PUERTO RICO
HIGHWAYS & TRANSPORTATION
AUTHORITY

New SHSP 2024-2028 & Vulnerable Road Users Assessment

Meeting Metro and North Region
September 7, 2023

SHSP
STRATEGIC HIGHWAY SAFETY PLAN

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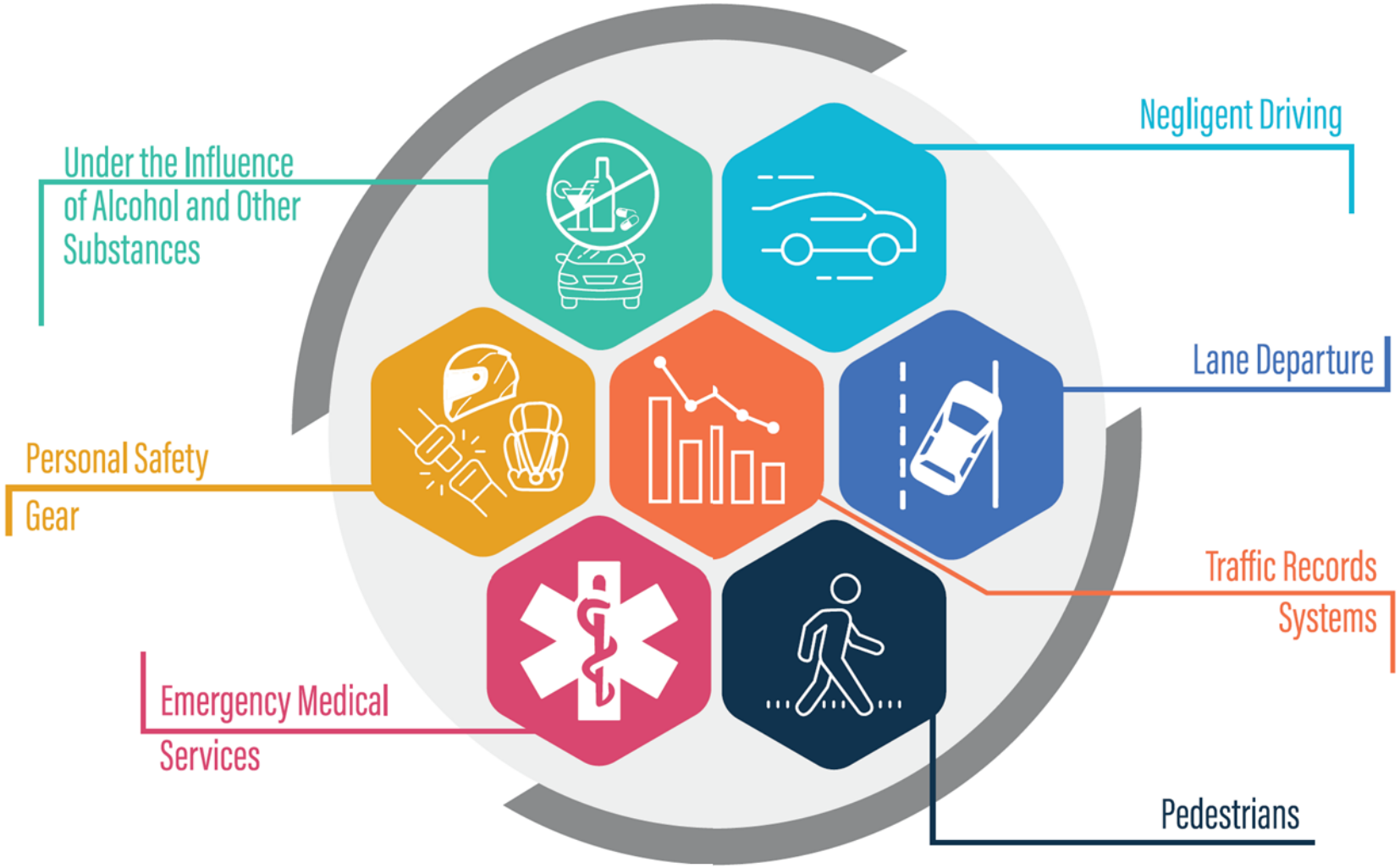
SHSP 2024-2028
Overview

SHSP
STRATEGIC HIGHWAY SAFETY PLAN

Current 2019-2023 Emphasis Areas



New Emphasis Areas (2024-2028)

High Priority Areas

- Vulnerable Road Users
- Speed Management
- Impaired Driving
- Occupant Protection
- Lane Departure
- Communication Integration

Focus Areas

- Traffic Records Systems
- Motorcyclists
- Aging Drivers (65+)
- Legislations & Procedures

