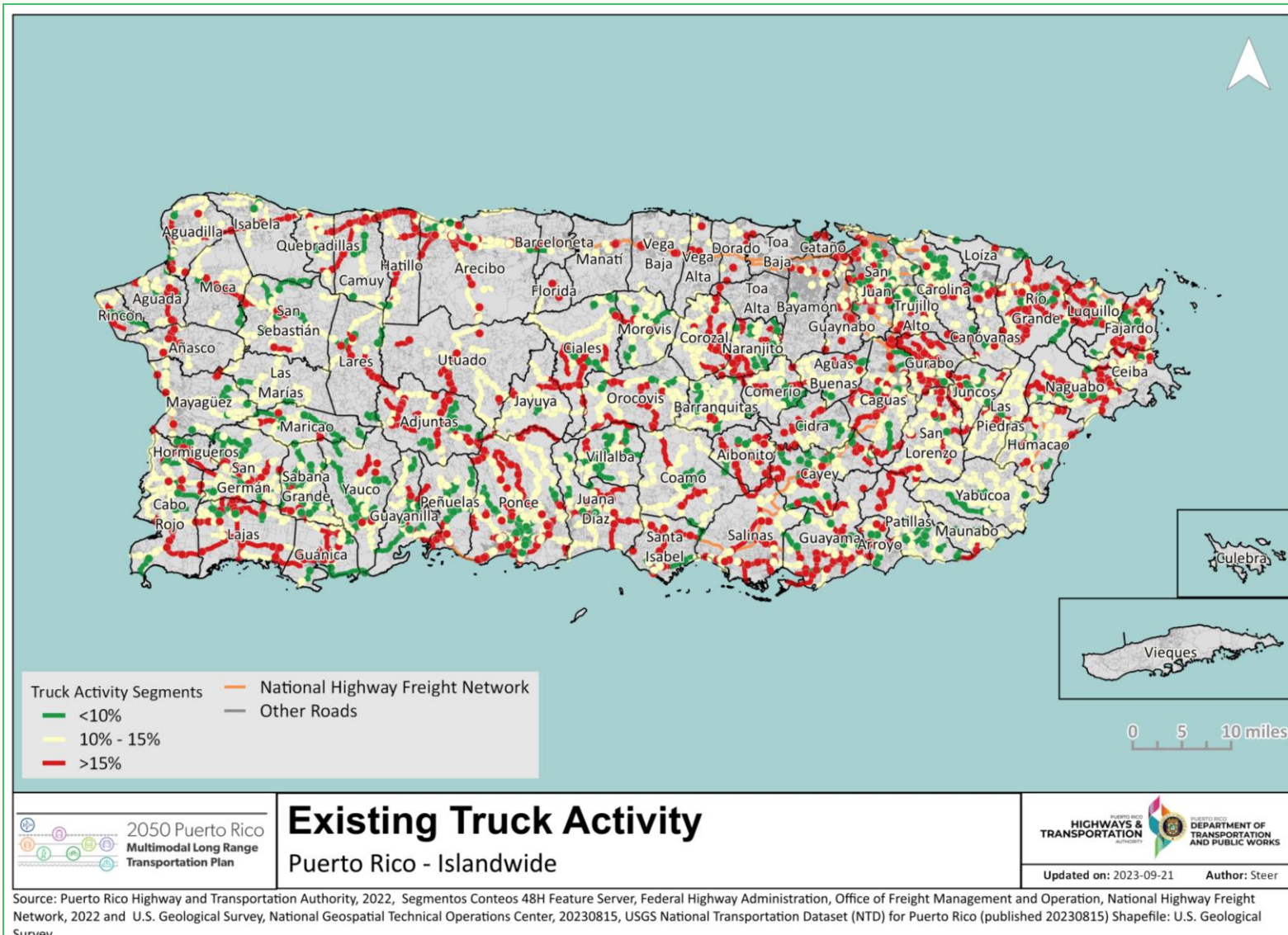


Figure 3.25: Truck Activity Hotspots in Puerto Rico

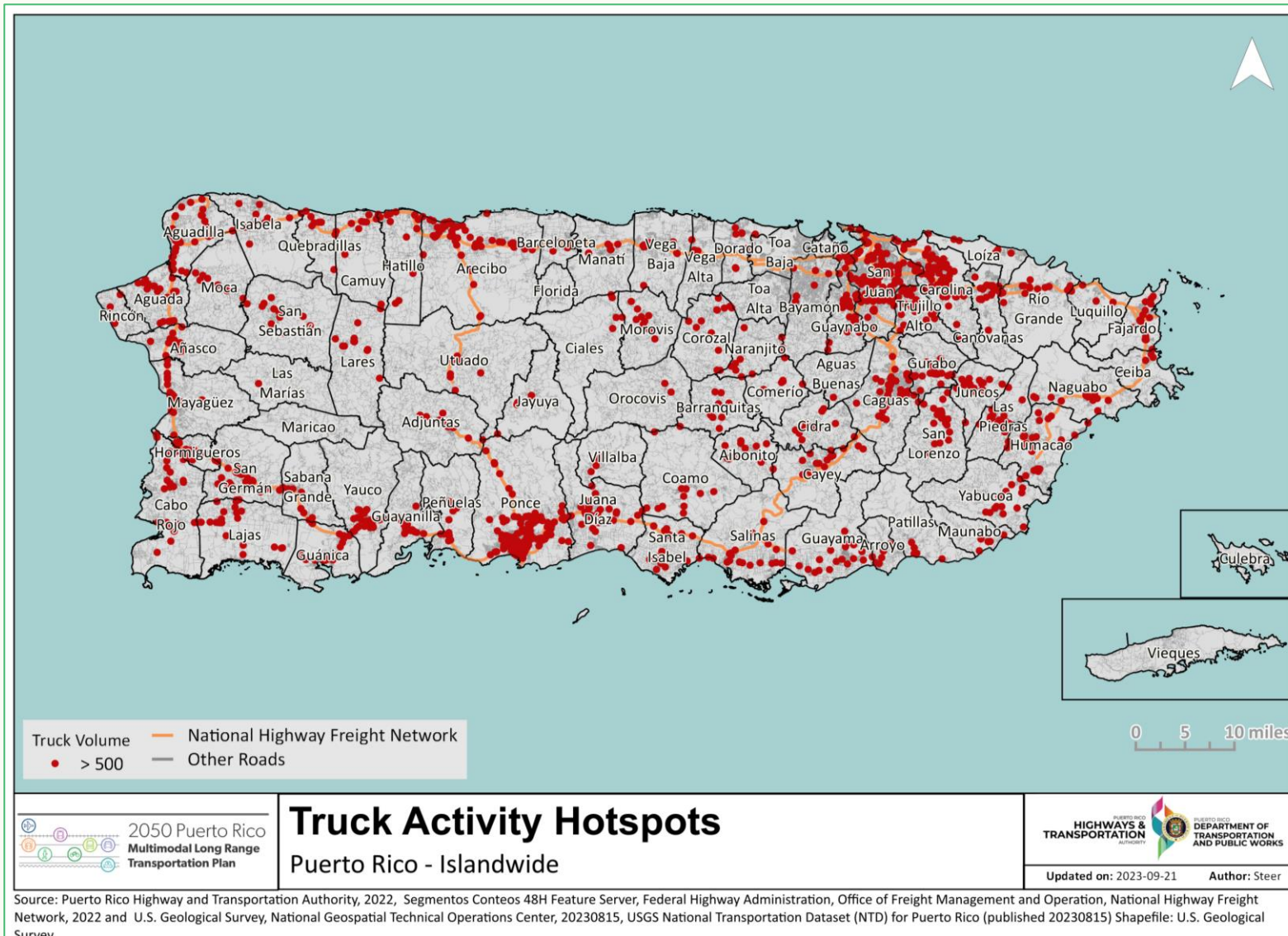
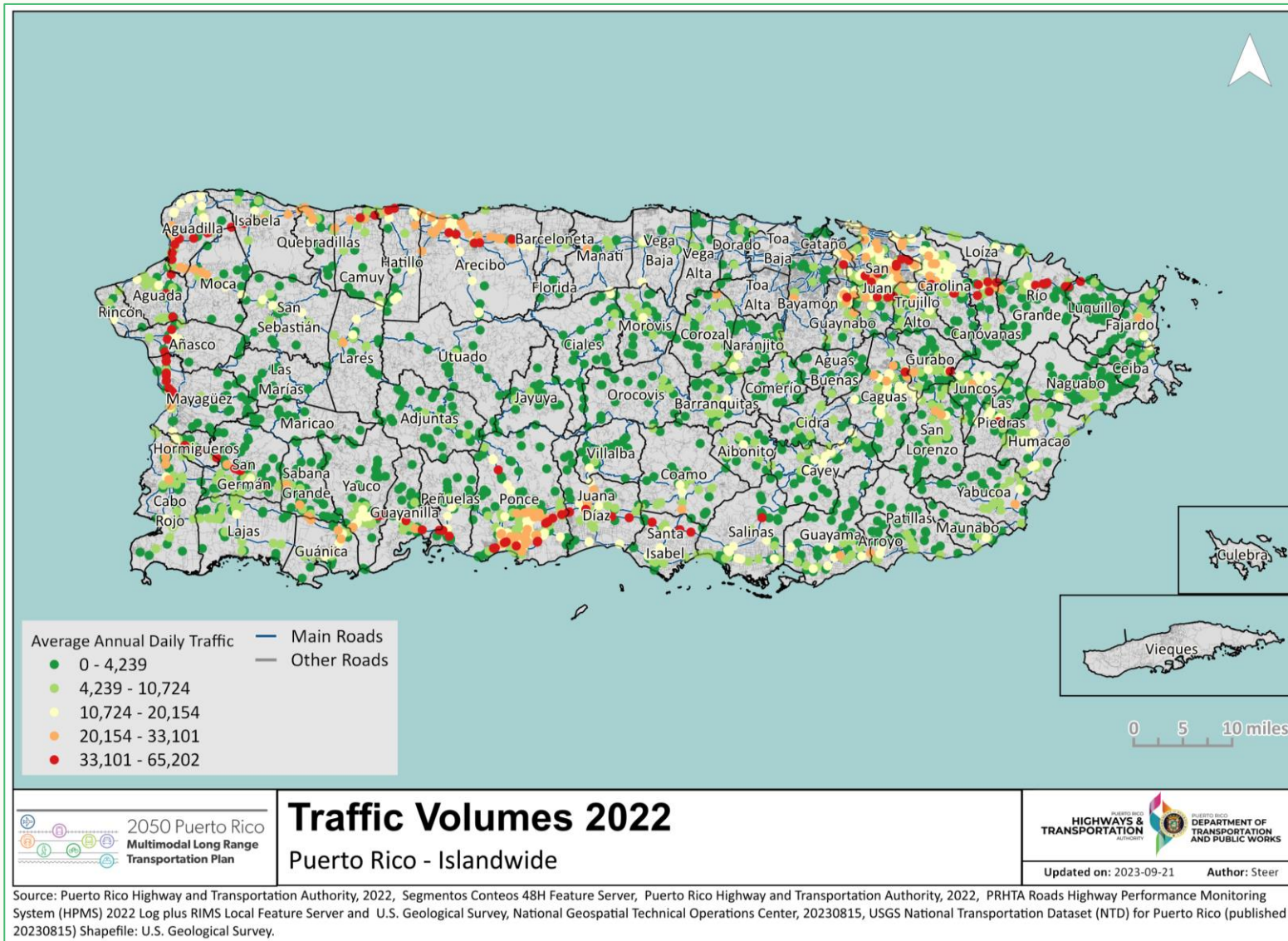


Figure 3.26: Traffic Volume Puerto Rico 2022



4

Island-Wide

A Shared Vision

This chapter aims to provide a brief description of Puerto Rico vision, objectives, targets, goals, and performance measures to provide a better understanding on how the transportation sector is developed in the Island. The chapter is divided into six (6) main sections. The first one describes the vision, goals, and guiding principles. The second one describes how the objectives pursue the goals. The third one describes the planning factors. The fourth one describes the national goals and performance measures. The fifth one describes how the system performance report is developed. And the sixth one describes the federal requirements.

Our Vision and Goals

The 2050 Multimodal Puerto Rico Long Range Transportation Plan (MLRTP) shall guide the development of the multimodal transportation system to create livable communities and contribute to the Region's and Island's strong competitive economy, while considering topics such as Environmental Justice. Current changes in sociodemographic trends, budget constraints, and new needs due to recent natural disasters (hurricanes and earthquakes) in Puerto Rico and the global health emergency due to COVID-19 require a comprehensive plan to address infrastructure needs that will best contribute to the Island envisioned for the future.

The MLRTP is a document that analyzes and develops the policies and strategies toward transportation investment in the Island for the next 27 years through a participatory process integrating diverse demographic, economic, and social characteristics, functional abilities, and different community needs. This planning process reaches out to the general public and key stakeholders and is executed in conformance with regulations that allow for effective citizen participation to assist in defining the path towards an integrated and multimodal transportation system.

The first step in this process was to define how our citizens foresee the future of Puerto Rico; how we envision our communities to become in terms of our living spaces, which include: where do we live, work, recreate and shop; safety and security; environmental justice; and how do we travel to those daily destinations. In addition, it was important to understand how the travel patterns changed during the COVID-19 pandemic.

Vision

The 2050 MLRTP vision was originally based on the 2045 Long Range Transportation Plan and was revisited in a participatory consulting process developed through active participation with the public and the committees that supported the development of this document. The plan's Vision states:

“The Island's transportation system will provide safe, efficient, and effective accessibility and mobility for the entire population and the movement of goods and services. It will focus on resilient infrastructure to extreme weather events, fostering energy efficient livable communities and sustainable economic development for the Island.”

Guiding Principles

The MLRTP's framework is multimodal in nature and focuses on meeting the Island's need for resilient and sustainable transportation options for all its residents and tourists. This framework will support the definition of specific interventions within each Region to:

- 1** Rehabilitate existing roadway network, or complete the current strategic highway network;
- 2** Improve transit services;
- 3** Consider non-motorized accessibility infrastructure and interventions;
- 4** Allow for proper access to air, and sea ports;
- 5** Allow for more efficient freight movements, while working to integrate and interconnect the respective modes considering the complete streets principles.

Our Objectives in Pursuing These Goals

To aid the implementation of the MLRTP Vision; four goals were developed with specific objectives. The updated goals and objectives are focused on four general topics, or the four E's: Efficiency, Environment, Effectiveness and Economy.

The MLRTP's goals and objectives were updated to reflect the interests and views of the citizens, while continuing the previously set goals in the Island's 2045 Long Range Transportation Plan and following modern planning trends and requirements. These updated goals and objectives also emphasize the imperative to adapt to climate change, and the capability of the transportation infrastructure to withstand extreme weather events.

It is important to mention that with these goals and objectives established at the Plan, will help the PRMPO, the DTPW and PRHTA in the fulfilment of the compromise of the Agency with improving the safety, management of assets, state of good repair of the infrastructure, among other elements, as mentioned below within each transportation plan described.

Table 4.1 presents the resulting updated goals and objectives that guided the development of the MLRTP. For more details on how these Objectives and Goals are directly related to the National Goals and Performance Measures refer to Appendix: A Shared Vision.

Table 4.1: 2050 MLRTP Goals and Objectives

Goals	Objectives
Efficiency	
GOAL A: To Improve the Transportation System's Performance Manage the Island's transportation facilities and services in a proactive and efficient manner to enable better economic development, maximizing the use of available assets and concentrating in safety and security.	A.1 Ease traffic delays and travel time through accurate congestion management programs.
	A.2 Optimize the use of available transportation assets and develop a better investment management structure to balance the efficiency of prior investments.
	A.3 Use available resources to preserve transportation assets in state of good repair.
	A.4 Develop strategies to deal with the cost of managing and operating the Island's transportation systems.
	A.5 Improve transportation system's safety and security and its ability to provide support when emergencies occur.
Environment	
GOAL B: Focus on the Environment's Sustainable Development Incorporate a careful and responsible environmental management to harmonize the need of a clean environment, social justice, and a well-functioning economy.	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.
	B.2 Reduce greenhouse gas emissions, energy consumption, and carbon footprint emittance; promote "smart growth", livable communities and improve air quality by implementing sustainability strategies and environmental management methodologies.
	B.3 Support integrated transportation and land use planning attempting to maintain consistency with existing and planned land uses.
	B.4 Improve alternative modes of transportation and travel demand strategies by implementing and improving pedestrian access, bikes lanes, public transportation plan, recharge ports for electric vehicles, among other environmentally sustainable alternatives, that reduce motorized vehicles dependency and enhance alternative modes of transportation.
	B.5 Reduce transportation infrastructure's vulnerability for it to withstand extreme weather events through resilient infrastructure.
	B.6 Improve physical and mental health by promoting and increase active modes through interventions or new project with proper infrastructure.

Table 4.1: 2050 MLRTP Goals and Objectives (cont.)

Goals	Objectives
Effectiveness	
<p>GOAL C: Improve Transportation Mobility and Access for the People and for Goods</p> <p>Achieve better mobility and access for all the transportation system users; provide more travel choices, integration between modes and connections between major population centers.</p>	<p>C.1 Improve connectivity between the Island's fundamental activity Regions, such as, but not limited to employment centers, touristic areas, and dense residential districts.</p> <p>C.2 Concentrate efforts in enhancing the connectivity of the Island's available modes of transportation.</p> <p>C.3 Facilitate mobility to residents, visitors, and workers in the Island by increasing the availability of travel choices.</p> <p>C.4 Invest in areas where users get the most benefit.</p> <p>C.5 Facilitate the access of transportation to elderly population, people with disabilities, or economic disadvantaged communities.</p>
Economy	
<p>GOAL D: Reinforce Economic Growth</p> <p>Procure the sustainment of livable and viable communities by encouraging economic strength, economic competitiveness, and the flexibility to withstand economic difficulties.</p>	<p>D.1 Facilitate the efficient movement of freight, business, and tourism activities to achieve economic competitiveness.</p> <p>D.2 Encourage potential public-private collaborations.</p> <p>D.3 Focus in providing commercial connectivity throughout the Island.</p>

Source: Steer, PRHTA

Planning Factors

The Fixing America's Surface Transportation Act, also known as the FAST-Act, was signed into law in December 2015 and replaces the previous Moving Ahead for Progress in the 21st Century Act (MAP-21). This legislation, like its predecessor, outlines the requirements for the transportation planning process, including the compliance with planning factors. Although planning factors have been part of previous highway legislation, the FAST-Act has a total of ten (10) planning factors, two more than the previously stated by MAP-21. Key transportation planning factors of the FAST-Act include, resiliency, reliability, the mitigation of storm water impacts and the enhancing of travel and tourism.

Planning factors identify the most important aspects of the transportation development. All projects, strategies, goals, and objectives considered in developing the 2050 MLRTP were designed to meet the FAST-Act required planning factors. Taking this into account, the ten (10) identified planning factors in this legislation were considered when analyzing the Island's economic development patterns, the path to achieve a more efficient use of the transportation system and resilience capabilities and the possible strategies to attend congestion issues, improve safety and mobility. Table 4.2 summarizes how the Island's 2050 MLRTP goals and objectives will meet the planning factors as required by the referred legislation. All planning factors were adequately considered by relating them to two (2) or more goals/objectives. These key objectives will determine the priority of the projects included in the plan's financial analysis and help secure the proposed investment on the sort, mid and long-term compliance with the FAST-Act Planning Factors.



Source: Steer, 2023

Table 4.2: Relation Between Planning Factors and 2050 MLRTP Goals

Planning Factors	2050 Goals Related to Planning Factor
Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.	<p>Goal A: Considers traffic congestion reduction, optimize use of assets and use of resources and existing infrastructure while dealing with efficient cost management.</p> <p>Goal B: Considers integrated transportation and land use planning to achieve livable communities.</p> <p>Goal C: Considers improving and enhancing connectivity, increase travel choices, and invest in higher cost/benefit initiatives.</p> <p>Goal D: Considers improving economic competitiveness thru movement, private investment in infrastructure and improving commercial connectivity.</p>
Increase the safety of the transportation system for motorized and non-motorized users.	<p>Goal A: Considers good state of repair maintenance and improving safety.</p> <p>Goal B: Considers integrated transportation and land use planning to achieve enhance alternative modes of transportation.</p> <p>Goal C: Considers improving access to elderly population, people with disabilities.</p>
Increase the security of the transportation system for motorized and non-motorized users.	<p>Goal A: Considers state of good repair maintenance and improving security.</p> <p>Goal B: Considers integrated transportation and land use planning to achieve livable communities.</p> <p>Goal C: Considers improving access to activity centers, improving, and increasing people movement populating the streets.</p>
Increase the accessibility and mobility of people and freight.	<p>Goal A: Considers managing the Island’s transportation facilities and services.</p> <p>Goal B: Considers developing transportation related solutions by better use of existing infrastructure.</p> <p>Goal C: Considers better mobility and access for all the transportation system users.</p> <p>Goal D: Considers facilitating efficient movement of freight, business, and tourism activities.</p>
Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and state and local planned growth and economic development patterns.	<p>Goal A: Considers extending its life and provide a safe and secure operating environment for users.</p> <p>Goal B: Considers incorporating a careful and responsible environmental management to harmonize the need of a clean environment, social justice, and a well-functioning economy.</p> <p>Goal C: Considers better mobility and access for all the transportation system users; provide more travel choices, integration between modes and connections between major population centers.</p> <p>Goal D: Considers sustainment of livable and viable communities by encouraging economic strength, economic competitiveness, and the flexibility to withstand economic difficulties.</p>
Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.	<p>Goal B: Considers projects and programs that reduce reliance on motorized travel and better manage vehicle congestion; promote the use of energy efficient products and more “reduce, reuse, recycle” practices in infrastructure projects and improve alternative modes of transportation and travel demand strategies.</p> <p>Goal C: Considers improving and enhancing connectivity, increase travel choices, and invest in higher cost/benefit initiatives.</p> <p>Goal D: Considers providing commercial connectivity Island-wide.</p>

Table 4.2: Relation Between Planning Factors and 2050 MLRTP Goals (cont.)

Planning Factors	2050 Goals Related to Planning Factor
Promote efficient system management and operation.	<p>Goal A: Considers managing the Island’s transportation facilities and services in a proactive and efficient manner to enable better economic development, maximizing the use of available assets and concentrating safety and security.</p> <p>Goal B: Considers applying Congestion Management Process or transportation network analysis to manage travel demands and improve the coverage, capacity, and service of alternative modes of transportation.</p> <p>Goal C: Considers addressing the Island’s most important transportation corridors, their infrastructure, and surrounding developments.</p> <p>Goal D: Considers investing in the completion of projects that facilitate commercial connections.</p>
Emphasize the preservation of the existing transportation system.	<p>Goal A: Considers optimizing the use of available transportation assets and preservation of these assets.</p> <p>Goal D: Considers congestion management on the Island’s main freight network.</p>
Improve the resiliency and reliability of the transportation system and reduce or mitigate storm water impacts of surface transportation.	<p>Goal A: Considers investment to promote better services before and after emergencies, resilience-redundancy capabilities to resist or assist during extreme climatic events, incidents, and system blockage.</p> <p>Goal B: Considers reducing transportation infrastructure’s vulnerability for it to withstand extreme weather events for a resilience and reliable infrastructure.</p>
Enhance travel and tourism.	<p>Goal A: Considers traffic congestion reduction, optimize use of assets and use of resources and existing infrastructure while dealing with efficient cost management.</p> <p>Goal C: Considers facilitating mobility to visitors in the Island by increasing the availability of travel choices.</p> <p>Goal D: Considers facilitating the efficient movement of tourism activities to achieve economic competitiveness.</p>

Source: Steer, PRHTA

National Goals and Performance Measures

National Goals

The FHWA has established the National Goals in the areas of Safety, Infrastructure Conditions, Congestion Reduction, System Reliability, Freight Movement and Economic Vitality, Environmental Sustainability, and Reduced Project Delivery Delays. These goals are part of the 23 U.S. Code § 150 - National Goals and Performance Management Measures. The main goal is to provide a mean to the most efficient investment of Federal Transportation fund, increasing the accountability and transparency of the Federal-aid highway program, and improving project decision-making through performance base planning and programming. Table 4.3 shows the relationship between Goal Area and National Goals.

Table 4.3: National Transportation Goals

Goal Area	National Goal
Safety	To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
Infrastructure Condition	To maintain the highway infrastructure asset system in a state of good repair.
Congestion Reduction	To achieve a significant reduction in congestion on the National Highway System.
System Reliability	To improve the efficiency of the surface transportation system.
Freight Movement and Economic Vitality	To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
Environmental Sustainability	To enhance the performance of the transportation system while protecting and enhancing the natural environment.
Reduced Project Delivery Delays	To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

Source: 23 United States Code § 150

Performance Measures

While a performance measure allows comparison, there should be identified desired targets associated with performance measures. By providing a direction or a specific level of performance that is intended to be achieved within a timeframe, this information helps to demonstrate whether the area is making progress toward achieving its goals and objectives. Federal regulations require States and MPOs to set targets for each of the national performance measures (23 C.F.R. 490.105, 23 C.F.R. 450.206, and 23 C.F.R. 450.306).

Table 4.4 establishes a relationship between the National Performance Measures, Performance Areas, the established Goal Area, and the transportation plans containing each Performance Measure.

Table 4.4: List of National Performance Measures by Performance Area

Goal Area	Report	Performance Area	Performance Measure
Safety	Puerto Rico Strategic Highway Safety Plan ⁸¹	Highway Safety	Average of the number of fatalities on all public roads
			5-year moving average of the number of fatalities on all public roads
			5-year moving rate (per 100 million VMT) of fatalities on all public roads
			Average of the number of serious injuries on all public roads (Revised)
			5-year moving average of the number of serious injuries on all public roads (Revised)
			5-year moving average of the rate (per 100 million VMT) of serious injuries on all public roads (Revised)
			5-year moving average of the number of non-motorized fatalities and serious injuries on all public roads (Revised)
Infrastructure Condition	Puerto Rico Transportation Asset Management Plan ⁸²	Pavement Condition	% of pavement lane miles on the Interstate and Non-Interstate National Highway System (NHS) in good condition**
		Pavement Condition	% of pavement lane miles on the Interstate and Non-Interstate NHS in poor condition**
		Bridge Condition	% of bridge deck area on the NHS in good condition
		Bridge Condition	% of bridge deck area on the NHS in poor condition
System Reliability		Travel Time Reliability	% of person-miles traveled with reliable travel times on the Interstate and Non-Interstate NHS** ⁸³
Freight Movement and Economic Vitality	Freight Plan	Freight Reliability	Truck Travel Time Reliability Index ⁸⁴
Environmental Sustainability		Emissions	Total emissions reductions from CMAQ projects (for criteria pollutants and precursors, where applicable) ⁸⁵

81. Targets established for 2023 as stipulated at the Puerto Rico Strategic Highway Safety Plan 2023

82. Targets established for 2025 as stipulated at the Puerto Rico Strategic Highway Safety Plan 2032

83. Data not collected; it could be an opportunity to start collecting this data.

84. Data not collected; it could be an opportunity to start collecting this data.

85. Data not collected; it could be an opportunity to start collecting this data.

Table 4.4: List of National Performance Measures by Performance Area (cont.)

Goal Area	Report	Performance Area	Performance Measure
Congestion Reduction	Congestion Management Process	Congestion	Annual hours of peak hour excessive delay per capita (for urbanized areas, where required) ⁸⁶
			% of non-single occupancy vehicle travel (for urbanized areas, where required) ⁸⁷
System Reliability	Transit Asset Management Plan ⁸⁸	Transit Asset Management	% of assets not in an SGR
			% of assets over ULB
			% of track segments with performance restrictions
			% of facilities rated below condition 3 on the Transit Economic Requirements Model (TERM) scale (by asset class)
Safety	Public Transportation Agency Safety Plan	Transit Safety	Number of reportable fatalities by mode***
			Rate of reportable fatalities (per total vehicle revenue miles) by mode
			Number of reportable injuries by mode***
			Rate of reportable injuries (per total vehicle revenue miles) by mode
			Number of reportable safety events by mode***
			Rate of reportable safety events (per total vehicle revenue miles) by mode
			Number of major mechanical failures***
Mean distance between major mechanical failures by mode			

* Revised 2023 goals for the SHSP

**Note: Separate measures for Interstates and Non-Interstate NHS

*** Total numbers based on an average of 200k VRM for fixed route service and 50k VRM for demand response service

Source: 23 CFR § 450.216 - Development and content of the long-range statewide transportation plan.

86. Data not collected; it could be an opportunity to start collecting this data.

87. Data not collected; it could be an opportunity to start collecting this data.

88. Goals established for 2022 as stipulated at the Transit Asset Management Plan 2020. The Plan is divided into three (3) types of assets: rolling stock, facilities, and equipment.

System Performance Report

The System Performance Report for this MLRTP evaluates the condition and performance of the Island's transportation system, sets performance targets and updates on current progress in meeting those established targets. There are several planning documents that are part of the MLRTP as appendices and have been considered in the development of the performance measures and targets of this MLRTP. Within these documents are the Strategic Highway Safety Plan (SHSP), the Transportation Asset Management Plan (TAMP), the Highway Safety Improvement Program (HSIP), the Public Transportation Agency Safety Plan (PTASP) and the Transit Asset Management Plan (TAM).

To define the performance measures considered for this 2050 MLRTP were considered the performance measures integrated as part of the system report for the SHSP, HSIP, PTASP, TAM and TAMP. Those measures comply with the federal requirements and includes targets/trends that helps to track the programs' compliance. For more detailed information regarding the targets/trends for each document, can be seen at Appendix: A Shared Vision.

Puerto Rico Strategic Highway Safety Plan (SHSP, 2019)

The SHSP is a major component and requirement for the HSIP, required by the FHWA (23 U.S.C. 148). This is a comprehensive plan that establishes Puerto Rico's goals, objectives, and safety emphasis areas. The Plan is developed by the PRHTA in close coordination with the Puerto Rico Traffic Safety Commission (PRTSC) and the Puerto Rico Police (PRP), among many other entities from all sectors, including other public and federal agencies, non-governmental organizations, and private companies. It allows highway safety stakeholders to work in an effort to align goals, leverage resources, and to address Puerto Rico safety's challenges.

According to the data obtained and the progress reported on each of the Performance Measure of the SHSP, there's only one (1) Performance Measure that achieved and overachieved the goal proposed, meanwhile three (3) of the performance reflected a reduction to get closer to the goal and three (3) of them reflected an increase. More detailed information on the progress related to the Performance Measures of the SHSP can be found at Appendix: A Shared Vision.

Puerto Rico Transportation Asset Management Plan (TAMP, 2022)

The TAMP describes the condition of the National Highway System (NHS) pavement and bridges in Puerto Rico. It also identifies PRHTA's investment strategies to manage them for ten (10) years, and forecasts their condition based on those strategies. The 10-year financial plan included is linked to the Statewide Transportation Improvement Program (STIP) as well as the 28-year Fiscal Plan approved by the Financial Oversight and Management Board. The TAMP applies life-cycling planning to develop the investment for preserving, maintaining, rehabilitating, and reconstructing or replacing critical assets.

The actual progress data reported for 2021 reflects that for 2023 goals' only the % Interstate in good condition and % Non-NHS Interstate in good condition did not get to the target. But as stated at the TAMP, there is programmed at the STIP projects related to pavement projects at the Interstates, meaning that once delivered, it will continue to make progress in reducing Poor Interstate miles. For the bridge's measures, the data reflects that has reached or overreach the targets established. More detailed information on the progress related to the Performance Measures of the SHSP can be found at Appendix: A Shared Vision.

Highway Safety Improvement Program (HSIP, 2022)

The HSIP is a core Federal-aid program with the purpose of achieving a projects. significant reduction in fatalities and serious injuries on all public roads. As per 23 U.S.C. 148(h) and 23 C.F.R. 924.15, States are required to report annually on the progress being made to advance HSIP implementation and evaluation efforts. The Program is responsible for managing the 25% of federal funds allocated for Puerto Rico under de ZP-30 Fiscal Management Information System program code for highway safety improvement

The Program is guided by the SHSP, being responsible for coordinating the highway safety initiatives, performance measures, and targets with internal and external safety stakeholders.

According to the HSIP 2022 Report, during 2021, four (4) out of five (5) safety targets were met o were better than the baseline established.

According to the HSIP 2022 Report, during 2021, four (4) out of five (5) safety targets were met o were better than the baseline established.

The number of fatalities did not meet the 2021 target, but was better than the baseline 2015-2019, representing a decrease of 0.7%.

The number of serious injuries met the 2021 target and was better than the baseline 2015-2019. Nevertheless, for the 2022 report, the definition of serious injuries changed to comply with the requirements of the HSIP, changing the database from ACAA to the KABCO severity scale found in the digital crash report PR-621.4. however, the actual number of serious injuries was better than the baseline, representing a reduction of 2.1%.

The fatality rate did not meet the 2021 target nor the baseline 2015-2019, representing an increase of 3.2% for the 2021 targets and 2.0% for the baseline 2015-2019.

The serious injuries rate met the 2021 target but was not better than the baseline 2015-2019, where the increase represents a 0.7%.

The non-motorized fatalities and serious injuries met the 2021 target and was better than the baseline 2015-2019. This performance measure involved the same characteristics of change in the definition of serious injuries, resulting in a decrease when comparing targets versus actual values. The actual number of non-motorized fatalities and serious injuries represented a reduction of 3.8%. More detailed information on the progress related to the Performance Measures of the SHSP can be found at Appendix: A Shared Vision.

Public Transportation Agency Safety Plan (PTASP, 2022)

On July 2018, the FTA issued the new Public Transportation Agency Safety Plan (PTASP) final rule (49 C.F.R. Part 673) to improve public transportation safety by guiding transit agencies to manage safety risks more effectively and proactively in their systems. The PTASP Final Rule (49 C.F.R. Part 673.1) requires recipients or sub-recipients of financial assistance under 49 U.S.C. Chapter 53 (Public Transportation) that operates a public transportation system to develop PTASPs. It also indicated that this part does not apply to operators of public transportation that only receives federal financial assistance under 49 U.S.C. 5310 (enhanced mobility of seniors and individuals with disabilities), 49 U.S.C. 5311 (formula grants for rural areas), or both.

The PTHRA procured the development of a PTASP for the PRHTA's small provider subrecipients that did not opt out the group, as required by federal regulation (49 CFR 673.11 (3)).

There is no data available to track if there has been progress of the Plan towards the achievement of the targets established. More detailed information on the progress data related to the Performance Measures of the SHSP can be found at Appendix: A Shared Vision.

Transit Asset Management Plan (TAM, 2020)

The Final Rule issued by MAP-21 established the requirement for recipients and sub-recipients of FTA funding to develop a Transit Asset Management Plan (TAMP). TAMPs are required to be updated every four years, though agencies may decide to update their TAMPs intermittently to reflect the most up-to-date information. It is noted that the TAMPs will need to be realigned with their respective agency's capital budget process as well as other regulatory investment and work plans.

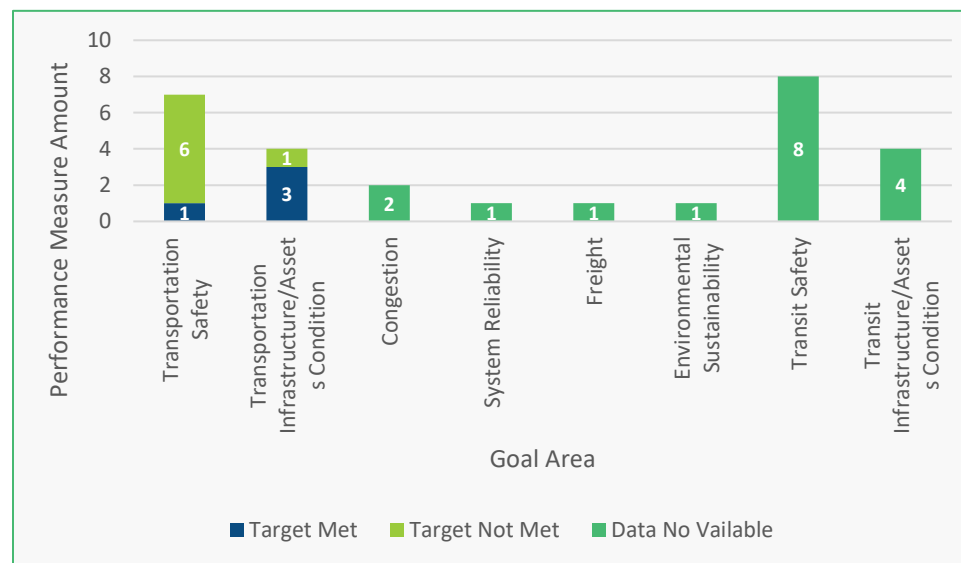
The Plan is used to assess the current condition of the assets owned by transit providers, support the long-term capital planning process, and provide justification for the use of taxpayer's dollars and fares. The TAMP aims to demonstrate the optimal use of funds to maintain and improve the service provided.

By developing the TAMPs, FTA aims to improve safety and performance of the transportation network, reduce the \$85.9 billion backlog to achieve a State of Good Repair (SGR), and enhance the asset management capabilities of transit providers nationwide. According to the Final Rule, “[a] capital asset is in an SGR if it is in a condition sufficient for the asset to operate at a full level performance”⁸⁹.

There is no data available to track if there has been progress of the Plan towards the achievement of the targets established. More detailed information on the progress data related to the Performance Measures of the SHSP can be found at Appendix: A Shared Vision.

Guided by those targets/trends and the data available, is reflected that through the Safety Goal Area and the SHSP and the HSIP Performance Measures, there has been progress made towards the targets projected, even though most of the targets haven't been met, there has been progress towards it. Through the System Reliability Goal Area and the TAMP there has been progress made towards the targets projected. Figure 4.1 shows the different Goal Areas within are distributed the different plans containing the performance measures considered for this plan as presented in Table 4.4.

Figure 4.1: List of National Performance Measures by Performance Area



Source: Steer, 2023

Federal Requirements

This 2050 MLRTP update has been characterized by important challenges conforming the transportation infrastructure and its vision of developing a livable Island with economic competitiveness. The PRMPO, and its transportation agencies, considered the Puerto Rico Oversight, Management, and Economic Stability Act (PROMESA), a 2016 federal law that established an oversight board and procedures for approving critical infrastructure projects to improve the Puerto Rican government-debt crisis, and as a result, the certified Fiscal Plan for the PRHTA was considered as the financial basis of this analysis. The investment plan for infrastructure in this 2050 MLRTP is thus fiscally constrained to the current Puerto Rico financial and fiscal conditions.

The 2045 LRTP considered aspects as the planning factors required by MAP-21 as well as additional key issues as set out by the FAST-Act federal legislation and the local public policy (Law 201-2010⁹⁰, Law 74-1965 as amended by Law 97-2012⁹¹ and Law 22⁹²) including a wider emphasis on non-motorized modes, complete streets, freight mobility, livability, resilient infrastructure, reliability, environment, energy, tourism considerations, and principles of sustainability and smart growth. But the updated 2050 MLRTP also considers the Bipartisan Infrastructure Law (BIL), also known as the Infrastructure Investment and Jobs Act (IIJA; Pub. L. No. 117-58) enacted in November 2021.

In accordance with the regulations mentioned, the federal transportation planning requirements to comply with are:

- Consideration of ten (10) planning factors.⁹³
- Inclusion in the plan of a “discussion of potential environmental mitigation activities and potential areas to carry out these activities, including activities that may have the greatest potential to restore and maintain the environmental functions affected by the plan.”⁹⁴
- Consultation with governments and participation by interested parties.⁹⁵
- Air quality conformity requirements in States and metropolitan areas containing nonattainment and maintenance areas (compliance with sections 174 and 176(c) and (d) of the Clean Air Act, as amended (42 U.S.C. 7504, 7506(c) and (d) and 40 C.F.R. part 93)).⁹⁶

90. Law 201, 2010 to declare the public policy regarding the adoption of the concept of Complete Streets.

91. Law 74 of June 23, 1965, PRHTA Law (“Ley de la Autoridad de Carreteras y Transportación de Puerto Rico”) amended by Law 97 in 2012 to include a disposition of adding a fence to all bridges with pedestrian facilities.

92. Vehicle and Traffic Law of Puerto Rico, as amended by Law 132 of June 3, 2004, which includes the charter of rights and obligations of cyclists and drivers.

93. 23 C.F.R. 450.206(a) and 23 C.F.R. 450.306 (b)

94. 23 C.F.R. 450.216(k) and 23 C.F.R. 450.324 (f) (10)

95. 23 C.F.R. 450.210 and 23 C.F.R. 450.316

96. 23 C.F.R. 450.220(a)(7) and 23 C.F.R. 450.336(a)(2)

In addition, all aspects of the planning process are subject to Federal laws, regulations, and executive orders concerning the fair and equitable treatment of people, including, but not limited to:

- Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d-1) and 49 C.F.R. part 21, which prohibit recipients of Federal financial assistance from taking actions that discriminate on the basis of race, color, or national origin.
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which further amplifies Title VI by providing that “each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations”.⁹⁷
- 49 U.S.C. 5332, which prohibits discrimination on the basis of race, color, creed, national origin, sex, or age in employment or business opportunity.
- Section 11101(e) of BIL and 49 C.F.R. part 26, regarding the involvement of disadvantaged business enterprises in DOT funded projects.
- 23 C.F.R. part 230, regarding implementation of an equal employment opportunity program in Federal and Federal-aid highway construction contracts.
- The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) and 49 C.F.R. parts 27, 37 and 38.
- The Age Discrimination Act of 1975, as amended (42 U.S.C. 6101 et seq.), prohibiting discrimination on the basis of age in programs or activities receiving Federal financing assistance.
- 23 U.S.C. 324, regarding the prohibition of discrimination based on gender.
- Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794) and 49 C.F.R. part 27 regarding discrimination against individuals with disabilities.

97. Federal Register. February 11, 1994. “Executive Order 12898.” <http://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf>.

5

Island-Wide

Public and Stakeholder Participation

Island-wide Stakeholder & Public Involvement Process

Public participation is an important aspect of any planning process. It is an integral part of the transportation system's improvement by helping to ensure that decisions are made in consideration with and for the benefit of the public needs and preferences. These public inputs help agencies to: (1) make better informed decisions through collaboration, (2) build mutual understanding and trust between agencies and citizens. In order to make these public events accessible to the general community all the engagements were done in Spanish, and we also had staff available to assist any English-speaking individual that wanted to participate of the Open Houses.

Gathering this collaborative information, as part of the MPO's planning process, requires obtaining broad insight from the public, professional and civic organizations, private companies, and key governmental stakeholders. It is necessary to consider all sectors for a final determination, especially those traditionally underserved by existing transportation systems, such as low-income and minority households. As a result of these considerations, both rounds of the MLRTP's Informative seminars were held in locations where these underserved groups could travel without the use of a private vehicle.

A summary of the different strategies utilized to accommodate different underserved groups, can be found below:

- **Train stations:** To provide access to those who do not own a car.
- **Universities:** To accommodate the student's needs.
- **CESCOS and Integrated Services Center:** For people that were doing other governmental processes.
- **Off-hours:** For people who work could also attend.

The 2050 MLRTP Public Involvement Plan (PIP) was developed early in the process. As presented in Appendix: Puerto Rico MLRTP 2050 Public Involvement Plan, this document establishes the different goals and strategies that were proposed to engage the public in the discussion of the 2050 MLRTP. This document is in alignment with the MPO Public Involvement Plan, vision, goals, and objectives.



Vision

> The vision of the PRMPO's Public Involvement Plan is to involve and enable agencies, the interested parties, and the community to provide meaningful input to the transportation planning process.



Goals

> To consult with the public and stakeholders to gather their ideas for solutions to transportation needs. This process is an opportunity for the community to voice concerns and opinions about current and future transportation policies, plans and programs across Puerto Rico.

> To inform and involve the public throughout the process. This plan is structured to inform, listen to, and learn from the public throughout the process.

Strategies

Several methods for engaging the public in the discussion of the 2050 MLRTP were recommended as part of the PIP. Those strategies are listed below and will be discussed in further detail in the next section.

Website: Significant effort was put into the development of a website that provided relevant information about the project to anyone interested, as well as a space to collect useful information from citizens.

Policy (PRMPO) Committees: Throughout the development of the MLRTP, policymaking officials were approached, in four(4) meetings, to acquire their perspective and ideas on various project activities.

Technical Committees: The Technical Committee participated to provide their opinions on the development of the projects that is responsive to their reality.

Informative Workshops: Workshops were held in an Open House format and were designed to inform and collect essential details from participants to use in the data collection process for the 2050 Plan. Workshops took place at two project milestones: during project initiation and before implementation plan development.

Public Notices

First Round of Public Involvement Events: A public notice was published in English and Spanish in two (2) local newspapers, El Nuevo Día and Primera Hora, on April 18, 2022. This event was also promoted via the Facebook page of the DTPW on April 21 and 26.

Second Round of Public Involvement Events: The public notice for the second round of public involvement events was published in English and Spanish in two (2) local newspapers, El Nuevo Día and Primera Hora, on April 6 and 10, 2023. It was also published on the DTPW Facebook page in April 11 and 19, 2023, and flyers were posted in all the train stations on April 12, 2023.

For both rounds, a banner was created on the PRHTA home page announcing the open houses to make the announcement visible.

Public Involvement Activities

Open House

While all types of community engagement and outreach are important, of particular importance are open community forums where individuals can come and hear information about the study process and provide input regarding their specific needs and concerns.. Two rounds of open houses were held to inform and receive input from the public involving the MLRTP. The first round of open houses and took place between April 16 and May 5, 2022, and the second round in April 18 and May 4, 2023. Further details regarding the Open Houses can be found in Appendix: Public Involvement Summary Report.

Table 5.1 shows a summary of both rounds of the open house's location, participants and dates.

Table 5.1: First and Second Round of Open Houses Locations, Participants, and Dates Summary

Region	First Round	Participants	Date	Second Round	Participants	Date
San Juan TMA	San Juan: Graduate School of Planning	28 In-person	<ul style="list-style-type: none"> April 16, 2022 4:00 pm – 8:00 pm 	Bayamón: Bayamón Train Station	12 In-person	<ul style="list-style-type: none"> April 18, 2023 8:30 am – 3:00 pm
	San Juan: Sagrado Corazón Urban Train Station	78 In-person	<ul style="list-style-type: none"> May 5, 2022 8:30 am – 4:00 pm 	San Juan: Sagrado Corazón Urban Train Station	72 In-person	<ul style="list-style-type: none"> April 21, 2023 9:00 am – 4:00 pm
	Vega Baja: América Theater (Hybrid)	25 In-Person 38 Virtual ⁹⁸	<ul style="list-style-type: none"> April 27, 2022 10:00 am – 12:00 pm 	Barranquitas: CESCO	43 In-person	<ul style="list-style-type: none"> April 25, 2023 9:30 am – 2:00 pm
				Caguas: CESCO	65 In-person	<ul style="list-style-type: none"> April 28, 2023 9:30 am – 2:00 pm
Aguadilla TMA	Aguadilla: City Hall (Hybrid)	38 Virtual ⁹⁸	<ul style="list-style-type: none"> April 27, 2022 10:00 am – 12:00 pm 	Aguadilla: CESCO 54 participants	54 In-person	<ul style="list-style-type: none"> April 26, 2023 9:30 am – 2:00 pm
Other Urbanized Areas (UZAs)	Hatillo: Convention Center Solvia Lucerna (Hybrid)	12 In-person 25 Virtual ⁹⁹	<ul style="list-style-type: none"> April 27, 2022 2:00 pm – 4:00 pm 	Arecibo: CESCO	5 In-person	<ul style="list-style-type: none"> April 19, 2023 9:30 am – 2:00 pm
	Mayagüez: University of Puerto Rico Mayagüez Campus	71 In-person	<ul style="list-style-type: none"> May 3, 2022 10:00 am – 2:00 pm 	Mayagüez: CESCO	54 In-person	<ul style="list-style-type: none"> April 27, 2023 9:30 am – 2:00 pm
	Fajardo: Multipurpose Center (upper Municipal parking lot) (Hybrid)	8 In-person 25 Virtual ⁹⁹	<ul style="list-style-type: none"> April 27, 2022 2:00 pm – 4:00 pm 	Ceiba: Ferry Terminal in Ceiba	57 In-person	<ul style="list-style-type: none"> April 20, 2023 7:30 am – 2:00 pm
	Ponce: Municipal Legislature Hall (Hybrid)	8 In-person 25 Virtual ⁹⁹	<ul style="list-style-type: none"> April 27, 2022 2:00 pm – 4:00 pm 	Yauco: Integrated Services Center	63 In-person	<ul style="list-style-type: none"> May 2, 2023 9:00 am – 2:00 pm
	Guayama: Interamerican University; Guayama Campus	48 In-person	<ul style="list-style-type: none"> April 28, 2022 10:00 am – 2:00 pm 	Guayama: CESCO	80 In-person	<ul style="list-style-type: none"> May 4, 2023 8:30 am – 2:00 pm

Source: Steer, 2022

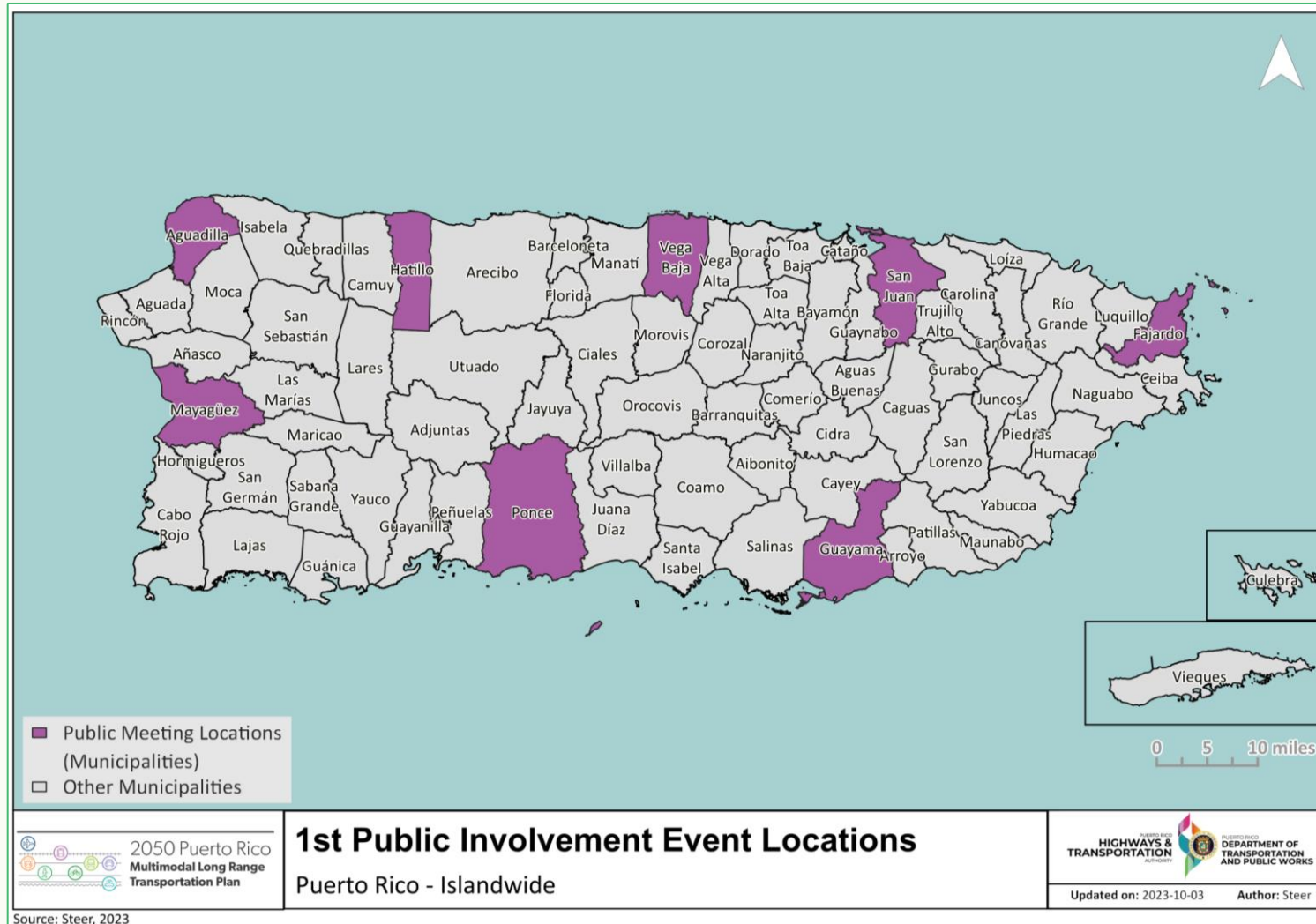
98. The number of virtual participants in these Hybrid Open House is a combination of the ones celebrated in Vega Baja, and Aguadilla.

99. The number of virtual participants in these Hybrid Open House is a combination of the ones celebrated in Hatillo, Fajardo, and Ponce.

First Round In-person and Hybrid Open Houses

The first round of Open Houses served as an educational process where citizens received information about the MLRTP and for them to provide input regarding their mobility needs. Figure 5.1 shows a summary of the first round of open houses location.

Figure 5.1: First Round of Open House Locations



Hybrid Open House

To avoid the spread of COVID-19, this round was held in a hybrid format with in-person participation and virtual participation (via Microsoft Teams). The public was able to participate using either option. The objective was to present the participants about :

- the work team that will be leading the tasks for the 2050 MLRTP,
- the definition and the importance of a MLRTP and the challenges that the Puerto Rico transportation system faces,
- the work plan schedule including dates and places for the In-person Open Houses,
- and the QR Code to complete the online survey.

There were two virtual informative workshops one in the morning at 10:00 am – 12:00 pm and on in the afternoon from 2:00pm - 4:00pm. These meetings were held simultaneously in several locations: In the morning, Vega Baja, and Aguadilla, and in the afternoon Fajardo, Ponce, and Hatillo. For these meetings fifty-three (53) people attended in-person, while sixty-three (63) people joined through Microsoft Teams for a total of a hundred and sixteen (116) in attendance. Table 5.1 shows more details about the regional participants distribution.

Figure 5.2: Hybrid Open House



Source: Steer, 2022

In-Person Open Houses

These Open Houses were held at four locations around the Island; at Río Piedras, Guayama, Mayagüez and Santurce. These In-person Open Houses had 225 attendees.

The participants were asked to select their Top 10 Issues with the Transportation System. Table 5.2 shows the responses from the 289 participants.

Table 5.2: Top 10 Issues with the Puerto Rico Transportation System

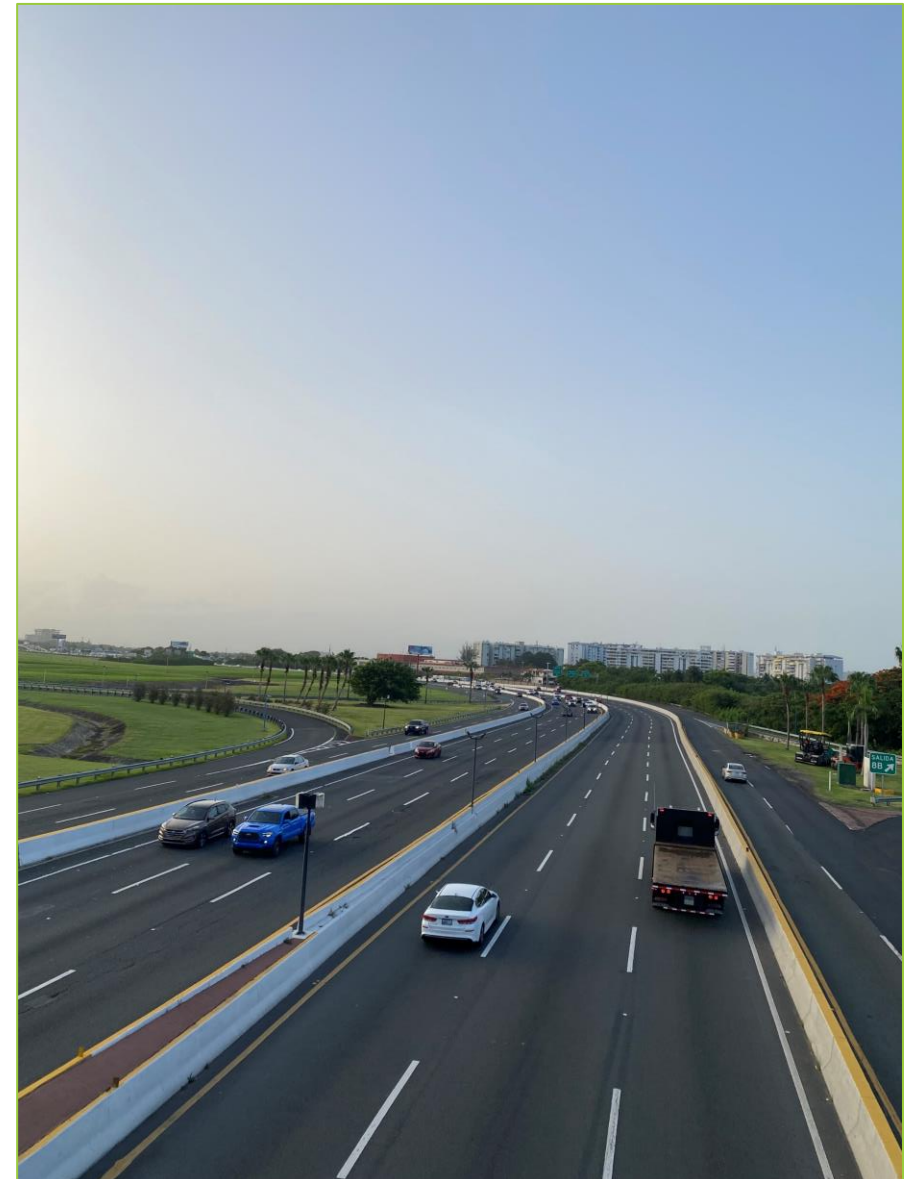
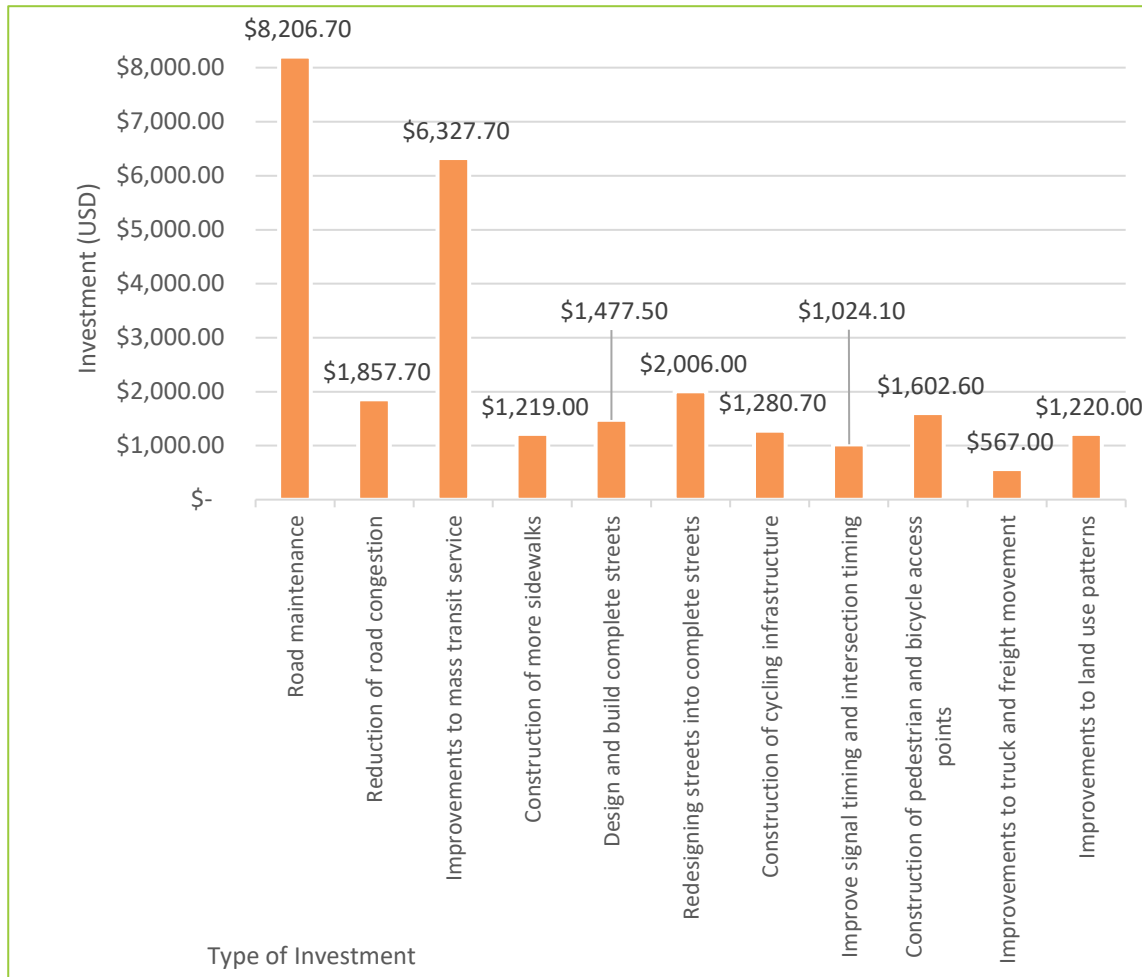
Top Issue with the Transportation System	Mode	Percentage
Insufficient Routes	Public Transportation	61%
Poor condition of sidewalks	Pedestrians	52%
Poor coverage of the existing routes	Public Transportation	48%
Poor condition of the roads (potholes, poor identification of lanes, etc.)	Automobile	45%
Lack of information available to the user	Public Transportation	44%
Lack of sidewalks	Pedestrians	44%
Lack of cycling infrastructure (lanes, parking lots, etc.)	Cycling	44%
Traffic congestion	Automobile	43%
High costs (gasoline, vehicle maintenance)	Automobile	43%
It is slower than using my car	Public Transportation	43%

Source: Steer, 2022

Figure 5.3 shows the responses of two hundred sixty-eight (268) participants that responded to the following question:

If you had \$100 to invest in the Island transportation system, how would you distribute the money to improve the transportation system?

Figure 5.3: Investment in the Transportation System Responses



Source: Steer, 2023

A summary of the responses given to the topics of trips before and during COVID, Safety, equality and inclusion, and accessibility can be found below. Note that not every participant responded to every question, thus there will be a disparity in the number of responses.

Trips Before and During COVID 19

- Before the COVID-19 pandemic, 64% of the trips were made in private vehicles, followed by public transportation with 18%.
- During the COVID-19 pandemic, private vehicles accounted for 60% of all the trips, with walking accounting for 14%.

Safety

- Participants were asked how safe they felt utilizing transportation systems (automobiles, public transportation, and non-motorized modes). From 290 participants, 42% said they were neutral, followed by 26% who said they felt unsafe utilizing the transit system.

Equality and Inclusion

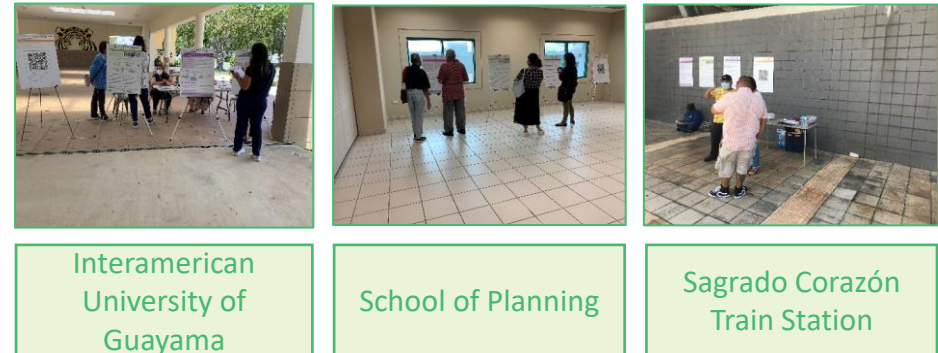
- Participants were asked to assess if “transportation in Puerto Rico takes into consideration equity and Inclusion”. From the 287 participants, 41% answered that they were neutral in this regard, while 24% stated that they disagreed with this statement.

Accessibility

- Participants were asked to assess if they “consider transportation in Puerto Rico (cars and mass transit/non-motorized modes) to be accessible”. From the 287 participants, 34% said they disagreed with the statement, while 27% said they were neutral.

For more details about all the findings of this round of open houses can be found in Appendix: Public Involvement Summary Report.

Figure 5.4: In-Person Open Houses



Source: Steer, 2022

Figure 5.5: Informative Boards – First Round of Open Houses

2050 Puerto Rico Plan de Transportación Multimodal a Largo Plazo

¿Qué es un Plan de Transportación Multimodal a Largo Plazo?

Documento que analiza la necesidad de la infraestructura de transportación terrestre, establece las prioridades del desarrollo de este sistema mediante la definición de una visión, metas y objetivos, y así definir los criterios de selección de los proyectos y servicios que se realizarán en el corto y largo plazo para mejorar los sistemas y servicios de transporte.

Un plan de transportación multimodal a largo plazo:

- Establece todas las mejoras e inversiones en proyectos de transporte programadas para la financiación fiscalmente viable en los próximos 20 años;
- Establece la dirección estratégica y la política pública para la operación y desarrollo de carreteras y servicios que sean seguros y eficientes para la gente; y
- Atiende la diversidad de los modos de transporte y las necesidades presentes y a largo plazo de la movilidad de las personas, bienes y servicios.

Importancia

Un plan de transportación multimodal a largo plazo es fundamental para:

- Facilitar la movilidad y acceso a personas, bienes o servicios por carreteras y modos (autobuses, trenes, bicicletas, entre otros) de transporte seguros
- Actualizar los datos, proyecciones de población y patrones de viajes de los usuarios de manera que las necesidades y alternativas respondan a su realidad
- Promover el desarrollo económico
- Mejorar la calidad de vida para las generaciones presentes y futuras

Proceso de Planificación

El proceso de planificación del transporte:

- Define la visión hacia donde se dirige el desarrollo de la infraestructura del transporte;
- Evalúa las necesidades de infraestructura tanto de carreteras como servicios de transporte público;
- Analiza las alternativas que mejoren la movilidad y acceso de los usuarios ya sea en sus vehículos privados, transporte público, bicicleta o caminando.
- Analiza la viabilidad financiera de la inversión de esa infraestructura;
- Define y programa los proyectos y servicios en el corto y largo plazo.

La Organización Metropolitana de Planificación en Puerto Rico (OMP/PO, por sus siglas en inglés) es el organismo encargado de formular la política pública sobre la transportación, llevar a cabo el proceso de planificación y a su vez generar el Plan de Transportación a Largo Plazo.

2050 Puerto Rico Plan de Transportación Multimodal a Largo Plazo

Plan de trabajo

Recopilación de datos Abril - Septiembre 2022

Actualmente

Participación ciudadana (Primera ronda casa abierta) Abril - Mayo 2022

Desarrollo del modelo (Análisis técnico) Mayo - Noviembre 2022

Desarrollo de escenarios Noviembre - Diciembre 2022

Participación ciudadana (Segunda ronda casa abierta) Diciembre 2022

Formulación del Plan Marzo 2023

Comentarios Abril - Mayo 2023

2050 Puerto Rico Plan de Transportación Multimodal a Largo Plazo

Actualidad

Actualmente está vigente el Plan Multimodal de Transportación a Largo Plazo 2045 hasta diciembre de 2023.

Retos que enfrenta Puerto Rico en su sistema de transportación

Migración de la población, Envejecimiento de la población, Vulnerabilidad de la infraestructura, Cambios en los patrones de viaje debido a la pandemia.

Cultura enfocada en automóviles privados, Falta de la seguridad entre usos del suelo y transportación, Falta de mantenimiento de la infraestructura existente.

Participación ciudadana

La participación de los ciudadanos es sumamente necesaria para el desarrollo de los Planes de Transportación Multimodal a Largo Plazo. Este proceso participativo nos permitirá conocer de primera mano las experiencias, necesidades y preocupaciones de los usuarios, incluyendo las poblaciones más vulnerables como lo son comunidades desventajadas económicamente, personas envejecientes o con diversidad funcional. Con su participación se podrá desarrollar un plan inclusivo e integral.

El público tendrá varias oportunidades para poder participar:

- Primera ronda de Talleres Informativos;
- Segunda ronda de Talleres Informativos
- Te informaremos sobre el progreso del desarrollo del plan y nos ayudarán en la validación de información; y
- Correo electrónico: 2050_PRLRTP@dotp.p.r.gov
- Escríbenos en cualquier momento sobre tus necesidades, preocupaciones y/o recomendaciones.

¿Por qué organizar esta primera ronda de Talleres informativos?

Para informarte, Para iniciar un diálogo con la población, Para conocer tus necesidades y que nos expreses tus recomendaciones y opiniones.

2050 Puerto Rico Plan de Transportación Multimodal a Largo Plazo

Ejercicio interactivo

Como ejercicio interactivo, tendremos una encuesta de movilidad.

Encuesta de movilidad

A través del siguiente enlace de QR o "link" por favor complete la encuesta:



<https://LRTP.sawtooths360.com/login.html>

En la encuesta se incluyen los siguientes ejercicios:

- Identificación de problemas en transportación;
- Priorización de inversión en el Sistema de Transportación;
- Comentarios generales.

Source: Steer, 2022

Second Round of Open Houses In-Person and Virtual Room

The purpose of the second round of Open Houses was to provide an update on the progress of the MLRTP and to validate the vision, goals, and objectives for the 2050 MLRTP. This round was held in-person alongside a virtual room for online participation. The public had the opportunity to participate using either format .

The virtual room was an experience created specifically for this second round of Open Houses where the participants had the opportunity to be part of the activities from any device (computer, tablet, or cellphone) and any location. The virtual room was accessed via a link provided in multiple locations. The virtual room contained the same information and boards as the in-person activities. The virtual boards also allowed the public to complete different exercises, such as the validation of the goals and objectives of the MLRTP and the Transportation Demand Management (TDM) survey. Figure 5.6 shows the virtual room experience entered from a computer.

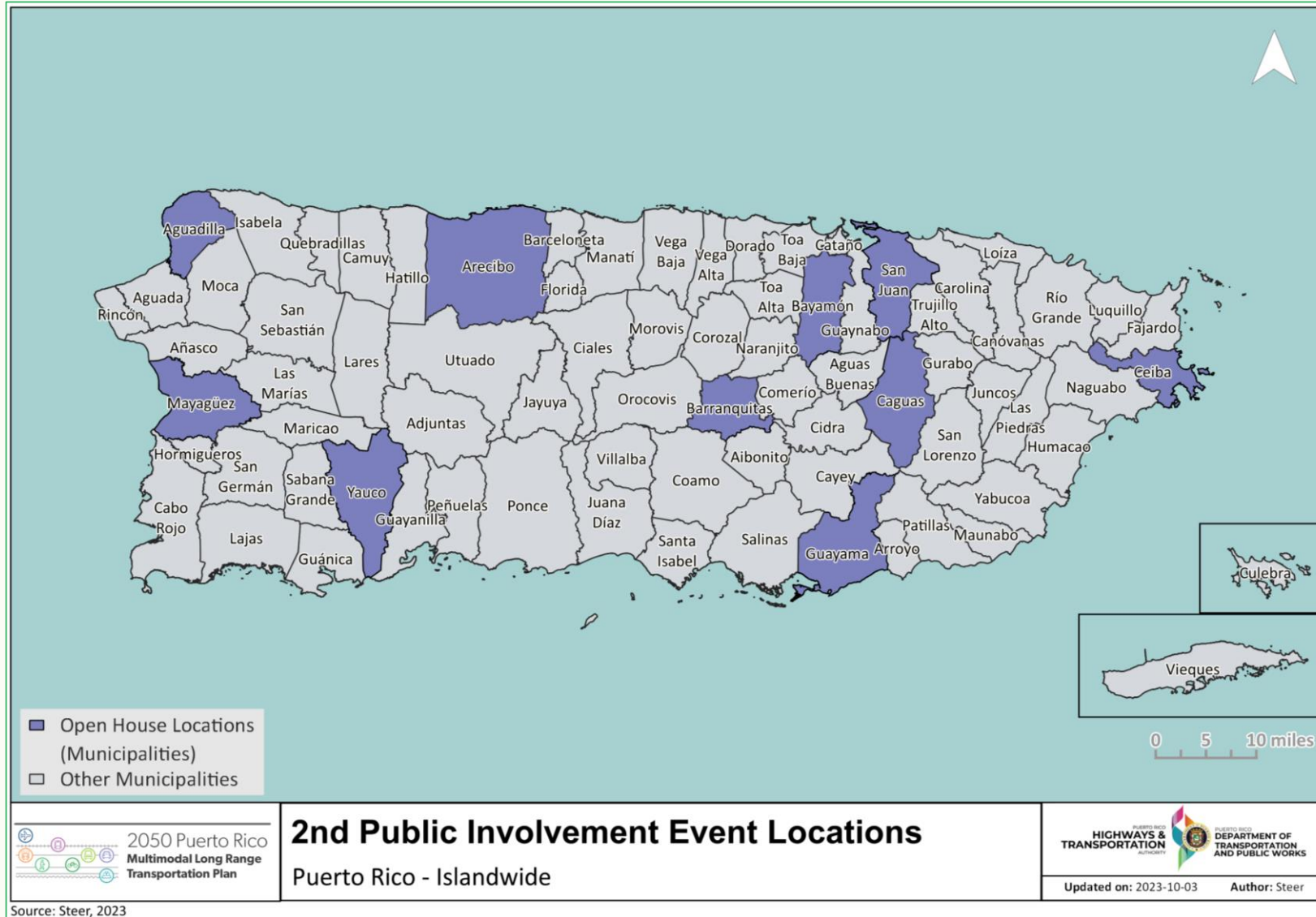
These Open Houses were held at ten locations around the Island mostly in Train Stations, CESCOs and Integrated Services Centers at Aguadilla, Arecibo, Barranquitas, Bayamón, Caguas, Ceiba, Guayama, Mayagüez, San Juan and Yauco, while the virtual room gave the opportunity to participate to each municipality of Puerto Rico. This Open House round had an attendance of 505 people for the in-person events. Figure 5.7 shows the location of the second round of open houses.

Figure 5.6: Virtual Room Experience



Source: Steer, 2023

Figure 5.7: Second Round of Open House Locations

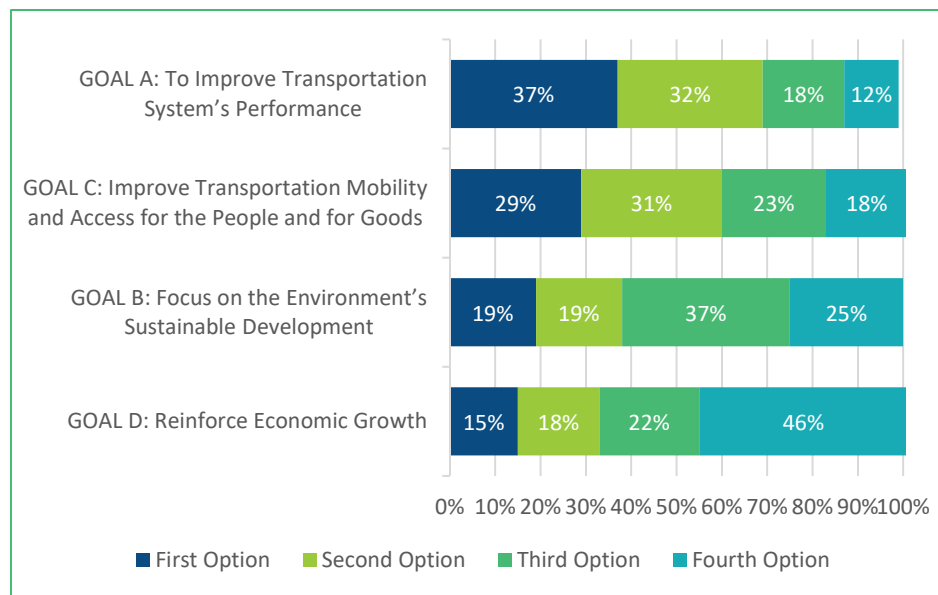


Goals and Objectives Prioritization Survey

As mentioned above one of the goals of this round was to validate and prioritize the vision, goals, and objectives of the 2050 MLRTP, the following table shows the results of this prioritization.

Figure 5.8 shows the ranking position occupied by each of the 2050 MLRTP goals. Goal A received 37% of the 142 votes received as the most important goal of the MLRTP. Goal C received 29% of the votes as the first option, Goal B received 19%, and Goal D received 15%

Figure 5.8: Goals Ranking Prioritization



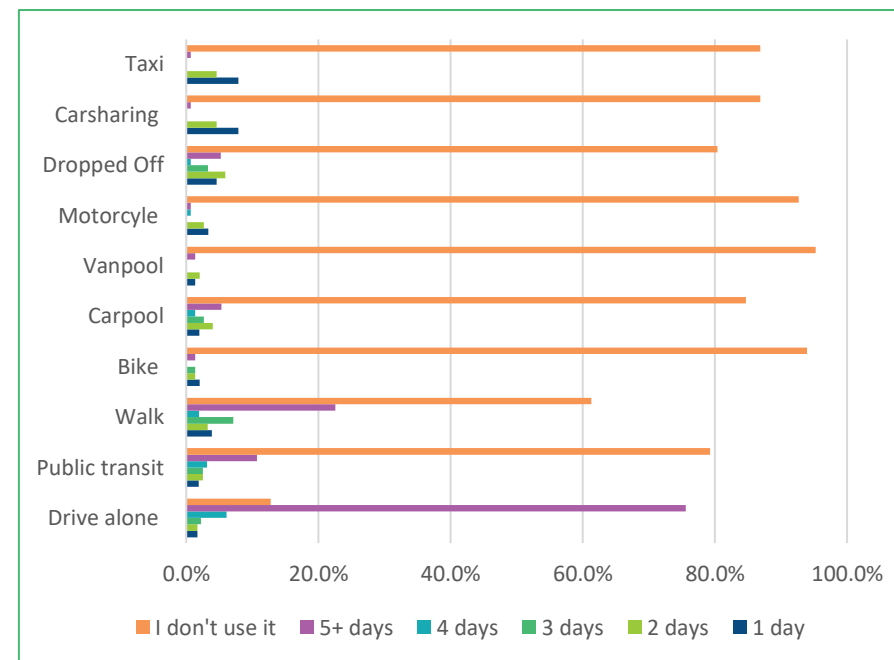
Source: Steer, 2023

Transportation Demand Management Survey

During this round of Open Houses, a Transportation Demand Management (TDM) survey was conducted to learn about Puerto Rican's transportation challenges. The purpose of the survey was to inform the development of an appropriate package of measures targeted at encouraging sustainable travel and minimizing the effects of transportation on climate change with an emphasis on reducing Single Occupancy Vehicles (SOV) trips, congestion, Vehicle Miles Travelled (VMT), and parking demand. For more information regarding TDM see Appendix: Long-Range Multimodal Plan Travel Survey and TDM Report.

As shown in Figure 5.9, 76% of 208 survey respondents drive alone 5+ days a week. The second most popular commute choice over a 5-day period is walk at 23%, followed by public transit at 11%.

Figure 5.9: Commute Mode in Puerto Rico



Source: Steer, 2023

Throughout the survey, particularly through the comments section, respondents stressed that inadequate public transportation amenities were a major challenge to them exploring alternative transportation modes. They also indicated safety concerns, lack of bike infrastructure, and commute times being too long as some of the reasons they choose to drive.

Figure 5.10: In-person Open Houses



Source: Steer, 2023

Figure 5.11: Informative Boards – Second Round

Metas del Plan

A continuación, se describen de manera general las metas que apoyan la visión para la transportación de Puerto Rico. Favor evalúe y clasifique las metas por orden de importancia para usted, siendo uno (1) el de mayor importancia y cuatro (4) el de menor importancia.

Meta A

Mejorar el desempeño del sistema de transportación

Administrar las instalaciones y servicios de transportación de la Isla de manera proactiva y eficiente para permitir un mejor desarrollo económico, maximizando el uso de los bienes disponibles y concentrándose en la seguridad y la protección.

Meta B

Promover el desarrollo sostenible del medio ambiente

Incorporar una gestión ambiental cuidadosa y responsable para armonizar la necesidad de un medio ambiente limpio, justicia social y una economía que funcione bien.

Meta C

Mejorar la movilidad y el acceso a la transportación para personas y carga

Lograr una mejor movilidad y acceso para todos los usuarios del sistema de transportación; proporcionar más opciones de viaje, integración entre modos y conexiones entre los principales centros de la isla.

Meta D

Reforzar el crecimiento económico

Procurar el desarrollo de comunidades habitables y viables fomentando la fortaleza económica, la competitividad económica y la flexibilidad para resistir las dificultades económicas.

Visión Propuesta

El sistema de transportación de la isla ofrecerá de manera segura, eficiente y efectiva; accesibilidad y movilidad para toda la población y el movimiento de bienes y servicios. Este se enfocará en la resiliencia de la infraestructura ante eventos climáticos extremos, propiciando comunidades habitables de eficiencia energética y desarrollo económico sostenible del país.

Validación de la Visión

En el siguiente espacio coloque un sello verde si está de acuerdo con la visión y si no está de acuerdo con la visión coloque un sello naranja.

Sugerencia de la Visión

Si desea realizar una sugerencia a la visión propuesta favor colocar un "post-it" con su comentario en el siguiente espacio.

Encuesta sobre viajes en Puerto Rico

¿Qué es la Gestión de la Demanda de Transporte?

La Gestión de la Demanda de Transporte (TDM, por sus siglas en inglés) es el uso de estrategias, incentivos y políticas para fomentar el uso del transporte sostenible. Los objetivos de estas estrategias son reducir:

- Viajes de un solo conductor,
- Kilómetros recorridos en vehículo (KVT, por sus siglas en inglés),
- Emisiones de gases de efecto invernadero y
- Demanda de estacionamiento.

Atiende la diversidad de los modos de transporte y las necesidades presentes y a largo plazo de la movilidad de las personas, bienes y servicios.

¿Por qué es importante?

La estrategia de TDM apoyará el desarrollo del plan a Largo Plazo de Puerto Rico permitiendo a los residentes, viajeros y visitantes tomar decisiones de transporte sostenibles teniendo en cuenta el conjunto de opciones disponibles.

Queremos conocer su opinión. Responda la encuesta

Nuestro equipo quiere conocer sobre:

- Cómo viaja alrededor de Puerto Rico
- Desafíos de sus opciones de viaje actuales
- Motivaciones que le animarían a seleccionar una forma sostenible de viajar
- Su conocimiento de los recursos de transporte en sus comunidades

<https://17tp/viajes.sawtoothsoftware.com/cgi-bin/civ-web.pl?siteid=1&url=https://www.mpo.gov.pr/transportacion/encuestas/encuesta-viajes-2022>

Su participación es importante

La información obtenida de esta encuesta se utilizará para comprender el comportamiento y las preferencias de viaje existentes para informar adecuadamente el Plan de Gestión de la Demanda de Transporte (TDM) para el Plan de Transportación Multimodal a Largo Plazo de Puerto Rico.

Resumen Primera Ronda de Casas Abiertas

Durante el mes de abril 2022, se llevó a cabo la primera ronda de Casas Abiertas en las 7 regiones definidas por el MPO.

Las reuniones se realizaron en 2 modalidades: Híbridas y presencial.

Modalidad	Regiones
Híbridas	Aguadilla, Vega Baja, Fajardo, Ponce, Hatillo
Presenciales	Río Piedras, Guayama, Mayagüez, Santurce

Esta primera ronda tuvo como objetivo:

- Informar sobre el desarrollo del Plan
- Obtener insumo sobre las necesidades y preocupaciones sobre la transportación

Perfil de los Participantes

Las casas abiertas contaron con una participación global de 341 personas.