The Safe System Approach

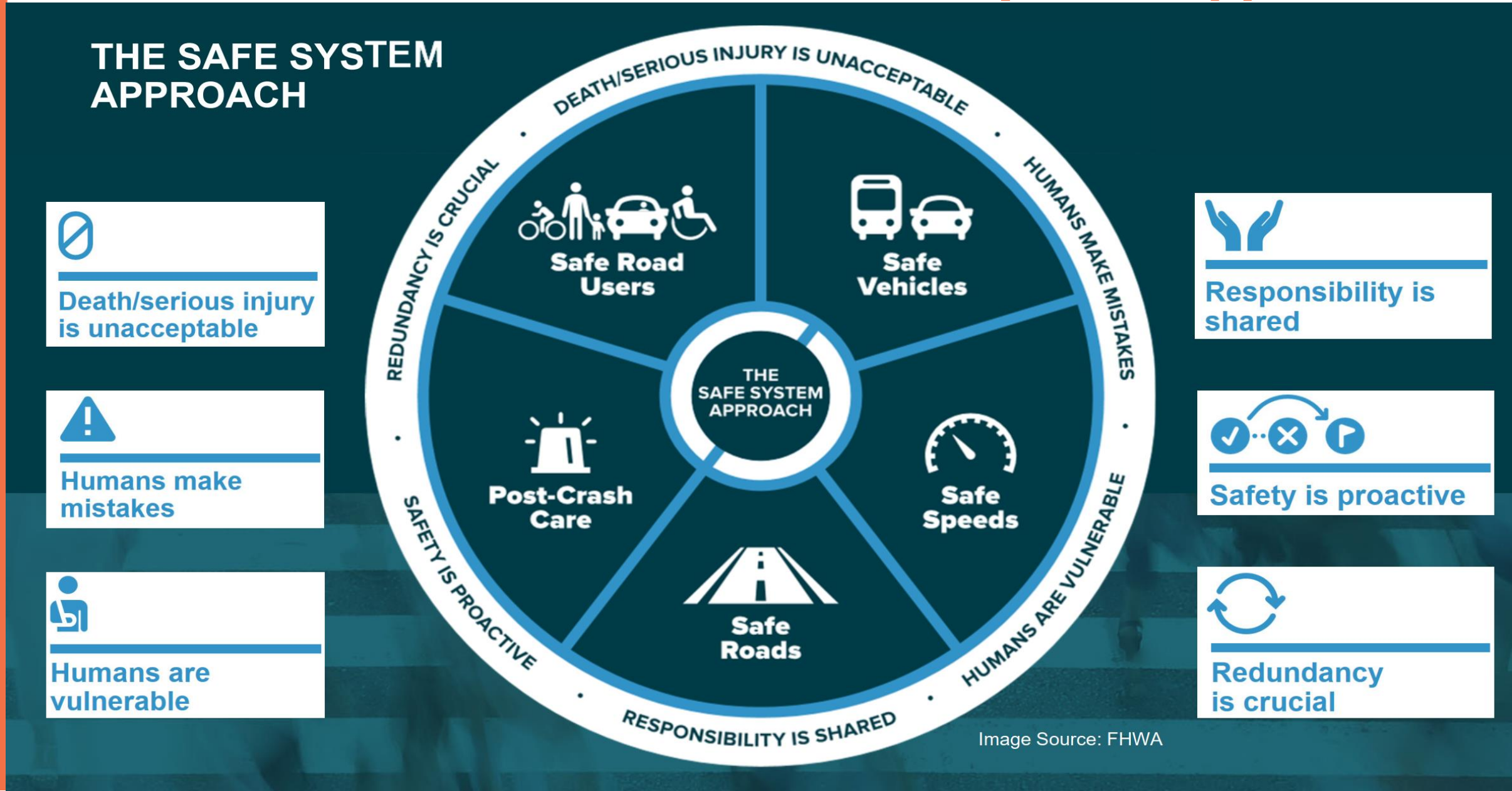
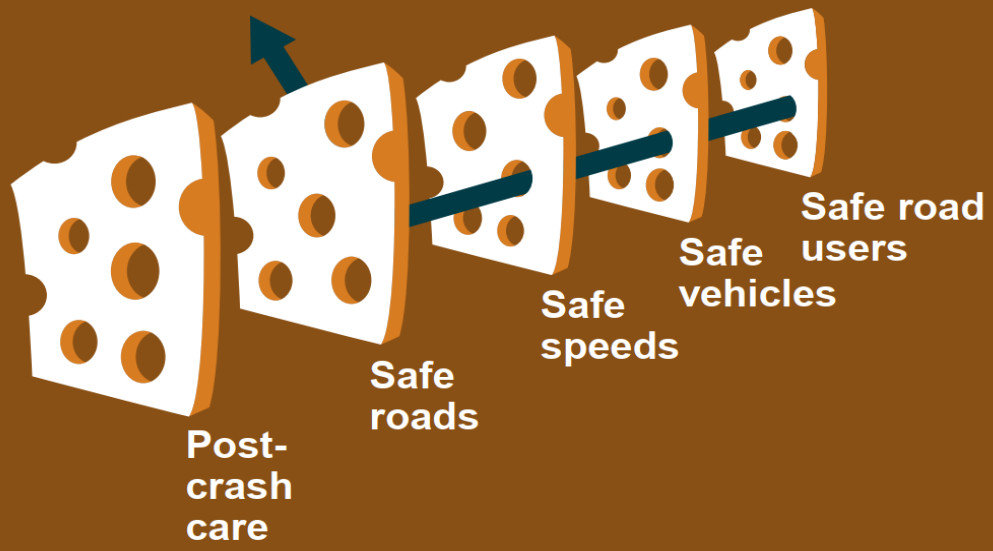


Image Source: FHWA

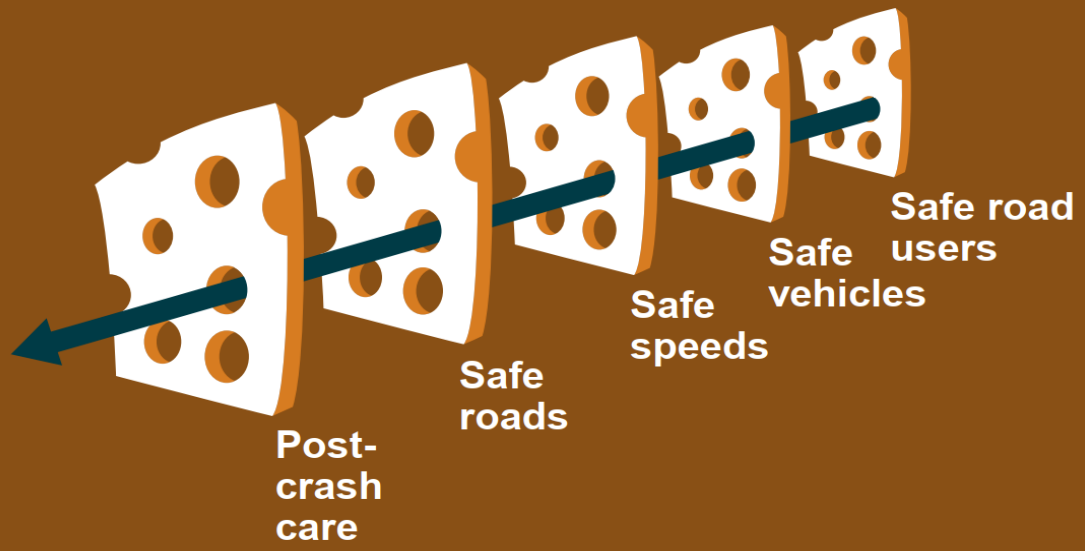
The Safe System Approach (Cont.)

THE 5 SAFE SYSTEM ELEMENTS CREATE REDUNDANCY

The "Swiss Cheese Model" of redundancy creates layers of protection



Death and serious injuries only happen when all layers fail



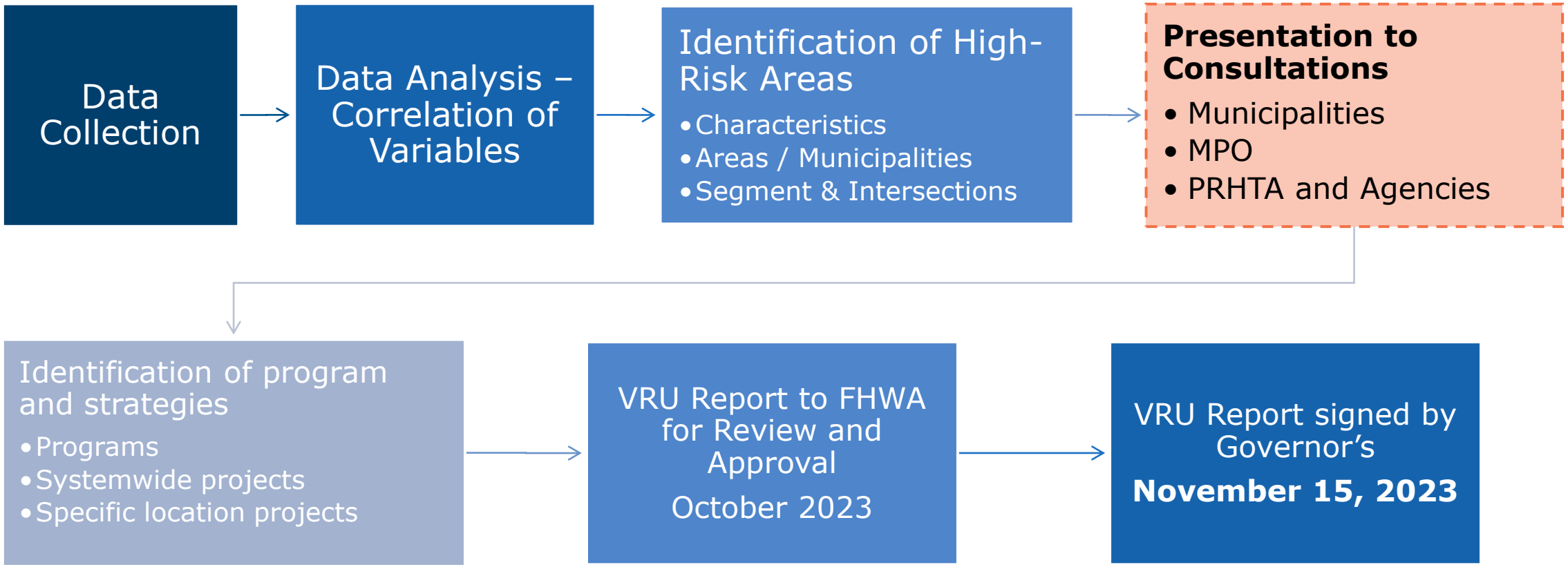
Source: FHWA

2

VRU Assessment:
Development Process

SHSP
STRATEGIC HIGHWAY SAFETY PLAN

Development Process



PR VRU Assessment Data

Data Base

Crash Data (Observatorio de Seguridad Vial OSV)

- 2019 to 2022
- Fatal and Severe Injury
- Pedestrian and Bikes
- Age of Victim
- Time of Day
- Month
- Location
- Intersection vs Non intersection

Highway Performance Monitoring System (HPMS)

- Functional Classification
- Speed
- Annual Average Daily Traffic (AADT)
- Number of Lanes
- Kilometers of road by area

PR VRU Assessment Data (Cont.)