166 Híbridas	43% Mujeres	55% Hombres
225 Presenciales	42% participantes en edades de 20-34 años	64% utilizan vehículo de motor privado como principal modo de transportación

10 problemas principales del sistema de transporte Puerto Rico

Transporte colectivo	Automóvil	Peatones	Ciclistas
• Rutas insuficientes 61%	• Mal estado de las vías (boquetes, pozos, identificación de los carriles, etc.) 45%	• Poca cobertura de las rutas existentes 48%	• Pobre condición de las ciclistas (carriles, estacionamientos, etc.) 44%
• Falta de información disponible al usuario 44%	• Congestión vehicular (tráfico) 43%	• Es más lento que usar mi carro 43%	• Falta de infraestructura ciclista (carriles, estacionamientos, etc.) 44%

Source: Steer, 2023

Other Engagement Activities

Meetings with Stakeholders

Individuals, organizations, and stakeholders were provided with additional options to engage in the Plan's process and development of the 2050 MLRTP. These groups were invited to committee meetings to review the latest issues and decisions and to provide their inputs.

MPO Meetings: MPO participants received updated on the MLRTP process and provided regular input and recommendations.

Stakeholder Meetings: Meetings were held with all committees as appropriate, to provide input, discuss any issues, and to ensure wide participation in the decision-making process so as to benefit the plan. Some of these stakeholders were the Puerto Rico Integrated Transit Authority (PRITA), Skootel, and the PRHTA Directive Committee.

Web Page

A web page was built as part of the efforts to involve the public in the development of the 2050 MLRTP. The website was primarily used to collect public input for the review process. Citizens will be able to access all the documents for the 2050 MLRTP on this website, as well as assess the process and provide comments and recommendations on the documents.

Figure 5.12: 2050 MLRTP Web Page



6

Island-Wide

Tomorrow's Needs

This chapter aims to outline the future transportation demands of Puerto Rico while considering the regional needs of each mode. It will help to have a greater understanding of what future strategies should be implemented to accomplish the state and regional goals. This chapter is divided into four (4) sections: Regional Needs by Mode, Strategic Approach by Mode, Policy Guidelines, and Future Scenarios.

Deficiencies by Mode

During the 2050 MLRTP preparation, transportation needs have been assessed from different perspectives. An evaluation from the agencies' viewpoint was performed in Appendix: A Shared Vision. There, the progress of current transportation system goals was recorded. It is important to note that this progress data is only available at an Island-wide level because policy goals are communicated by the state government. From the user's perspective, results from the first public involvement survey are considered. Specifically, a summary of their main transportation system concerns by mode is included, more information on the surveys can be found in Chapter 5.

Performance Deficiencies

The performance deficiencies discovered during the System Performance Report (found in Appendix: A Shared Vision), reflected a lack of progress on several goals by plan. The evaluated documentation with recorded progress includes the PR Strategic Highway Safety Plan (SHSP), the PR Transportation Asset Management Plan (TAMP), and the Highway Safety Improvement Program (HSIP). Additional planning documents were described, but the data on progress was not available.

The progress made on the 2019 SHSP goals showed deficiencies in reducing the 5-year moving averages in fatalities and fatality rate, and in reducing serious injuries and their corresponding moving averages. In addition, there has been a failure to reach the projected goals on non-motorized fatalities and serious injuries.

In contrast, the 2022 TAMP showed more progress on their goals. The only deficiencies were found on the percentage of pavement lane miles in good condition and on the percentage of non-interstate lane miles in poor condition. Like the 2022 TAMP, the 2022 HSIP showed only two measures without progress made. These measures were the number of fatalities and the fatality rate.

Transit System

From all the municipalities, only forty-one (41) have a transit system and only 37 report to have operational transit services as of 2021. This data implies reduced transit coverage. When they are represented geographically, transit deserts are present where there are no público routes nor municipal or state transit systems. Aside from the coverage or presence of transit, it is also important to analyze the quality of the infrastructure and operation.

Although transit coverage varies by region, survey responses from the first public involvement activity, showed consensus in the main transit concerns. In general, the main transit concerns were the lack of routes and of coverage where transit is available. And in operational terms, a prevalent concern was the lack of transit information available for users, and concerns with safety (Covid-19) and security (crime or theft).

Roadway System

The roadway system is the main transportation system used in Puerto Rico. The main roadway concerns by region are presented in the regional documents and are a result of the analyses performed with current data and the first public involvement activity survey.

The main roadways that connect the Island are PR-1, PR-2, and PR-3. These are composed by other highways that connect the different municipalities. PR-1 is composed mainly by PR-18 that runs through the San Juan municipality and PR-52 that runs southwest of San Juan. The PR-2 is composed by P-22 that runs from San Juan to Barceloneta, Arecibo and Hatillo. PR-3 is composed by PR/26 that runs from Carolina to Loíza, PR-53 that runs from Fajardo to Maunabo, but is incomplete and PR-66 that starts in at the intersection with PR-3 and runs to Rio Grande.

The top problems that cited by survey respondents were poor road conditions, (potholes, poor road lane markings, etc.), traffic congestion and the high maintenance cost associated with driving, including gas.

Non-Motorized

The non-motorized system has general deficiencies that may give rise to safety issues for pedestrians and cyclists. In general, failure to reach the projected safety goals to reduce non-motorized fatalities and serious injuries has been reported on the SHSP.

The non motorized modes in the Island have been increasing, especially in the San Juan TMA and Aguadilla TMA. Nevertheless, the bicycle facilities are not equally distributed in the Island and there are municipalities with no existing bicycle and pedestrian network at the moment.

The main complaints about the non-motorized modes, were focused on the infrastructure and the lack of accessibility in the existing areas. Specifically, respondents complained about the lack of sidewalks, ramps for people with movement disabilities and bicycle infrastructure.

Strategic Approach by Mode

After evaluating sociodemographic and employment trends, transportation demands, and potential challenges, the following section outlines the strategies required to meet Puerto Rico's transportation and planning needs.

This section is divided into four (4) categories that describe the strategies:

1. Transit System;
2. Roadway System;
3. Non-Motorized; and
4. Resiliency Strategies.

Transit System

Transit improvement strategies are essential for enhancing the efficiency, accessibility, and sustainability of public transportation systems. PRITA is working on the five (5) key transit improvement strategies:

1. Improve, Rehabilitate, and Preserve the Infrastructure of the Transit Network.

Upgrading transit infrastructure, including stations, terminals, and transit hubs. This can involve adding amenities such as shelters, seating, and digital information displays, making transit more comfortable and user-friendly.

2. Enhance the Transit Network at the Regional, Metropolitan, and Rural Level.

Expanding the coverage of transit by adding new routes and increasing the frequency of services. This can help serve more communities, reduce congestion, and provide convenient access to public transportation.

3. Increase the Efficiency, Effectiveness, and Reliability of the Transit System.

Leveraging technology to enhance transit services. This includes implementing real-time tracking and scheduling systems, contactless payment options, and smart ticketing solutions, which improve the overall passenger experience and operational efficiency. In addition to the use of data analytics and ridership information to optimize routes, schedules, and service frequencies.

4. Improve Transit Accessibility and Equity.

Integrating different modes of transportation, such as buses, train, ferry, bicycles, and walking into a seamless transit system. This allows passengers to easily transfer between modes, reducing travel time and increasing convenience. In addition, mode integration ensures that everyone, regardless of their income, age, or physical abilities, can access essential services, employment opportunities, educational, and recreational activities.




















5. Strengthen Mobility to Support the Environment and the Economy.

Implementing sustainable practices and eco-friendly technologies in transit operations. This includes transitioning to electric or hybrid buses, incorporating green infrastructure, and promoting active transportation options such as biking and walking to reduce emissions and environmental impact.

A comprehensive approach that combines elements of these strategies can lead to significant improvements in public transportation systems, ultimately benefiting both commuters and the environment.

Table 6.1 shows which strategic approaches should be emphasized for the transit system in each region over the term of the 2050 MLRTP. It should be clarified that all policies described previously apply to all the MPO regions, and the emphasis given to each policy may change.

Table 6.1: Transit System Strategic Approach Emphasis Area for 2050

Regions	1. Improve, Rehabilitate, and Preserve the Infrastructure of the Transit Network	2. Enhance the Transit Network at the Regional, Metropolitan, and Rural Level	3. Increase the Efficiency, Effectiveness, and Reliability of the Transit System	4. Improve Transit Accessibility and Equity	5. Strengthen Mobility to Support the Environment and the Economy
North					
East					
South					
Southeast					
Southwest					
San Juan TMA					
Aguadilla TMA					

Source: Steer, 2023

Roadway System

1. Improve, Rehabilitate and Preserve Existing Roadways

The Transportation Asset Management Plan 2032 (TAMP) is the PRHTA four-(4) year update to the Federally required TAMP. This document provide the investment strategies to manage the national highway systems' infrastructure (pavements and bridges) during the following ten (10) years. The strategies are based on the infrastructure status diagnosis and a forecast of future conditions after implementing the pertinent actions.

The PRHTA has updated the TAMP aiming to accomplish a systematic process of operating, preserving, and improving physical assets. Specifically, the plan seeks to rehabilitate pavement conditions and bridges to get the infrastructure to a state of good repair.

As a federal requirement the NHS cannot have more that 5% of the pavement in a poor condition. According to 2023 two (2) year goal of the TAMP, for bridges the target is that the infrastructure in poor conditions should be under 10% of the total.

The objectives established to guide the TAMP are¹⁰⁰:

1. "PRHTA will implement data-driven, life cycle-based pavement and bridge management processes to achieve the condition targets and the desired SOGR, enhance safety, increase resilience, and lower life-cycle costs for managing pavements and bridges."
2. " PRHTA will partner with the MPO to communicate the targets and incorporate asset management-based projects into the Transportation Improvement Program, the Long-Range Statewide Transportation Plan, and the Metropolitan Transportation Plan."
3. " PRHTA will work with stakeholders to communicate the importance of reliable and sufficient funding to achieve condition targets and desired SOGR to provide safe and reliable bridges and pavements for the movement of people and goods."

2. Comply with the data collection requirements and Monitoring Systems for the Agency.

There are various programs that help maintain the infrastructure inventory to have a better transportation system, and this may be done through the various data collection programs that the PRHTA has available, such as Model Inventory of Roadway Elements (MIRE), Road Information Management System (RIMS), and Strategic Highway Safety Plan (SHSP).

3. Monitoring Road Safety and Data Collection Thru the Strategic Highway Safety Plan (SHSP)

The Federal Highway Administration's (FHWA) should develop planning tools to improve road safety in the US territory such as Highway Safety Improvement Programs (HSIP). The main goal of this effort is to reduce severe traffic crashes as the incidents with victims' fatalities and serious injuries. Puerto Rico receives \$30 million per year of federal funds to implement the HSIP under the Fiscal Management Information System (FMIS) ZP-30 initiative for improving road safety.

Puerto Rico prepared and executed the 2014-2018 SHSP and the 2019-2023 SHSP in accordance with this rule. The SHSP is a five-year plan that has benefited from the involvement and work of road safety delegates from around the country. The primary road safety concerns and possibilities to meet the aim of the HSIP, as well as other transportation plans, have been identified and studied through this Plan¹⁰¹. One of the conditions specified by FHWA was that the SHSP be revised on or before the conclusion of the five (5) year cycle.

100. Puerto Rico Highways and Transportation Authority. (2022). Retrieved from Puerto Rico Transportation Asset Management Plan 2032: <https://act.dtoppr.gov/wp-content/uploads/2023/04/2022-12-29-BIL-Compliant-TAMP-2032.pdf>, p.17

101. Puerto Rico Highway and Transportation Authority. (2021). About Us. Retrieved from Strategic Highway Safety Plan: <https://carreterasegurapr.com/en/about-us/>

4. Continue to gather the information required for the Model Inventory of Roadway Elements (MIRE)

The MIRE Fundamental Data Element (FDE) 2023-2026 Action Plan provides the roadmap towards the collection of FDE for all Puerto Rico public roads by September 30, 2026. The collection of FDE will allow the PRHTA and partners to better work collaboratively by using coordinated data. The Action Plan is among one of the strategies that are being taken to ensure Puerto Rico's continuous improvement for all road users.

To ensure that the September 30, 2026, deadline is met the Action Plan identifies the following major actions to take place by and continuously through 2026:

- Continue with bi-weekly progress meetings coordinated by PRHTA's Integrated Technical Committee;
- Identify a methodology for AADT estimation on local roads;
- MIRE FDE data gathering (minus AADT gathering);
- MIRE FDE data sharing with other databases; and
- AADT data gathering and continuous update.

Table 6.2 shows which strategic approaches should be emphasized for the roadway system in each region over the term of the 2050 MLRTP. It should be clarified that all policies described previously apply to all the MPO regions, and the emphasis given to each policy may change.

Table 6.2: Roadway System Strategic Approach Emphasis Area for 2050

Regions	1. Improve, Rehabilitate and Preserve Existing Roadways	2. Comply with the data collection requirements and Monitoring Systems for the Agency.	3. Monitoring Road Safety and Data Collection Thru the Strategic Highway Safety Plan (SHSP)	4. Continue to gather the information required for the Model Inventory of Roadway Elements (MIRE)
North				
East				
South				
Southeast				
Southwest				
San Juan TMA				
Aguadilla TMA				

Source: Steer, 2023

Non-Motorized

The Non-motorized modes strategies intend to construct a multi-modal transportation system that combines all modes of transportation to enhance mobility and access conditions, as well as to create a more livable urban environment and a more efficient transportation system. To do this, the measures outlined below must be implemented.

1. Comply with the Puerto Rico Complete Streets Plan and Design Guideline

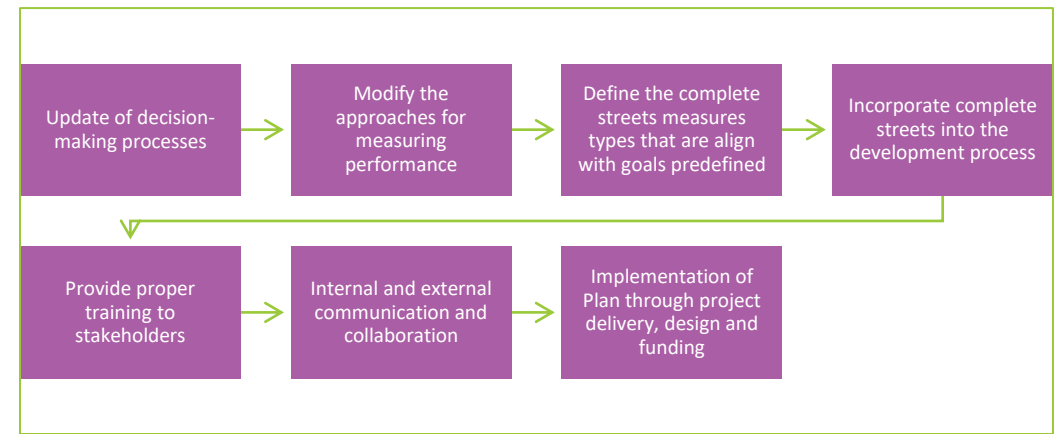
The MPO accepted this plan in September 2018, and it has not been amended subsequently. As a result, the information on the Complete Street Plan has not changed since the 2045 LRTP.

In this project complete streets will be considered as the definition of the Puerto Rico Complete Streets Plan and Design Guidelines of the PRHTA:

...designed to allow safe, comfortable and convenient access for pedestrians, cyclists, drivers, and public transport users, regardless of age, abilities or capacities. Also, a complete street implies that mobility in all its forms, is safe, it has the infrastructure to make travel enjoyable, is aesthetically pleasing and promotes the social and economic exchange. (PRHTA, 2018)

The Puerto Rico Complete Streets Plan and Design Guidelines is developed under three main objectives. First, infrastructure to improve people's quality of life. Second, the guideline includes tools to enhance pedestrians and cyclist access to the transit system. Finally, defines components to create accessible infrastructure that is inclusive to every population group despite its individual characteristics such as age or physical conditions. These objectives should be implemented based on a seven (7) step strategy, consisting of the ones described in the Figure 6.1.

Figure 6.1: Implementation strategy of the Puerto Rico Complete Streets Plan and Design Guidelines



Source: PRHTA, 2018

2. Comply with the Comprehensive Bicycle and Pedestrian Plan.

The MPO accepted this plan in September 2018, and it has not been amended subsequently. As a result, the information for the Bicycle and Pedestrian Plan has not changed since the 2045 LRTP. The Plan “aims to make bicycling and walking safe, accessible and integrated transportation choices for residents and visitors” (PRHTA, 2018).

The main objectives of this plan are:

- “Promote and increase the use of cycling and walking as alternative modes of transportation;
- Enable the physical integration of urban centers through a cycling and pedestrian network that improves accessibility to different land uses;
- Incorporate the development of projects and bicycle/pedestrian facilities into statewide and municipal transportation plans;
- Provide cycling and walking infrastructure to improve mobility, accessibility, and safety for all users of public roads; and
- Develop an educational program for all users to share the public roads in a safe manner”(PRHTA, 2018).

This plan define a four (4) step implementation process that includes:

- Set up a timeframe to accomplish the improvements;
- Development of a monitoring and evaluation process;
- Funding sources definition; and
- The stakeholder’s involvement

Other strategies under the scope of the PRHTA for this 2050 MLRTP are:

- Road safety analysis
 - Study roads with motor vehicle and bicycle conflicts and identify potential improvements to increase safety for all users.
- Improve and expand bike signage for the bike network
 - Along essential bike network routes, bike should be placed. On or near roadways, signs should offer direction and distances to major destinations.
- Improve and Expand the Bike Lanes along the Bike Network by analyzing the feasibility of implementing a continuous Class II or Class IV bike lane.
- Continuous maintenance of the roadway keep the road free of landslides and debris.

3. Comply with the Vulnerable Road User (VRU) Safety Assessment Recommendations

Pedestrian, bicyclist, and other non-motorist road users account for a growing share of all United States traffic fatalities and are referred to as vulnerable road users. Puerto Rico has a history of fatal crashes involving pedestrians. As established in the SHSP, in Puerto Rico pedestrians make up 3 out of every 10 traffic fatalities per year. Halting the growing number of non-motorists killed or injured by motor vehicles requires a collaborative and comprehensive, data-oriented approach to road user safety. Therefore, as part of the Puerto Rico Strategic Highway Safety Plan (SHSP) all state transportation agencies are required to complete a Vulnerable Road User (VRU) Safety Assessment by November 2023¹⁰².















VRU Safety Assessment shall be a data-driven process considering fatal and severe injury crash data, infrastructure data and social and demographic data to identify areas of high-risk for vulnerable road users. The State must consult with local governments, metropolitan planning organizations (MPOs), and regional transportation planning organizations that represent these high-risk areas and develop a program of projects or strategies to reduce safety risks to vulnerable road users in areas identified as high-risk.

The quantitative analysis and project or strategy program results from the VRU Safety Assessment should be included into applicable SHSP priority areas, strategies, and actions. It should also be carried out through state and municipal planning procedures. Vulnerable road user safety should be fully considered in States transportation investment decisions, from planning and programming, environmental analysis, project design, and construction, to maintenance and operations. States should use data-driven safety analyses to ensure that safety is a key input in any decision made in the project development process for all project types and fully consider and improve the safety of all road users, especially vulnerable road users, in project development.

102. Federal Highway Administration (October 21, 2022) Vulnerable Road User Safety Assessment Guidance Memorandum. Retrieved from: https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-10/VRU%20Safety%20Assessment%20Guidance%20FINAL_508.pdf

Table 6.3 shows which strategic approaches should be emphasized for the non-motorized in each region over the term of the 2050 MLRTP. It should be clarified that all policies described previously apply to all the MPO regions, and the emphasis given to each policy may change.

Table 6.3: Non-motorized Strategic Approach Emphasis Area for 2050

Regions	1. Comply with the Puerto Rico Complete Streets Plan and Design Guideline	2. Comply with the Comprehensive Bicycle and Pedestrian Plan.	3. Comply with the Vulnerable Road User (VRU) Safety Assessment Recommendations
North			
East			
South			
Southeast			
Southwest			
San Juan TMA			
Aguadilla TMA			

Source: Steer, 2023

Resiliency Strategies

The information from the 2045 LRTP remains current given that the data used for the following section, such as flood zones by FIRMS and other data, has not been updated after Hurricane María. However, the 2050 MLRTP has been updated with information on earthquakes, which were causing damage to roadways in Puerto Rico, particularly but not limited to the southern part of the Island, during December 2019 and January 2020.

Because of its geographical location, Puerto Rico is especially vulnerable to catastrophic weather events such as earthquakes, tropical storms, and hurricanes moving close to or passing through the island every year, mainly between the months of July and November. Due to the exposure to severe rainfall, high-speed winds, and storm surge, landslides and flooding occur, affecting transportation infrastructure, it is critical to have a transportation system that can anticipate, prepare for, and adapt to changing conditions, as well as withstand, respond to, and recover quickly from disruptions.

Vulnerability Assessment

In order to incorporate actions into decision making process, it is key to understand the existing transportation infrastructure's vulnerabilities. Such an understanding would serve as basis for developing the resiliency strategy as stated by the FHWA framework: "assessing and addressing vulnerabilities allows agencies to build their resilience, or the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions".

The MLRTP incorporates a vulnerability assessment. This assessment was mainly triggered by the effects of Hurricane María and the earthquakes in the south of the Island on the transportation infrastructure. The assessment is focused on hurricane and earthquake-related hazards.

A more comprehensive analysis should be completed not only considering flooding and landslides but also earthquakes given the tectonic events that occurred in the year 2020 in the Island. Additionally, analysis of design and construction elements that will make for a more resilient transportation infrastructure is recommended.









Based on the additional vulnerability assessment need created by the previous earthquake occurrences in 2020, the resilience and vulnerability assessment are considering the recent seismic events that occurred in Puerto Rico, particularly in the island's southern portion. The goal of this analysis is to assess the system's vulnerability based on the knowledge gained after the 2020 earthquakes, as well as the connection or future connectivity difficulties based on the system's vulnerability. When comparable incidents take place, this risk assessment can assist PRHTA in identifying locations that require increased connectivity.

The data utilized for this research is the liquefaction¹⁰³ in the area caused by the effects of the 2020 earthquakes. Considering the communities and the locations of the roadways that assist the people in moving or obtaining goods and services during an emergency. Furthermore, having an official logistics is beneficial in the event of a major disasters that need additional logistics. This helps to identify where these risks exist and where the PRHTA should strengthen or offer alternative infrastructure to ensure that these communities remain accessible.

103. Liquefaction takes place when loosely packed, water-logged sediments at or near the ground surface lose their strength in response to strong ground shaking. Liquefaction occurring beneath buildings and other structures can cause major damage during earthquakes. U.S. Geological Survey (n.d.) What is Liquefaction? Retrieved from: <https://www.usgs.gov/faqs/what-liquefaction#:~:text=Liquefaction%20takes%20place%20when%20loosely,cause%20major%20damage%20during%20earthquakes.>

Table 6.4 shows which strategic approaches should be emphasized for the resiliency in each region over the term of the 2050 MLRTP. It should be clarified that all policies described previously apply to all the MPO regions, and the emphasis given to each policy may change.

Table 6.4: Resiliency Strategic Approach Emphasis Area for 2050

Regions	Hurricane	Earthquakes
North		
East		
South		
Southeast		
Southwest		
San Juan TMA		
Aguadilla TMA		

Source: Steer, 2023

Policy Guidelines and Evaluation for the Transportation Infrastructure

Following the national transportation goals, this 2050 MLRTP update emphasizes safety (lower fatalities), increasing asset conditions to a state of good repair, decreasing congestion, improving freight mobility, and protecting the environment and air quality. This section discusses policies that have been or will be developed to handle these concerns.

This chapter is separated into four (4) sections that describes the policies by mode:

1. Transit System for the Next Five (5) Years;
2. Roadway System;
3. Non-Motorized; and
4. Freight.

Transit System for the Next Five (5) Years

This section presents an overview of PRITA Transit Systems upcoming and identified as high priority projects for Puerto Rico for the next five (5) years. This section is divided into five (5) sections that corresponds to PRITA's programs, and the development of a Transit Master Plan. The five (5) programs are:

- Reliability and Integration;
- Mobility for All;
- A Sound Infrastructure;
- Culture of Excellence; and
- Climate Action.

Reliability and Integration

To enhance the transit network at the metropolitan, regional, and municipal level.

- Ceiba San Juan Intercity Bus
 - Viability, planning and design of new Intercity route between Ceiba Ferry Terminal to Tren Urbano Station in San Juan (yearly).
- On Demand service study for the Metropolitan Area of San Juan:
 - Assessment for the development opportunities of the On Demand Service in the Metropolitan Area of San Juan.
- On Demand Pilot Project linked to Train Station Area.
- Rehabilitation of the Mosquito Terminal and Ticketing Area:
 - New Route for Vieques - "Short Route" from Ceiba to Mosquito. Rehabilitation of the Mosquito Terminal and Ticketing Area.

Mobility for All

To improve transit accessibility and equity.

- Purchase and installation of bike racks for the entire bus fleet.
- Transit Oriented Development (TOD) Revitalization Plan for the ATI-TU Rail Stations includes an analysis and revision of opportunities for the 16 train stations.

A Sound Infrastructure

To improve, rehabilitate, and preserve the infrastructure of the transit stations.

- Rehabilitation of Covadonga Terminal
 - Design, permit acquisition and construction of the Covadonga Terminal Remodeling.
- Acquisition of four (4) New Cargo/Passenger Vessels to attend the Island Service with a capacity of more than 300 and replacement of vessels in process of disposition. New Ceiba Terminal for the Island Service
- New Ceiba Terminal for the Island Service
- Rehabilitation of the Maintenance Base and pier for Marine Hoist
- Acquisition of a Marine Hoist
- Acquisition of New Barge for the Island Service
- Preventive Maintenance and drydock activities for the Island Service, Authority owned vessels.
- Preventive Maintenance and drydock activities for the Metro Service.
- New integrated transit fare collection system.
- New PRITA Office Building:
 - Design and construction of new administration building

Culture of Excellence

To increase the efficiency, effectiveness, and reliability of the transit system.

- Operation & Maintenance contract for eight (8) routes
- Bus service and users profile study (Data Collection and analysis activities) yearly:
 - Field study to identify the actual bus user profile.
- Train service and users profile study (Data Collection and analysis activities) yearly:
 - Field study to identify the actual bus user profile.
- Ferry service and users profile study (Data Collection and analysis activities) yearly:
 - Field study to identify the actual bus user profile.
- Transit Marketing Campaign yearly:
 - Educational and marketing campaign of about the transit system.
- Website:
 - Creation and Maintenance of Website to provide information, service, and support of all transit related activity in Puerto Rico.
- Trip Planner:
 - Create and maintain of a web tool to help clients make transit travel arrangements of existing operation.
- New transit system maps:
 - Map update for the transit system including train, bus, and ferry.

- Online engagement surveys (Data collection and analysis activities) yearly:
 - Online engagement surveys for public participation in transit planning.
- Real-Time Transit Data:
 - Provide users with transit data updates in real time to enhance their experience of the transit services. Providing up-to-date information about current arrival and departure times allows users to smoothly plan their trips.
- Transit Economic Sustainability Plan:
 - Economic sustainability study to identify challenges and opportunities for the financial stability of the transit system.

Climate Action

To strengthen mobility to support the environment and the economy.

- 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.

Development of a Transit Master Plan

Transit in Puerto Rico has been concentrated in the San Juan Transit Metropolitan Area. With the proliferation of other municipal transit systems and the decline of the Público services, as stated in Chapter 2, it is important for PRITA to establish a Transit Master Plan.

A Transit Master Plan will create strategies and policies in the short, medium, and long term to direct and improve the growth around the public transportation system Island-wide, whether it consider buses, rail, or transit centers. This plan will have a strategic vision for the transit service as well as forecast future transit demands

Roadway System

Puerto Rico Transportation Asset Management Plan (TAMP) 2032

PRHTA has established some short-term goals (two (2) years and four (4) years). These terms are based on the targets reported to the FHWA through the Transportation Performance Management (TPM) process. The targets are set according to estimated projections based on expected investment, expected improvement, and expected deterioration.

As stated in the TAMP 2032, the Table 6.5 shows the FHWA metrics used for the computation of pavement ratings. “The Federal measure is based on four pavement condition metrics. For asphalt pavements the rating is based on the International Roughness Index (IRI), percent of cracking and rutting. For concrete pavements, the measure is based on IRI, cracking, and faulting.¹⁰⁴” (PRHTA, 2022)

Table 6.5: FHWA Condition Metrics - Calculation of Performance Measures

Condition	IRI Asphalt & Concrete (in/mi)	Rutting Asphalt (inches)	Faulting Concrete (inches)	Cracking (%)		
				Asphalt	Concrete	
Good	<	95	0.2	0.1	5	5
Fair	<=	170	0.4	0.15	20	15
Poor	>	170	0.4	0.15	20	15

Source: Puerto Rico Transportation Asset Management Plan 2032

Table 6.6 shows the short-term pavement targets, and Table 6.7 shows the short-term bridge targets.

Table 6.6: PRHTA Pavements Targets for 2 and 4 Years

Condition Measure	2-year (2023)	4-year (2025)
Interstate Pavements in Good Condition	20.0% or more	25.0% or more
Interstate Pavements in Poor Condition	11.0% or less	11.0% or less
Non- Interstate NHS Pavements in Good Condition	5.0% or more	10.0% or more
Non- Interstate NHS Pavements in Poor Condition	12.0% or less	14.0% or less

Source: Puerto Rico Transportation Asset Management Plan 2032

Table 6.7: PRHTA Bridge Condition Targets for 2 and 4 years

Condition Measure	2-year target (2023)	4-year target (2025)
NHS Bridges in Good Condition	15% or more	15% or more
NHS Bridges in Poor Condition	10% or less	11% or less

Source: Puerto Rico Transportation Asset Management Plan 2032

The TAMP does not define projects, but rather the types of work to be conducted every year to fulfill the goals, depending on budget, degradation, and forecast progress. The TAMP 2023 has a tool designed to identify plan projects that are aligned with the targets of the document. The principal tools are the Pavement Data, Bridge Data, Pavement Scenario 1, and Bridge Scenario 1.

- **Pavement Scenario 1 and Bridge Scenario 1:** provide information on the mileage lanes and bridge area to be intervened in by type of work and by year.
- **Pavement Data and Bridge Data:** provides the information to identify specific roadway segments and bridges requiring each type of work or treatment, which can then be assigned by year as indicated on the Pavement Scenario 1 and Bridge Scenario 1 tabs.

Safety thru the Strategic Highway Safety Plan

PRHTA is attempting to be proactive rather than reactive in the present scenario. Although there will always be a reaction to how fatalities occur, the idea is that by designing complete streets and incorporating various safety devices, we can avoid these fatalities rather than waiting for them to occur and then solving the problems.

The Puerto Rico SHSP contemplates the following high priority and focus areas for 2024-2028:

High Priority Areas

- Vulnerable Road Users (VRU);
- Speed Management;
- Impaired Driving;
- Occupant Protection;
- Lane Departure; and
- Communication Integration.

Focus Areas

- Traffic Record Systems;
- Motorcyclists;
- Aging Driver (65+); and
- Legislations and Procedures.

One of the High Priority Areas that can be highlighted is the execution of the VRU as part of the work of the SHSP.

PRHTA prepares the High Crash Location Report as part of the implementation strategies of the SHSP. This report is created every two (2) years and the main purpose of this report is to define the corridors (3-km or more), hot-spots (500-meters), and intersections that has the highest Crash Cost Factor and Frequency Indexes for a period of five (5) years¹⁰⁵.

Installation of Intelligent Transport System (ITS) devices for traffic incident management and traveller information dissemination.

PRHTA has been implementing ITS technology for several years and intends to keep pursuing these projects in the future. This section will offer an overview of recent ITS initiatives as well as forthcoming projects, both now in place and suggested for the next five (5) years.

The ITS devices to be installed include CCTV cameras, vehicle detectors, Bluetooth readers for travel time, dynamic message signs, and communication systems (wired and/or wireless). These devices will aid in the detection/verification of traffic incidents, dissemination of information to the travellers, including roadway/lane closure events, alternate routes, and travel time, and real-time performance measurement.

The following is a list of upcoming ITS projects:

- PR-66 ITS Implementation Complete)
- PR-20 ITS Implementation (Complete)
- PR-30 ITS Implementation (Complete)
- PR-52 ITS Implementation from Caguas Sur Toll Plaza to Ponce.
- PR-53 ITS Implementation on PR-53 (All concession segments)
- PR-1 ITS Implementation on PR-1 (Luis Muñoz Rivera Expressway Segment)
- PR-2 ITS Implementation on PR-2 (Roberto H. Todd Expressway Segment)
- New Integrated Corridor Management Center

Non-Motorized

Safety of pedestrian as part of the SHSP Vulnerable Road User (VRU) Potential future Projects

The VRU assessment will be implemented for the first time in 2023 and is still in development at the time of this MLRTP's release. As a result, while information on the VRU is limited, it is nevertheless highly important and should be considered as a future policy guideline.

As part of the plan, the VRU examines three (3) potential projects, which are stated below:

- Evaluation of site crash report conditions including crash report review and road safety audits.
- Identification of countermeasures, design, implementation, and evaluation.
- Prioritize roadway segments by high-risk roadway features for potential projects.

Complete Streets Projects

The DTPW has considered the Complete Streets under several initiatives to implement the Complete Street in collaboration with the PRHTA.

Among the projects that have been done are the following:











- The incorporation of the Complete Streets Guide into the Puerto Rico Housing Department's Community Development Block Grant (CDBG);
- The DTPW arranged this Peer-Exchange in collaboration with the FHWA to reaffirm and educate about the Concepts of Complete Streets and Complete Streets Guidelines for Puerto Rico. This initiative was tailored to the many Complete Streets consultants and specialists in Puerto Rico;
- Memorandum of Understanding with AARP to incentivize a culture shift toward Complete Streets among DTPW and municipalities' umbrella employees, including consultants; and
- DTPW is working with the Planning Board to integrate the Complete Street Guidelines to their projects and regulations.

Bicycle and Pedestrian

Among PRHTA's goals are many initiatives that the agency intends to begin during the next five (5) years. The Projects shown in the Table 6.8 includes interventions in these two levels:

- **Short Term:** Road Safety Analysis
- **Short-Medium Term:** Install signpost indicating the presence of bicycles along the route.

Table 6.8: Non-motorized Projects Intervention Types

Project	Short Term	Short-Medium Term
PR-25 (Ponce de León Avenue) and PR-35 (Fernández Juncos)		
PR-115 (Añasco to Aguadilla)		
PR-194 (Fajardo)		
PR-129 (Hatillo y Arecibo)		
PR-1 (Santa Isabel to Ponce)		
PR-3 (Patillas, Arroyo, Guayama except urban center, and Salinas)		
PR-324 (Lajas)		

Source: PRHTA, 2018

Freight

The 2045 Puerto Rico LRTP identified a series of freight-related interventions, including projects, strategies, and recommendations. These interventions, which are still ongoing due to the lack of progress as of this MLRTP update, are summarized below. Additional information regarding this topic can be found in the Appendix: 2050 MLRTP Freight Assessment. The Freight Network is fully described in Chapter 3; all the strategies suggested in this section must be undertaken at the relevant locations.

Freight Network Extensions

A travel demand analysis¹⁰⁶ was undertaken, to identify new freight corridors and freight corridors for improvement.

- **Five new freight corridors were identified**, with the largest being the PR-22 Extension to Aguadilla (27.63 miles).
- **Freight corridors were also identified for improvement**, with most of these corridors spanning Aguadilla and San Juan.

These extensions implies an important benefit which is an optimized distribution of trucks on roadways: freight related vehicles move from minor, local roads to those offering better and most suitable capacity (such as expressways and major arterials).

It is likely that this spreading of heavy traffic could result in positive effects on other road users, result in better Level of Service (LOS), more reliable travel times and ideally, improved road safety.

State Freight Plans

The Fixing America's Surface Transportation (FAST) Act included a provision requiring states to develop a State Freight Plan¹⁰⁷. This plan should provide a comprehensive plan for the state's immediate and long-term freight planning activities and investments (US Department of Transportation, 2015)¹⁰⁸.

State Freight Plans can assist states in contributing to the National Multimodal Freight Policy goals in 49 U.S.C. 70101(b) and the NHFP goals in 23 U.S.C. 167(b). The Department of Transportation strongly believes that these objectives provide critical direction and assistance for the advancement of freight transportation across all modes (US Transportation Department, 2016).

“When implementing complete streets guidelines, the Freight Plan is critical for those specific locations. Complete Streets are significant because they provide economic activity on both sides of the road. Because people will be using both roads for movement, adequate infrastructure is required” (US Transportation Department, 2016).

As these locations where the complete streets are implemented have businesses and restaurants, there is an additional truck loading activity when supplies are distributed. This is why a truck loading and unloading plan is required in locations with complete streets where we want to have the best infrastructure between automobiles and pedestrians during the day.

This type of plan also supplements complete streets projects and guidelines for urban zones. Especially in mixed commercial and residential areas, they can support the logistics of when and how goods should be supplied to the businesses and restaurants. An example of this is the Loíza Street, where there is commercial activity along both sides of the street, and people cross the street at different points to access different services.

106. The travel demand analysis considered 2016 levels of population and employment.

107. This requirement applies to states that receive funding under the National Highway Freight Program.

108. https://www.transportation.gov/sites/dot.gov/files/2023-01/State%20Freight%20Plan%20and%20State%20Freight%20Advisory%20Committee%20Guidance_signed.pdf

State Freight Advisory Committees

The FAST-Act requires DOT to encourage each State to establish a local Freight Advisory Committee, comprising a representative cross-section of public and private freight stakeholders. The role of a State Freight Advisory Committee is based on five (5) main aspects. First, to advise the state administration in the actions to take in order to attend the territorial freight related needs. Second, create a discussion space to address the freight relevant topics. Additionally, it should create communication channels between both public and private sector to prioritize the regional main affairs. Finally, to participate in the definition of the state freight plan¹⁰⁹.

Complete and Enhance Freight Network (Strategy)

Alongside the Freight Network Extensions identified, the 2045 LRTP recommended additional improvements to the freight network, including:

- Improving the Mayagüez to Aguadilla corridor;
- Improving cargo services to Vieques and Culebra; and
- Completing PR-10; PR-53.

Improving roads providing access to/from ports and distribution centers to the strategic highway network.

Congestion Reduction Strategy

The 2045 LRTP identified that strategies to reduce congestion on the strategic highway network would benefit the freight network. Congestion Management Processes (CMPR) were therefore developed, and include the following objectives:

- Monitor and evaluate the performance of multimodal transportation system;
- Identify the causes of congestion;
- Identify and evaluate alternative actions that provide information supporting the implementation of actions; and
- Evaluate the efficiency and effectiveness of implemented actions.

Transportation Demand Management (TDM) (Related to Congestion Reduction strategy)

The intention of TDM is to help alleviate travel congestion through lower-cost means than major capital investments for physical system capacity. Additionally, TDM provides strategies to increase shared and non-motorized forms of transportation, while addressing the need to reduce congestion and air pollution.

As TDM is clearly an integral component of congestion reduction, TDM measures have been included in the Congestion Management Process (CMP) developed for the San Juan and Aguadilla TMAs, however, freight-specific TDM measures have not currently been identified.

In the case of UZA they don't meet with the federal requirements to have their own CMP and or TDM strategy.

Resilience

For the first time, the 2045 LRTP incorporated a vulnerability assessment based on the FHWA's 2017 Vulnerability Assessment and Adaptation Framework. This assessment was mainly triggered by the effects of Hurricane Maria on transportation infrastructure and focused on floods and landslides.

Considering the recent seismic activity in the south of the island from December 2019 to January 2020, it was concluded that an earthquake resilience strategy for the freight network was necessary for this MLRTP update. The FHWA's 2017 Vulnerability Assessment and Adaptation Framework did not consider earthquakes in its approach. More details about the resiliency strategy are included in the Future Scenarios.

A more comprehensive assessment should be designed to include additional risk factors and adaptation measures. The assessment should also be expanded to include design/construction-related considerations as these considerations play a key role in infrastructure resilience.

Intelligent Transportation

It is important that Puerto Rico continues to build on the progress made with ITS (primary focus being on congestion management in key corridors and on non-car mode trips to influence behaviour change) and identify opportunities for ITS to improve the goods movement process across the island. For example, Intelligent Communication Technologies have been observed to enhance supply chain performance, contributing to three main functions related to freight: resource management; ports and terminals operations management; and freight and vehicle tracking and tracing.

New modes, such as Transportation Network Companies (TNCs), electric bike share, electric scooters etc. are mixing with more traditional modes such as transit, providing a much broader 'transportation ecosystem' to the user. In many cases, these new services are providing 'first/last mile' solutions for riders who live a distance from transit stops and stations. An opportunity therefore exists to expand this type of service into the goods movement sector as a last-mile urban delivery / pick-up service.

Electrification

The emissions from on-road fleets (light duty cars and trucks as well as heavy-duty trucks), reached peak levels during the 2000-2010 decades and are predicted to fall over time. However, despite this prediction, reductions are not sufficient to reach the desired goal of having emission levels comparable to 1990 levels. In addition, the most significant driver for the reductions in emissions: new fuel efficiency standards, are not predicted to continue up to 2050. Therefore, additional measures will be needed to be taken to continue helping to reduce vehicle-related emissions. Examples include:

- Provision of electric vehicle charging infrastructure, specifically rapid charge points for the commercial sector;
- Easing of the permitting process for the construction of private charging facilities;
- Establishing or enhancing subsidies for charging equipment and/or vehicles; and
- Enhancing tax credits for electric vehicles purchases.

Recent advancements in the electrification of goods movement vehicles (e.g., heavy trucks) has improved the ability / willingness of companies to transition their fleets away from diesel and towards electric¹¹⁰.

Issues and Opportunities

Taking into consideration the findings discussed above, several key issues and challenges, as well as opportunities related to current and potential future goods movement conditions in Puerto Rico are identified and summarized in Table 6.9.

Table 6.9: Issues, Challenges, Opportunities of the Freight Network

Issue / Challenge	Description and Example	Opportunities
Natural Hazards / Extreme Weather Events	<ul style="list-style-type: none"> • Puerto Rico is highly susceptible to natural hazards, which damages freight-related infrastructure (e.g. seaports, airports, roads) and the movement of goods. • An example of this was when the 2020 Southwest Puerto Rico Earthquake Sequence compounded damage caused by Hurricane Maria (2017). <ul style="list-style-type: none"> ○ The Rafael Cordero Santiago Port of the Americas was weakened by the impacts of the hurricane, and further damaged by the earthquakes, delaying construction of the mega port. ○ The Port of San Juan suffered major damage and disruption from the 2017 hurricane. 	<ul style="list-style-type: none"> • Comprehensive Vulnerabilities Assessment that expands current analysis and adaptation framework. Workforce capacity building, including truck drivers, to address logistics challenges ahead of the development and roll out of recovery plans. • Scenario planning to assist with preparedness for unprecedented / rapid systems change. • Land use assessments to identify more resilient locations to provide new/ retrofitted infrastructure.
Congestion	<ul style="list-style-type: none"> • The road network routinely exceeds its capacity as a result of too many vehicles and trucks being on the road. As a result, Puerto Rico sees sustained congestion and air quality issues. • The San Juan TMA in particular is observed to have some of the worst congestion / hot spots in the network given it is the largest metropolitan area on the island, and home to the island's largest airport and seaport. • Capacity constraints on inter-modal connecting nodes, and/or a configuration that limits network redundancy can create or exacerbate freight bottlenecks. • A recent example of this was post-hurricane Maria, where supply chain challenges arose in Puerto Rico centered around the Port of San Juan. While cargo was able to make it to the port, due to blocked roads and shortages of trucks and drivers, many goods could not be transported out of the port area. 	<ul style="list-style-type: none"> • Logistics hubs and ITS technologies can work to help to optimize fleets and movement of goods, which can then help to reduce congestion along the network as delivery vehicle trips are reduced. • Hubs can be located at a regional or urban scale to assist with the (re)distribution of goods. <ul style="list-style-type: none"> ○ Urban logistics hubs pair well with sustainable last-mile service alternatives (e.g. cargo bikes) to reduce the amount of diesel-fueled medium / heavy trucks in cities, helping to reduce air and noise pollution as well as road and curbside congestion (provided bikes do not have to operate in mixed traffic, and have, at least to some extent, access to dedicated cycling infrastructure). • Policies around the timing of goods movement, such as through off-peak and nighttime delivery requirements / incentives can help to reduce congestion as it re-assigns truck traffic to a time when roads are less busy. • The Marine Highway Network is an effective alternative to road-based trucking for regional distribution as it capitalizes on underutilized waterways, moving goods more efficiently and, to some degree, more sustainably: ships, like trucks, have their own environmental footprint as they require a fuel source and contribute to emissions/pollution unless powered electrically or by more sustainable bio-fuels¹¹¹. That said, removing diesel-fueled trucks from the road nonetheless helps tackle pollution and congestion issues. Importantly, the logistics of shipping / receiving goods by ships in other ports would have to be managed accordingly.

Source: Steer, 2023

111. <https://www.resilience.org/stories/2022-07-28/making-waves-electric-ships-are-sailing-ahead/>

Table 6.9: Issues, Challenges, Opportunities of the Freight Network (cont.)

Issue / Challenge	Description and Example	Opportunities
Connectivity	<ul style="list-style-type: none"> In Puerto Rico, the road network is dominated by circumferential routes around the perimeter / coast of the country. Subsequently, inland locations, away from metropolitan centers along the coast, are more isolated, and can face more severe problems with delivery of critical goods. 	<ul style="list-style-type: none"> Expand the road network and improve efficiency / communication of routes using ITS technology. Expand the regional road and sustainable transport network, adding infrastructure not just in cities, but between them. Expand network redundancies. Add truck only lanes.
Traffic Safety / Accidents	<ul style="list-style-type: none"> According to the 2022 Puerto Rico Highway Safety Plan, hundreds of people are killed, and thousands injured from traffic crashes. Although, a reduction of less than 300 between 2016 to 2020 has been achieved, still road users' behaviors are the biggest problem and the hardest to change. Over the last years, alcohol-impaired driving and pedestrian fatalities have represented two-thirds of total traffic fatalities in Puerto Rico. While the relationship between accidents and freight are not discussed in this report specifically, accident-caused delays undoubtedly impact the goods movement process. As well, medium and heavy trucks being the size that they are would be more dangerous to other road users if ever involved in a crash as compared to other vehicle types. Some of the state's problems that hinder traffic safety are funding constraints and budget cuts, out of date technology and data gathering, VMT delayed actualization, among other situations. All these limit the traffic data analysis process, which depends on multiple microanalyses of different databases, manual reports, and data (where entries are often delayed). 	<ul style="list-style-type: none"> Better road safety design that accommodates the needs of all users, particularly people who are most vulnerable (e.g. people on foot). Capacity / resource improvements to better manage this issue-area. Reducing the overall number of vehicles would help reduce congestion, as well as potentially mitigating conflicts between users in certain locations.
Air Quality	<ul style="list-style-type: none"> As diesel-fueled trucks are still the primary mode for regional and urban goods movement, the emissions from these trucks, particularly when idling along congested corridors / in cities, has a notably negative impact on air quality. 	<ul style="list-style-type: none"> With advancements in truck electrification technology, it is becoming more feasible for trucking companies to transition away from diesel-fueled trucks towards electric. Currently, Puerto Rico has some charging infrastructure on the Island, which could be outfitted (if necessary) for truck charging. Expansion of charging infrastructure is also possible. In addition to the electrification of fleets, there is a role to be played by more sustainable transport modes (e.g. cargo bikes), particularly for the urban 'last mile', as well as TDM whereby the implementation of measures can help reduce the number of trucks needed on the road.

Source: Steer, 2023

Table 6.9: Issues, Challenges, Opportunities of the Freight Network (cont.)

Issue / Challenge	Description and Example	Opportunities
COVID-19 Pandemic	<p>The COVID-19 pandemic led to unprecedented changes to nearly all aspects of life.</p> <p>In terms of how COVID-19 impacted the goods movement sector / process, more goods were being demanded and more frequently. Buying habits / patterns shifted, particularly with lockdowns and people working from home. Unprecedented supply chain issues resulted from the unprecedented demand for goods. As well, how goods were being delivered (and picked-up) changed, from contactless / curbside delivery to a surge in bicycle and motor-cycle delivery modes.</p> <p>Congested roads were, in some places, made worse, although with a reduction in traffic from lockdowns this was temporarily offset. Also increased was the demand for sustainable transport infrastructure to accommodate bike delivery services, as well as curbside/parking space.</p>	<ul style="list-style-type: none"> • Logistics hubs and ITS technologies to help to optimize fleets and movement of goods. • Curbside/Parking Management Strategies • Expand/improve safety conditions of the road and sustainable transport network. • Invest Puerto Rico (a public-private partnership), in collaboration with the Department of Economic Development and Commerce (DEDC)¹¹², identified opportunities for public/private coordination for supply chain development in Puerto Rico, post COVID-19 pandemic including: <ul style="list-style-type: none"> • Maintain stability of Island’s supply chain connectivity in terms of price, frequency, and security between mainland US resulting from pandemic. • An increase in tourism to the Island can help support increased air cargo capacity.
Data Collection / Sharing / Analysis	<p>There is an overall lack of freight-related data collection /sharing /analysis in Puerto Rico, from ports, to regional road, to cities and curbs. As well, there is a lack of data related to freight-adjacent sectors such as traffic safety, as well.</p>	<ul style="list-style-type: none"> • An opportunity exists to collect freight-related data both through ports and through freight vehicles (ships or trucks) and their companies. Having consistent and up-to-date datasets is critical for effective goods movement planning as it can provide insight into issue areas, and therefore, what may be an effective method for tackling said issues. • Data collection requirements can be incorporated into licensing/permitting processes, particularly for new gig economy businesses.

Source: Steer, 2023

112. “Puerto Rico’s Path Towards Competitiveness”, presentation by DEDC, published by Puerto Rico Chamber of Commerce, 2021.

Congestion Management Process

Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. “A congestion management process (CMP) is a systematic and regionally accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs” (Federal Highway Administration’s (FHWA), 2011).

Some expected benefits from the CMP and derived strategies are the improvement of infrastructure capacity, environmental quality and livability and safety, to support sustainability, economic advancement, promote innovation and interagency collaboration, interdisciplinary integration and procure new financial opportunities.

The CMP has eight elements/actions that are:

Regional Objectives

The first element of a CMP is to consider the desired outcome, this includes the goals that the region wants to achieve. For this CMP, the regional objectives for San Juan TMA and Aguadilla TMA are:

- Reduce congestion intensity;
- Reduce and provide reliable travel times in the National Highway System (NHS);
- Promote alternative modes of transportation and intermodal connectivity;

- Improve transportation system’s safety and security;
- Reduce delay caused by incidents and emergencies;
- Reduce transportation infrastructure’s vulnerability for it to withstand extreme weather events through resilient infrastructure; and
- Facilitate the efficient movement of freight.

Regional CMP Network

The CMP network involves the geographic boundaries or area of application and the system components/network of surface transportation facilities. This CMP will be initially applied in the metropolitan areas of San Juan and Aguadilla, since federal law requires a CMP for metropolitan areas in Puerto Rico with populations over 200,000. Between San Juan and Aguadilla TMAs, this CMP covers the 50.3% of the island surface. Figure 6.2 and Figure 6.3 shows the Congestion Management Network in the Aguadilla TMA and the San Juan TMA.

Multimodal Performance Measures

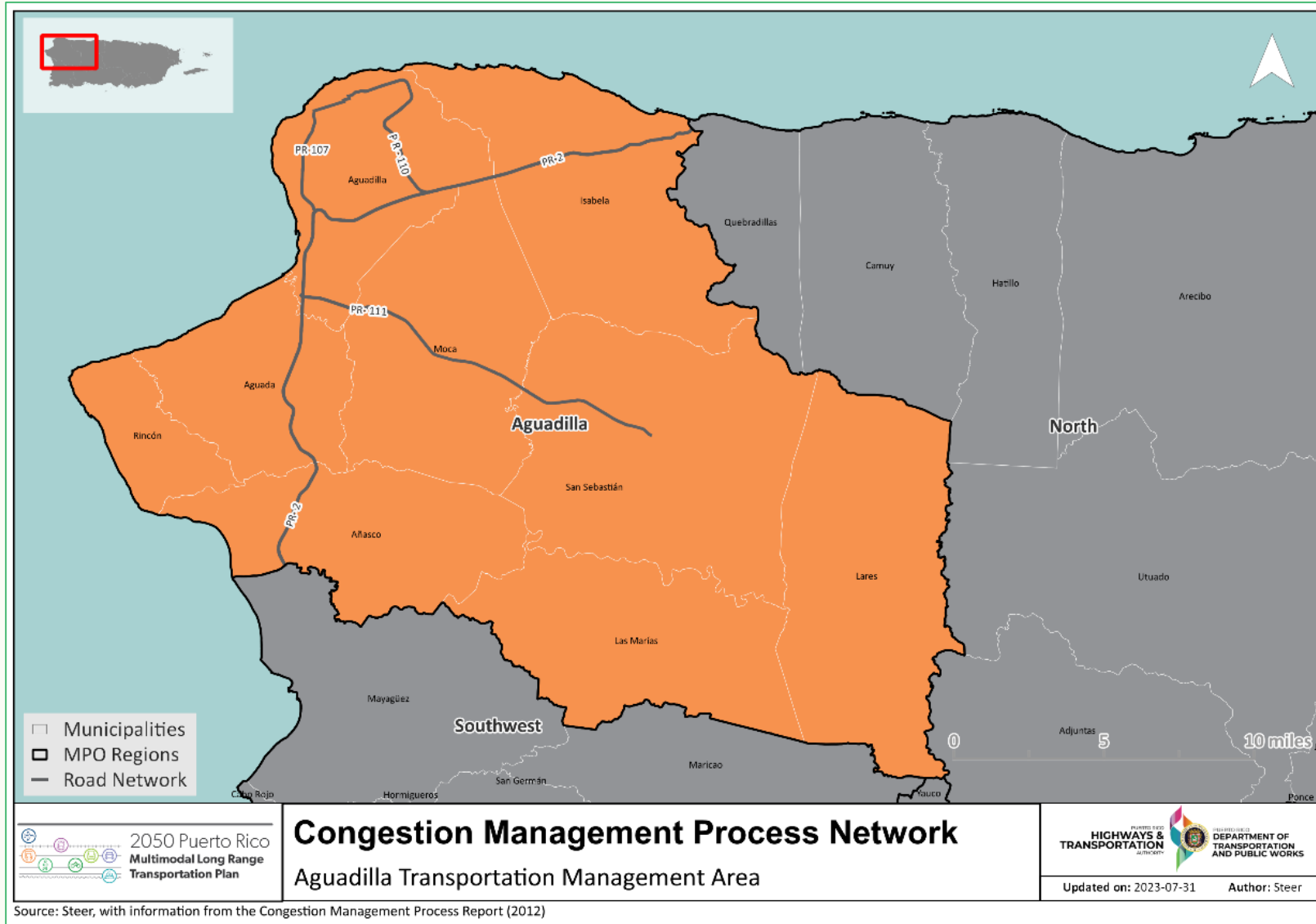
One key to the effectiveness of the CMP is the ability to adequately assess system performance by quantifying levels of congestion and providing an analytical framework to determine congestion trends. For this purpose, Performance Measures are the key measures that will define and measure congestion. These measures relate and support the regional objective, developed on the first element.

Data Collection/Monitor System Performance

This element of the CMP describes the data needed to support the performance measures and those responsible for collection. The data must be continuously collected to determine the evolution of the performance measures, therefore the congestion, and to analyze the level of accomplishment of the regional objectives mentioned before.

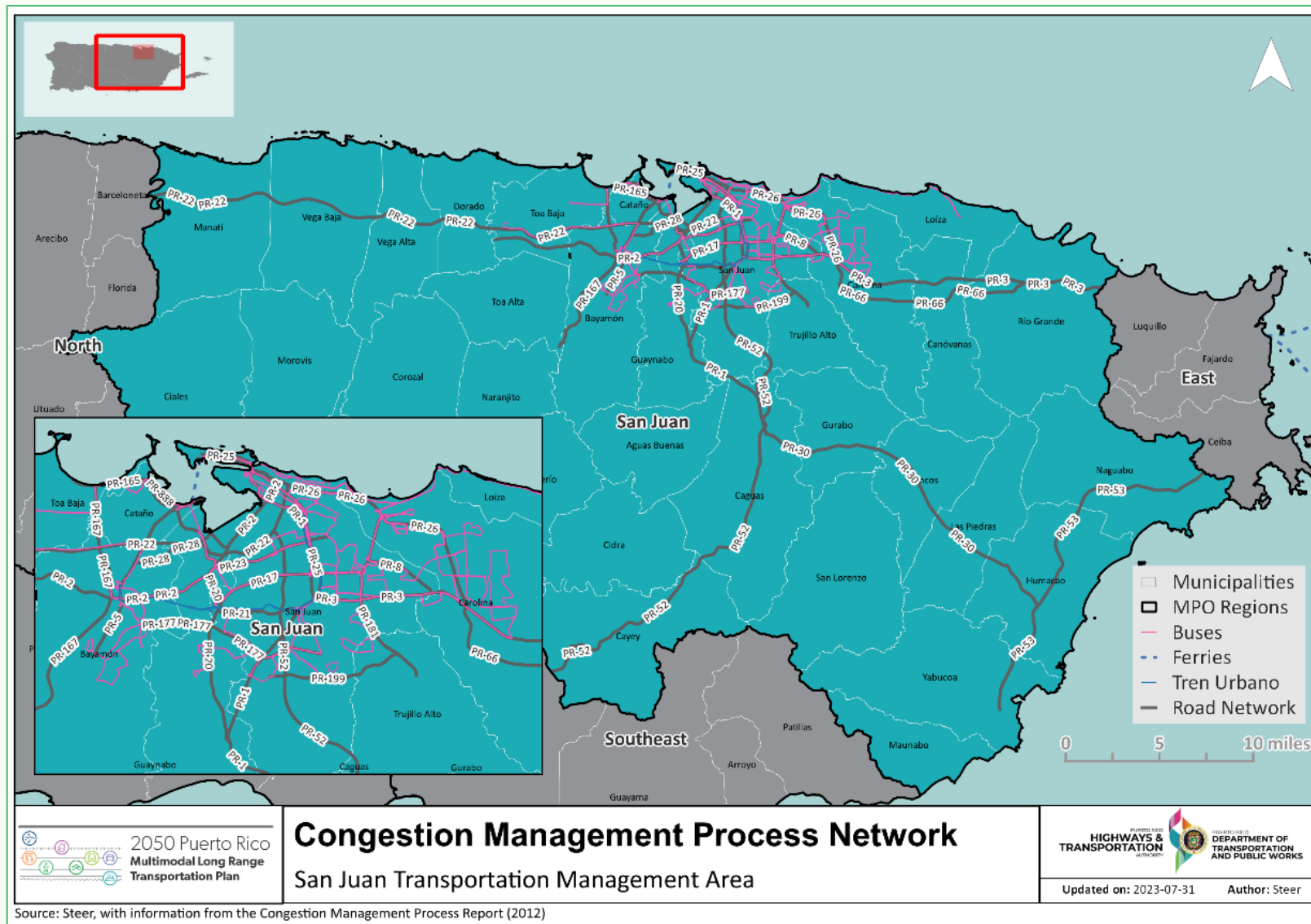
The data that needs to be constantly collected includes Traffic Counts, Vehicle Speed, Vehicle Occupancy Rates, Transit data, Inventory of transportation facilities and infrastructure and Crash reports.

Figure 6.2: Congestion Management Network for the Aguadilla TMA Region



Source: Steer, with information from the Congestion Management Process Report (2012)

Figure 6.3: Congestion Management Network for the San Juan TMA Region



Source: Steer, with information from the Congestion Management Process Report (2012)

Congestion Problems and Needs

To identify the congestion management strategies, it is necessary to identify what system problems, location and cause. There are different traffic analysis tools that can be effective at identifying the potential causes of congestion, as well as reports/literature that are periodically updated and that identify problems. These reports include the Strategic Highway Safety Plan (SHSP) and the Long-Range Transportation Plan (LRTP).

Identification and Assessment of Strategies

This element turns the data of action 4 and the analysis of action 5 into a set of recommended solutions to effectively manage congestion and achieve congestion management objectives. A wide range of strategies are available and can be broadly grouped into: Demand Management, Traffic Operations, Public Transportation and Road Capacity.

Programmed and Implementation Strategies

It is important to transform the strategies identified on the previous section into implemented projects. For this, the strategies can be implemented/categorized in regional or local strategy. Regional-level implementation consists of including the strategies into the Long-Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP). At local level, the strategies can be assessed by individual studies and implemented using a variety of funding sources.

In case it is necessary to rank projects using the CMP objectives, Appendix: Congestion Management Process contains a specific scoring process for the congestion management.

Evaluation Strategies of Effectiveness

It is important to ensure that implemented strategies are effective at addressing congestion as intended, and to make changes based on the findings. Two general approaches used for this type of analysis are System-Level Performance Evaluation and Strategy Effectiveness Evaluation. At this point, the process will repeat itself, with the feedback from the strategies implemented, the regional objectives, performance measures, congestion problems and the assessment of strategies should be reviewed.

Transit Demand Management (TDM)

Transportation Demand Management (TDM) is the application of strategies and policies to encourage the use of sustainable modes within a transportation network. A TDM Strategy is a plan for a region, city, neighbourhood, or site that seeks to deliver sustainable transportation objectives. It is articulated in a document that is regularly reviewed by the implementing organization, usually on an annual basis. It involves identifying an appropriate package of measures aimed at promoting sustainable travel and mitigating climate change impacts of transportation, such as greenhouse gases (GHG) and decarbonization, with an emphasis on reducing SOV trips, congestion, Vehicle Miles Travelled (VMT), and parking demand. It can also assist in meeting other objectives such as increasing the accessibility of different transportation options, improving access to economic options, improving health and safety, attracting, and retaining staff.

The TDM Strategy will support the implementation of the CMP and the 2050 MLRTP by enabling residents, employees, and visitors to make sustainable transportation choices given the suite of available options. The effective implementation of TDM strategies aims to reduce congestion in the focus areas of San Juan and Aguadilla TMAs, but also on the Island as a whole. In addition, it aims to reduce the demand for parking and will align with the Island's environmental goals of encouraging sustainable modes of transportation. It should be reviewed on an annual basis separate from the MLRTP to ensure that adjustments can be made to the TDM Strategy if goals are not being met, this will assist in the entire MLRTP meeting its goals.

Given the opportunities, the main goals of the TDM Strategy are:

- **Congestion Management:** Reduce demand for parking and congestion on major highways, by promoting alternative modes of transportation and off-peak travel culture, particularly in San Juan and Aguadilla Transportation Management Areas;
- **Promotion of Travel Options:** Identify innovative and cost-effective solutions that encourage mode shift from single-occupant vehicles to multi-modal options;
- **Environmental Stewardship:** Reduce VMT and GHG emissions in Puerto Rico by supporting sustainable modes of transportation; and
- **Collaboration:** Leverage and support other regional and local initiatives related to public health, active transportation, sustainability, climate change, and smart growth.

Table 6.10 presents a summary of all the recommended TDM Strategies that could contribute towards mitigating congestion challenges in the San Juan and Aguadilla regions. The strategies summarized in this section are strategies that can potentially be implemented at a regional or MPO level. More detail regarding the TDM strategy can be found at the Appendix Long Range Multimodal Transportation Plan Travel Survey and TDM Report.

Considering that there is currently no TDM program in Puerto Rico, it is important to conduct an inventory of data that is readily available through other programs such as the CMP, traffic modelling, and traffic data. The review of existing data provides the opportunity to streamline data being collected. It also allows for the uniformity of data collection across all municipalities, if and when a TDM program is implemented.

Table 6.10: Summary of TDM Strategies

Mode/Program	Strategy
 Policies and Programs	Advisory board at regional level-TDM Regulations
	Regional collaboration and Leadership-TMA/Commuter program
	Voluntary Employer Commute Program
	Congestion Charges
	Multimodal Information
	Policy on Hybrid/modified Schedule
 Transit	New Hire Packages
	Support Strategies: guaranteed ride home, multi modal wayfinding, personal trip planning
	Expanded Transit Network
 Active Transportation	Transit Education and Awareness Integration and Collaboration
	Transit Subsidy
	Secured Public Bike Parking + Support facilities
 Carpooling and Parking	Provision of Funding and Grants for Cycle Tracks
	Provision of Funding and Grants for Shared Micromobility
	Bike Education
	Carpool and Ride Matching Program
	Priority Carpool Parking + Carpool Lanes-advisory role
	Parking Fees

Source: Steer, 2023

Based on the inventory of existing data, a standardized reporting system should be developed across all municipalities that collects a core set of data measuring the same metrics. This will enable the progress of TDM to be compared across various municipalities and provide opportunities for the data to be aggregated on a regional level. It also provides opportunities for the region to set region wide TDM targets that reduce congestion.

If instituted, TDM Regulations should encourage individual sites (of a certain number of employees or occupants) to develop annual compliance reports, which would include:

- TDM Plan describing the list of strategies being implemented (how and where implemented) and projected impact.
- Annual Travel Survey to understand motivations and challenges to using TDM strategies, as well as impact.
- Annual Monitoring Report describing the status of TDM strategies and their impact on reducing congestion and parking demand.

The implementation of a Voluntary Employer Commute program further provides the opportunity for TDM metrics to be collected on a site level. The compliance reporting from sites in conjunction with the Congestion Management Process (CMP) can form the base of the monitoring strategy for the region. Municipalities in the regions are encouraged to develop annual TDM reports based on information from individual sites and other available metrics. This can be further amalgamated on a regional level.

Air Quality Analysis

This section summarizes the status of the air quality for Puerto Rico with emphasis on those pollutants that are related to transportation sources. Air quality measurement stations are located through the entire island in municipalities such as Bayamón, Juncos, San Juan, Adjuntas, Arecibo, Mayagüez, Salinas, Cataño, Guaynabo, Ponce, Guayama and Guayanilla¹¹³. The Puerto Rico Air Monitoring Network Plan 2022, prepared by the DNER, provides evidence that meets current federal air monitoring requirements. The air quality data of the Puerto Rico Air Monitoring Network is used to determine compliance with the National Ambient Air Quality Standards (NAAQS). The results of the mentioned plan were that Puerto Rico Air Monitoring Network meets the monitoring requirements established by the federal regulations. The procedures that are used and the instruments that are operated meet the standards that has been established by Environmental Protection Agency (EPA).

Pursuant to the provisions of the Clean Air Act (CAA) and its subsequent amendments, the EPA has established the NAAQS for six (6) criteria pollutants. These standards have been established to protect the public health. When an area meets a particular standard, it is stated that it is an “Attainment” area. Otherwise, it is designated as a “Nonattainment” area, which implies that a compliance plan shall be developed until the “Attainment” status is obtained. Nevertheless, transportation sources contribute to four (4) of the six (6) criteria pollutants for which EPA has established standards to protect public health and/or safety. The pollutants are ozone (O₃), carbon monoxide (CO), particulate matter (PM₁₀ and PM_{2.5}), and nitrogen dioxide (NO₂).

Until 1991, the entire Island was designated as meeting NAAQS. Current Nonattainment and Maintenance Areas in Puerto Rico are identified in Figure 6.4¹¹⁴.

113. <https://www.drna.pr.gov/wp-content/uploads/2022/05/Air-Monitoring-Plan-PR-2022-english.pdf>

114. US EPA. Green Book. Puerto Rico Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants.

Figure 6.4: Nonattainment and Maintenance Areas in Puerto Rico

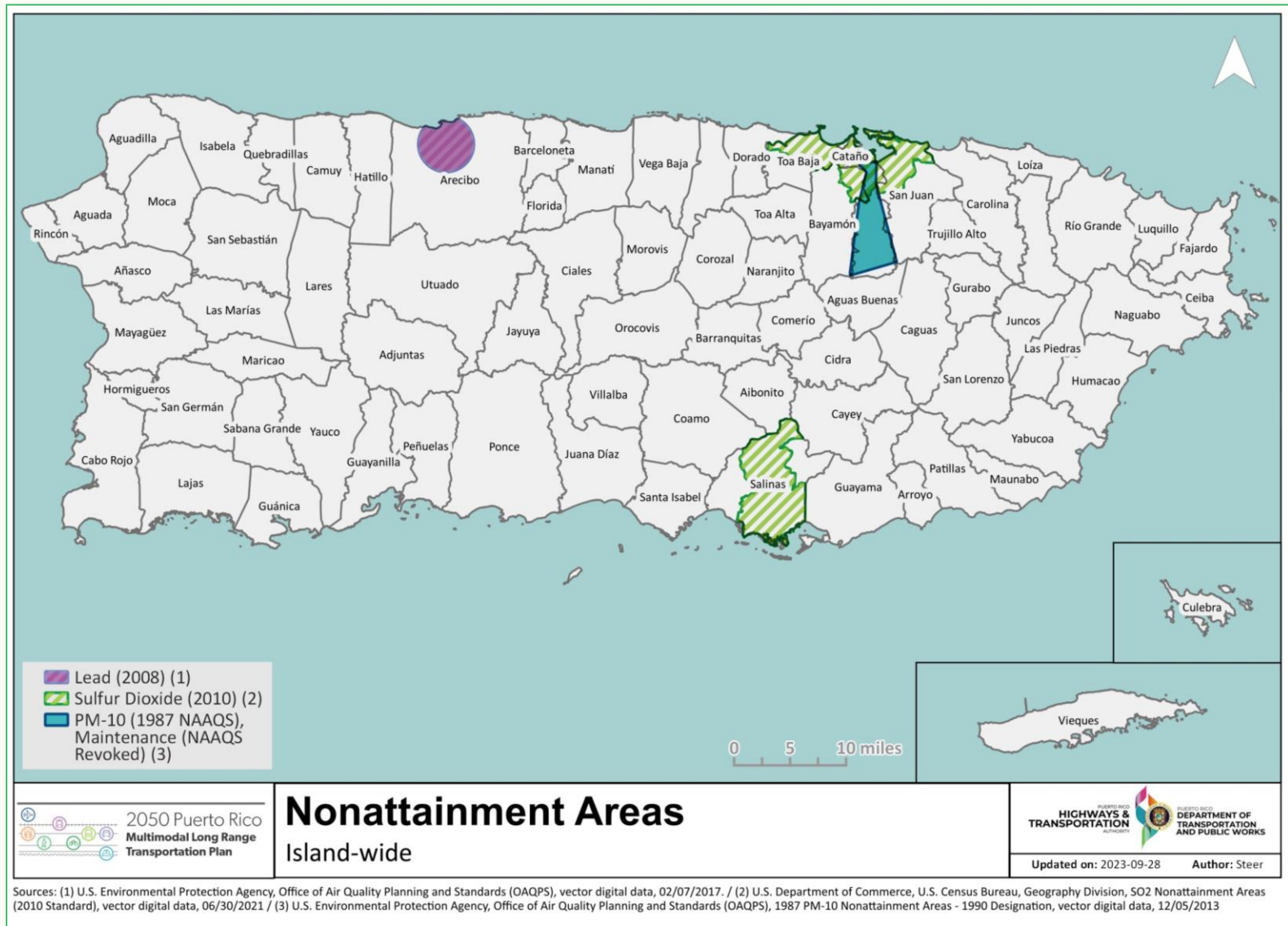


Table 6.11 shows that currently there are not Nonattainment Areas for transportation related NAAQS. There is only a Maintenance Area for PM 10, which is a transportation related NAAQS. It corresponds to the Municipality of Guaynabo. After developing and implementing compliance measures that were incorporated in the State Implementation Plan (SIP), air quality monitoring data provided support for a delisting request that was submitted and approved by the EPA on January 12, 2010. The decision was published in the Federal Register¹¹⁵.

Table 6.11: Puerto Rico Nonattainment and Maintenance Areas in 2022

County: Puerto Rico	NAAQS	Area Name	Period under Nonattainment	Whole or/ Part County	Redesignation to Maintenance
Arecibo Municipio	Lead (2008)	Arecibo, PR	2011-2023	Part	--
Bayamon Municipio	Sulfur Dioxide (2010)	San Juan, PR	2018-2023	Part	--
Cataño Municipio	Sulfur Dioxide (2010)	San Juan, PR	2018-2023	Whole	--
Guaynabo Municipio	Sulfur Dioxide (2010)	San Juan, PR	1992-2009	Part	02/11/2010
Guaynabo Municipio	PM 10	Guaynabo , PR	2018-2023	Part	--
Salinas Municipio	Sulfur Dioxide (2010)	Guayama- Salinas, PR	2018-2023	Part	--
San Juan Municipio	Sulfur Dioxide (2010)	San Juan, PR	2018-2023	Part	--
Toa Baja Municipio	Sulfur Dioxide (2010)	San Juan, PR	2018-2023	Part	--

Source: EPA, 2022

The Transportation Conformity Rule apply to Nonattainment Areas and Maintenance Areas by an approved maintenance plan. Air quality conformity is a process intended to ensure that FTA funding goes to transit activities that are consistent with the air quality goals set forth in the Clean Air Act.

The Municipality of Guaynabo is under a Maintenance Plan and is for this reason that a variety of concerted actions and policies help to maintain PM₁₀ Attainment status in the municipality improving air quality and creating more sustainable communities. Such policies include, among others, pedestrian friendly land uses and improvement of pedestrian facilities, intersection improvements and other low-cost transportation measures, covering of loads on trucks, stabilizing the sides of roadways, paving parking areas, street cleaning and removal of road dust, and restoring roads to good repair. The increased emphasis on and implementation of transit improvements is a major commitment that will bring benefits for many years to come. These and other actions of the responsible agencies and officials will serve to improve the air quality on the Island.

The aforementioned actions and policies, established for the Municipality of Guaynabo, if implemented at Island-wide level would yield similar benefits to air quality and communities. Other concerted actions and policies would improve the air quality at Island-wide level, such as:

- Strict enforcement of vehicle inspection requirement prescribed by the Vehicles and Transit Law of Puerto Rico (Law 22- 2000). This law requires that every vehicle that travels on public roads must be equipped with the exhaust emission control system, including catalytic converter and parts related. Catalytic converters speed up the chemical reactions between oxygen and pollutants in the air to convert them into less toxic byproducts like water vapor, carbon dioxide, and nitrogen gas.
- Additional measures to reduce emissions. The most promising of them is the adoption of a local strategy that provides incentives for the conversion of the auto fleet to electric vehicles. Potential candidates for this strategy are:
 - Provide vehicles charging infrastructure;
 - Easing of the permitting process for the construction of private charging facilities;
 - Establishing or enhancing subsidies for charging equipment and/or vehicles; and
 - Enhancing tax credits for electric vehicles purchases.

Environmental Mitigation

Another important facet of transportation is the impact of transportation projects on the environment. The prevalence of environmental assets across the Island heightens the need to plan projects to avoid or minimize environmental impacts, and to devise proactive mitigation strategies to compensate properly for needed improvements with unavoidable impacts. As individual projects are developed, they are subjected to the required environmental planning process scrutiny, complying with both federal and Commonwealth laws and regulations. Puerto Rico has in place its local environmental impact review process that, in tandem with National Environmental Policy Act (NEPA) requirements for environmental assessment of qualifying projects, creates a framework for minimizing environmental harm.

As part of the environmental planning process for transportation projects the Infrastructure Voluntary Evaluation Sustainability Tool (INVEST) could be implemented. INVEST is a web-based self-evaluation tool comprised of voluntary sustainability best practices, called criteria, which cover the full lifecycle of transportation services, including system planning, project planning, design, and construction, and continuing through operations and maintenance. Some of the criteria include integrated planning (land use, natural environment and social) air quality, energy and fuels, financial sustainability, life cycle cost analysis, tracking environmental commitments, habitat restoration, stormwater quality and flow control and ecological connectivity, among others. FHWA developed INVEST for voluntary use by transportation agencies to assess and enhance the sustainability of their projects and programs.

Overall, environmental transportation sustainability is a complex and multifaceted issue that requires the implementation of a wide range of strategies. One of them is the mitigation of environmental impacts through a process of analysis, alternative designs, and various design/construction.

Future Scenarios

Roadway Network Vulnerability Assessment - Update incorporation of Earthquake Scenario

Resilience Component for The Long-Range Transportation Plan 2045: Hurricane Vulnerability

Puerto Rico's Location in the Caribbean makes it susceptible to the passing of hurricanes each year. The hurricane season is between the months of July and November, with September being the month with the most historical activity. The hurricane season is distinguished by heavy rainfall, high-velocity winds, and storm surges, which cause flooding and landslides throughout the Island.

However, the level of destruction varies based on several factors, such as the hurricane's trajectory, severity, size, forward speed, geotechnical characteristics in each place, land elevation, and so on.

In 2017, the island was hit by two consecutive storms, Irma and María. Hurricane María was the most powerful hurricane in 80 years. The electricity, communications, and water systems were all seriously affected in terms of infrastructure. The Roadway network was damaged by the floods, landslides, or storm surges. Bridges suffered the greatest amount of structural damage because of river floods.

For the resilience component established by the 2045 LRTP, a vulnerability analysis for the transportation network is performed in accordance with the US Department of Transportation's vulnerability assessment and adaptation methodology.

The information from the 2045 LRTP remains current since the data utilized for the vulnerability assessment was not updated following Hurricane María. Therefore, the results of the vulnerability assessment will only be summarized for the purposes of this MLRTP update. The complete methodology can be found in the Appendix Roadway Network Vulnerability Assessment -Update incorporation of Earthquake Scenario.

It is important to note that just because risk assessment data has not changed, it does not indicate that no additional weather-related incidents have occurred in the last several years. When Hurricane Fiona hit Puerto Rico in 2022, particularly in the southern half, there was damage to the roadway system. Specifically, there was structural damage to some NHS and non-NHS roadways caused by landslides that was not necessarily reflected in this study.

- Results as presented in the 2045 LRTP Vulnerability Assessment

The vulnerability index was obtained by combining the three components: Exposure, Sensitivity and Adaptive Capacity. A simple average might hide single-component criticalities that is why the scoring for vulnerability index followed these rules:

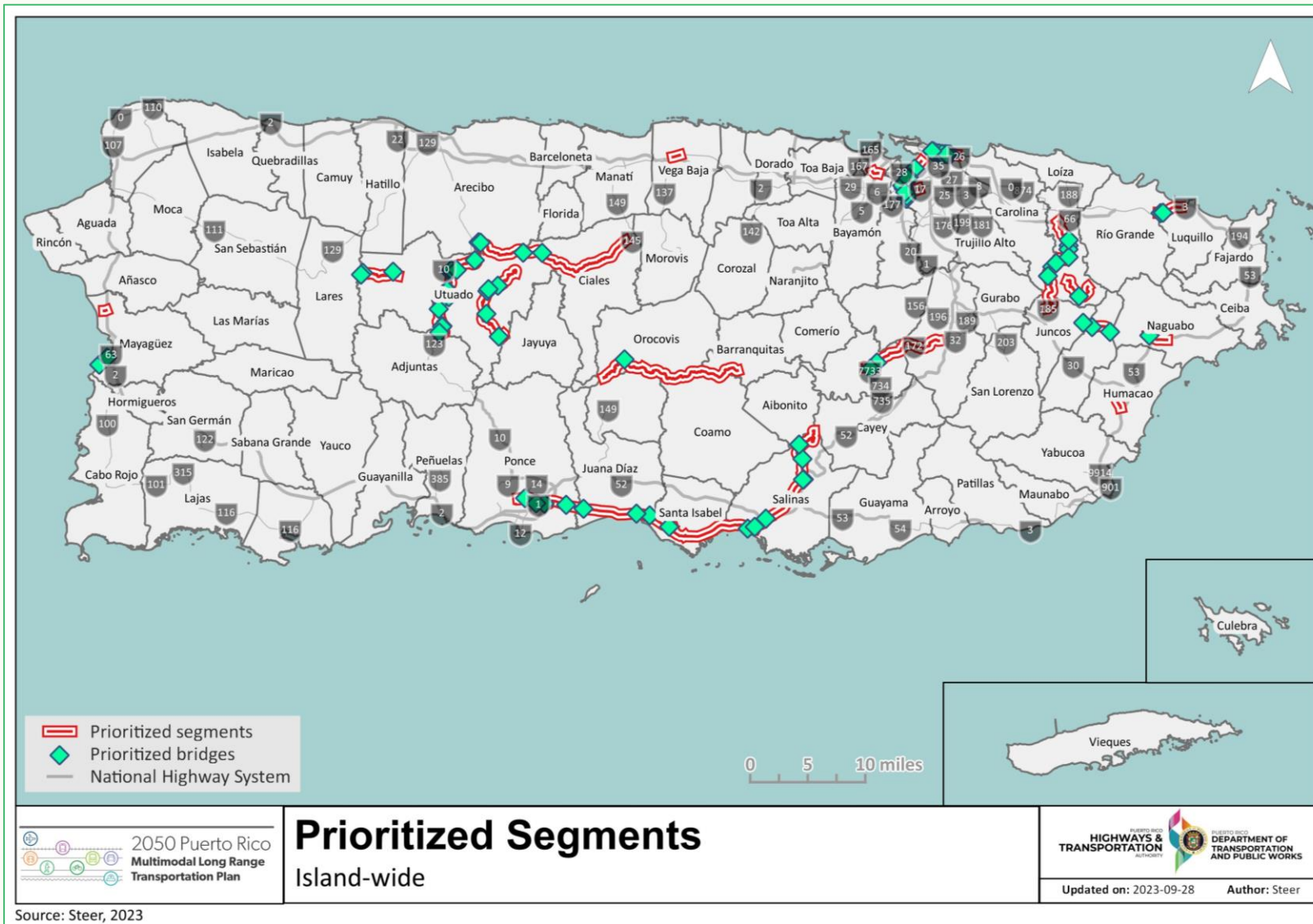
- Score=5: If the three (3) components had score of five (5);
- Score=4: If two (2) out of three had a score equal or higher than 4;
- Score=3: If at least one (1) of the components had score equal or higher than four (4), or the average is above three (3);
- Score=2: If the average is above two (2) and below three (3); and
- Score=1: Any other case.

Due to the level of detail defined in this analysis, the vulnerability index is defined as a discrete scale from 1 to 5, where “one” (1) is the lowest score and “five” (5) the highest. It is important to note that three of the selected segments were given a score of “cero” (0) because there was no evidence of Exposure. However, these might be due to uncertainties in the location or type of hazard responsible for failure. Therefore, it is important to re-visit these points and develop further hazard analysis.

These results were shared with the stakeholders in a final workshop, where the top twenty-one (21) segments (i.e., score four (4) and five (5)) were selected for further analysis and definition of mitigation analysis.

Table 6.12 and Figure 6.5 shows a brief description of each prioritized segment for the Island-wide. For all the identified segments a detailed study needs to be carried out to identify the appropriate adaptation option.