Data Base		
	Geographic Area 	Urban vs Rural
		PRHTA Regional Areas
		DTPW Areas
		Municipalities
	Transit 	Bus routes (AMA) and stop locations
		Transit route (TU) and stop locations
	Census 	Population
		Ethnicity and Race
		Income
		Zero Car Households
		Disability

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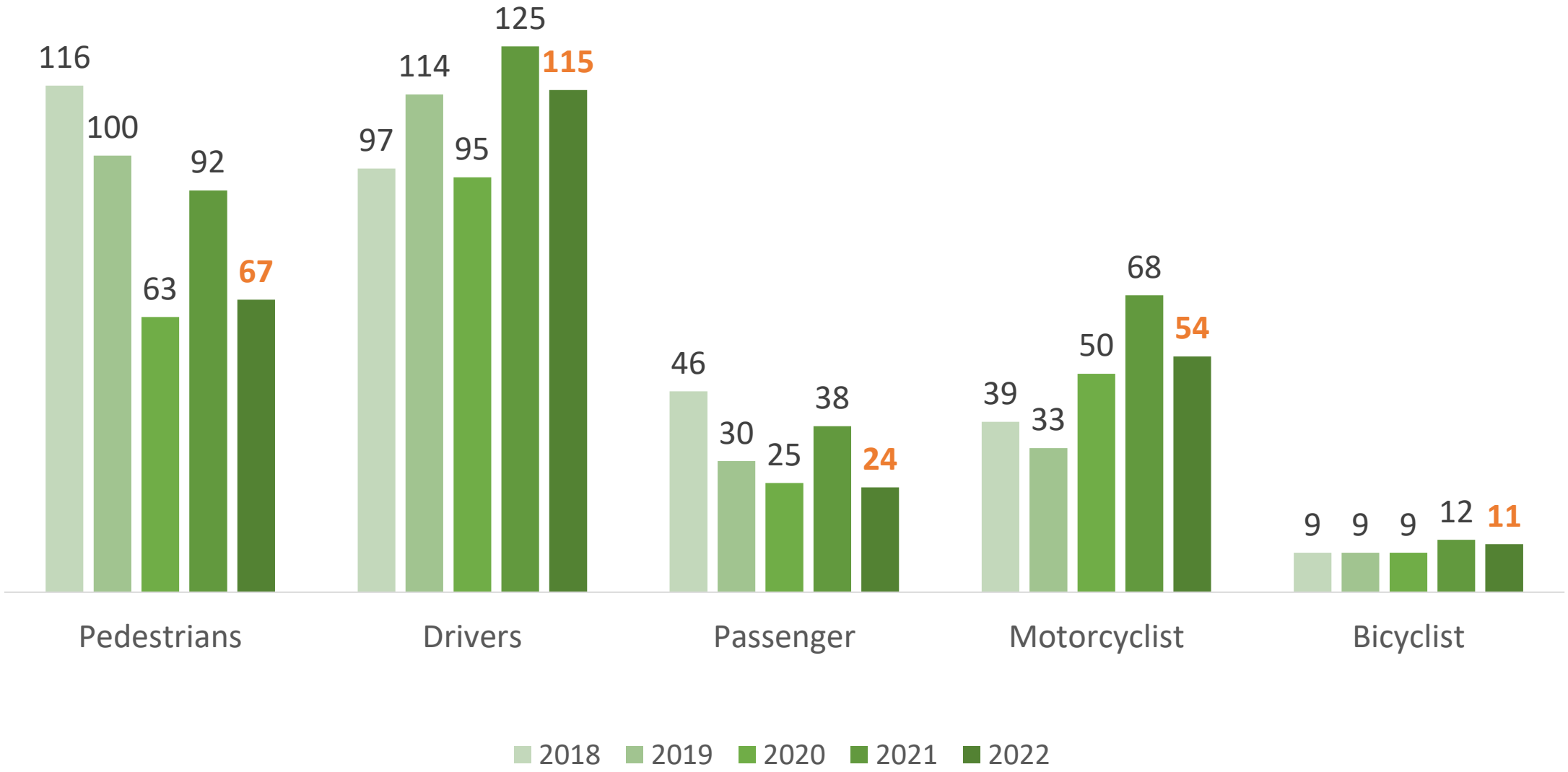
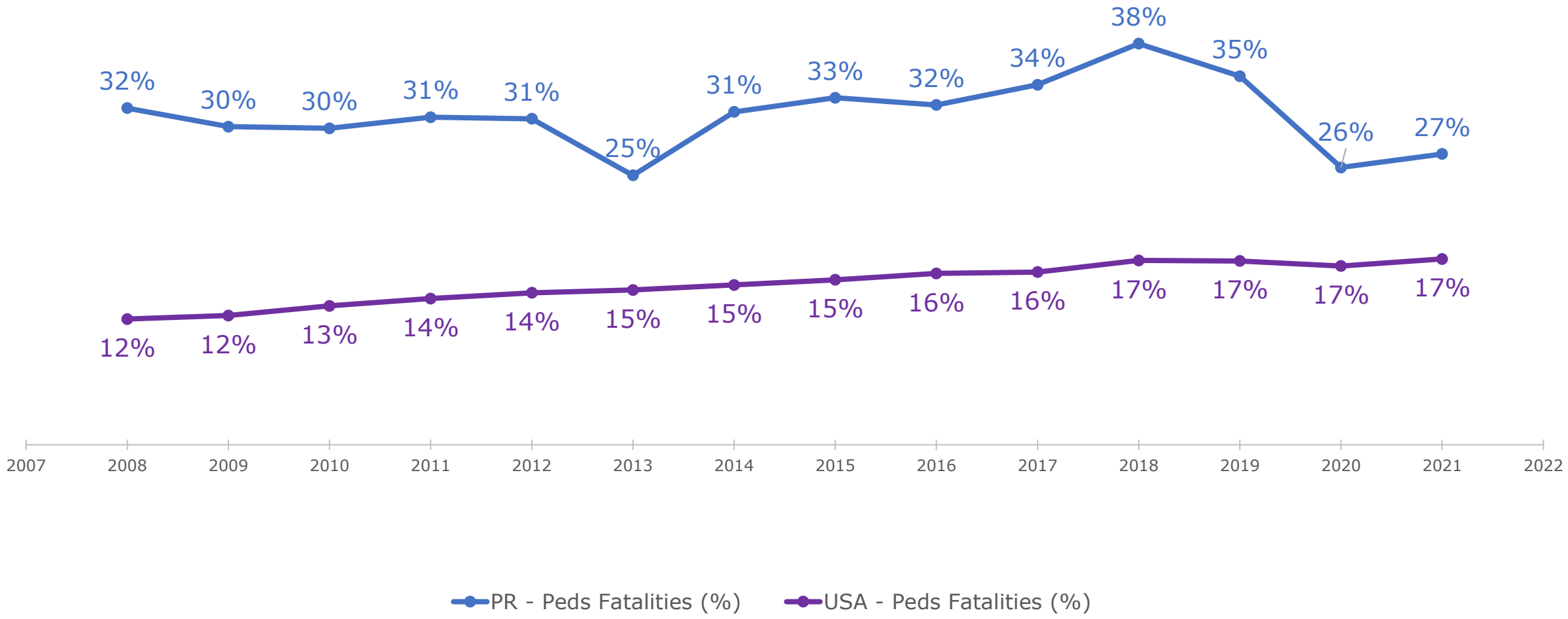
VRU Assessment:
Preliminary Results

SHSP
STRATEGIC HIGHWAY SAFETY PLAN

PR Fatalities by Users



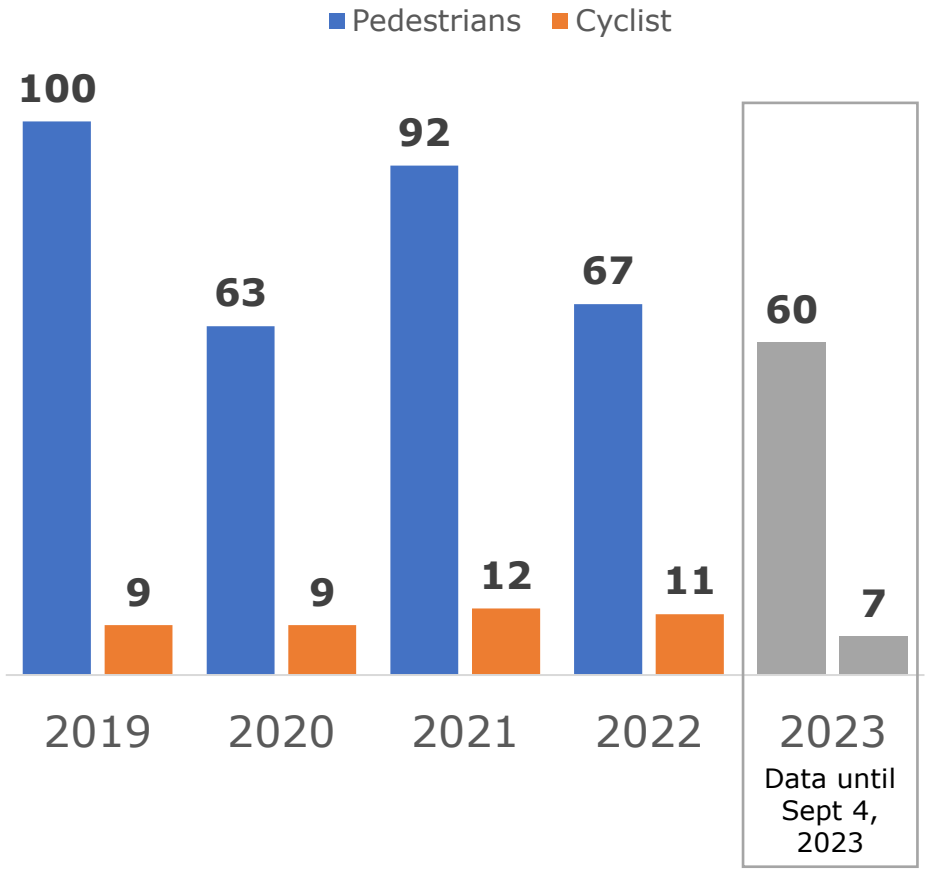
Pedestrian Fatality Percent (PR vs US)