Figure 6.5: Prioritized Segments in Puerto Rico



Source: Steer, 2023

Table 6.12: Prioritized Segments Assessment

Road Name	Location	AADT	Length (km)	Hazard	Vulnerability Index
PR-20	Guaynabo	51,337	2	Floods	5
PR-31	Las Piedras	9,633	4	Floods	4
PR-123	Utua	9,139	19	Landslides	4
PR-172	Cidra/Caguas	9,504	13	Landslides	4
PR-31	Naguabo	15,670	2.8	Floods	4
PR-143	Orocovis/ Barranquitas	3,208	27	Landslides	4
PR-2	Guaynabo	51,337	4	Floods	4
PR-185	Canóvanas/Juncos	11,521	17	Landslides	4
PR-3	Luquillo	15,385	3.2	Floods	4
PR-869	Cataño	57,104	1	Floods	4
PR-186	Canóvanas	4,369	6	Landslides	4
PR-3	Humacao	14,985	2	Floods	4
PR-26	San Juan	75,190	3	Floods	4
PR-1	Ponce, Juana Díaz, Santa Isabel, Salinas	1,420	58.8	Floods	4
PR-146	Ciales	1,444	27	Landslides	4
PR-140	Utua	2,181	20	Landslides	4
De Diego Roosevelt Avenue	San Juan	8,536	1.1	Floods	4
PR-64	Mayagüez	8,112	0.3	Floods	4
PR-2	Vega Baja	34,127	1	Floods	4
PR-102	Mayagüez	6,164	1.9	Floods	4
PR-111	Utua	5,081	6.8	Landslides	4

Source: Steer, Note: The AADT presented for each segment was estimated using an annualization factor and it is shown in Passenger Car Unit (PCU). This factor converts toll revenue from the weekday values derived from the study area forecast models to an equivalent annual total. SDG set this factor based on available observed toll transaction data and SDG estimate of the number of weekdays, weekends, and a weekend day's share of weekday transactions in 2016. Assuming a weekend has one-third of a weekday's transactions, SDG Team estimated a revenue factor of 296 (261 weekdays plus 104 weekends * 1/3)

Resilience Component Update: Earthquake Vulnerability

Puerto Rico's location between two major tectonic plates makes it susceptible to the occurrence of telluric movements such as tremors and earthquakes. In the past, the island has suffered the impact of high-magnitude earthquakes such as the 1918 San Fermín earthquake which struck Puerto Rico with a magnitude of 7.1 on the Richter scale causing a lot of distress in the population and serious damage to the existing infrastructure. Several other minor earthquakes have taken place on the island since then, showing that the risks associated with this type of natural disaster are always present.

In recent years there has been an increase in the activity of telluric movements that led to the occurrence of the 2020 earthquakes near the island's southern portion and has produced an elevated aftershock productivity that continues to this day. This recent increase in seismic activity brought to attention the necessity of analysing the resilience and vulnerability of the island infrastructure to this type of phenomenon, especially the connectivity and the capacity to ensure aid to every significant population center on the island in case of major disasters.

Based on this we have updated the resilience component of the MLRTP with the inclusion of Earthquake Vulnerability analysis. The goal of this analysis is to assess the system's vulnerability based on the knowledge gained after the 2020 earthquakes, as well as the connection or future connectivity difficulties based on the system's exposure. This would help to identify where these risks exist and where the PRHTA should strengthen or offer alternative infrastructure to ensure that all communities remain accessible after a major disaster.

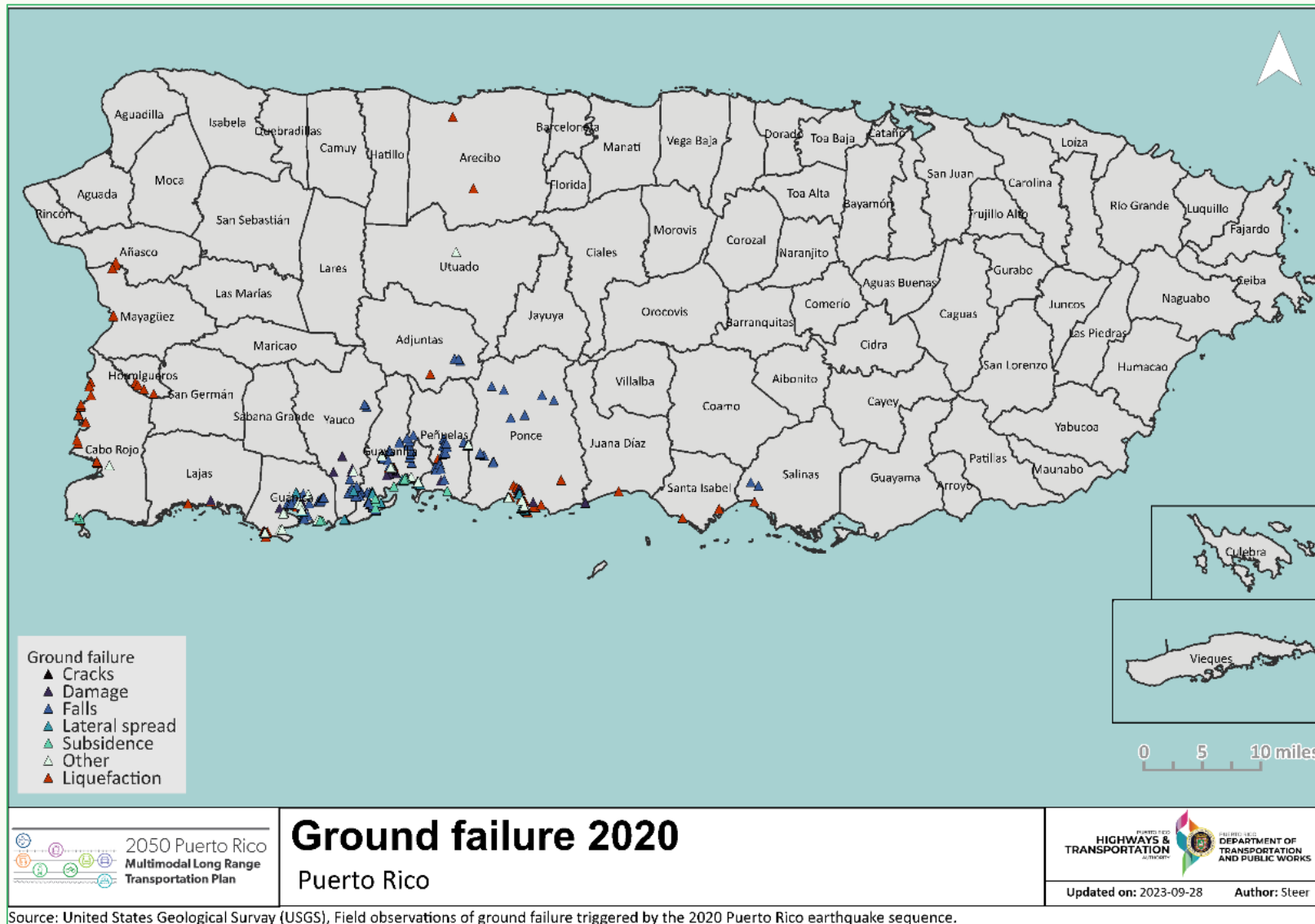
The data used for this earthquake vulnerability update is the field observations of ground failures such as cracks, damage, falls, lateral spread, liquefaction and other damages caused by the Puerto Rico earthquake sequence of 2020 according to the United States Geological Survey (USGS).

The main damage caused by the earthquakes is found towards the south and west of Puerto Rico, mainly affecting the municipalities of Hormigueros, Cabo Rojo, Guánica, Yauco, Guayanilla, Peñuelas and Ponce. According to the USGS damage information, liquefaction and landslides were the most frequent type of ground failure observed in the aftermath of 2020 Earthquakes. Figure 6.5 shows the location of the damages triggered by the 2020 Puerto Rico earthquake sequence as reported by the USGS.

Also, as part of the evaluation, we analysed the impact that the 2020 earthquakes had on the road network and the service infrastructure. It is worth clarifying that in the road network, only primary and secondary roads were considered, since these would address logistical issues and the distribution of essential goods and services in the event of a disaster. Figure 6.6 and Figure 6.7 show the location of the damages triggered by the 2020 Puerto Rico earthquake sequence and its relationship with the road network and service infrastructure.

Also, Figure 6.6 and Figure 6.7 show that the ground failures reported have proximity to major roads and important service infrastructure in the southwestern section of the island, especially around Ponce, Peñuelas, Yauco, and Mayagüez. Indicating that any major roads or vital service infrastructure could be affected by the occurrence of another earthquake of similar magnitude.

Figure 6.6: Principal Ground Failure Affections due to 2020 Earthquakes

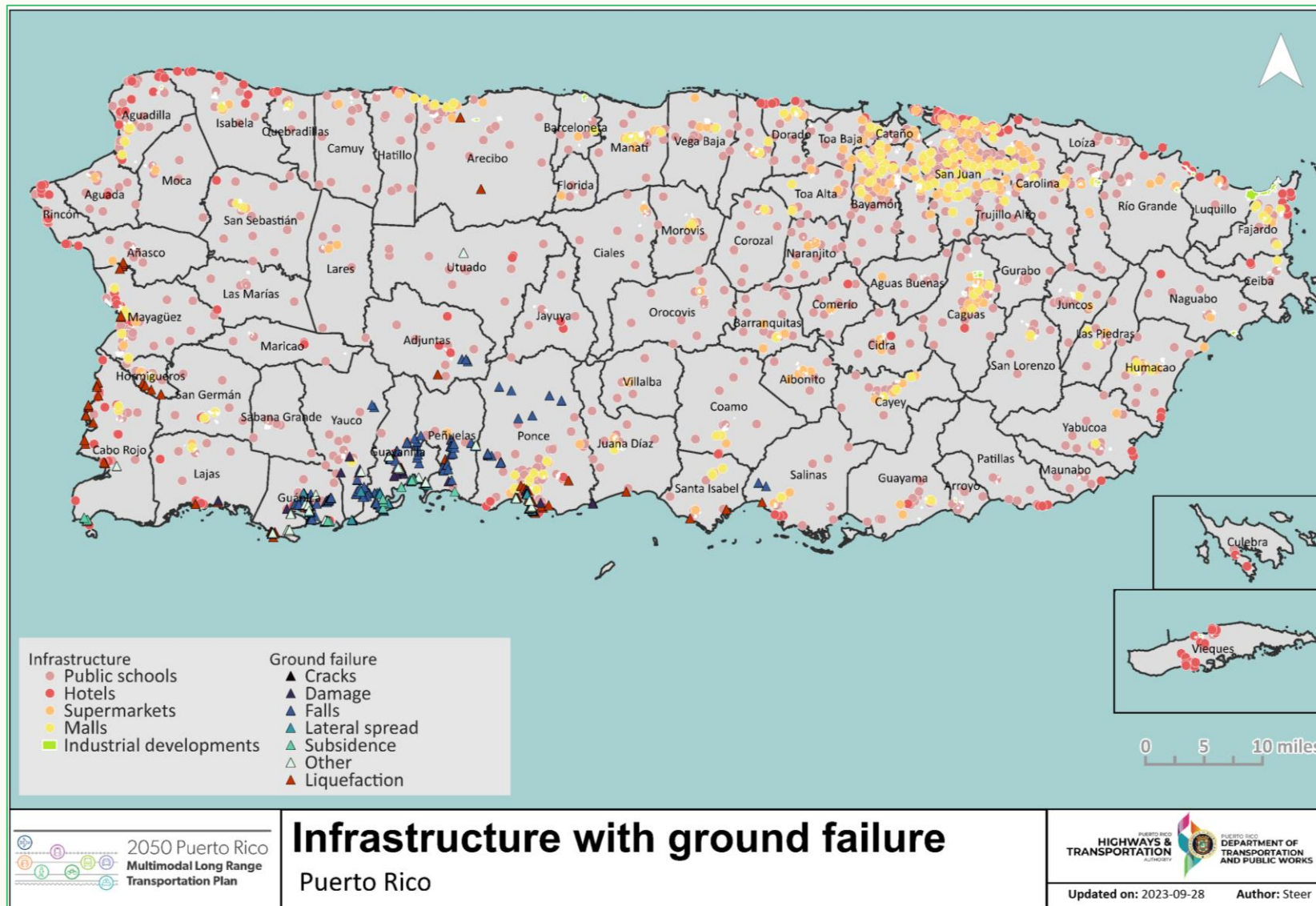


Source: United States Geological Survey (USGS), Field observations of ground failure triggered by the 2020 Puerto Rico earthquake sequence.

Figure 6.7: Principal Ground Failure Affections due to 2020 Earthquakes and Puerto Rico Road Network (Primary and Secondary Roads)



Figure 6.8: Principal Ground Failure Affections due to 2020 Earthquakes and Service Infrastructure



Even though we examined the ground failures caused by the 2020 earthquake, it is important to note that the location of these failures is linked to the earthquake's epicenter, i.e., the absence of ground failures in other sections of the island does not necessarily mean that those sectors are not susceptible to earthquakes, nor that only the southwest section of the island is vulnerable to this type of disaster. Because the location of the earthquake may be the primary driver of where the damage occurs on the island, it is important to consider the big picture and comprehend Puerto Rico's vulnerability as a whole.

For this purpose, we have included in our analysis the Earthquake vulnerability Vs30 model developed by the USGS for Puerto Rico. This model classified the land according to their earthquake vulnerability on a scale from 100 to 760, where the numbers closer to one-hundredth (100) have a higher vulnerability and the values closer to seven-hundred and sixty (760) have less of it.

According to this Puerto Rico Vs30 model the most vulnerable areas are the North and South coast of the country, affecting the municipalities of Arecibo, Vega Baja, Toa Baja, Cataño, San Juan, Carolina, Loíza, Ponce, Lajas, Santa Isabel and Salinas. It is also presented that the interior of the island has a low vulnerability to earthquakes, within this area are the municipalities of Jayuya, Orocovi, Villalba, among others (Figure 6.9).

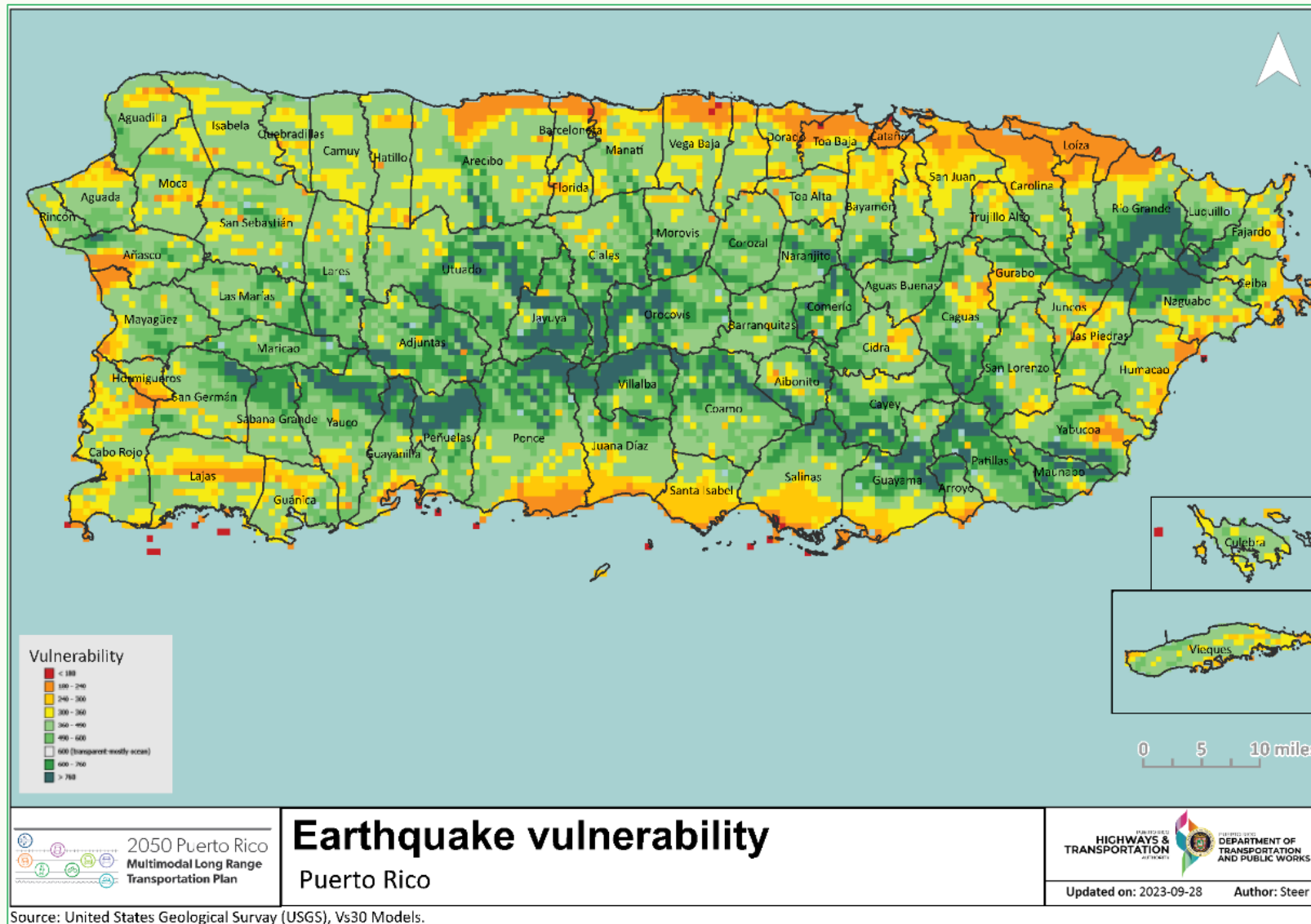
When comparing, the earthquake damage recorded in 2020 and the vulnerable areas according to the Vs30 model in Figure 6.8, there is a correspondence between the areas with the greatest vulnerability and those with the greatest damage due to an earthquake (see Figure 6.10). However, the northern part of the country has a high vulnerability but has not reported damage from the 2020 earthquake. As mentioned earlier, this could be presumed due to the location of the 2020 earthquake epicenter at the southern of the Island.

Once we analyzed the earthquake vulnerability throughout the island the next step is to understand the connectivity around the different locations. With this we could compare which zones in Puerto Rico that have poor road connectivity and infrastructure are located within an earthquake vulnerable area, this could lead us to potential areas of conflict where there could be potential access problems in case of an earthquake.

The road network was used to determine the connectivity indicator for each of the census blocks of Puerto Rico. The connectivity indicator is presented as the ratio of the number of primary or secondary roads that connect the centroid of a census block area and the total number of roads, including the tertiary roads, which are related to the centroid of the census block. With this definition, we constructed the connectivity indicator. A number close to zero (0) means that that census block has low connectivity in terms of road networks while a number close to one (1) has high connectivity in the road network within that census block.

Figure 6.9 shows the Earthquake Vulnerability according to Vs30 USGS Model and Figure 6.10 shows the Puerto Rico Earthquake Vulnerability according to Vs30 USGS Model and Principal ground failure affectations due to 2020 Earthquakes.

Figure 6.9: Puerto Rico Earthquake Vulnerability according to Vs30 USGS Model



Source: United States Geological Survey (USGS), Vs30 Models.

Figure 6.10: Puerto Rico Earthquake Vulnerability According to Vs30 USGS Model and Principal Ground Failure Affectations due to 2020 Earthquakes

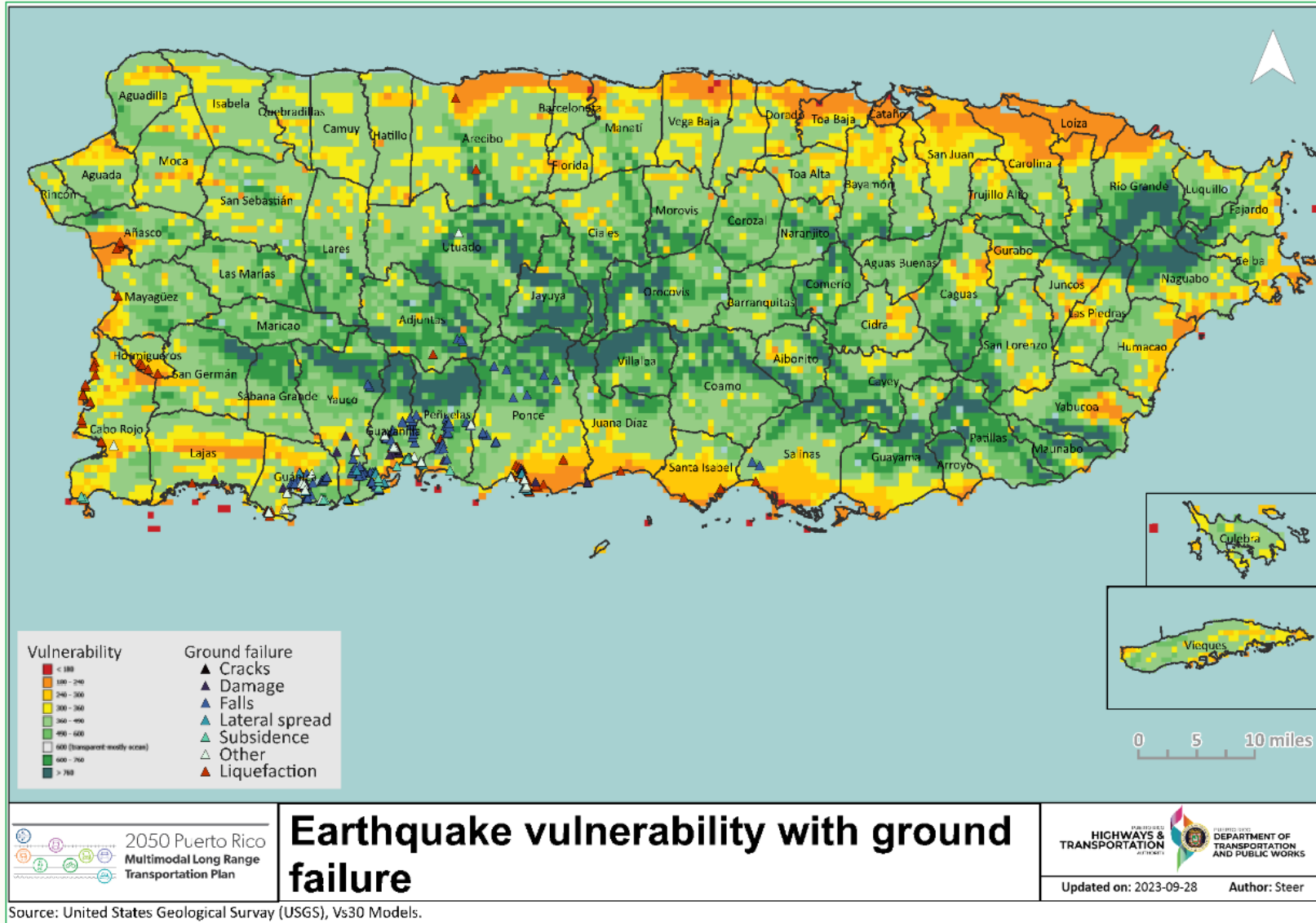


Figure 6.11 shows the average connectivity indicator of every census block in Puerto Rico. The darker colours indicate a weaker connectivity indicator while the lighter colours indicate a stronger one. Figure 6.11 shows that the Census blocks near the San Juan Metropolitan Area present a high connectivity indicator, also some census blocks near Ponce, Mayagüez, Aguadilla, and Comerío, while others near Yauco and Maricao municipalities show a weaker connectivity indicator.

When comparing, the earthquake damage recorded in 2020 and the connectivity indicator in Puerto Rico it could be seen that in the municipalities of Peñuelas, Guayanilla, Ponce, Cabo Rojo, and Guánica there is a high incidence of earthquake damage and at the same time a low connectivity indicator, implying that in the event of any damage that affects the primary or secondary roads of these municipalities, the distribution of goods and services would be more complex to carry out.

On the contrary, in the municipality of Hormigueros where the greatest damage occurs, there is an average connectivity indicator, making it easier to distribute goods or services within this area if a disaster occurs (see Figure 6.12).

Likewise, when comparing the location of the infrastructure and the connectivity indicator, there is the highest concentration of infrastructure where there are medium and high connectivity indicators. On the other hand, it can be observed that the areas where earthquake damage has occurred, have a low concentration of infrastructure, therefore, there would be no major impact on reaching these facilities if an earthquake disaster were to occur (see Figure 6.13).

The connectivity indicator gave us interesting insights into the relationship between observed 2020 earthquake damages to the road network and the service infrastructure. However, the comparison between the earthquake vulnerability and the connectivity situation in the whole island is key to identifying potential areas of conflict in the event of future earthquakes.

Figure 6.14 shows the comparison between the earthquake vulnerability map and the connectivity indicator. In this figure it could be observed that the northern area of Puerto Rico presents a high earthquake vulnerability however it has a high connectivity index, especially near San Juan. Meanwhile, in the south and west areas of the island, there are high levels of earthquake vulnerability accompanied by low connectivity indicators. This could represent a potential area with high risk to ensure accessibility in case of an earthquake disaster.

Figure 6.11: Puerto Rico Connectivity Indicator

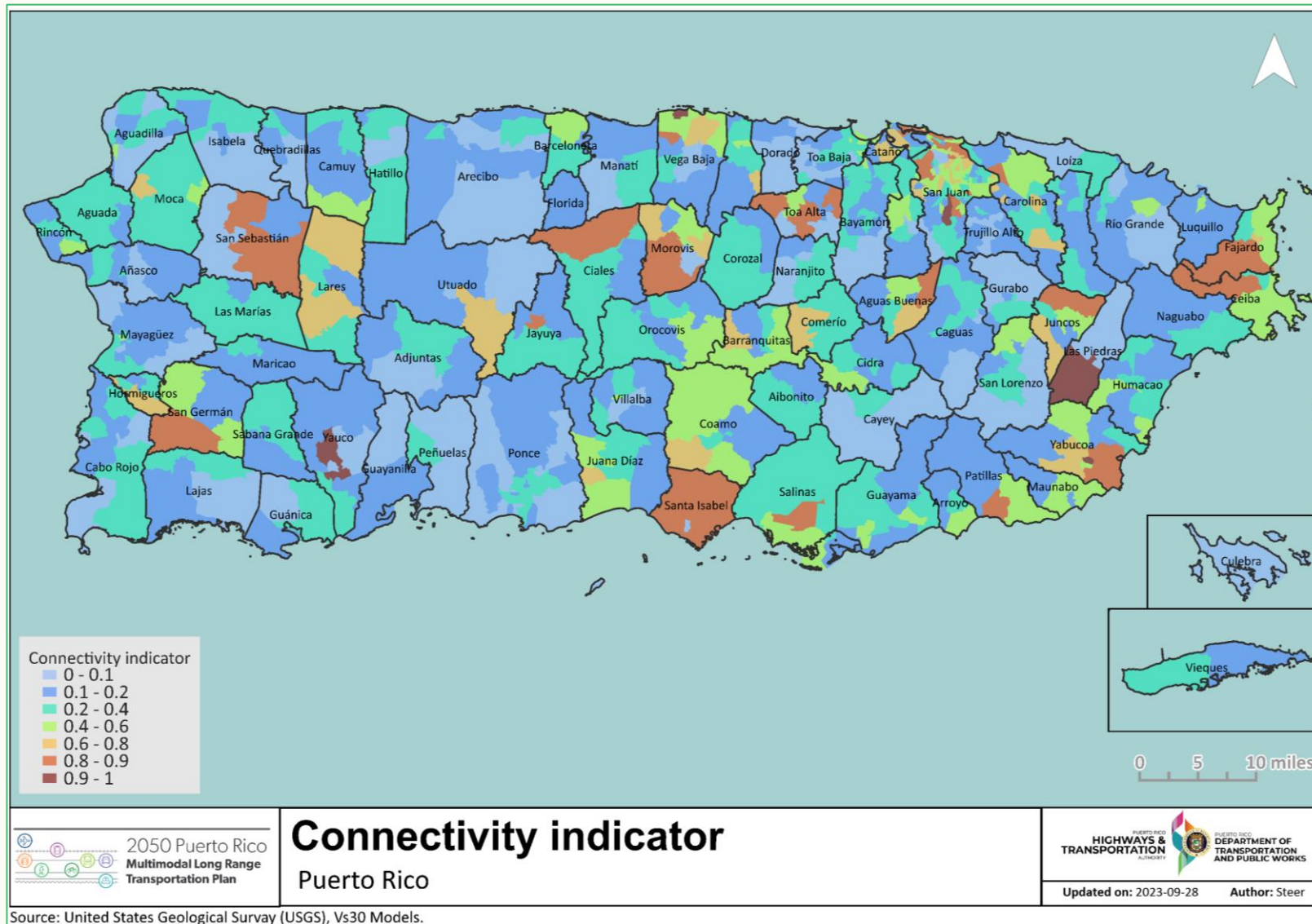
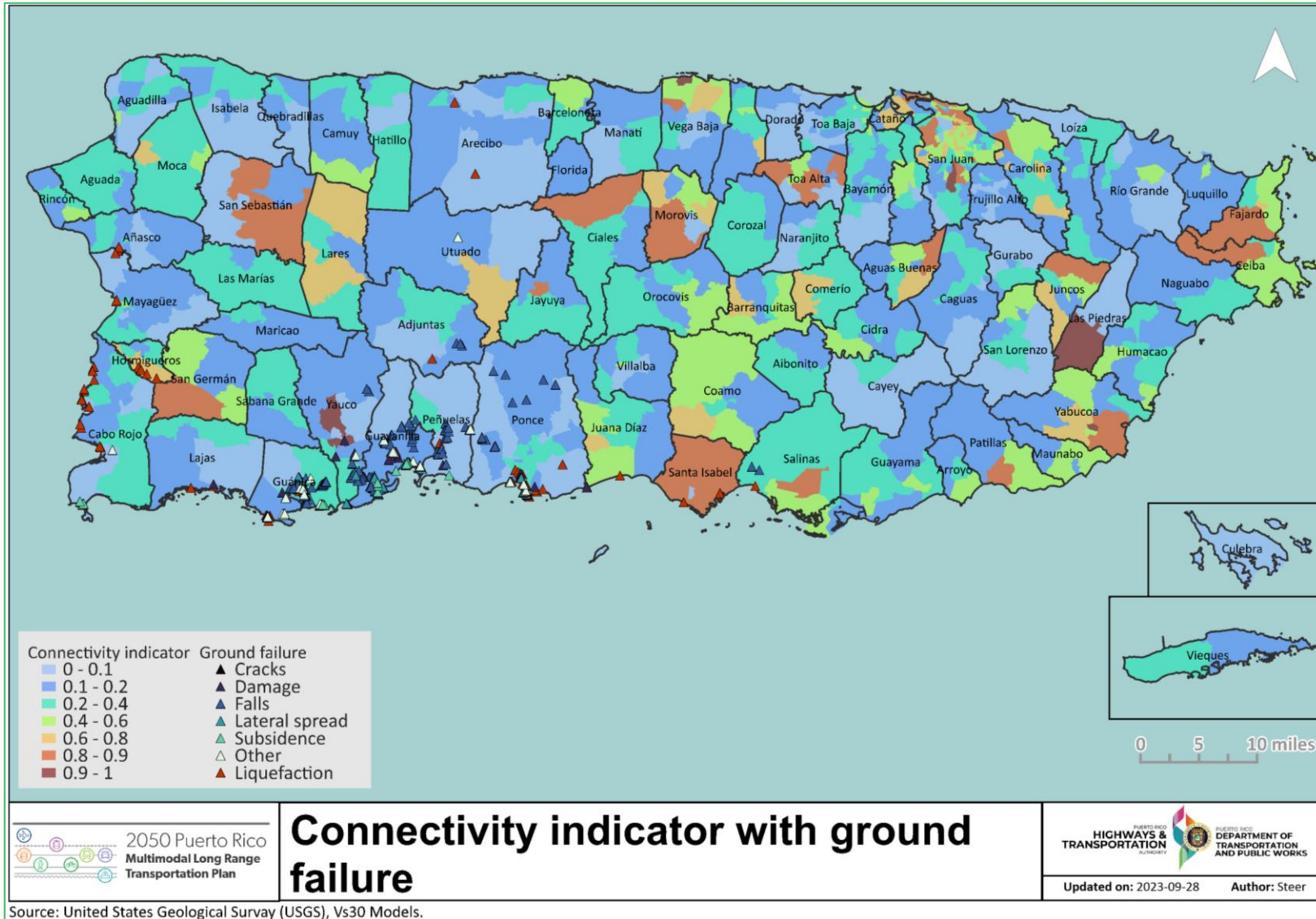
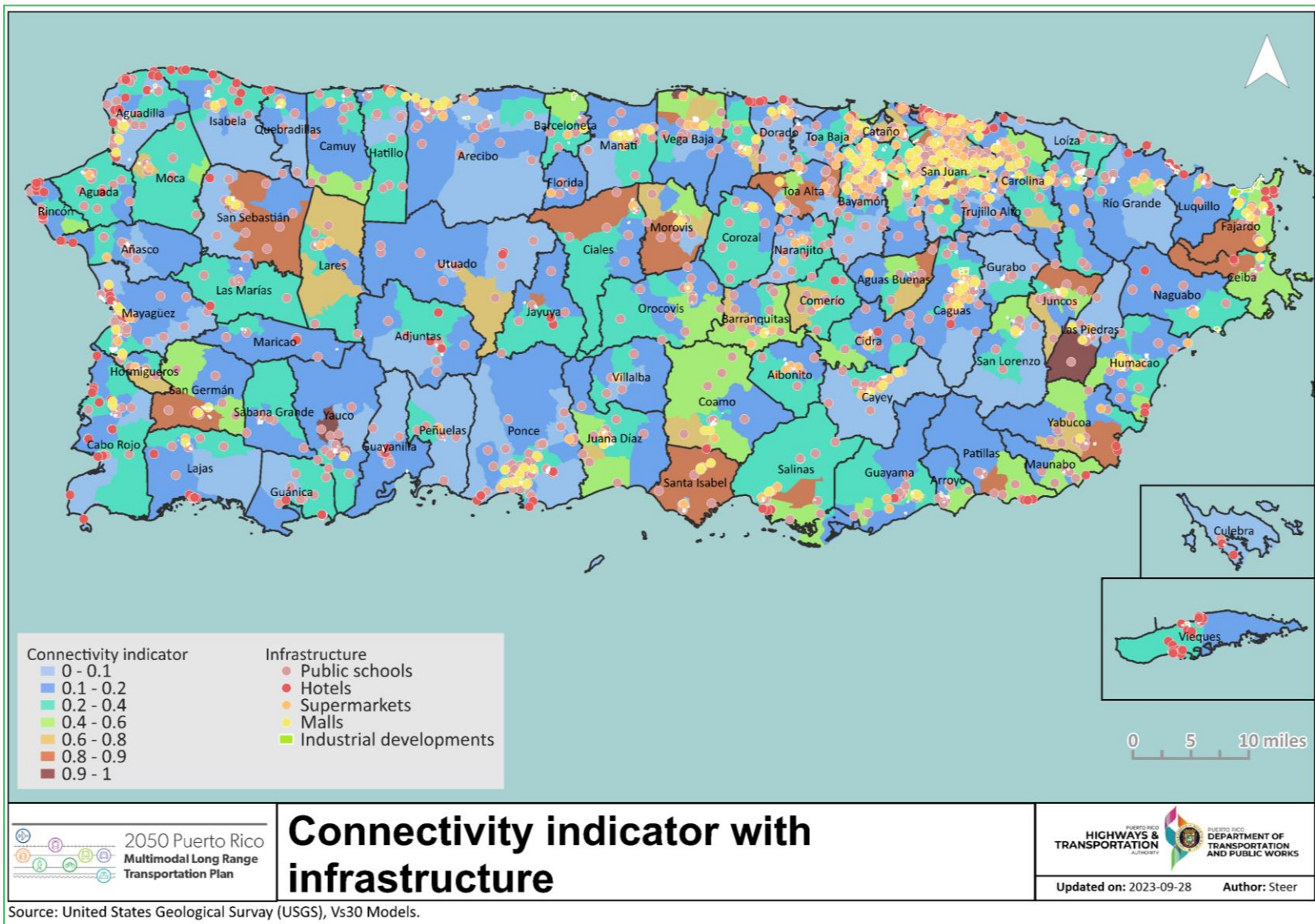


Figure 6.12: Puerto Rico Connectivity Indicator and Principal ground failure affectations due to 2020 Earthquakes



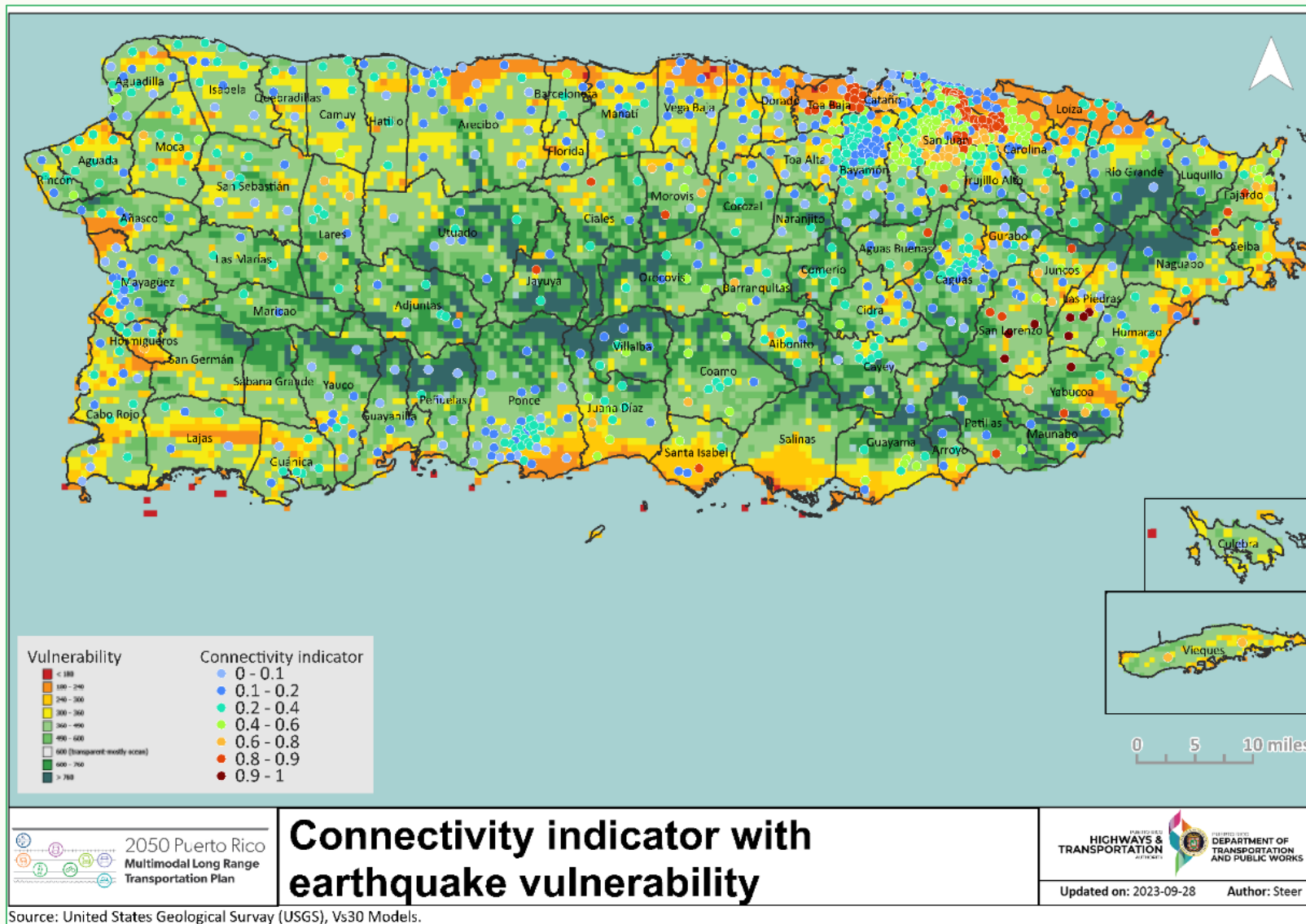
Source: United States Geological Survey (USGS), Vs30 Models.

Figure 6.13: Puerto Rico Connectivity Indicator and Service Infrastructure



Source: United States Geological Survey (USGS), Vs30 Models.

Figure 6.14: Puerto Rico Earthquake Vulnerability according to Vs30 USGS Model and Connectivity Indicator



The comparisons made above gave us a better understanding of how the interaction of potential vulnerability to earthquakes, the observed damages due to 2020 seismic activity, and the existence of actual road and service infrastructure could set the conditions for the resilience of a determinate region at the occurrence of earthquakes. However, the social aspect is as crucial as the physical conditions of the island. In order to understand the potential vulnerability of a determinate region to natural disasters is key to know how the population that lives on the island is prepared as a society for the impact of natural inclemency, in this case, earthquakes.

Therefore, the Social Vulnerability Index (SVI) was used to link the social aspect of variables such as Socioeconomic status and household characteristics, among others, found in each region to help us characterize the social vulnerability to the occurrence of natural disasters in the island.