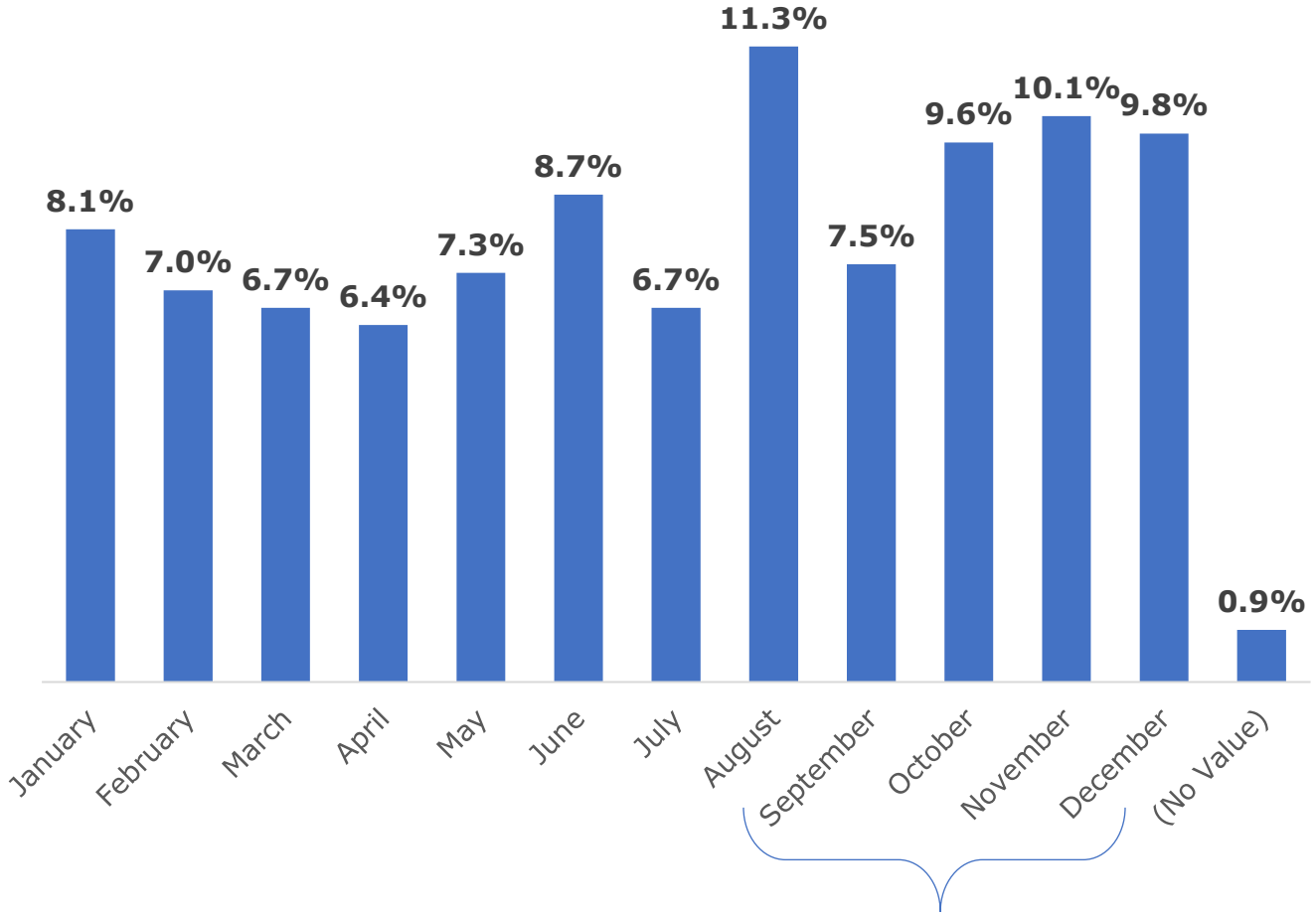
PR VRU Data Results

Fatal & Severe

VRU Fatalities by Year



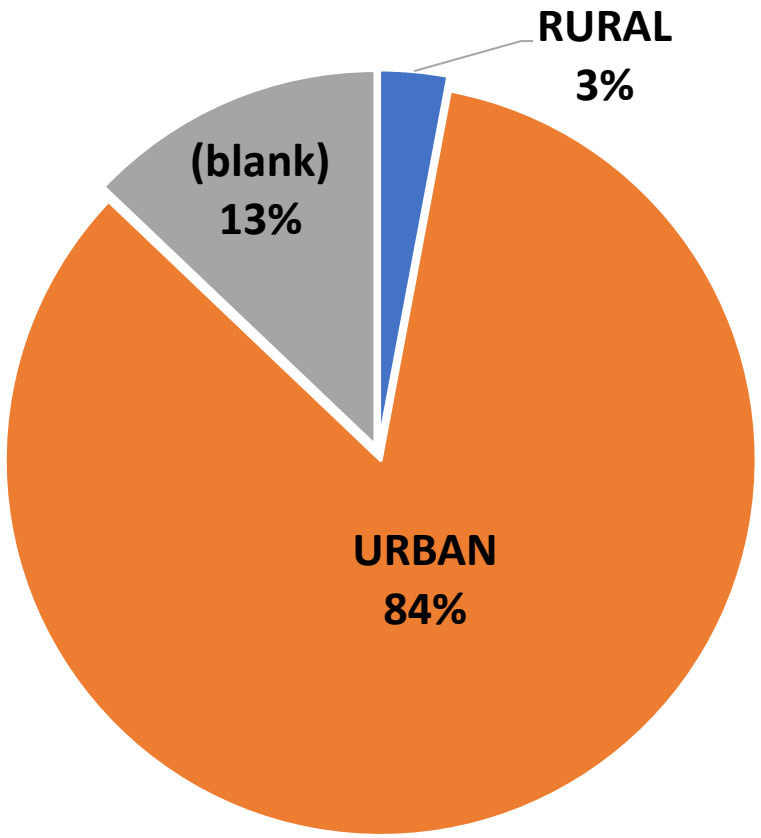