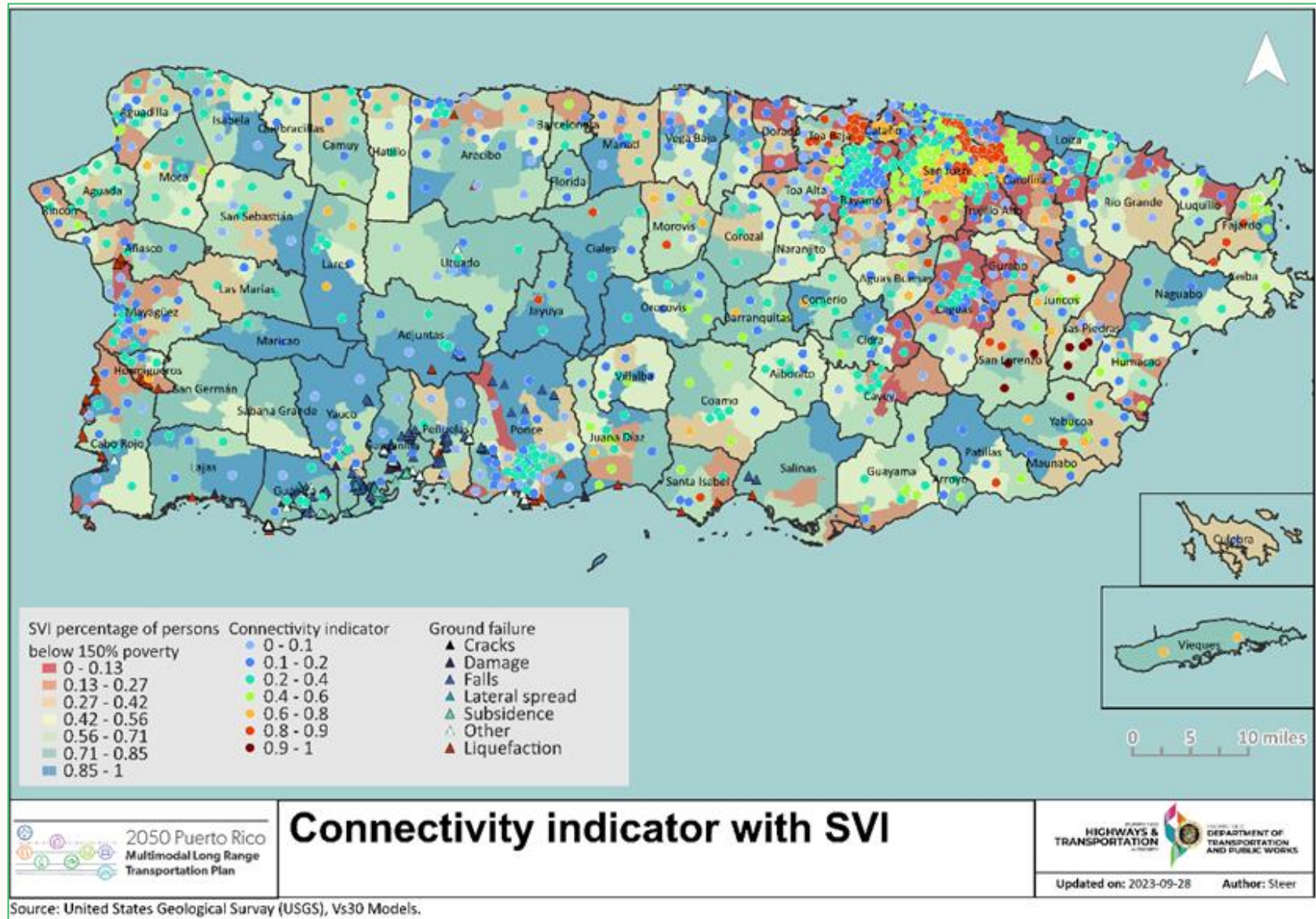
Figure 6.15 shows the SVI percentage of people below 150% poverty within the island as well as the connectivity indicator and the ground failures triggered by the 2020 earthquake. In this figure, it can be observed that most regions with the highest proportion of their population below the 150% poverty threshold (portrayed in the map with sky blue colours) are located on the western side of the island. However, there are also some regions outside the western area of the island presenting high proportions of inhabitants below the 150% poverty threshold such as Naguabo, Patillas, and Loiza. Municipalities such as Loíza, Cabo Rojo, and Lajas present a combination of high poverty levels and high vulnerability to earthquakes.

Figure 6.16 shows the SVI percentage of civilians (age 16+) unemployed within the island as well as the connectivity indicator and the ground failures triggered by the 2020 earthquake. Municipalities such as Loíza, Lajas, Mayagüez, and Yabucoa present high unemployment rates while being within the high vulnerability for earthquakes spectrum.

Figure 6.17 shows the SVI percentage of persons aged 65 or older within the island as well as the connectivity indicator and the ground failures triggered by the 2020 earthquake. Municipalities such as Cabo Rojo, Mayagüez, and Ceiba present a high proportion of elderly people as well as high vulnerability to earthquakes.

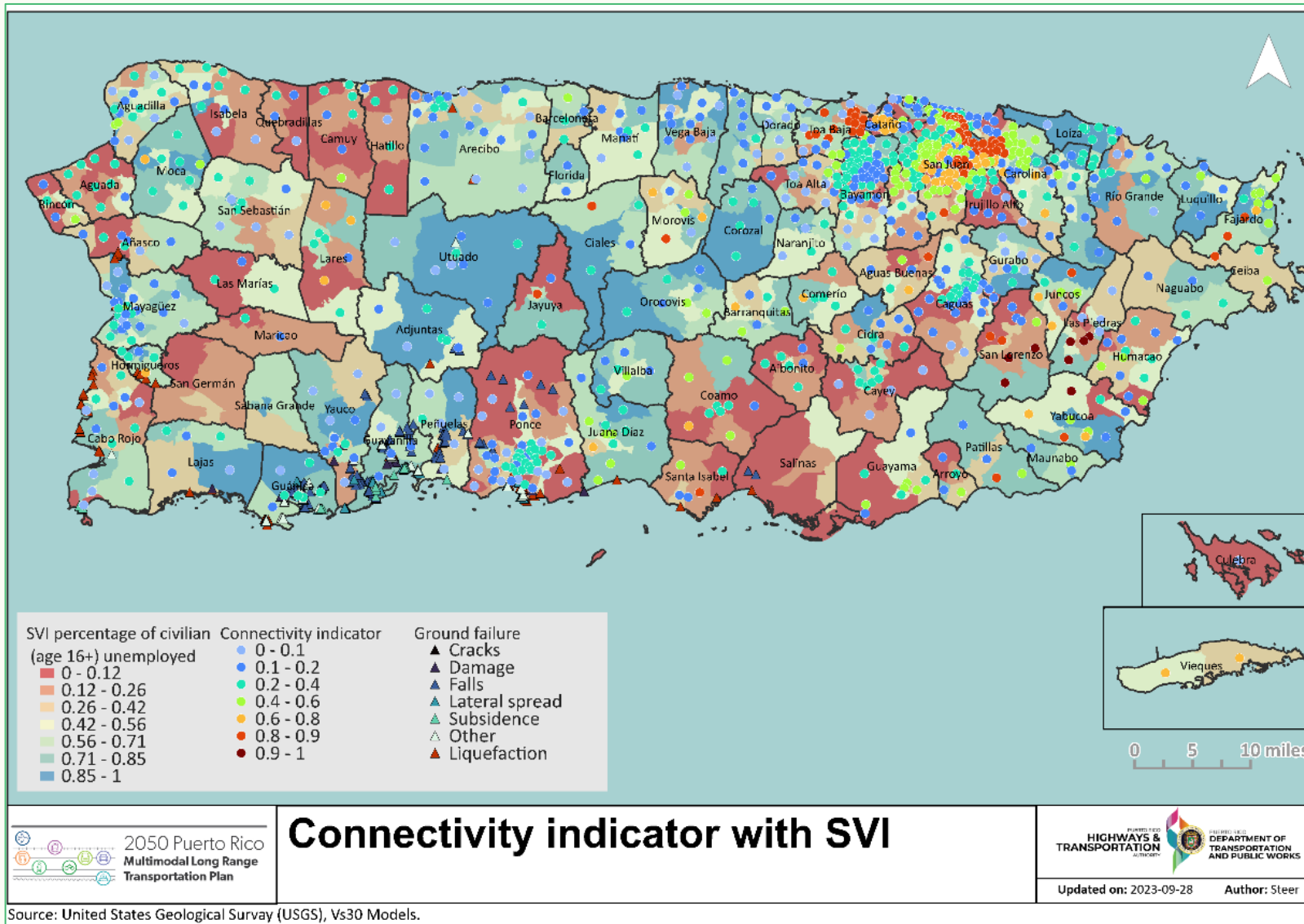
As part of the analysis, it was found that some municipalities such as Cabo Rojo, Loiza, Lajas, and Mayagüez present some social characteristics, on top of the already established earthquake vulnerability, that could affect the resilience of these municipalities in the case of an Earthquake. Also, these municipalities have sections with poor connectivity and, in some cases, the presence of ground failures such as cracks and liquefaction on previous occurrences. Therefore, these municipalities vulnerabilities should be addressed in order to build their resilience, or the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions that could provoke the occurrence of an earthquake.

Figure 6.15: Puerto Rico SVI percentage of Persons below 150% Poverty, Puerto Rico Connectivity Indicator and Principal Ground Failure Affections due to 2020 Earthquakes



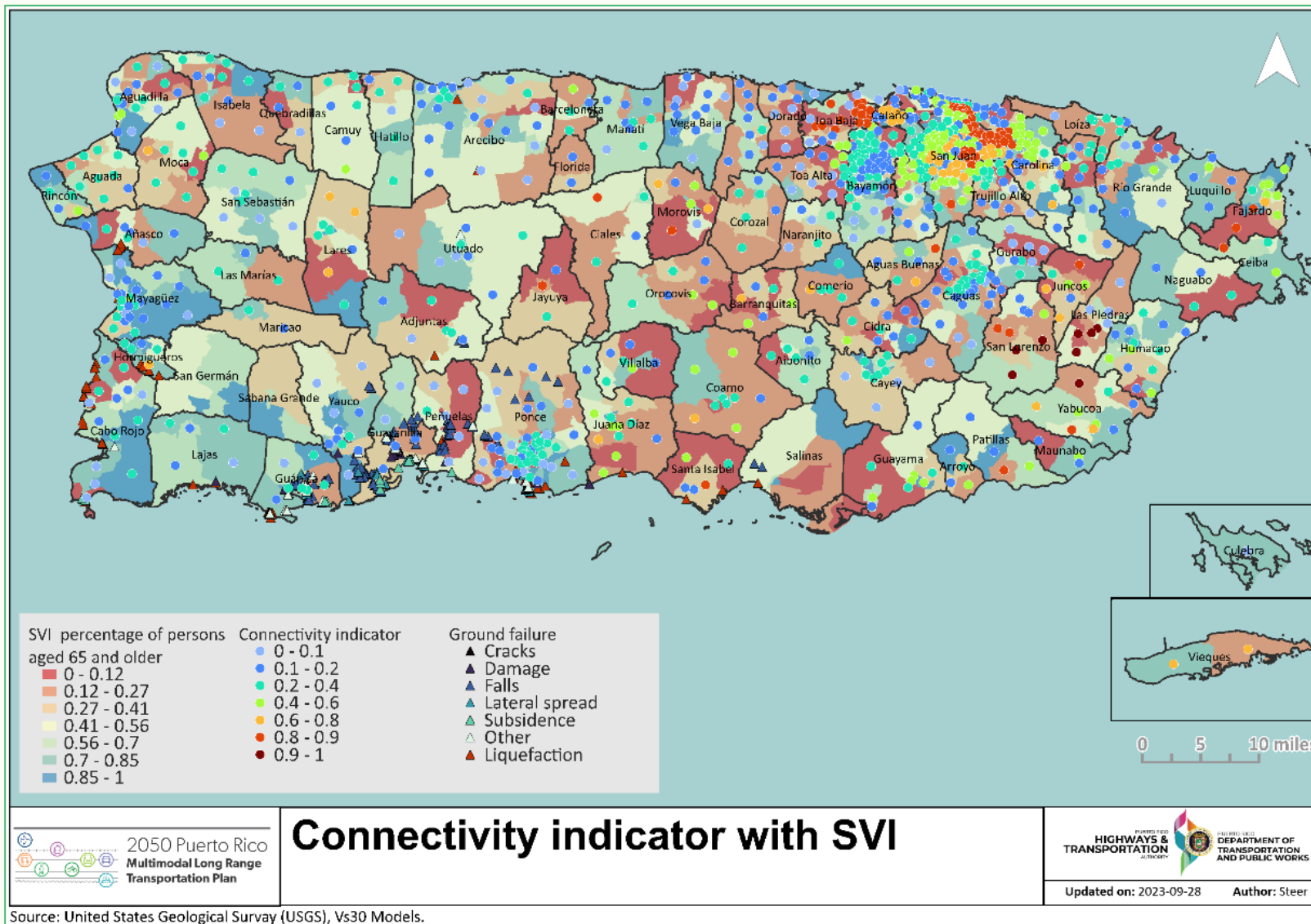
Source: United States Geological Survey (USGS), Vs30 Models.

Figure 6.16: Puerto Rico SVI Percentage of Civilian (age 16+) Unemployed, Puerto Rico Connectivity Indicator and Principal Ground Failure Affections due to 2020 Earthquakes



Source: United States Geological Survey (USGS), Vs30 Models.

Figure 6.17: Puerto Rico SVI Percentage of Persons Aged 65 and Older, Puerto Rico Connectivity Indicator and Principal Ground Failure Affections due to 2020 Earthquakes



Bottleneck Analysis

Within the planning factors is included the priority of supporting the economic vitality (global competitiveness), productivity, and efficiency as well as promoting efficient system management and operation. The congestion management and reduction are an important factor to consider within this 2050 MLRTP.

The road congestion is typically associated with speed, level of service (LOS), and traffic volume. Those are indicators that can be measured considering the following Key Performance Indicators (KPIs): Delay, Queue, LOS, Volume to Capacity Ratio (V/C), Speed, Travel Time, or Density.

A bottleneck analysis based delay-identification for the NHS was performed as part of the 2050 MLRTP. For this analysis, data from NPMRDS for the year 2022 was utilized for extracting speed and distance of TMC segments coded segments, in order to calculate travel time. The variable delay was obtained through comparing travel time at reference speed and travel time at traffic speed, to assess the time of delay for all segments, per period of day.

Travel Time Reliability

The urban areas are the ones that generally face congestion during peak hours. As a result of the traffic congestion, citizens are led to adjust their trips to ensure their desired arrival times while accounting for the estimated delays. That reliability of the travel time adjustment is an important one as it determines the user's options on whether to leave early to account for that delay or risk it to being late to their destination. Value of time, quality of life and well-being are citizen's everyday factors, every time more valued, that are affected by the travel time reliability.

Bottleneck Analysis

Bottlenecks are recurring congestion events and considered "a critical point of traffic congestion evidenced by queues upstream and free flowing traffic downstream¹¹⁶" according to FHWA. The bottlenecks are predictable in location, cause, time of the day and approximate duration. This is contrary of non-recurring congestion events normally attributed to traffic anomalies such as car crashes. This bottleneck analysis is specifically focused on the identification of segments with major delays along the NHS in Puerto Rico. From the identification of those segments, there can be a determination of specific locations where congestion is highest along a road and the daily period of occurrence.

Methodology

Segment Identification

It is necessary to consider the segments with travel times higher than the expected at referenced speed for a road segment or TMC to identify possible bottlenecks. Subsequently, subtracting the average travel and reference travel time give us the vehicle delays per segment. Possible bottleneck segments and roads can be identified as those with higher delays on traveling time by measuring delay.

To conduct the bottleneck analysis, it was performed in each Region, per period of the day (AM, PM, MD) during the months of March, April, and May of 2022. The data used for this analysis is the same used for the travel time and speed data in the model calibration, just to keep congruence within that data and as mentioned before already having that those locations will have a predictable congestion.

Once all the Regions were analysed by period, a recurrence assessment was made to identify the top ten (10) worst segments in terms of delays and are presented in the following section.

Analysis of Results

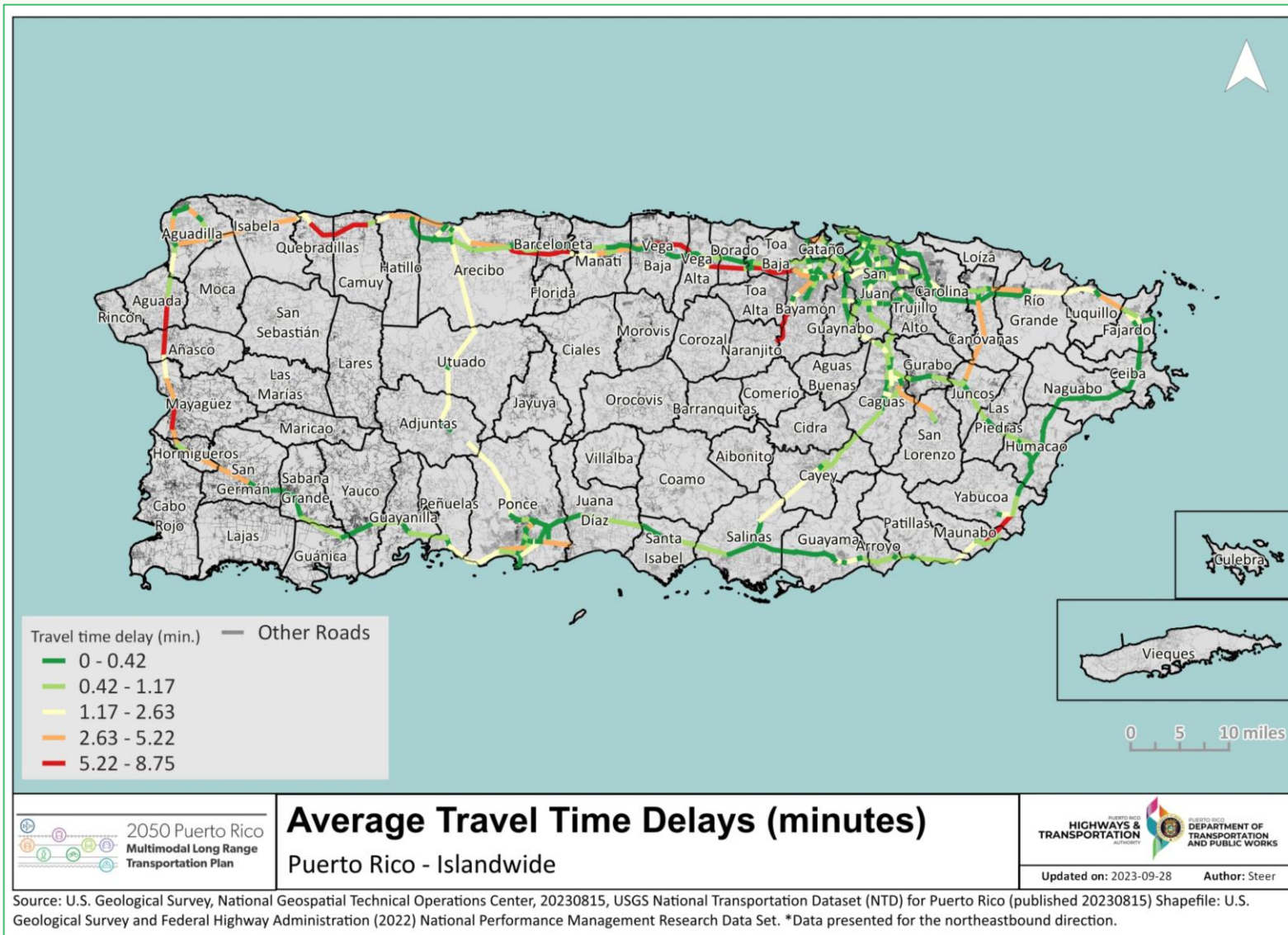
For Puerto Rico overall, periods with the highest delays were at PM and AM periods. For the periods evaluated along the day (AM, PM, MD), the Regions with the highest delays were San Juan TMA and North TPR with values above 7 minutes up to 14.5 minutes on average delay for the top ten (10) segments. The San Juan TMA have the highest delays with the first five (5) times over 11 minutes, the remaining five times goes from 7.9 to 8.9 minutes distributed among San Juan TMA and North TPR.

For Aguadilla TMA the top ten (10) segments had a high average delays going from 4.9 to 7.4 minutes; for UZA, the South TPR top then (10) segments had a high average delays going from 3.3-4.1 minutes; the East TPR top then (10) segments had a high average delays going from 1.7 to 3.2 minutes; the Southwest TPR top then (10) segments had a high average delays going from 3.8-7.6 minutes; the Southeast TPR top then (10) segments had a high average delays going from 1.6-2.4 minutes.

Figure 6.18 presents the results of the bottleneck analysis performed. It shows that the top ten (10) road segments with highest delays are located within the municipalities of Bayamón, Toa Baja, Dorado, Vega Baja, Camuy, Barceloneta and Mayagüez, along the roads PR-2 (Northbound/Southbound) and PR-167 (Northbound/Southbound).

For more detailed information related to each Region, could be found at the regional documents.

Figure 6.18: Average Travel Time Delays in Minutes





Island-Wide

Cost Feasibility Plan Scenarios

Transportation Funding Summary

This section describes the cost-feasibility plan recommendations based on the projects prioritized and analyzed through the development of the demand model.

As outlined in a previous chapter, the funding and financing sources are forecasted up until 2050, the horizon year of this plan. The MLRTP should be developed fiscally constrained and only recommend the investment of funds in the projects that generate the most cost-effective outcomes for the Island. Also, the plan only recommends projects and improvements where there is an identified funding or financing source to provide useful guidance on the implementation of the plan.

As it was described before, a big part of the funding available for transportation infrastructure comes from disaster- or reconstruction-focused funding from the federal government. This is due to the large number of disasters that have happened in the Island. For this purpose, the ER funds from the FHWA and the ER funds from FTA are focused on this purpose.

Particularly for this MLRTP, there are new funding sources coming from the federal government given the Coronavirus Public Health Emergency and the economic impacts of this event. First, the CARES Act and the CRRSAA Act provide economic assistance to American workers and families. Specifically the FTA allocated resources to the transit industry, to all three (3) regions (San Juan, Aguadilla, and UZA).

Second, the Bipartisan Infrastructure Law is the largest long-term investment in infrastructure in the country's history and will provide funding for projects in Puerto Rico. These two, are very specific and will provide additional funds that were not available before. These new funding sources will be relevant when matched with existing funding sources such as toll credits, U.S. DOT grants, and state funds earmarked for Capital Expenditure (CAPEX).

Finally, the Capital Improvement Program (CIP) will cover anticipated revenues and capital and operating spending from FY2023 to FY2027. This program was produced by the PRHTA following the FHWA regulations and the strategies in the current TAMP.

The projects' programming addresses the various situations that PR has faced, such as hurricanes, earthquakes, pandemics, and severe rainfall events. As a result of these events, the agency is in a reactive mode, rebuilding the existing infrastructure.

Furthermore, the list of projects identifies those that seek to keep infrastructure in good repair in order to meet the targets of various federal requirements and align with the agency's fiscal adjustment. The projects are planned in three stages: short, medium, and long term. They are also organized by project category:

- Safety Improvements;
- Bridges;
- Transit; and
- ITS.

Short-term projects are consistent with the projects in the current STIP. The medium-term projects are linked to the projects needed to bring the infrastructure to SOGR. Furthermore, there is an item that, while it is programmed in the various temporary cuts as projects that contemplate financing with discretionary funds, is subject to the specific requirements of each available fund.

The projected funding streams are presented in Table 7.1 below.

Table 7.1: Funding Streams 2017- 2050

Agency	Fund Stream	Total (2017-2050)
FHWA	ER Funds	\$ 42,759,113
	BIL	
	Bridges	\$ 225,000,000
	Puerto Rico Highway Program	\$ 180,000,000
	NEVI	\$ 10,102,450
	Toll Transportation Development Credits	\$ 600,000,000
	State funds earmarked for Capex	\$ 334,000,000
US DOT	MEGA projects	\$ 5,000,000,000
	Nationally Significant Multimodal Freight and Highways Projects	\$ 8,000,000,000
	Rural Surface Transportation	\$ 2,000,000,000
FTA	ER funds	\$ 802,293,719
	CARES	\$ 206,829,249
	American Rescue Plan	\$ 120,385,293
	Local taxes dedicated	\$ 5,291,000,000
PRHTA		\$ 2,007,000,000
	Toll revenues (for roads managed by the Authority)	\$ 1,193,000,000
	Toll Highway Administration and Maintenance	\$ 232,000,000
PRHTA	CIP	
	FHWA Funds	\$ 7,563,691
	Commonwealth appropriations	\$ 2,500,124
	Other Commonwealth State Funds	\$ 173,139
	FTA funds	\$ 940,047
	Emergency funds	\$ 446,100
	Transit funds and Capex	\$ 93,325,428
Total		\$ 26,349,318,353

Source: Steer, 2023 based on fiscal information from National and State agencies.

Note: Information from 2017 until 2022 is presented to avoid mistakes in the calculation of annual funds

Projects Considered

The projects considered for the 2050 MLRTP are detailed in the Appendix section. This list of projects was decided on different committees and discussions with the relevant agencies and authorities. There are projects that, even though they are very relevant for the transportation sector in Puerto Rico, already have other funding streams.

There is a series of projects to be considered for CDBG'DR funding that will potentially have access to additional funds in the short- to mid-term, there are:

1. PR-10 (AC-100069, AC-100071, AC-100055, AC-100076) Adjuntas-Utuado;
2. San Lorenzo South Bypass, from PR-183/ PR-181 to PR-745 (AC-918101) San Lorenzo;
3. Aguas Buenas North Bypass, from PR-156 East to PR-156 West (AC-020802, AC-020803) Aguas Buenas;
4. PR-158 Connector, Phase I and Phase II from PR-52 to PR-1, (AC-015802) Cayey;
5. PR-122, Lajas-San German Connector from PR-321 to PR-166, (AC-012201) Lajas-San German;
6. PR-18N to PR-21E ramp and Medical Center Connector San Juan;
7. Extension PR-5, from PR-199 to PR-167, Bayamón-Toa Alta;
8. Isabela Connector, from PR-472 to PR-112 (AC-047205) Isabela;
9. Expressway Conversion of PR-2 Ponce-Mayagüez;
10. Higuilar Avenue from PR-696 to PR-22/PR-694 Dorado;
11. PR-22 extension, Hatillo- Aguadilla from PR-22/PR-2 to PR-2/PR-111Hatillo-Aguadilla;
12. Cidra Connector, from Avenida Industrial to PR-184 (AC-017242, AC-017246, AC-017247) Cidra;
13. Relocation of PR-111 from PR-111/PR-448 to PR-111/PR-111R San Sebastián-Lares;
14. Barranquitas Bypass from PR-156 to PR-759 (AC-010194) Barranquitas;
15. Villalba Bypass, from PR-151 to PR-150, (AC-556103) Villalba;
16. Improvements to Aguadilla's Airport Access, from PR-110 to PR-107, includes Burns Street Connector (AC-000218) Aguadilla;
17. Loíza Bypass, from PR-188 to PR-187, (AC-018760) Loíza;
18. Widening PR-845, from PR-844 to PR-199, (AC-084511) San Juan-Trujillo Alto;
19. Widening PR-545, from PR-52 to PR-14, Coamo; and
20. Peñuelas South Bypass (PR-3132) from its intersection with PR-3132 (Northwest limit) to existing PR-3121 (Northeast Limit) Peñuelas.

The demand model serves as a tool for decision-making. In the case of Puerto Rico, it helps public authorities see how different projects add or offer better transportation services to citizens. The model allows the quantification of benefits and impacts that each project will have on the Island. Currently, in Puerto Rico, the committed projects are the same as in previous iterations and those were the ones included in the demand modeling for this iteration.

Based on a meeting with the Authority on October 5, 2023, it was agreed that some projects will require an increased capacity. For this purpose, additional analysis will be required. For this purpose, these projects will be analyzed and included in the Appendix section. This will allow constant review and further modification when the context requires changes.

Table 7.2: Island-wide: Safety – List of Projects in STIP Short Term (2023-2026)

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
TBD	Safety Improvements PR-2 From Km. 214.5 To Km. 216.5	FHWA	Peñuelas	\$ 5,566,161.00
	Safety Improvements PR-385 From Km. 0.0 To Km. 5.6	FHWA	Peñuelas	\$ 6,000,000.00
AC-240007	Safety Improvements PR-829 From Km. 0.0 To Km. 11.1	FHWA	Bayamon	\$ 3,300,000.00
AC-230023	Safety Improvements PR-2 From Km. 67.0 To Km. 76.30	FHWA	Arecibo-Hatillo	\$ 8,175,328.00
	Safety Improvements PR-60 From Km. 0.0 To Km. 4.0	FHWA	Humacao	\$ 10,000,000.00
AC-230048	Safety Improvements PR-177 From Km. 3.0 To Km. 6.0	FHWA	Guaynabo	\$ 4,058,043.00
	Traffic Lights System PR-640 Ave. Domingo Ruiz	FHWA	Arecibo	\$ 1,275,000.00
	Safety Improvements PR-2 From Km. 204.0 To Km. 208.0	FHWA	Guayanilla	\$ 5,000,000.00
	Safety Improvements PR-107 From Km. 0.0 To Km. 6.0	FHWA	Aguadilla	\$ 7,500,000.00
	Safety Improvements PR-2 From Km. 82.40 To Km. 90.0	FHWA	Hatillo-Camuy	\$ 10,000,000.00
AC-090011	Safety Improvements PR-900 From Km. 0.0 To Km. 11.0	FHWA	Yabucoa	\$ 3,000,000.00
	Safety Improvements PR-2 From Km. 140.00 To Km. 148.90	FHWA	Añasco-Mayaguez	\$ 10,500,000.00
	Safety Improvements PR-54 From Km. 0.0 To Km. 6.0	FHWA	Guayama	\$ 8,116,085.00
	Safety Improvements PR-2 From Km 149.0 To Km. 157.90	FHWA	Añasco-Mayaguez	\$ 12,257,864.00
	Safety Improvements PR-3 From Km. 21.90 To Km. 32.00	FHWA	Rio Grande	\$ 13,662,077.00
	Safety Improvements PR-7718 From Km. 0.0 To Km. 5.0	FHWA	Aibonito	\$ 6,577,404.00
AC-220050	Safety Improvements PR-420 From Km.0 To Km. 9.4	FHWA	Moca	\$ 2,800,000.00
TBD	Safety Improvements PR-782 From Km. 0 To Km. 10	FHWA	Cidra	\$ 3,000,000.00

Source: Collaboration PRHTA technical team and Steer, 2023

Safety improvement projects should be evaluated and considered in the decision-making process according to the Comprehensive Bicycle and Pedestrian Plan recommendations, if applicable.

Table 7.3: Island-wide: Bridges – List of Projects in STIP Short Term (2023-2026)

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
	Bridge #122, PR-3, Km. 68.10, Santiago River		Naguabo	\$ 8,192,219.00
	Bridge #176, PR-14, Km. 57.25, Honda Creek		Aibonito	\$ 4,710,000.00
	Bridge #158, PR-123, Km. 59.30, Depression		Utua	\$ 1,742,000.00
AC-800473	Bridge #1133, Off PR-200, Km. 0.01, Creek		Vieques	\$ 3,800,000.00
AC-010612	Bridge #217, PR-106, Km. Km. 2.50, Gandel Creek		Mayaguez	\$ 3,550,000.00
AC-010313	Bridge #1381, PR-103, Km. 3.60, Channel		Cabo Rojo	\$ 1,550,000.00
AC-230014	Bridge #162, PR-123, Km. 66.70, El Jobo Creek		Arecibo	\$ 970,000.00
AC-230013	Bridge #348, PR-777, Km. 0.1, Caguitas River		Caguas	\$ 625,000.00
TBD	Bridge #1740, Local Road, Km. 0.5, Grande De Maunabo River		Maunabo	\$ 2,000,000.00
AC-230009	Bridge #2178, Santa Elena Creek, Km. 0.1, Creek		Yabucoa	\$ 1,250,000.00
AC-230009	Bridge #2192, Casillas Street, Km. 0.05, Los Muertos Creek		Humacao	\$ 2,950,000.00
AC-230013	Bridge #382, PR-7731, Km. 0.85, La Plata River		Cayey	\$ 323,578.00
AC-068112	Bridge #702, PR-681, Km. 0.10, Caño Tiburones		Arecibo	\$ 8,000,000.00
AC-230015	Bridge #809, PR-348, Km. 17.20, Nueve Pasos River		San German	\$ 2,000,000.00
AC-230013	Bridge #851, PR-765, Km. 1.10, Beatriz Creek		Caguas	\$ 580,667.00
AC-230009	Bridge #900, PR-901, Km. 6.20, Juan Martin Creek		Yabucoa	\$ 3,600,000.00
AC-230011	Bridge #1086, PR-163 Eastbound, Km. 1.30, Portugues River		Ponce	\$ 4,000,000.00
AC-230012	Bridge #1157, PR-558, Km. 0.20, Usabon River		Barranquitas	\$ 1,306,909.32
AC-070801	Bridge #1186, PR-708, Km. 5.10, Creek		Cayey	\$ 4,042,126.00
AC-230014	Bridge #1465, PR-150, Km. 0.20, Jacaguas River		Villalba	\$ 2,180,737.00

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
AC-210004	Bridge #1695, PR-123, Km. 55.10, Grande De Arecibo River		Utua	\$ 1,642,000.00
AC-220060	Bridge #1326, Local Road, Km. 0.10, Majagual Creek		Arroyo	\$ 1,000,000.00
AC-220056	Bridge #1976, Off PR-377, Km. 0.10, Consejo Creek		Guayanilla	\$ 964,364.00
AC-800595	Bridge #2472, PR-2, Km. 197.30, Berenchin Creek		Yauco	\$ 2,000,000.00
AC-800594	Bridge #2499, Off PR-156, Km. 0.10, Narajos Creek		Aguas Buenas	\$ 271,000.00
AC-230015	Bridge #2506, Local Road, Km. 0.20, Canas River		Aguada	\$ 1,400,000.00
AC-230013	Bridge #2736, PR-7736, Km. 0.10, Plata Creek		Cayey	\$ 2,000,000.00
AC-800594	Bridge #2764, Urban Local Road, Km. 0.15, Caguitas River		Caguas	\$ 968,000.00
AC-220043	Bridge #2899, PR-2, Km. 173.65, Hospital Concepcion Access		San German	\$ 2,172,000.00
AC-230014	Bridge #2944, Off PR-511, Km. 12.70, Inabon River		Ponce	\$ 2,100,000.00
AC-800595	Bridge #2962, PR-372, Km. 16.50, Duey River		Yauco	\$ 1,000,000.00
AC-230014	Bridge #3051, Off PR-149, Km. 0.40, Creek		Orocovis	\$ 2,038,227.00
AC-095505	Bridge #105, PR-955, Km. 2.00, Juan Gonzalez Creek		Rio Grande	\$ 5,000,000.00
TBD	Bridge #453, PR-187, Km. 1.9, Castañon Channel		Rio Grande	\$ 1,850,000.00
AC-075919	Bridge #530, PR-759, Km. 2.80, De Los Chinos Creek		Maunabo	\$ 2,675,000.00
AC-082509	Bridge #549, PR-825, Km. 0.10, Guadiana River		Naranjito	\$ 2,630,000.00
TBD	Bridge #1325, PR-757, Km. 4.00, Del Apeadero River		Patillas	\$ 2,050,000.00
AC-230015	Bridge #790, PR-2, Km. 166.80, Rosario River		Hormigueros	\$ 2,000,000.00
AC-230009	Bridge #850, PR-912, Km. 5.50, Arenas Creek		San Lorenzo	\$ 2,200,000.00
AC-800586	Bridge #1114, PR-2 Eastbound, Km. 204.00, Guayanilla River, Local Road		Guayanilla	\$ 2,000,000.00

Source: Collaboration PRHTA technical team and Steer, 2023

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
AC-800586	Bridge #1115, PR-2 Westboundkm. 204.00, Guayanilla River, Local Road		Guayanilla	\$ 2,000,000.00
AC-800589	Bridge #1192, PR-2 Northbound, Km. 71.40, PR-543 And Jueyes River		Santa Isabel	\$ 6,000,000.00
AC-800589	Bridge #1193, PR-2 Southbound, Km. 71.40, PR-543 And Jueyes River		Santa Isabel	\$ 6,000,000.00
AC-230009	Bridge #1201, PR-920, Km. 0.40, Waterway		Yabucoa	\$ 4,600,000.00
AC-230013	Bridge #1311, Eugenio Aston Avenue, Km. 1.20, Bairoa River		Caguas	\$ 1,156,694.00
AC-230015	Bridge #1390, PR-303, Km 0.10, Platina Creek		Lajas	\$ 2,000,000.00
AC-230019	Bridge #1772, PR-167, Km. 9.10, La Plata River		Bayamon	\$ 12,288,761.10
AC-230018	Bridge #2012, PR-18		San Juan	\$ 18,225,000.00
AC-800591	Bridge #2385, PR-53 Southbound, Km. 33.40, Dirt Road		Humacao	\$ 899,046.00
AC-800591	Bridge #2386, PR-53 Northbound, Km. 33.40, Dist Road		Humacao	\$ 899,046.00
TBD	Bridge #2482, Off PR-355, Km. 0.90, Yauco River		Yauco	\$ 2,956,802.00
AC-800596	Bridge #2500, PR-165 R, Km. 0.10, La Plata River		Dorado	\$ 12,000,000.00
AC-220036	Bridge #2593, PR-28, Km. 6.20, PR-2		Guaynabo	\$ 3,500,000.00
AC-800596	Bridge #2793, PR-25, Km. 3.40, San Antonio Channel		San Juan	\$ 5,000,000.00
AC-065404	Bridge #670, PR-654, Km. 0.20, Grande De Arecibo River		Arecibo	\$ 1,994,794.00
AC-220008	Bridge #703, PR-836, Km. 4.10, Guaynabo River		Guaynabo	\$ 9,000,000.00
AC-082601	Bridge #1497, PR-826, Km. 3.00, Guadiana River		Naranjito	\$ 12,979,142.00
AC-220061	Bridge #1597, Local Road, Km. 0.10, Jobitos Creek		Villalba	\$ 1,750,000.00
AC-220061	Bridge #1598, Local Road, Km. 0.05, Caricaboa River		Jayuya	\$ 1,750,000.00
AC-992904	Bridge #1851, PR-9929, Km. 0.10, Creek		San Lorenzo	\$ 3,400,000.00

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
AC-333601	Bridge #734, PR-336, Km. 0.68, La Manuela Creek		Guayanilla	\$ 1,577,189.00
AC-800588	Bridge #867, PR-30 Eastbound, Km. 22.30, Humacao River		Humacao	\$ 6,960,000.00
AC-800588	Bridge #931, PR-30 Westbound, Km. 22.70, Humacao River		Humacao	\$ 6,960,000.00
AC-220039	Bridge #1883, PR-114, Km. 4.00, Guanajibo River		Hormigueros	\$ 1,161,940.00
AC-220036	Bridge #1941, PR-52 Southbound, Km. 100.80, PR-1		Ponce	\$ 3,450,000.00
AC-220036	Bridge #1942, PR-52 Northbound, Km. 100.80, PR-1		Ponce	\$ 3,400,000.00
TBD	Bridge #1944, Off PR-157, Km. 0.10, De Cacaos Creek		Orocovis	\$ 1,400,000.00
AC-800585	Bridge #1956, PR-52 Eastbound, Km. 90.80, PR-706		Salinas	\$ 1,960,000.00
AC-800585	Bridge #1957, PR-52 Westbound, Km. 90.80, PR-706		Salinas	\$ 1,920,000.00
AC-800591	Bridge #2389, PR-53 Southbound, Km. 30.00, PR-925		Humacao	\$ 880,000.00
AC-800591	Bridge #2390, PR-53 Northbound, Km. 30.00, PR-925		Humacao	\$ 880,000.00
AC-800591	Bridge #2633, Off PR-750, Km. 0.40, Waterway		Maunabo	\$ 354,000.00
AC-012333	Bridge #156, PR-123, Km. 56.20, Salto Abajo Creek		Utua	\$ 2,000,000.00
AC-065403	Bridge #1638, Victor Rojas Ave, Km. 0.10, Grande De Arecibo River		Arecibo	\$ 9,055,535.00
AC-230031	Bridge #2464, Off PR-747, Km. 0.10, Trinidad Creek		Guayama	\$ 1,500,000.00
AC-230013	Bridge #2588, Off PR-184, Km. 0.10, Grande De Patillas River		Patillas	\$ 3,500,000.00
AC-220055	Bridge #2627, Off PR-788, Km. 0.10, Unknown Creek		San Lorenzo	\$ 1,040,000.00
AC-220056	Bridge #2763, Off PR-332, Km. 0.60, Loco River		Guanica	\$ 450,000.00
	Bridge #2877, PR-2, Km. 162.85, PR-319		Hormigueros	\$ 5,564,413.00
AC-230011	Bridge #1085, PR-163 Westbound, Km. 1.30, Portugues River		Ponce	\$ 4,000,000.00
AC-230012	Bridge #1730, Local Road, Km. 0.30, Descalabrado River		Coamo	\$ 2,000,000.00

Source: Collaboration PRHTA technical team and Steer, 2023

Table 7.4: Island-wide: Pavement - List of Projects in STIP Short Term (2023-2026)