VRU Crash Data by Month



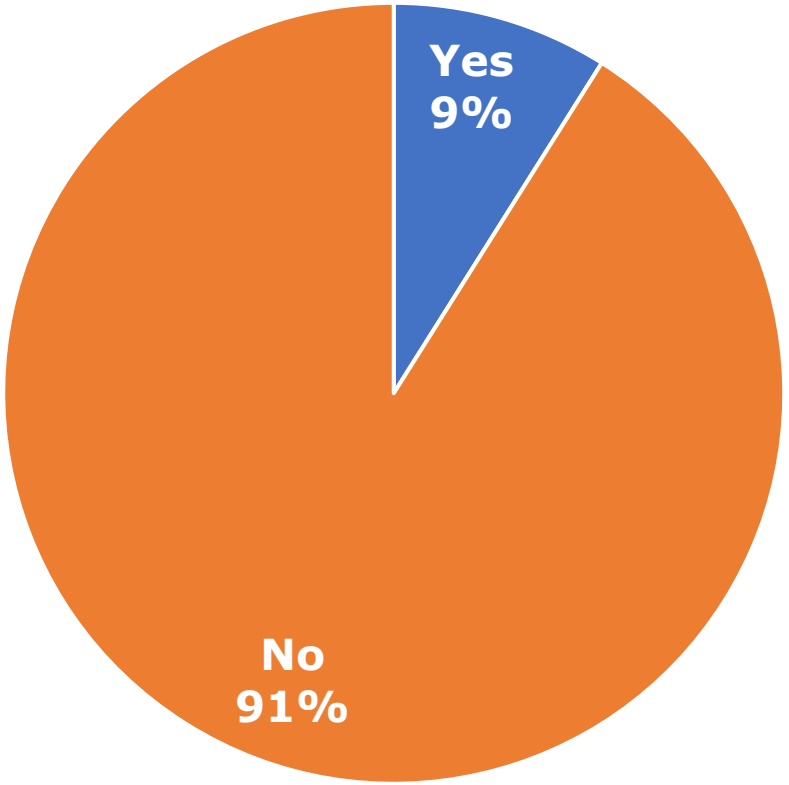
September to December 37%

Urban vs Rural and Intersection

VRU Crashes Urban vs Rural