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
AC-220066	Pavement Reconstruction Of PR-765 From Km. 0.0 To Km. 11.1	FHWA	Caguas	\$ 3,850,000.00
AC-230002	Pavement Reconstruction Of PR-779 From Km. 0.0 To Km. 10.86	FHWA	Comerio	\$ 2,541,000.00
AC-230024	Pavement Reconstruction PR-100 From Km. 0.0 To Km. 9.5	FHWA	Cabo Rojo	\$ 1,838,998.72
AC-230010	Highway Reconstruction PR-142 From Km. 0.0 To Km. 9.0	FHWA	Dorado-Toa Alta-Corozal	\$ 6,160,000.00
TBD	Highway Reconstruction PR-185 From Km. 0.0 To Km. 10.0	FHWA	Canovanas	\$ 4,620,000.00
AC-230006	Pavement Reconstruction PR-2 From Km. 125.50 To Km. 125.90	FHWA	Aguadilla	\$ 769,692.00
AC-240008 Y AC-240009	Pavement Reconstruction PR-26 From Km. 0.0 To Km. 15.50	FHWA	San Juan-Carolina	\$ 12,872,181.63
AC-230027	Pavement Reconstruction PR-53 From Km. 69 To Km. 71	FHWA	Patillas	\$ 2,998,591.75
AC-230021	Pavement Reconstruction PR-52 From Km. 106 To Km. 108.79	FHWA	Ponce	\$ 2,430,943.90
AC-230022	Pavement Reconstruction PR-52 From Km. 32 To Km. 38	FHWA	Cayey	\$ 10,262,560.00
AC-230025	Pavement Reconstruction PR-2 From Km. 1.0 To Km. 6.0	FHWA	Guaynbao	\$ 9,200,000.00
AC-230029	Pavement Reconstruction PR-25R From Km. 0.0 To Km. 4.0	FHWA	San Juan	\$ 4,000,000.00
AC-240016	Pavement Reconstruction PR-3 From Km. 0.36 To Km. 5.76	FHWA	San Juan	\$ 13,512,000.00
AC-240017	Pavement Reconstruction PR-3 From Km. 37.37 To Km. 42.49	FHWA	Luquillo-Fajardo	\$ 19,180,000.00
AC-240018	Pavement Reconstruction PR-52 From Km. 21.74 To Km. 28.44	FHWA	Caguas-Cayey	\$ 22,579,147.00
TBD	Pavement Reconstruction PR-129 From Km. 0.10 To Km. 3.10	FHWA	Arecibo	\$ 4,000,000.00
TBD	Reconstruction Pf PR-1 From Km. 0.16 To Km. 8.95	FHWA	San Juan	\$ 14,306,000.00
TBD	Pavement Reconstruction PR-2 From Km. 158 To Km. 171	FHWA	Mayaguez-Hormigueros-San German	\$ 14,733,008.00
TBD	Pavement Reconstruction PR-172 From Km. 13.65 To Km. 27.58	FHWA	Cidra	\$ 6,965,186.00
TBD	Pavement Reconstruction PR-3 From Km. 110.35 To Km. 122.74	FHWA	Maunabo-Patillas	\$ 8,000,000.00
TBD	Pavement Reconstruction PR-111 From Km. 23.38 To Km. 31.85	FHWA	San Sebastian-Lares	\$ 11,800,000.00
TBD	Pavement Reconstruction PR-2 From Km. 156 To Km. 158	FHWA	Mayaguez	\$ 10,108,000.00
TBD	Pavement Reconstruction PR-2 From Km. 173 To Km. 180	FHWA	San German	\$ 9,000,000.00
TBD	Pavement Reconstruction PR-2 From Km. 125 To Km. 131	FHWA	Aguadilla-Aguada	\$ 8,000,000.00
	Reconstruction PR-181, Km. 38.60-55.00	FHWA - EARMARK	Gurabo	\$ 4,800,000.00

Source: Collaboration PRHTA technical team and Steer, 2023

Table 7.5: Island-wide: Non-SOGR - List of Projects in STIP Short Term (2023-2026)

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
AC-010029	Widening PR-100 From PR-308 To PR-101	FHWA	Cabo Rojo	\$ 100,000.00
AC-010029	Widening PR-100 From PR-308 To PR-101	FHWA	Cabo Rojo	\$ 35,000,000.00
AC-800510	Congested Managed Lanes- Noise Barriers-Vista Alegre Community, Borinquen Gardens, Parque Forestal, Berm-Residential Area, Quintas De San Luis, Berm-Villa Parana	FHWA	San Juan-Trujillo Alto-Caguas	\$ 3,000,000.00
	New Connector From PR-22 From To PR-6696/ PR-696	FHWA	Dorado	\$ 1,000,000.00
TBD	Aguas Buenas New Bypass Intersection PR-156 To PR-173, Phase I	FHWA	Aguas Buenas	\$ 1,000,000.00
TBD	Aguas Buenas New Bypass Intersection PR-156 To PR-173, Phase I	FHWA	Aguas Buenas	\$ 5,500,000.00
TBD	Cayey Connector PR-158 Between Int. PR-1 To PR-743	FHWA	Cayey	\$ 2,000,000.00
TBD	Construction Of Interchange At PR-199/ PR-845 Includes Widening PR-845	FHWA	San Juan Trujillo Alto	\$ 15,000,000.00
TBD	Improvements To Aguadilla Airport Access Through PR-107, PR-110	FHWA	Aguadilla	\$ 3,000,000.00
AC-230036	Extension PR-22 From PR-22/PR-2 To PR-2/PR-111-Financial Plan	FHWA	Hatillo-Aguadilla	\$ 1,000,000.00
TBD	PR-2 La Vita	FHWA	Mayaguez	\$ 1,000,000.00
TBD	Urban Interchange At PR-2 & PR-114	FHWA	Mayaguez	\$ 1,000,000.00
TBD	Connector Phase 2 PR-122 From PR-321 To PR-166	FHWA - EARMARK	Lajas-San German	\$ 3,000,000.00
AC-000218	Access Improvements To Aguadilla Airport, From PR-110 To PR-107, Includes Burns Street Connector	FHWA	Aguadilla	\$ 35,000,000.00
AC-230036	Extension PR-22 From PR-22/PR-2 To PR-22/ PR-111	DISCRETIONARY	Hatillo-Aguadilla	\$ 1,183,000,000.00

Source: Collaboration PRHTA technical team and Steer, 2023

Table 7.6: Island-wide: Transit - List of Projects (2024-2029)

Projects	Description	Priority	Length (months)	Cost Estimate (\$)	Funding source	Fiscal Year
ENHANCE THE TRANSIT NETWORK AT THE METROPOLITAN, REGIONAL, AND MUNICIPAL LEVEL: RELIABILITY AND INTEGRATION						
Ceiba San Juan Intercity Bus	Viability, planning and design of new Intercity route between Ceiba Ferry Terminal to Tren Urbano Station in San Juan (YEARLY)	High	12	\$1,000,000	Rural 5311	2024
Study for the new transit routes for the users of the maritime system - island service	Study to develop new transit routes for the users of Ceiba Ferry system in the region	Medium	12	\$300,000	UPWP 5303/5304	2024
Bus Network Redesign Plan	Plan for the transit network design in the San Juan Metropolitan Zone	Medium	12	\$475,000	UPWP 5303/5304	2025
On Demand service study for the Metropolitan Area of San Juan	Assessment for the development opportunities of the On Demand Service in the Metropolitan Area of San Juan	High	6	\$125,000	UPWP 5303/5304	2024
Study for the development of "On Demand" service at the Municipal level	Study to identify the opportunities and scheme required for the development of "On Demand" service at the Municipal level	Low	6	\$125,000	UPWP 5303/5304	2025
On Demand Pilot Project linked to Train Station Area	On Demand Pilot project Linked to Train Stations	High	12	\$1,300,000	SJ 5307	2024
Rehabilitation of the Mosquito Terminal and Ticketing Area.	New Route for Vieques - "Short Route" from Ceiba to Mosquito. Rehabilitation of the Mosquito Terminal and Ticketing Area.	High	30	\$16,000,000	Rural 5311	2024
Puerto Rico Regional Transit Plan	A comprehensive analysis of key regional corridors and/or areas that could be transit ready in the next ten years.	Medium	12	\$625,000	UPWP 5303/5304	2026
New Regional North-Central Route	Plan & Design of New Regional North-Central Route	Medium	12	\$300,000	UPWP 5303/5304	2027
New Regional East Route	Plan & Design of New Regional East Route	Low	12	\$300,000	UPWP 5303/5304	2028
New Regional South Route	Plan & Design of New Regional South Route	Low	12	\$300,000	UPWP 5303/5304	2029

Projects	Description	Priority	Length (months)	Cost Estimate (\$)	Funding source	Fiscal Year
IMPROVE TRANSIT ACCESSIBILITY AND EQUITY: MOBILITY FOR ALL						
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	Medium	6	\$175,000	UPWP 5303/5304	2025
Purchase and instalation of bus shelters. Phase 1	Shelter instalation for "Troncal" Routes	Medium	9	\$2,500,000	SJ 5307	2025
Purchase and instalation of bus shelters. Phase 2	Shelter instalation for "Troncal" Routes	Medium	10	\$2,500,000	SJ 5307	2026
Purchase and instalation of bus shelters. Phase 3	Shelter instalation for "Troncal" Routes	Medium	11	\$2,500,000	SJ 5307	2027
Purchase and instalation of bus shelters. Phase 4	Shelter instalation for "Troncal" Routes	Medium	12	\$2,500,000	SJ 5307	2028
Rehabilitation of Convadonga Terminal	Design, permits and construction of the Covadonga Terminal Remodelation	High	24	\$10,000,000	SJ 5307	2025
Rehabilitation of Iturregui Terminal	Design, permits and construction of the Iturregui Terminal Remodelation	Medium	24	\$10,000,000	SJ 5307	2027
Acquisition of four New Cargo/Passenger Vessels	Acquisition of four New Cargo/passenger Vessels for the Island Service. 300 + passenger capacity. Replacement of vessels in process of disposition.	High	36	\$79,889,000	Rural 5311	2024
Acquisition of one New Passenger Vessel	Acquisition of New Passenger Vessel. 300 + passenger capacity. Scheduled for FY24	Medium	18	\$15,841,000	Rural 5311	2024
Acquisition of one New Electric Vessel (Passengers only)	Acquisition of one New Electric Vessel (Passengers only). Scheduled for FY26	Medium	18	\$5,000,000	SJ 5307	2026
New Ceiba Terminal for the Island Service	New Ceiba Terminal for the Island Service	High	30	\$30,000,000	Rural 5311	2024
Rehabilitation and Maintenance of the Island Service Terminals (Ceiba, Vieques and Culebra)	Rehabilitation and Maintenance of the Island Service Terminals (Ceiba, Vieques and Culebra)	Medium	12	\$2,000,000	Rural 5311	2026
Rehabilitation of the Metro Service Terminals (Cataño and San Juan)	Rehabilitation of the Metro Service Terminals (Cataño and San Juan)	Medium	12	\$960,000	SJ 5307	2026
Rehabilitation of the Maintenance Base and pier for Marine Hoist	Rehabilitation of the Maintenance Base and pier for Marine Hoist	High	34	\$8,976,000	SJ 5307	2024
Acquisition of a Marine Hoist	Acquisition of a Marine Hoist	High	15	\$5,200,000	SJ 5307	2024
Acquisition of New Barge for the Island Service	Acquisition of New Barge for Vieques and Culebra	High	14	\$4,000,000	Rural 5311	2024
Preventive Maintenance and drydock activities for the Island Service	Preventive Maintenance and drydock activities for Authority owned vessels	High	-	\$33,603,619	Rural 5311	2025
Preventive Maintenance and drydock activities for the Metro Service	Preventive Maintenance and drydock activities for Authority owned vessels	High	-	\$2,548,010	SJ 5307	2025
New integrated transit fare collection system	New fare collection for the train and buses.	High	24		SJ 5307	2024
Functional Land Scaping Project	Bioswale, flood control	Low	36	\$3,000,000	SJ 5307	2027
Automatic bus location announcement systems			12	\$1,000,000		2026
New PRITA Office Building	Design and construction of new administration building	High	36	\$15,000,000	ER 5324	2024

Projects	Description	Priority	Length (months)	Cost Estimate (\$)	Funding Source	Fiscal Year
INCREASE THE EFFICIENCY, EFFECTIVENESS, AND RELIABILITY OF THE TRANSIT SYSTEM: CULTURE OF EXCELLENCE						
Operation & Maintenance contract for 8 routes	New O&M contract for the 8 intermodal routes	High	12	\$12,000,000	SJ 5307	2024
Bus service and users profile study (Data Collection and analysis activities) yearly	Field study to identify the actual bus user profile	High	3	\$150,000	UPWP 5303/5304	2024
Train service and users profile study (Data Collection and analysis activities) yearly	Field study to identify the actual bus user profile	High	3	\$150,000	UPWP 5303/5304	2024
Ferry service and users profile study (Data Collection and analysis activities) yearly	Field study to identify the actual bus user profile	High	3	\$150,000	UPWP 5303/5304	2024
Transit Marketing Campaigning yearly	Educational and marketing campaigning of the transit system	High	12	\$150,000	SJ 5307	2024
Website	Creation and Maintenance of Website to provide information, service and support of all transit related activity in Puerto Rico.	High	6	\$100,000	SJ 5307	2024
Trip Planner	Create and Maintenance of a web tool to help clients make transit travel arrangements of existing operation	High	6	\$100,000	SJ 5307	2024
New transit system maps	Map update for the transit system including train, bus and ferry.	High	6	\$90,000	SJ 5307	2024
Online engagement surveys (Data collection and analysis activities) yearly	Online engagement surveys for public participation in transit planning	High	12	\$150,000	UPWP 5303/5304	2024
Transit Terminal Way Finding Design	Design and installation of new information and location signs on transit stations or facilities.	Medium	6	\$400,000	SJ 5307	2025
Transit Terminal Way Finding Implementation	Design and installation of new information and location signs on transit stations or facilities.	Medium	6	\$4,600,000	SJ 5307	2026
Real-Time Transit Data	Provide users with transit data updates in real time to enhance their experience of the transit services. Providing up-to-date information about current arrival and departure times allows users to smoothly plan their trips.	High	6	\$125,000	SJ 5307	2024
Study of new technologies and new mobilities for the Metropolitan Area of San Juan	Identify new technology and mobility patterns in the San Juan Metropolitan area	Low	3	\$300,000	UPWP 5303/5304	2026
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.	Medium	24	\$500,000	SJ 5307	2025
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.	Medium	24	\$500,000	SJ 5307	2025
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.	Medium	24	\$500,000	SJ 5307	2025
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.	Medium	24	\$500,000	SJ 5307	2025
Transit Economic Sustainability Plan	Economic sustainability study to identify challenges and opportunities for the financial stability of the transit system.	High	6	\$300,000	UPWP 5303/5304	2026
Employee Technical Training	Technical Capacity Training for PRITA Employees	Medium	36	\$250,000	SJ 5307	2024
Operation & Maintenance contract for 8 routes	New O&M contract for the 8 intermodal routes	High	12	\$12,000,000	SJ 5307	2024
Bus service and users profile study (Data Collection and analysis activities) yearly	Field study to identify the actual bus user profile	High	3	\$150,000	UPWP 5303/5304	2024
Train service and users profile study (Data Collection and analysis activities) yearly	Field study to identify the actual bus user profile	High	3	\$150,000	UPWP 5303/5304	2024

Projects	Description	Priority	Length (months)	Cost Estimate (\$)	Funding source	Fiscal Year
STRENGTHEN MOBILITY TO SUPPORT THE THE ENVIRONMENT AND THE ECONOMY: CLIMATE ACCTION						
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.	Medium	6	\$300,000	UPWP 5303/5304	2026
Study of energy alternatives with solar panels in the facilities of the Train	Assessment of energy alternatives for the Train using existend ROW and Infrastructure	Low	6	\$300,000	UPWP 5303/5304	2028

Source: Collaboration PRITA technical team and Steer, 2023

The PRITA team produced and analyzed this list of projects. The criteria for priority were based on the agency's priorities, goals, and 2050 MLRTP goals.

Table 7.7: Island-wide: Safety - List of Projects in STIP Mid Term (2027-2036)

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
	Safety Improvements PR-188 From Km. 0.0 To Km. 4.0	FHWA	Canovanas	\$ 5,233,924.00
	Safety Improvements PR-844 From Km. 3.0 To Km. 6.0	FHWA	San Juan	\$ 8,116,085.00
	Safety Improvements PR-2 From Km. 158.0 To Km. 166.0	FHWA	Añasco-Hormigueros	\$ 10,820,647.00
AC-811660	Highway Network Reconstruction - Safety	DISCRETIONARY	Islandwide	\$ 50,000,000.00

Source: Collaboration PRHTA technical team and Steer, 2023

Table 7.8: Island-wide: Bridges - List of Projects in STIP Mid Term (2027-2036)

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
TBD	Bridge #1130, PR-145, Km. 1.00, Grande De Manati River	FHWA	Ciales	\$ 5,845,000.00
AC-230032	Bridge #505, PR-603, Km. 0.07, Grande De Arecibo River	FHWA	Utua	\$ 2,391,000.00
AC-800562	Bridge #1531, PR-141, Km. 10.00, Unnamed Creek	FHWA	Jayuya	\$ 50,000.00
	0 Bridge #631, PR-200 R, Km. 0.10, Cofresi Creek	FHWA	Vieques	\$ 5,100,000.00
AC-520125	Bridge #2039, PR-52 Southbound, Km. 49.50, PR-714 And La Palma Creek	FHWA	Salinas	\$ 2,529,000.00
AC-055511	Bridge #2681, PR-555, Km. 9.30, Coamo River	FHWA	Coamo	\$ 530,000.00
TBD	Bridge #1740, Local Road, Km. 0.5, Grande De Maunabo River	FHWA	Maunabo	\$ 2,500,000.00
-	Bridge #2456, Off PR-111, Km. 0.48, Culebrinas River	FHWA	San Sebastian	\$ 2,012,957.00
AC-230042	Bridge #548, Rural Local Road, Km. 2.40, Yauco River	FHWA	Guayanilla	\$ 1,750,000.00
-	Bridge #1683, Off PR-603, Km. 0.01, Guaonica River	FHWA	Utua	\$ 1,750,000.00
-	Bridge #2143, 29 Street Se, Km. 0.10, Arana Creek	FHWA	San Juan	\$ 660,000.00
-	Bridge #62, PR-115, Km. 17.80, Grande River	FHWA	Aguada	\$ 350,000.00
TBD	Bridge #512, PR-676, Km. 7.10, Cibuco River	FHWA	Vega Baja	\$ 2,000,000.00
-	Bridge #647, PR-102, Km. 28.20, Mercado Creek	FHWA	San German	\$ 1,500,000.00
-	Bridge #781, PR-975, Km. 6.70, Rio Abajo Creek	FHWA	Ceiba	\$ 350,000.00
-	Bridge #1379, PR-651, Km. 0.85, Creek	FHWA	Arecibo	\$ 420,000.00
-	Bridge #1846, PR-833, Km. 12.10, Guaynabo River	FHWA	Guaynabo	\$ 1,000,000.00
-	Bridge #1945, PR-114, Km. 5.60, Guanajibo River	FHWA	Hormigueros	\$ 1,000,000.00
-	Bridge #2244, Off PR-912, Km. 0.2, Capeles Creek	FHWA	San Lorenzo	\$ 1,545,000.00
-	Bridge #2275, PR-26, Tapia & Degetau Street, Km. 3.80	FHWA	San Juan	\$ 4,000,000.00

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
-	Bridge #2276, PR-26, Providencia Street, Km. 4.30	FHWA	San Juan	\$ 4,000,000.00
-	Bridge #2200, PR-250, Km. 0.10, Ensenada Channel	FHWA	Culebra	\$ 3,000,000.00
-	Bridge #155, PR-123, Km. 56.00, Cambalache Creek	FHWA	Utua	\$ 2,000,000.00
AC-012333	Bridge #157, PR-123, Km. 59.10, El Muerto Creek	FHWA	Utua	\$ 2,000,000.00
TBD	Bridge #177, PR-14, Km. 63.30, Maton River	FHWA	Cayey	\$ 6,000,000.00
TBD	Bridge #335, PR-155, Km. 50.20, Morovis River	FHWA	Morovis	\$ 5,000,000.00
-	Bridge #1124, PR-890, Km. 0.04, Hondo River	FHWA	Bayamon	\$ 2,000,000.00
AC-041805	Bridge #1142, PR-418, Km. 0.50, Culebrinas River	FHWA	Aguadilla	\$ 3,095,216.00
-	Bridge #1258, PR-1, Km. 15.10, PR-18 (Las Americas Expressway)	FHWA	San Juan	\$ 5,000,000.00
-	Bridge #1801, PR-20, Km. 0.50, Gonzalez Giusti Avenue	FHWA	Guaynabo	\$ 12,000,000.00
AC-800594	Bridge #2651, PR-34, Km. 1.20, PR-52	FHWA	Caguas	\$ 1,500,000.00
AC-800594	Bridge #2735, PR-156, Km. 59.30, Caguitas River	FHWA	Caguas	\$ 846,000.00
TBD	Bridge #181, PR-15, Km. 1.04, Guamani River	FHWA	Guayama	\$ 1,507,275.00
TBD	Bridge #376, PR-167, Km. 13.70 Over Cancel Creek	FHWA	Bayamon	\$ 3,000,000.00
TBD	Bridge #1008, PR-18, Km. 2.60, PR-17 Piñero Avenue	FHWA	San Juan	\$ 15,175,000.00
TBD	Bridge #1012, PR-18, Km. 2.60, Domenech Street	FHWA	San Juan	\$ 11,275,000.00
TBD	Bridge #1016, PR-18, Km. 1.15, PR-23 (Roosevelt Avenue)	FHWA	San Juan	\$ 17,093,606.46
TBD	Bridge #1073, PR-52 Northbound, Km. 95.20, PR-506 Km. 1.5	FHWA	Ponce	\$ 1,662,392.22
TBD	Bridge #1074, PR-52 Southbound, Km. 95.20, PR-506 Km. 1.5	FHWA	Ponce	\$ 1,662,392.22
TBD	Bridge #1112, Off PR-4484, Km. 0.20, Depression	FHWA	Quebradillas	\$ 4,640,000.00

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
TBD	Bridge #1125, Off PR-372, Km. 0.30, Duey River	FHWA	Yauco	\$ 3,960,000.00
TBD	Bridge #1140, PR-52 Northbound, Km. 92.50, Jacaguas River	FHWA	Juana Diaz	\$ 5,450,457.34
TBD	Bridge #1141, PR-52 Southbound, Km. 92.50, Jacaguas River	FHWA	Juana Diaz	\$ 5,450,457.34
-	Bridge #1227, PR-52 Northbound, Km. 66.60, Nigua River	FHWA	Salinas	\$ 3,264,000.00
TBD	Bridge #1225, PR-52 Northbound, Km. 67.00, Local Access Road	FHWA	Salinas	\$ 425,318.40
-	Bridge #1226, PR-52 Southbound, Km. 67.00, Local Access Road	FHWA	Salinas	\$ 425,318.40
TBD	Bridge #1228, PR-52 Southbound, Km. 66.60, Nigua River	FHWA	Salinas	\$ 3,264,000.00
TBD	Bridge #1232, PR-52 Northbound, Km. 66.20, PR-1	FHWA	Salinas	\$ 1,591,833.60
TBD	Bridge #1233, PR-52 Southbound, Km. 66.20	FHWA	Salinas	\$ 1,611,302.40
TBD	Bridge #1251, PR-52 Southbound, Km.1.00, PR-177	FHWA	San Juan	\$ 6,000,000.00
TBD	Bridge #1259, PR-52 Southbound, Km. 15.10, PR-52	FHWA	San Juan	\$ 16,759,760.00
TBD	Bridge #1351, Local Road, Km. 0.05, Cubuy River	FHWA	Canovanas	\$ 3,300,000.00
TBD	Bridge #1377, Rural Local Road, Km. 0.01, Cubuy River	FHWA	Canovanas	\$ 2,000,000.00
TBD	Bridge #1819, PR-181, Km. 5.50, Grande De Loiza River	FHWA	Trujillo Alto	\$ 7,677,619.20
TBD	Bridge #1849, Periferal Street, Km. 0.40, PR-20 (Martinez Nadal Expressway)	FHWA	Guaynabo	\$ 3,000,000.00
TBD	Bridge #1932, PR-60, Km. 1.70, Local Road And Mabu Creek	FHWA	Humacao	\$ 26,173,442.10
TBD	Bridge #1951, Off PR-704, Km. 2.00, Obispo Creek	FHWA	Coamo	\$ 3,300,000.00
TBD	Bridge #2036, PR-52 Southbound, Km. 48.70, Depression	FHWA	Cayey	\$ 9,500,000.00
TBD	Bridge #2037, PR-52 Northbound, Km. 48.70, Depression	FHWA	Cayey	\$ 7,000,000.00
TBD	Bridge #2056, PR-52 Southbound, Km. 57.40, Majadas River And PR-712	FHWA	Salinas	\$ 5,000,000.00

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
TBD	Bridge #2059, PR-52 Northbound, Km. 57.40, Majadas River And PR-712	FHWA	Salinas	\$ 5,000,000.00
TBD	Bridge #2150, Acuario Street, Km. 0.01, San Jose Lagoon Channel	FHWA	Carolina	\$ 5,000,000.00
TBD	Bridge #2151, Luna Street, Km. 0.01, San Jose Lagoon Channel	FHWA	Carolina	\$ 5,000,000.00
TBD	Bridge #2179, Flo Romero Street, Km.0.00	FHWA	Caguas	\$ 1,650,000.00
TBD	Bridge #2249, PR-149, Km. 67.50, La Joya Creek	FHWA	Ponce	\$ 2,021,760.00
TBD	Bridge #2254, Off PR-173, Km. 0.10, Honda Creek	FHWA	Aibonito	\$ 1,650,000.00
TBD	Bridge #2269, PR-52, Km. 106.10, Portuguez River	FHWA	Ponce	\$ 21,997,440.00
TBD	Bridge #2392, Off PR-191, Km. 1.10, Waterway	FHWA	Naguabo	\$ 3,300,000.00
TBD	Bridge #2550, Off PR-535, Km. 0.10	FHWA	Juana Diaz	\$ 2,000,000.00
TBD	Bridge #2553, Off PR-765, Km. 0.16, Blanca Creek	FHWA	San Lorenzo	\$ 1,650,000.00
TBD	Bridge #2573, Off PR-372, Km. 0.20, Duey River	FHWA	Yauco	\$ 1,650,000.00
TBD	Bridge #2631, Off PR-123, Km. 48.10, Adjuntas River	FHWA	Utua	\$ 2,000,000.00
TBD	Bridge #2709, Off PR-348, Km. 1.20, Brujo River	FHWA	San German	\$ 2,000,000.00
TBD	Bridge #2749, Local Road, Km. 1.28, Maton River	FHWA	Cayey	\$ 2,000,000.00
TBD	Bridge #2860, Las Lozas Street, Km. 0.20, Camuy River	FHWA	Utua	\$ 3,960,000.00
TBD	Bridge #2952, Off PR-157, Km. 0.48, Riachuelos River	FHWA	Orocovis	\$ 600,000.00
TBD	Bridge #3015, Off PR-157, Km. 153.20, Unnamed Creek	FHWA	Salinas	\$ 1,040,000.00
NEW AC-810660	Highway Network Reconstruction - Bridges	DISCRETIONARY	Islandwide	\$ 100,000,000.00

Source: Collaboration PRHTA technical team and Steer, 2023

Table 7.9: Island-wide: Pavement - List of Projects in STIP Mid Term (2027-2036)

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
AC-230028	Pavement Reconstruction PR-333 From Km.0.0 To Km. 10.1	FHWA	Guanica	\$ 1,655,004.00
TBD	Pavement Reconstruction PR-1 From Km. 32.5 To Km. 34.0	FHWA	Caguas	\$ 4,000,000.00
TBD	Pavement Reconstruction PR-199 From Km. 8.41 To Km. 13.11	FHWA	San Juan-Guaynabo	\$ 6,595,000.00
TBD	Pavement Reconstruction PR-52 From Km. 7.0 To Km. 15	FHWA	Caguas	\$ 14,100,000.00
TBD	Pavement Reconstruction PR-53 From Km. 15 To Km. 23.7	FHWA	Caguas	\$ 22,500,000.00
AC-809660	Highway Network Reconstruction - Pavement	DISCRETIONARY	Islandwide	\$ 130,000,000.00

Source: Collaboration PRHTA technical team and Steer, 2023

Table 7.10: Island-wide: Non-SOGR - List of Projects in STIP Mid Term (2027-2036)

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
AC-300110	PR-30 Widening From PR-203 To PR-9944 (Eastbound)	DISCRETIONARY	Gurabo	\$ 10,000,000.00
AC-802660	PR-17, PR-18 & PR-22 Highway Capacity Enhancement, Including Cd Road Northbound Improvements), San Juan	DISCRETIONARY	San Juan	\$ 125,000,000.00
AC-803660	PR-52 Cd Road From PR-1 To PR-796	DISCRETIONARY	Caguas	\$ 40,000,000.00
AC-800660	PR-52 Highway Capacity Enhancement / Congestion Reduction Juana Díaz - Ponce	DISCRETIONARY	Ponce / Juana Díaz	\$ 176,900,000.00
AC-230058	Dtl Extension From Caguas Norte Toll Plaza To PR-30/PR-181 Interchange	DISCRETIONARY	Caguas / Gurabo	\$ 169,000,000.00
	Congestion Managed Lanes - Phase 5 - PR-30-San Juan (Km 0.30 To Km. 7.20) - Reversible Lane Using Reversible Lane Barrier System On PR-30	DISCRETIONARY	Caguas	\$ 30,000,000.00
	Congestion Managed Lanes - Phase 4-PR-52/PR-30-Improve The PR-52/PR-30 Interchange. This Phase Also Provide Open Road Tolling At Caguas Norte Toll Plaza	DISCRETIONARY	Caguas	\$ 30,000,000.00
AC-804660	PR-28 & PR-165 Interchange Utilities Relocation, Guaynabo	DISCRETIONARY	Guaynabo	\$ 30,000,000.00
AC-808660	Tolling System Infrastructure Improvement (Including Partial Toll Canopy Demolition, Optimization)	DISCRETIONARY	Islandwide	\$ 15,000,000.00
AC-807660	Roosevelt Road Access Road Widening, Ceiba	DISCRETIONARY	Ceiba	\$ 4,300,000.00
AC-805660	PR-1 And PR-176 Roadway And Pedestrian Improvements, San Juan	DISCRETIONARY	San Juan	\$ 3,600,000.00
AC-200200	PR-2 And Corazones Ave Interchange, Mayaguez (Ac-200200)	DISCRETIONARY	Mayaguez	\$ 42,000,000.00
AC-813660	Highway Network Reconstruction - Roadway Enhancement	DISCRETIONARY	Islandwide	\$ 50,000,000.00
AC-806660	PR-177 And Paraná Ave Intersection Capacity Enhancement	DISCRETIONARY	San Juan	\$ 4,000,000.00
	Access Improvements To PR-2, PR-680, PR-681,PR-6681	DISCRETIONARY	Arecibo	\$ 62,800,000.00
	Expressway Conversion Of PR-2	DISCRETIONARY	Ponce-Mayaguez	\$ 230,000,000.00
	Reversible Dynamic Toll Flyover Int. PR-2 And PR-22 (Kennedy-De Diego Expressway New Peak Period Access) Longitude .7Kms	DISCRETIONARY	San Juan	\$ 50,000,000.00
	Feasibility And Environmental Study PR-2 Km 145 To Km 152 Road Improvements And Congestion Management	DISCRETIONARY	Mayaguez	\$ 60,000,000.00
	Feasibility Study, Capacity Increase Of PR-181	DISCRETIONARY	Trujillo Alto	\$ 400,000.00
	Route Location And Traffic Analysis PR-865 And PR-2 Elevated Intersection	DISCRETIONARY	Toa Baja	\$ 1,000,000.00

Table 7.11: Island-wide: Non-SOGR (other) - List of Projects in STIP Mid Term (2027-2036)

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
AC-230007	Landslide PR-167, Km. 7.2	FHWA	Naranjito	\$ 2,233,508.00
	Landslides - Reconstruction PR-111 Kms. 10.8, 5.7, 12.50	FHWA	Utuado	\$ 2,600,00.00
AC-812660	Highway Network Reconstruction - Landslides	DISCRETIONARY	Islandwide	\$ 50,000,000.00
	Complete Streets Project-PR-686, PR-687, PR-692, Feliza Rincon Avenue	FHWA	Vega Baja	\$ 5,387,000.00
	Complete Streets Project-Boulevard Toa Alta Heights PR-828/ PR-829	FHWA	Toa Alta	\$ 200,000.00
	Vulnerability Study Islandwide	FHWA	Islandwide	\$ 1,000,000.00
	Improvements To PR-112 And Connector To PR-4494-Access To The Industrial Zone To The Isabela Connector, It Also Includes Improvements To The PR-112	FHWA	Isabela	\$ 4,435,000.00
	PR-165 Widening And Improvements From The Roundabout Bridge Until Int. With PR-2	FHWA	Toa Alta	\$ 150,000.00
	Construction Of An Overpass At The Intersection Of PR-2 With PR-114, Includes The Channelization Of Merle And Pulida Creek And The Construction Of A North - South Frontage Road At PR-114	FHWA	Mayaguez	\$ 28,620,000.00
	Feasibility Study PR-140 And PR-681 (Connector From Highway PR-140 To PR-681)	FHWA	Barceloneta	\$ 200,000.00
	Isabela Connector PR-112 To PR-472	FHWA	Isabela	\$ 12,350,000.00
	Isabela Connector From PR-472 To PR-113	FHWA	Isabela	\$ 12,350,000.00
	PR-545 Widening From PR-52 (Km. 1.03) To PR-14 (Km. 6.03)	FHWA	Coamo	\$ 6,500,000.00
	Feasibility Study- PR-861 To PR-819 Alternate Route	FHWA	Toa Alta	\$ 500,000.00
	PR-459 From Km 9 To 15 (Bo. Jobos/Bo. Bejucos)	FHWA	Isabela	\$ 3,000,000.00
	New Connector From PR-14 With Sgt. Gerardo A. Santiago Intersection To PR-725 And Salesiano Avenue Intersection	FHWA	Aibonito	\$ 6,000,000.00
	Cidra East Connector Form #2 Street (Industrial Avenue) To PR-734 (Phase 1) Length 1.38	FHWA	Cidra	\$ 32,300,000.00
	Roundabout At The Principal Entrances Of The Yabucoa Downtown At PR-3, PR-982 And PR-182	FHWA	Yabucoa	\$ 150,000.00
	Aguas Buenas New Bypass Intersection PR-156 To PR-173, Phase I	DISCRETIONARY	Aguas Buenas	\$ 68,790,000.00

Source: Collaboration PRHTA technical team and Steer, 2023

Table 7.12: Island-wide: Non-SOGR – List of Projects in STIP Long Term (2037-2050)

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
AC-814660	Completing Strategic Highway Network PR-53 From Yabucoa To Patillas	DISCRETIONARY	Yabucoa, Maunabo, Patillas	\$ 800,000,000.00
	Feasibility Of New Construction Of PR-183 To Pr181 Int. PR-9912	DISCRETIONARY	San Lorenzo	\$ 64,000,000.00
	PR-22 And Avenue Trio Vegabajeño (Ramps Side West For The PR-22 With The Avenue Trio Vegabajeño)	DISCRETIONARY	Vega Baja	\$ 500,000.00
	Completing PR-10	DISCRETIONARY	Utuaados - Adjuntas	\$ 600,000,000.00
	Widening Of PR-845 From PR-844 To PR-199	DISCRETIONARY	San Juan-Trijillo Alto	\$ 50,000,000.00
	Feasibility And Update Environmental Study South Bypass From PR-188 To Mediania Baja (PR-187)	DISCRETIONARY	Loiza	\$ 181,000,000.00
	Cayey Connector, Connector PR-1 To PR-743	DISCRETIONARY	Cayey	\$ 99,400,000.00
	New Conector From PR-22 From To PR-6696/ PR-696	DISCRETIONARY	Dorado	\$ 79,300,000.00
	Feasibility Study, PR-203 Extension	DISCRETIONARY	San Lorenzo	\$ 900,000.00
	Relocation Of PR-111 Km. 27.9 A Km. 34.0	DISCRETIONARY	San Sebastian-Lares	\$ 52,300,000.00
	Barranquitas South Bypass (From PR-156 To PR-719)	DISCRETIONARY	Barranquitas	\$ 17,500,000.00
	PR-3132 South Detour	DISCRETIONARY	Peñuelas	\$ 11,500,000.00
	Cidra Connector From Industrial Street To PR-734 Phase I	DISCRETIONARY	Cidra	\$ 68,800,000.00
	Cidra Connector From PR-734 To PR-1 And PR-7787 Phase II	DISCRETIONARY	Cidra	\$ 42,100,000.00
	Cidra Connector From PR-734 To PR-1 And PR-7787 Phase III	DISCRETIONARY	Cidra-Cayey	\$ 47,000,000.00
	Feasibility Study PR-7751 Connector De Arroyo From PR-753 To PR-3, Km 132.4	DISCRETIONARY	Arroyo	\$ 40,000,000.00
	Aguas Buenas North Bypass, From PR-156 East To PR-156 West-Phase 2	DISCRETIONARY	Aguas Buenas	\$ 47,600,000.00

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
NEW AC-801660	Higuillar Avenue (From Efron Avenue To PR-695), Dorado	DISCRETIONARY	Dorado / Toa Alta	\$ 98,000,000.00
	Villalba Bypass - From PR-560 To PR-151 (Sta. 24+82 To Sta. 31+64) Length 0.68	DISCRETIONARY	Villalba	\$ 31,000,000.00
	Route Location And Nepa Compliance PR-9187, Rio Grande; Int. PR-3 With PR-187 And PR-956 To PR-3	DISCRETIONARY	Rio Grande	\$ 80,000,000.00

Source: Collaboration PRHTA technical team and Steer, 2023

Table 7.13: Island-wide: Unfunded Projects

Region	Location	Proposed Improvement and Timeframe
San Juan TMA	Ponce de León Ave. (PR-25) and Fernández Juncos Ave. (PR-35)	<p>Short Term: Roadway safety analysis are required.</p> <p>Short-Medium Term: Signage warning drivers about presence of cyclists.</p> <p>Medium-Long Term: Analyze the feasibility and implement where possible a continuous Class II Bicycle Lane or Class IV Bikeway.</p>
Aguadilla TMA	PR-115 (Añasco to Aguadilla)	<p>Short Term: Road safety analysis are required.</p> <p>Short-Medium Term: Signage warning drivers about presence of cyclists.</p> <p>Medium-Long Term: Analyze the feasibility and implement where possible a continuous Class II continuous Class II Bicycle Lane or Class IV Bikeway or undertake proposed cycling infrastructure project considering all levels of cyclists as potential users to ensure real alternatives to PR-115.</p>
East TPR	PR-194 (Fajardo)	<p>Short-Medium Term: Signage warning drivers about presence of cyclists.</p> <p>Medium-Long Term: Analyze the feasibility and implement where possible a continuous Class II Bicycle Lane or Class IV Bikeway.</p>
North TPR	PR-129 (Hatillo and Arecibo)	<p>Short Term: Maintenance to keep the roadway and shoulder clear of debris</p> <p>Short to Medium Term: Signage warning drivers about presence of Cyclist</p> <p>Medium to Long Term: Analyze the feasibility and implement where possible a continuous Class II Bicycle Lane or Class IV Bikeway or traffic calming interventions to reduce speeds.</p>
South TPR	PR-1 (Santa Isabel to Ponce)	<p>Short Term: Maintenance to keep the roadway and shoulder clear of debris.</p> <p>Short to Medium Term: Signage warning drivers about presence of cyclists.</p>
Southeast TPR	PR-3 (Patillas, Arroyo, Guayama except along city center and Salinas)	<p>Short-Medium Term: Signage warning drivers about presence of cyclists.</p> <p>Medium-Long Term: Analyze the feasibility and implement where possible a continuous Class II Bicycle Lane or Class IV Bikeway.</p>
Southwest TPR	PR-324 (Lajas)	<p>Short- -Medium Term: Signage warning drivers about presence of cyclists.</p> <p>Medium-Long Term: Undertake proposed cycling infrastructure project for share the road.</p>

Source: Collaboration PRHTA technical team and Steer, 2023

Table 7.14: Island-wide: ITS Projects

AC-Number	Project Description	Funding Category	Municipality	Cost Estimate
	ITS Implementation PR-52, from Caguas Sur Toll Plaza to Ponce	FHWA	Caguas to Ponce	\$ 27,256,980.00
	ITS Implementation on PR-53 (All concession segments)	FHWA	Fajardo-Ceiba- Naguabo-Humacao- Yabucoa-Maunabo- Patillas	\$ 14,709,248.75
	ITS Implementation on PR-66 (Complete)	FHWA	Carolina-Canovanas-Rio Grande	\$ 3,680,501.25
	ITS Implementation on PR-20 (Complete)	FHWA	San Juan-Guaynabo	\$ 2,531,642.50
	ITS Implementation on PR-30 (Complete)	FHWA	Caguas-Gurabo-Juncos- Las Piedras-Humacao	\$ 8,250,000.00
	ITS Implementation on PR-1 (Luis Muñoz Rivera Expressway Segment)	FHWA	San Juan-Guaynabo- Caguas	\$ 1,177,500.00
	ITS Implementation on PR-2 (Roberto H. Todd Expressway Segment)	FHWA	San Juan-Guaynabo	\$ 1,115,000.00
	Integrated Corridor Management Center	FHWA		\$ 10,000,000.00

Source: Collaboration PRHTA technical team and Steer, 2023



Island-Wide

Finance Chapter

The purpose of this chapter is to provide the cost-effective plan proposals for the 2050 MLRTP. This chapter is divided into two (2) sections: the prioritization strategy, which includes high-level project prioritization that adheres to PRHTA's objectives, and the capital cost estimates, which include the prioritization approach and funding allocation for specific projects.

The Puerto Rico Highways and Transportation Authority (PRHTA) continues the implementation of an aggressive plan to extend the life cycle of their highway assets and to expedite the reconstruction effort associated to multiple disasters. Achieving State of Good Repair (SOGR) after many years of minimum to non-reconstruction work, and considering the very limited resources of the agency, requires detailed planning and conscious prioritization. SOGR projects focus on the preservation and/or rehabilitation of pavements and bridges (including full replacement) and safety improvements. The selection of SOGR projects and prioritization follow the Federal Highway Authority (FHWA) regulations (i.e., SHSP, TAMP, NBIS), based on data-driven decisions that allow for higher benefit/cost ratios and consider net present values of the life cycle costs.

Federal funds are complemented by state funds programmed for capital improvements and included in the PRHTA Fiscal Plan. The PRHTA fiscal plan allows for using state funds primarily for SOGR projects, while other non-SOGR initiatives (i.e., Completing PR Strategic Highway Network, highway network capacity enhancement, bypasses, and interchanges, among others) are fully dependent upon discretionary grant awards. Hence, financing for non-SOGR projects depends upon the allocation of discretionary funds from USDOT, as well as from special assignments from the Puerto Rico Central Government.

The critical nature of the local economic situation requires economic/financial analysis to help define the available budget and minimum spending obligations, prior to defining the alternatives to be modelled. A strategic review of funding and financing options has been prepared to provide a sensible and realistic assessment of potential financial resources, likely to be accessible to PRHTA over the coming years. The financial team has identified and reviewed the availability and eligibility of various capital grants and loan programs available for transportation infrastructure and transit initiatives, including both apportionment and discretionary/competitive funds.

The PRHTA and the Department of Transport and Public Works (DTPW) jointly prepared a Statewide Transportation Improvement Program (STIP), which sets out the proposed distribution of federal funds assigned to Puerto Rico by project, covering highways and transportation-related funding from the FHWA, and transit-related funding from the FTA.

PRHTA also generates a 5-year Capital Improvement Program (CIP), which is the basis for the preparation of TIP for FHWA federal aid projects. PRHTA has evaluated the condition of its highway assets, allowing it to identify and prioritize major needs, given the limitations of resources and the associated construction costs. The CIP is subject to approval by the Financial Oversight and Management Board for Puerto Rico.

The CIP estimates the steady state costs for FY22+ amounting to \$274M per annum (2021), including \$153M for pavement, \$86M for bridges, and \$35M for safety. These CIP figures exclude soft costs (in the range of 15-18.5% of capital expenditure; to be funded using state Capex). There is a separate budget for transit CIP projects. The level of projected costs implies more than doubling the expenditure on pavement and a three-fold increase in the amount allocated for bridges compared with prior 2018, and an allocation of approximately \$45M for the toll roads and \$229M for the non-toll roadways. Other highway network capacity enhancement initiatives will be funded using earmarked discretionary grants, or special assignments from the Central Government. The objective is to maximize federal funding by identifying, applying for, and pursuing additional discretionary Federal funds. The importance of these efforts has been magnified by the availability of discretionary grants under the Infrastructure Bill, which increases the available pool of discretionary grants funding for which PRHTA can compete.

Other financing opportunities will result from Public Private Partnerships (P3), including greenfields and brownfields. P3s are effective strategies to attract private investment into the transportation network. The PRHTA is currently concessioning the operation and maintenance of toll roadways PR-20, PR-52, PR-53 and PR-66. This transaction will result in a reduction in capital expenditures from the PRHTA on the toll roads, as the concessionaire will be responsible for any reconstruction work, as well as the operation and maintenance projects. However, it will also mean a reduction in toll revenues, which will require an adjustment in the Central Government transfer of funds to the PRHTA for the operational and capital expenditures of the remaining non-toll roads. Additionally, depending upon the magnitude of the upfront payment for the brownfield P3 transaction, some funds may become available for SOGR projects, as well as for highway network capacity enhancement and congestion relief initiatives. It should be noted that there is a large uncertainty in the execution of the P3 and the resulting funds, if any.

Many federal programs require some degree of local match. This could be provided by drawing on toll revenue credits, although there will also be a need for actual funding to achieve key targets for state of good repair.

In view of the lack of access to bond markets (due to default on existing bond issues), combined with the government's clawback arrangements for tax streams previously dedicated to transportation, there is no alternative source of funds to provide the local contribution other than specific government transfers.

Demand for construction and project management resources is likely to drive up costs in the short term. This is already being reflected in levels of construction costs inflation, which will inevitably reduce the amount of work possible within a fixed, finite budget. Timescales for project start dates may therefore be extended.

Prioritization Strategy

The high-level prioritization of projects, follows PRHTA's objectives detailed next (1, with the highest priority):

1. Completing Emergency Repair projects
2. Safety Projects (per SHSP strategies)
3. Achieving State of Good Repair (per TAMP strategies)
4. Highway Congestion Relief Program
5. Completing the PR Strategic Highway Network
6. Other CIP Projects

The initial focus is on emergency repairs and developing resilient infrastructure to modern standards. Safety projects will remain one of the top priorities of the PRHTA, with a focus on reducing fatalities and serious injuries in the highway network. It will also prioritize projects based on the FHWA guidelines and target high-crash locations. Extending the life cycle of the highway assets by preservation and reconstruction work will allow to meet FHWA targets for the condition of interstate and NHS pavements and bridges. Meanwhile, the PRHTA will identify P3 opportunities for other Non-SOGR initiatives, such as items 4 thru 6.

Financial support for disaster recovery

ER Funding from FHWA

Since 2017, the PRHTA has been immersed in the reconstruction efforts for multiple disaster events, including:

- 2017 Hurricanes Irma and María
- 2018 Tidal Waves
- May 2019 Heavy Rain
- 2019 Tropical Storm Karen
- January 2020 Earthquakes
- 2020 Tropical Storm Isaias
- 2022 Tropical Storm Fiona

Legislation from US Congress, under the terms of the Bipartisan Budget Act of 2018, allows for 100% federal share for Hurricanes Irma and Maria permanent repairs. For other disasters, the 100% federal share applies only for emergency repairs. The Emergency Relief funding is obtained from quick releases and ER assignments.

For the recovery efforts associated with hurricanes Irma and María, the PRHTA and Eastern Federal Land Highway Division (EFLHD) signed multiple Memorandums of Agreements (MOAs) for EFLHD to support the agency in the emergency repairs, as well as for the procurement, construction management and inspection of landslide projects, likewise to signage and safety projects and bridge replacement. Per the signed MOA, EFLHD is receiving partial allocations of ER funds directly from FHWA. Other permanent repair work, including improvements to traffic signals, lighting, communications, and some bridges, will still be executed by the PRHTA. The following table depicts the funding allocation, obligation, and funding availability for the previously mentioned disaster events. Available funding sources from FHWA are set out in Table 8.1.

Table 8.1: FHWA ER Funding Allocation and Obligations

Funding Allocation	Date	Funding	Transferred to EFLHD	Balance	Obligated in FMIS	Funds Available
Hurricanes Irma/María		\$707,563,670.84	\$398,380,000.00	\$309,183,670.84	\$291,491,244.53	\$14,784,191.31
Quick Release 1	September 14, 2017	\$2,500,000.00		\$2,500,000.00		
Quick Release 2	September 28, 2017	\$40,000,000.00		\$40,000,000.00		
Quick Release 3	November 22, 2017	\$30,000,000.00		\$30,000,000.00		
ER Assignment 1	April 13, 2018	\$70,000,000.00	\$8,100,000.00	\$61,900,000.00		
ER Assignment 2	February 5, 2019	\$130,000,000.00	\$79,500,000.00	\$50,500,000.00		
ER Assignment 3	September 5, 2019	\$208,195,000.00	\$150,000,000.00	\$58,195,000.00	\$291,491,244.53	\$14,784,191.31
ER Assignment 4	February 27, 2020	\$22,065,474.00	\$4,200,000.00	\$17,865,474.00		
ER Assignment 5	November 2, 2020	\$2,171,728.63	\$580,000.00	\$1,591,728.63		
ER Assignment 6	December 21, 2021	\$45,482,968.76		\$45,482,968.76		
ER Assignment 7	August 31, 2022	\$156,000,000.00	\$156,000,000.00	\$0.00		
ER Assignment 8	May 19, 2023	\$1,148,499.45		\$1,148,499.45		
Tidal Waves		\$1,788,025.00	\$0.00	\$1,788,025.00	\$0.00	\$1,788,025.00
ER Assignment 1	February 5, 2019	\$300,000.00	\$0.00	\$300,000.00		
ER Assignment 2	February 27, 2020	\$1,488,025.00	\$0.00	\$1,488,025.00	\$0.00	\$1,788,025.00

Funding Allocation	Date	Funding	Transferred to EFLHD	Balance	Obligated in FMIS	Funds Available
May 2019 Heavy Rains		\$6,378,488.52	\$0.00	\$6,378,488.52	\$5,363,543.44	\$1,014,945.08
ER Assignment 1	February 27, 2020	\$5,462,209.00	\$0.00	\$5,462,209.00		
ER Assignment 2	November 2, 2020	\$916,279.52	\$0.00	\$916,279.52	\$5,363,543.44	\$1,014,945.08
Tropical Storm Karen 2019		\$3,858,736.00	\$0.00	\$2,883,736.00	\$667,949.35	\$3,190,786.65
ER Assignment 1	February 27, 2020	\$2,883,736.00	\$0.00	\$2,883,736.00		
ER Assignment 2	December 21, 2021	\$975,000.00		\$975,000.00	\$667,949.35	\$3,190,786.65
Earthquakes Event 2020		\$35,778,361.20	\$0.00	\$35,778,361.20	\$14,070,979.43	\$20,777,347.11
Quick Release 1	January 14, 2020	\$5,000,000.00	\$0.00	\$5,000,000.00		
ER Assignment 1	February 27, 2020	\$9,000,000.00	\$0.00	\$9,000,000.00		
ER Assignment 2	November 2, 2020	\$70,979.43	\$0.00	\$70,979.43	\$14,070,979.43	\$20,777,347.11
ER Assignment 3	December 21, 2021	\$21,707,381.77		\$21,707,381.77		
Hurricane Fiona 2022		\$34,850,000.00	\$0.00	\$34,850,000.00	\$0.00	\$0.00
Quick Release 1	September 27, 2022	\$8,000,000.00	\$72,358.00	\$7,927,642.00		
ER Assignment 1	May 19, 2023	\$34,850,000.00	\$0.00	\$34,850,000.00	\$35,152,912.77	\$0.00
Total		\$829,143,719.06	\$398,380,000.00	\$429,788,719.06	\$314,466,336.37	\$42,759,113.03

Source: FHWA, 2023

FTA ER Funds

The FTA program (Section 5324) assists States and public transportation systems with emergency-related expenses for which the governor of Puerto Rico has declared an emergency, and the U.S. Secretary of Department of Transportation has concurred, or the President of the EEUU has declared a major disaster. The program funds capital projects to protect, repair, reconstruct, or replace transit assets, including equipment and facilities. It also funds transit agencies operating costs related to evacuation support, rescue activities, and temporary public transportation service. FTA covers those expenses not reimbursed by the Federal Emergency Management Agency (FEMA).

The Federal share is 90% of permanent or emergency repairs, incurred more than 270 days after the disaster declaration date. The funds can also be applied to 100% of transit operating costs of evacuation services and temporary emergency services in the area affected by the emergency.

Under Section 5324, Puerto Rico allocated the following funds for several agencies and municipalities, as shown on Table 5.2.

Table 8.2: Emergency Relief Fund under Section 5324

Emergency Relief Fund (Section 5324)	
Recipient	Funding
Autoridad Metropolitana de Autobuses	\$13,599,000
Barceloneta	\$901,000
Bayamón	\$164,000
Caguas	\$1,116,000
Camuy	\$159,000
Carolina	\$414,000
Cataño	\$928,000
Cayey	\$2,452,000
Ciales	\$708,000
Cidra	\$193,000
Dorado	\$49,000
Fajardo	\$77,000
Guaynabo	\$482,000
Hatillo	\$306,000
Hormigueros	\$29,000
Humacao	\$1,823,000
Juncos	\$311,000
Manatí	\$233,000
Ponce	\$906,000
Puerto Rico Highways and Transportation Authority	\$169,412,000
San Juan	\$2,701,000
San Lorenzo	\$258,000
Toa Baja	\$131,000
Vega Alta	\$230,000
Vega Baja	\$148,000
Yauco	\$59,000

Source: FTA, 2023

Coronavirus Aid, Relief, and Economic Security (CARES) Act of 2020 and the Coronavirus Response and Relief Supplemental Appropriations Act (CRRSAA) of 2021

The Coronavirus Aid, Relief, and Economic Security (CARES) Act (2020) and the Coronavirus Response and Relief Supplemental Appropriations (CRRSAA) Act (2021) provide a variety of programs to provide fast and direct economic assistance for American workers, families, small businesses, and industries related to the onset of the COVID-19 pandemic. The Coronavirus Response and Consolidated Appropriations (CRCA) Act continued many of these programs by adding new phases, new allocations, and new guidance to address issues related to the continuation of the COVID-19 pandemic.

Under CARES, FTA allocated \$25 billion to recipients of urbanized area and rural area formula funds, with \$22.7 billion to large and small urban areas and \$2.2 billion to rural areas. Funding provides a 100-percent federal share, with no local match required, and support capital, operating, and other expenses generally eligible under those programs to prevent, prepare for and respond to COVID-19.

Also, FTA allocated \$14 billion in supplemental appropriations for COVID-19 relief to support the transit industry during the COVID-19 public health emergency, under the Coronavirus Response and Relief Supplemental Appropriations Act of 2021 (CRRSAA).

Under Section 5307 (Urbanized Areas) and 5311 (Rural) Formula Programs, FTA allocated the following funds to Puerto Rico, as shown in Table 8.3.

Table 8.3: Coronavirus Aid, Relief and Economic Security under Section 5307

Coronavirus Aid, Relief, and Economic Security (CARES) Act (Section 5307)	
Recipient	Funding
San Juan Urbanized Area (SJUA)	\$96,100,590
Aguadilla Urbanized Area (AUA)	\$7,475,140
Urbanized Area Under 200,000 (UZA)	\$58,250,078
Coronavirus Aid, Relief, and Economic Security (CARES) Act (Section 5311)	
Recipient	Funding
Rural Area	\$6,847,672
Coronavirus Response and Relief Supplemental Appropriations (CRRSA) Act (Section 5307)	
Recipient	Funding
San Juan Urbanized Area (SJUA)	\$29,105,286
Urbanized Area Under 200,000 (UZA)	\$9,050,483

Source: FTA, 2023

American Rescue Plan Act of 2021

The American Rescue Plan (ARP) Act of 2021, provides federal funding to support the nation's public transportation systems for continue the respond to the COVID-19 pandemic, among others. Under ARP, FTA allocates \$26.6 billion to urbanized and rural areas and \$50 million under the Enhanced Mobility of Seniors and Individuals with Disabilities formula programs. Funding provides a 100-percent federal share, with no local match required.

FTA program looks to improve mobility for seniors and individuals with disabilities throughout by removing barriers to transportation services and expanding the transportation mobility options. Section 5310 program provides financial assistance for transportation services planned, designed, and implemented to meet these special transportation needs for seniors and individuals with disabilities in all areas—large urbanized, small urbanized, and rural.

Under Section 5307 (Urbanized Areas), 5311 (Rural), and 5310 (Enhanced Mobility of Seniors and Individuals with Disabilities) Formula Programs, FTA allocated the following funds to Puerto Rico.

Table 8.4: American Rescue Plan Act Funds

American Rescue Plan Act (Section 5307)	
Recipient	Funding
San Juan Urbanized Area (SJUA)	\$95,156,466
Aguadilla Urbanized Area (AUA)	\$424,535
Urbanized Area Under 200,000 (UZA)	\$22,460,897
American Rescue Plan Act(Section 5311)	
Recipient	Funding
Rural Area	\$1,050,111
Rural Transportation Assistance Program (RTAP)	\$76,631
Intercity	\$353,071
American Rescue Plan Act (Section 5310)	
Recipient	Funding
San Juan Urbanized Area (SJUA)	\$444,028
Aguadilla Urbanized Area (AUA)	\$68,774
Urbanized Area Under 200,000 (UZA)	\$350,780

Source: FTA, 2023

FEMA Public Assistance Grants

Public Assistance (PA) grants tend to be the largest disbursement of federal funds or both short- and long-term disaster recovery. These funds are focused on repairing, replacing or restoring public infrastructure that might have been affected during a natural disaster. The funds are disbursed on a project-based detailed cost estimated from each of the damaged infrastructure. For example, for the emergencies related to Hurricane Maria FEMA's PA program had allocated \$2.6 billion in total funding (up to July 16, 2018).

FEMA usually provides 75% of the estimated costs, requiring that 25% be covered by local funding sources from local governments. These contributions from local governments can also be covered by other federal grant programs.

PA funds are intended to restore facilities to their pre-disaster state and only allow upgrades to meet applicable codes and standards. Nevertheless, local governments can solicit hazard mitigation add-on funding (designated as PA-406 program funds) to improve facilities so they are more resilient and able to withstand future hazardous events. These additional funds are subject to a cost-benefit analysis to demonstrate their cost-effectiveness.

Sources of Capital Improvement Program Funds

There are several sources of funds available to the PRHTA:

- Federal Funds (Regular and Discretionary);
- Tolls credits;
- State Funds earmarked for CAPEX;
- Toll Rates and Additional Tolling Opportunities; and
- P3 project Investment.

The formal documents that define the shorter-term investment strategies regarding the PRHTA available funds are:

- The Capital Improvement Plan (CIP);
- The Statewide Transportation Improvement Program (STIP);
- The TAMP; and
- The SHSP.

Federal Funds

FHWA Infrastructure Investment and Jobs Act – Bipartisan Infrastructure Law (BIL)

On November 15, 2021, President Biden signed the Infrastructure Investment and Jobs Act (IIJA) (Public Law 117-58, also known as the Bipartisan Infrastructure Law) into law. The Bipartisan Infrastructure Law is the largest long-term investment in our infrastructure and economy in our Nation's history. It provides \$550 billion over fiscal years 2022 through 2026 in new Federal investment in infrastructure, including in roads, bridges, mass transit, water infrastructure, resilience, and broadband.

The BIL provides apportioned funding to states/territories for Federal-aid highway programs over a 5-year period (at the time FY-2022 through FY-2026). Although Puerto Rico is included in the definition of "state" for most purposes under Title 23, it is not eligible to receive funds apportioned among states. Specific authorization for the Puerto Rico Highway Program (PRHP) is provided, with an allocation varying from \$173M to \$187M for fiscal years 2022 through 2026. Penalties are imposed because of the lower minimum drinking age and minimum penalties for repeat offenders due to driving while intoxicated, reducing the available funds to an average of \$159M.

The lump sum payments for each year cover all the apportioned highway programs combined, including the following pre-defined allocations:

- At least 50% are available only for purposes eligible under the National Highway Performance Program (NHPP),
- At least 25% are available only for purposes eligible under the Highway Safety Improvement Program (HSIP),
- And any remaining funds may be used on any activity eligible under Chapter 1 of Title 23, United States Code (U.S.C.) and preventative maintenance on the National Highway System [§ 11126(2); 23 U.S.C. 165(b)(2)(C)(iii)].

The BIL also allocates \$45M to Puerto Rico per annum for 5 years under the Bridge Formula Program and \$2,020,490 under the National Electric Vehicle Infrastructure (NEVI) Program.

Federal grant funding typically falls into two categories: Apportioned and allocated, depending on the way the funds are distributed. The Federal aid provided to Puerto Rico is not determined by the standard formula apportionment (which applies to states), but instead by a fixed term allocation.

The FHWA requires a minimum 10-year financial plan to be developed, which sets out how the Authority expects to fund future work and investment, as set out in the asset management plan. The plan is to be based on funding levels that can be expected to be “reasonably available” by year, with the planning process required to address the anticipated sources of funding.

The FHWA acknowledges that future funding amounts may be uncertain, and in these circumstances, allows the financial plan to use estimates based on historical values. In the case of apportionment, the potential variance is reasonably limited, with the base allocation to each state typically reflecting their respective share of the prior year's funding. With a fixed allocation, rather than a formula-based apportionment, it is extremely difficult to predict the future level of funding beyond the current commitments. The fiscal plan assumes that funding for the period up to 2026 will continue at the current level, with the exception of the \$45M for the Bridge Formula Program and the \$2M for NEVI, which will remain only during the 5-year period defined in the BIL.

For the 2050 MLRTP Financial Plan, it has been assumed that the level of funding will be maintained at its current level in real spending terms. Nevertheless, the surge in construction prices due to Hurricanes Irma and María and the COVID-19 pandemic is adversely affecting the capacity to execute SOGR projects and reach KPI objectives. Hence, an adjustment in levels of investments in the near future shall not be discarded. In terms of state matching requirements, the available toll revenue credits would be adequate to provide the required 20% local match, allowing projects to be fully federally funded.

US DOT Discretionary Federal Grants

The BIL provided funds to the US Department of Transportation across three programs to invest in projects of national or regional significance – (1) the National Infrastructure Project Assistance grants program, found under 49 U.S.C. § 6701 (Mega), (2) the Nationally Significant Multimodal Freight and Highways Projects grants program, found at 23 U.S.C. § 117 (Infrastructure for Rebuilding America or INFRA), and (3) the Rural Surface Transportation Grant program, found at 23 U.S.C. § 173 (Rural). The BIL makes available up to \$5 billion for the Mega program for Fiscal Year (FY) 2022 through 2026; up to \$8 billion to the INFRA program for the period of FY 2022 through 2026; and up to \$2 billion for the Rural program for the period of FY 2022 through 2026, for a combined total of up to \$15 billion for FY 2022 through 2026.

The funding opportunities are awarded on a competitive basis for surface transportation infrastructure projects. The infrastructure projects include highway and bridge, intercity passenger rail, railway-highway grade crossing or separation, wildlife crossing, public transportation, marine highway, and freight projects, or groups of such projects. All the projects need to have a significant national or regional impact or to improve and expand the surface transportation infrastructure in rural areas.

Toll Transportation Development Credits (Formerly Toll Revenue Credits) – Matching Contribution

Section 120(i) of Title 23 of the United States Code permits states to substitute certain previous toll-financed investments for state matching on current Federal-aid projects. The non-Federal share of a project's cost may be met through a "soft match" of toll credits. This means the Federal share can effectively be increased to 100 percent of the total project cost. The credits can be applied for the construction of new infrastructure, or the maintenance or improvement of existing public highways, including those which have received federal-aid funding in the past.

It should be noted that although these credits are often referred to as a source of funding, they do not represent actual available funding. They are typically applied to free local funds that would otherwise need to be committed, allowing the flexibility to fund other transportation projects that may not themselves be eligible for federal funds, or to support operating costs.

Toll credits may be claimed only for the share of a project's capital expenditures, which are supported by toll revenues accruing to a toll authority (public agency or private entity). The allowable credit excludes revenues needed for debt service, returns to investors, or the operation and maintenance of toll facilities.

In addition, an annual Maintenance of Effort (MOE) test is applied, which must certify that the toll facilities are being properly maintained in the year to which the credit relates before excess revenues can be credited. The actual level of maintenance spent in relation to initial estimates is also monitored, and any shortfall will result in a requirement to replace federal funds with local funds on projects where the credit was applied. Future ability to accrue additional credits will therefore depend on meeting the MOE requirements.

The amount of credit earned equals the amount of excess toll revenues spent on Title 23 highway capital improvement projects. However, if Federal funds were used for the project that generates the tolls, then the available credit is reduced by the percentage of the total project cost sourced from federal funds; i.e., if 80% of the original project was federally funded, the toll credit is reduced by 80%. Once approved, the credit remains available until used.

In December 2021 the SOP 09-11-06 "Procedures for the Use of Toll Credits" was approved by the PRHTA. This procedure is aligned with FHWA guidelines. The use of these credits as matching contributions is estimated at approximately \$30M per year, based on the current level of allocated funding, implying the potential for these credits to be applied over the next 20 years.

Local Taxes Dedicated to Transportation and Government Transfers

The Authority's funding originally included a range of pledged tax and license revenue streams. However, starting in 2016 these revenues have been subject to government clawback, being used instead to make payments on bonds of the Government Development Bank (GDB), guaranteed by the government. The clawback covers Taxes on Gasoline; Diesel; Petroleum and derived products; vehicle license fees, and cigarettes.

However, in Puerto Rico these allocations are not constitutionally dedicated, and the funds can be re-purposed by the government, as is the case under the “clawback” arrangement now applied. At the present time, there is no end date for the clawback and, as a prudent and conservative approach, it has been assumed that these funds will not be available over the term of the 2050 MLRTP.

The net result of the clawback to date is that PRHTA has been unable to make interest or principal payments on bonds, or interest payments due to the former GDB. PRHTA initially continued to make bond payments using reserve funds, but they were unable to do so beginning in July 2017. The result has been PRHTA filing for bankruptcy under Title III of PROMESA.

The clawback has also resulted in an overall shortfall against approved expenditures. To address the shortfall, transfer payments are expected from the Commonwealth in the form of Capex appropriations and Commonwealth Transfers, totaling \$5,291M, from FY2023 through FY2051, which is the term of the current Fiscal Plan.

State Funds Earmarked for Capex

As per the approved fiscal plan, there is \$334M in Capex appropriations from FY2023 through FY2027, and \$2,007M from FY2023 through FY2051. With the additional Commonwealth transfer (\$3,284M from FY23 through FY51) to cover both Capex and OPEX. Additional funds may be available depending upon the P3 ongoing brownfield transaction.

Toll Rates and Additional Tolling Opportunities

Toll Revenues

As per the current approved fiscal plan, toll revenues contribute 72% of PRHTA’s total operating revenue baseline, including both PRHTA and concessionaire-operated roads. Toll fares for the toll roads operated by the PRHTA (i.e., PR-20, PR-52, PR-53, and PR-66) have not been adjusted since 2005. Future toll revenues were estimated in the Fiscal Plan using actual toll revenues and toll transactions from FY19 (pre-pandemic) and then adjusted each year based on the Commonwealth’s real GNP projections. Additionally, the Fiscal Plan’s projections adjusted upward PR-53's baseline to reflect the fact that both the North and South Humacao toll plazas were closed during FY19, used as a base year and unaffected by COVID, but reopened in August 2019.

Toll revenues estimates included in the Fiscal Plan are \$975M from FY23 through FY27, plus \$218M from toll fines from the same period.

Toll Highway Administration and Maintenance

Toll highway administration and maintenance costs are estimated at \$232M from FY23 through FY27, averaging around \$46.4M per year. It should be noted that the toll revenues and the administration and maintenance expenditures may be modified in the near future, depending upon the undergoing P3 transaction for the PRHTA toll roads not previously concessioned.

Potential for Additional Tolling

Federal law limits the imposition of tolls on existing highways that have been built or maintained using federal funds. Tolls can be imposed for single-occupant use of HOV lanes or with the objective of congestion pricing. In other circumstances, tolls can only be levied on existing roads following reconstruction (e.g., for capacity expansion or other improvements).

If the Authority certifies that the facility is being adequately maintained, and generating sufficient revenue to pay for operations, the surplus can be applied to contribute to the cost of other highway activities. It can also be used to support public transportation operations, provided that the application would not be in violation of the authority's bond covenants.

P3 Project Investment

Encouraging private sector capital investment would appear to offer a means of implementing projects whilst minimizing the dependence on government funding. The Puerto Rico Government is proposing to further strengthen the P3 legal framework to facilitate critical infrastructure investments.

The P3 Authority is focused on developing critical infrastructure projects, and unsolicited private sector proposals can be submitted. The success of toll road concessions for PR-22 and PR-5 would appear to provide a successful precedent. Current priority projects in development include a concession to modernize, operate and maintain government-owned parking facilities.

New Projects

Any investor in a P3 will have expectations of a return over the duration of a concession, either from user fees or availability or service fees payable by PRHTA or the PR Government. A complicating factor is that there is considerable uncertainty associated with forecasts of future usage of any infrastructure, given the outlook for the macroeconomic environment and a decline in population through continued net migration.

At the same time, PRHTA is unlikely to be able to provide cast-iron assurances with regards to providing either a minimum revenue guarantee or making availability and service payments without access to additional funds. The Government is equally unlikely to be able to offer such guarantees as a backstop, given other demands on its finite resources. Similarly, there may be concern about the ability of PRHTA to fund the construction or maintenance of essential related infrastructure (e.g., roads that feed or distribute traffic using the tolled facilities).

The potential return for investors could be improved by an upfront government contribution to offset capital costs. This might be recovered in the longer term by a revenue-sharing mechanism. In these circumstances, it may be possible to apply for a discretionary TIFIA loan during construction, with an appropriate grace period and a 35-year repayment term, as discussed earlier. The credit contribution from a TIFIA loan is typically limited to 33% of eligible project costs which may prove a significant constraint, given the relatively low levels of revenue generated by potential highway projects identified by PRHTA.

In these circumstances, the potential to secure P3 investment is likely to be a binary option, depending on whether an application for a TIFIA loan is granted or not. Given the time required to make an application, and for its evaluation, it is suggested that any associated projects cannot begin before FY2024.

P3 Covering Existing Assets

The option of transferring existing highway infrastructure assets with a proven history of toll revenue generation is subject to uncertainty. This is based on considering the associated direct loss of a revenue stream supporting PRHTA's activities, and the corresponding adjustments in Central Government transfer to maintain in SOGR the Non-Toll System. The PRHTA is in the advanced stages of procuring the concession of the toll roads not previously concessioned (i.e., PR-20, PR-52, PR-53, and PR-66). However, there is uncertainty regarding the financial elements of the transaction at this point in time. It would be more certain if the proposed transactions and associated asset transfers, as part of a P3, were to be included in a fiscal plan certified by the PROMESA Board. The PRHTA is currently developing an updated Fiscal Plan that will include the P3 transaction, as well as the Transportation Sector Reform.

Capital Improvement Program (CIP) Funding Allocation

The Fiscal Plan approved and certified by the Financial Oversight and Management Board (FOMB) on October 14, 2022, covers anticipated revenues and capital and operating spending from FY 2023 through FY 2027. It includes the completion of current projects based on the projected level of transfers from the Government, in addition to state funds already earmarked for Capex.

The construction program reflects the Capital Improvement Program (CIP) budget produced by PRHTA. The projected "steady state" run rate of \$253M in hard costs per year, which reflects a reduction from the goal of \$274M in spending level deemed necessary to keep the National Highway System (NHS) and Interstate system in a state of good repair compliant with federal standards, but only a minimal level of intervention on non-NHS roads. An additional annual reduction in state Capex for hard costs is observed after FY2030. On average, 49.5% of the funding is allocated to pavement work, 32.7% to bridges, 12.8% to safety, and 5% to traffic signaling. Nevertheless, the priorities and final distribution of funds are obtained following the FHWA regulation, applying penalties, and the strategies within the current TAMP.

Allocation of Funds

The 2050 MLRTP assumes that the first priority, post-disaster recovery, will be to meet federal targets for the interstate and NHS bridges. Failure to meet the targets will, in any case, oblige all Federal funding to be directed toward these efforts. The assumed spending profile is based on PRHTA's "balanced" scenarios, which seek to apply a realistic approach to a ramp-up of work. A 25% of the available FHWA funds also need to be committed to safety projects.

There are sufficient toll revenue credits available as local matches over the next 20 years, so the available level of federal funding should not be available in full, irrespective of the level of local contribution. However, the level of funding currently provided by FHWA is below the level of expenditure required to deliver the State of Good Repair (SGR) program over the next 10 years. This means there will be a continuous need for the Government of Puerto Rico to transfer funds to balance the books, beyond the period covered by the present fiscal plan.

Source and Allocation of Capital: Highways and Bridges Projections FY-2023-2051

Table 5.3 sets out the anticipated level of funding and capital expenditure during the period of the current fiscal plan (from FY2023 through FY2051), with greater granularity during the first 5 years. This level of expenditure was considered during the development of the TAMP. It should be noted that the targets established in the TAMP may be affected by the increase in construction costs experienced during recent years locally.

The projections shown in Table 5.3 considers a 5-year year allocation of \$225M for the bridge program, from FY 2023 thru FY2027. After FY 2027, if additional funding is not allocated for the Bridge Program, state Capex funds shall be identified to replace the \$45M per annum investment in bridge program under BIL to maintain the SOGR projected investments.

The sources of capital revenue for the CIP are:

- FHWA Funds;
- Commonwealth Appropriations;
- FTA funds; and
- Emergency Funds

Meanwhile the capital expenditures are grouped into the following categories:

- Right of Way;
- Local Construction;
- Federal Hard Costs;
- Non-Federal Hard Costs;
- Federal Soft Costs;
- Non-Federal Soft Costs;
- Discretionary Federal Soft Costs;
- Federal Emergency Repair Program;
- Local Emergency Repair Program;
- Toll Optimization CIP;
- Transit CIP;
- Construction salaries and related benefits; and
- Other construction program expenses.

Table 8.5: Highways – Source and Application of Funds 2023-2051 (All Figures in \$000 at 2022 Prices)

In \$ Thousands	FY2023	FY2024	FY2025	FY2026	FY2027	FY2023-27	FY2023-51
FHWA Funds	269,734	224,923	238,964	203,750	186,328	1,123,699	5,316,293
Main CW Capex Appropriation	53,761	54,370	55,027	55,797	56,600	275,555	1,949,014
Other CW State Funds	57,713	-	-	-	-	57,713	57,713
Federal Emergency Revenues	33,666	73,734	33,300	8,000	-	148,700	148,700
Capex FTA funds	39,353	20,640	17,100	43,362	17,646	138,101	663,845
Capital Contribution - Federal	309,087	245,563	256,064	247,113	203,974	1,261,801	5,980,138
Capital Contribution - State	111,474	54,370	55,027	55,797	56,600	333,268	2,006,727
Capital Contribution - Emergency	33,666	73,734	33,300	8,000	-	148,700	148,700
Capital Contribution	454,227	373,667	344,391	310,910	260,574	1,743,768	8,135,564
Right of Way	(6,200)	(4,013)	(4,013)	(4,013)	(4,076)	(22,316)	(143,223)
Local Construction	(1,000)	(9,500)	(9,500)	(9,500)	(9,647)	(39,148)	(325,339)
Federal Hard Costs	(245,239)	(204,968)	(219,749)	(185,068)	(167,357)	(1,022,380)	(4,652,174)
Non-Federal Hard Costs	(35,129)	(58,475)	(69,444)	(97,042)	(117,066)	(377,156)	(3,391,269)
Federal Soft Costs	(24,495)	(19,955)	(19,216)	(18,682)	(18,971)	(101,319)	(664,119)
Non-Federal Soft Costs	(44,051)	(54,384)	(59,756)	(58,607)	(41,842)	(258,639)	(1,238,489)

In \$ Thousands	FY2023	FY2024	FY2025	FY2026	FY2027	FY2023-27	FY2023-51
Discretionary Federal Soft Costs	(2,386)	-	-	-	-	(2,386)	(2,386)
Federal Emergency Repair Program	(33,666)	(73,734)	(33,300)	(8,000)	-	(148,700)	(148,700)
Local Emergency Repair Program	(7,431)	(4,400)	(1,400)	-	-	(13,231)	(13,231)
Toll Optimization CIP	(23,429)	(30,979)	-	-	-	(54,408)	(54,408)
Transit CIP	(39,753)	(21,040)	(17,500)	(43,762)	(18,046)	(140,101)	(675,445)
Construction Salaries and Related Benefits	(27,635)	(23,170)	(23,166)	(23,485)	(23,816)	(121,273)	(815,658)
Other Construction Program Expenses	(4,075)	(4,102)	(1,627)	(1,652)	(1,678)	(13,134)	(62,907)
Total Capital Expenses - Federal	(269,734)	(224,923)	(238,964)	(203,750)	(186,328)	(1,123,699)	(5,316,293)
Total Capital Expenses - State & Local	(109,810)	(157,351)	(142,713)	(169,162)	(172,631)	(751,667)	(5,152,729)
Total Capital Expenses - Transit	(39,753)	(21,040)	(17,500)	(43,762)	(18,046)	(140,101)	(675,445)
Total Capital Expenses - Emergency	(41,097)	(78,134)	(34,700)	(8,000)	-	(161,931)	(161,931)
Total Capital Expenses	(494,490)	(508,720)	(458,671)	(449,812)	(402,498)	(2,314,191)	(12,187,349)

Source: 2022 PRHTA Fiscal Plan (Approved on October 14, 2022)

Transit Funds and Capex

Under BIL, US Congress establishes the funding for FTA programs through authorizing legislation by amending Chapter 53 of Title 49 of the U.S. Code. The BIL authorizes up to \$108 billion to support federal public transportation programs, including \$91 billion in guaranteed funding. It largely maintains current program structures and funding shares between highways and transit.

BIL transit program established several important goals, including safety, state of good repair, performance, and program efficiency. It also provides the Federal Transit Administration (FTA) significant resources to strengthen the safety of public transportation systems throughout the United States. The Act also establishes a new needs-based formula program and new asset management requirements.

Under BIL, the following programs were established:

- All Stations Accessibility Program,
- Electric or Low Emitting Ferry Pilot Program,
- Ferry Service for Rural Communities, and
- State of Good Repair and Rail Vehicle Replacement Program.

FTA funding allocations to grantees in Puerto Rico are from the following sections:

- Metropolitan Planning and Statewide Planning and Research Programs (Section 5305(d) and (e) to implement Section 5303 and Section 5304) - These programs provide federal assistance to support cooperative, continuous, and comprehensive planning for making transportation investment decisions in metropolitan areas and statewide.

- Urbanized Area Formula Program (Section 5307), including a Passenger Ferry Grant Program (Section 5307(h)). The Urbanized Area Formula Program makes federal resources available to urbanized areas for transit planning, capital, and operating assistance in urbanized areas. An urbanized area is an area encompassing a population of not less than 50,000 people that has been defined and designated in the most recent decennial census as an “urbanized area” by the Secretary of Commerce.
- Enhanced Mobility of Seniors and Individuals with Disabilities Formula Program (Section 5310). The goal of the Section 5310 program is to improve mobility for seniors and individuals with disabilities throughout the country by removing barriers to transportation services and expanding the transportation mobility options available.
- Rural Areas Formula Program (Section 5311). The Rural Areas Formula Program is a formula grant program that provides capital, planning, and operating assistance to states and Indian tribes to support public transportation in rural areas with populations of less than 50,000, where many residents often rely on public transportation to reach their destinations.
- Public Transportation Safety Program (Section 5329). The Public Transportation Safety Program, Section 5329, requires DOT to create and implement a national safety plan for all public transportation system recipients of 49 U.S.C. Chapter 53 funds.
- State of Good Repair Formula Program (Section 5337). The State of Good Repair Grants Program is authorized by 49 U.S.C. 5337. The Secretary may make grants under this section to assist state and local governmental authorities to develop and implement a transit asset management plan (TAM).
- Buses and Bus Facilities Program (Section 5339). The Grants for Buses and Bus Facilities program (49 U.S.C. § 5339) makes federal assistance available to states and eligible recipients to replace, rehabilitate and purchase buses and related equipment and to construct bus-related facilities including technological changes or innovations to modify low or no-emission vehicles or facilities.

The information in the following table includes the most recent apportionments for formula programs (FFY23) published on January 27, 2023 from FTA, totalling \$93,325,428.

Table 8.6: Most Recent Apportionments for Formula Programs (FFY23)

FTA Section	Description	Apportionment
5303	Metropolitan Planning	\$ 2,293,525
5304	Statewide Planning	\$ 468,948
5307 + 5340	Urbanized Area Formula	\$ 62,946,636
	Enhanced Mobility for Older	
5310	Adults and People with Disabilities	\$ 7,277,091
5311 + 5340	Nonurbanized Area Formula	\$ 2,834,011
5311(b)(3)	RTAP	\$ 110,910
5337	State of Good Repair	\$ 11,101,170
	Bus and Bus Facilities	
5339	Formula	\$ 5,677,464
5329	State Safety Oversight	\$ 615,673

Source: FTA, 2023

Capital Cost Estimates

A list of potential projects for inclusion in the MLRTP was prepared based on:

- Municipalities needs to comply with their land use and transport plans;
- Rehabilitation of highway infrastructure needs in coordination with TAMP strategies;
- Existing projects requiring further investments; and
- Projects included in 2045 LRTP that are in the pipeline.

Approach

The prioritization approach and the funding allocation for specific projects follow two trends: one for SOGR projects and another for Non-SOGR projects. As previously indicated, the priority of the PRHTA, documented in the current STIP and Fiscal Plan, is to assign available federal and state funds for SOGR initiative. In that regard, priorities are established based on asset conditions and strategies to extend the life cycle of those assets, as indicated in the TAMP. Additionally, the following federal requirements apply:

- Of allocated funds, 25% shall be assigned to Safety Projects. Project selection is based on SHSP strategies, the high crash location identification, and the benefit/cost ratio;
- Pavement and Safety Penalties – Not meeting the objectives included in the TAMP or SHSP results in set-asides for specific federal fund use in certain corridors;
- Of allocated funds, 50% shall be assigned to projects in the NHS; and
- And the Priorities for SOGR and Non-SOGR, based on priorities from USDOT in the case of discretionary grants from USDOT. For non-SOGR, the prioritization process will be to select candidates for discretionary grant applications.

The PRHTA continuously monitors and updates its plans and strategies to optimize the use of federal and state funds for SOGR (i.e., SHSP, TAMP, NBIS), and project priorities are modified accordingly. Strategies include preservation interventions, as well as reconstruction. The TAMP includes deterioration models to predict the remaining service life of the assets and to better forecast future priorities and KPI results. Nevertheless, priority shall be given to infrastructure in critical conditions (i.e., Bridge with Critical findings).

The list of non-SOGR potential projects was analyzed based on the priorities defined for the Goals and Objectives of this 2050 MLRTP, giving higher priority to projects already programmed in the STIP. The projects were then ranked (the methodology applied is described in Appendix H). The project identification and ranking process were discussed in detail with the Technical Committee and the leadership of the PRHTA. For those projects not programmed in the STIP, the prioritization process will be used for assigning soft costs for pre-construction efforts (Feasibility Study, environmental document, preliminary PE, etc.). The final selection of those projects will be directly dependent upon the P3 feasibility, as well as the requirements from the agency providing the discretionary grant opportunity. With the objectives of maximizing the award of discretionary grants, the PRHTA will continuously evaluate the available sources of discretionary grant and the eligibility requirements to submit grant applications for projects that better match the grant objectives.

Source Data

Project Details

A wide range of projects have been included in the MLRTP, covering investments in the following categories:

- SOGR (including preservation, reconstruction or replacement) related to pavement, bridges and highway safety;
- Non-SOGR, including:
 - Highway Capacity Enhancement or New Construction;
 - Highway Congestion Management; and
- Complete Street Initiatives

In each case, information is provided including a description of the project, and key statistics regarding the scale and scope of the project.

Costs

Estimated costs associated with the project metrics have been developed based on:

- Costs associated with project metrics included within the PRHTA current Transportation Asset Management Plan (TAMP);
- Estimates of capital costs associated with projects included within the Statewide Transportation Improvement Program (STIP), Fiscal Years 2023-2026, Amendment #1 report, April 20, 2023; and
- Estimates of capital costs from recent bids within the PRHTA Capital Improvement Program (CIP) database.

The reference costs are intended to reflect the latest estimates at 2022 prices, recognizing that, in that regard, there is high volatility in the construction industry due to the lack of materials and resources, as well as the increase in cost for imported materials. Additionally, there is a high demand for construction services from non-transportation related ER programs, which are ramping up quickly.