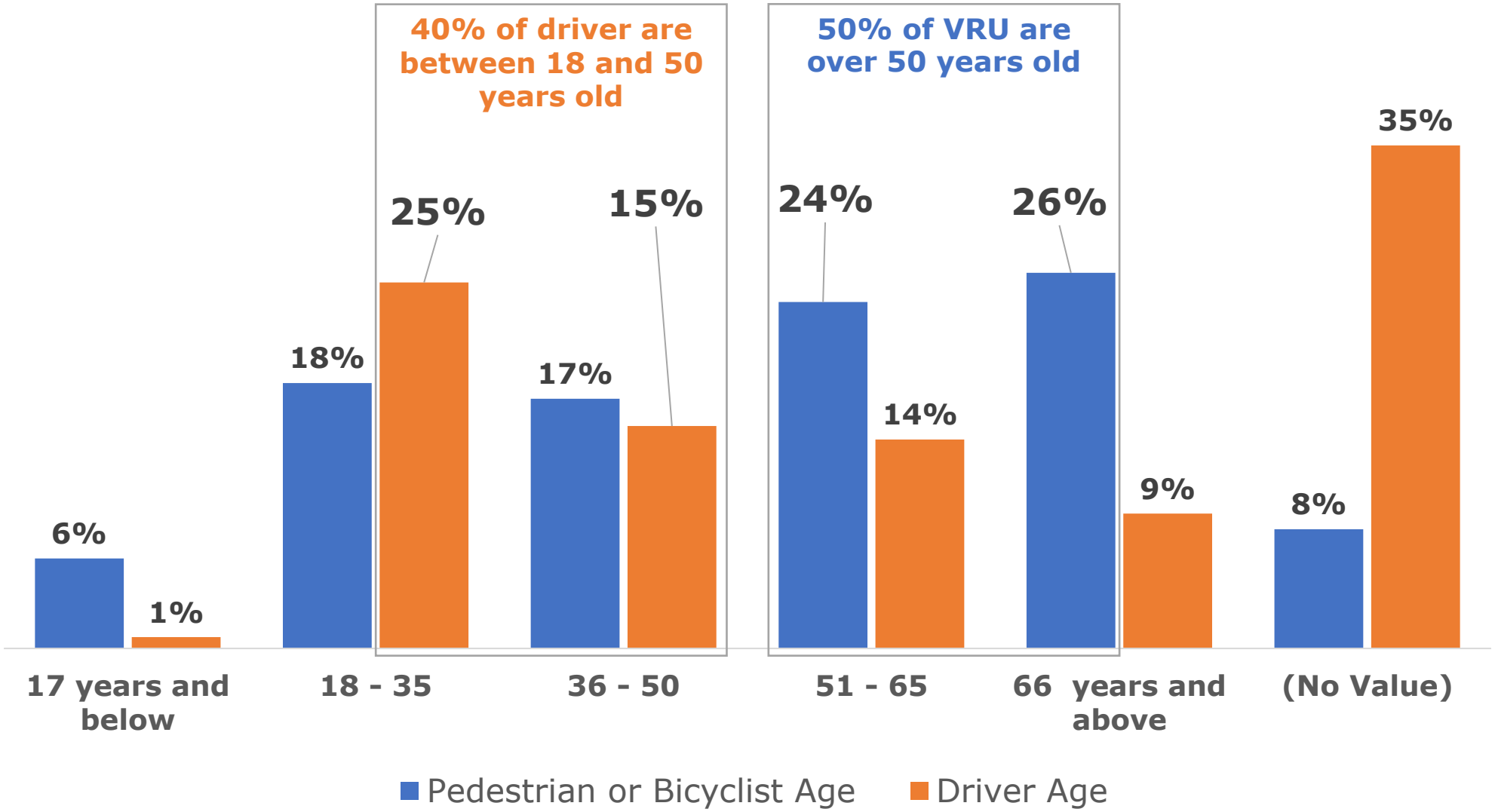


Intersection Related Crashes

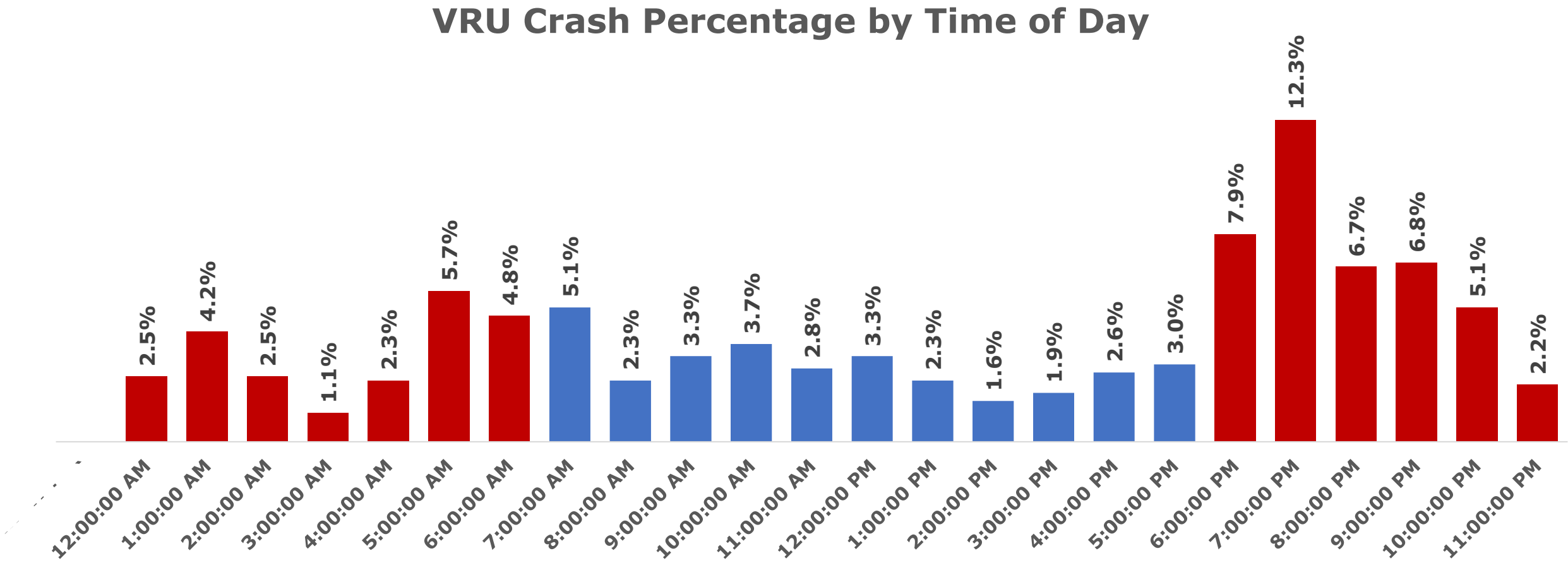


VRU Age vs. Driver Age

Fatal & Severe



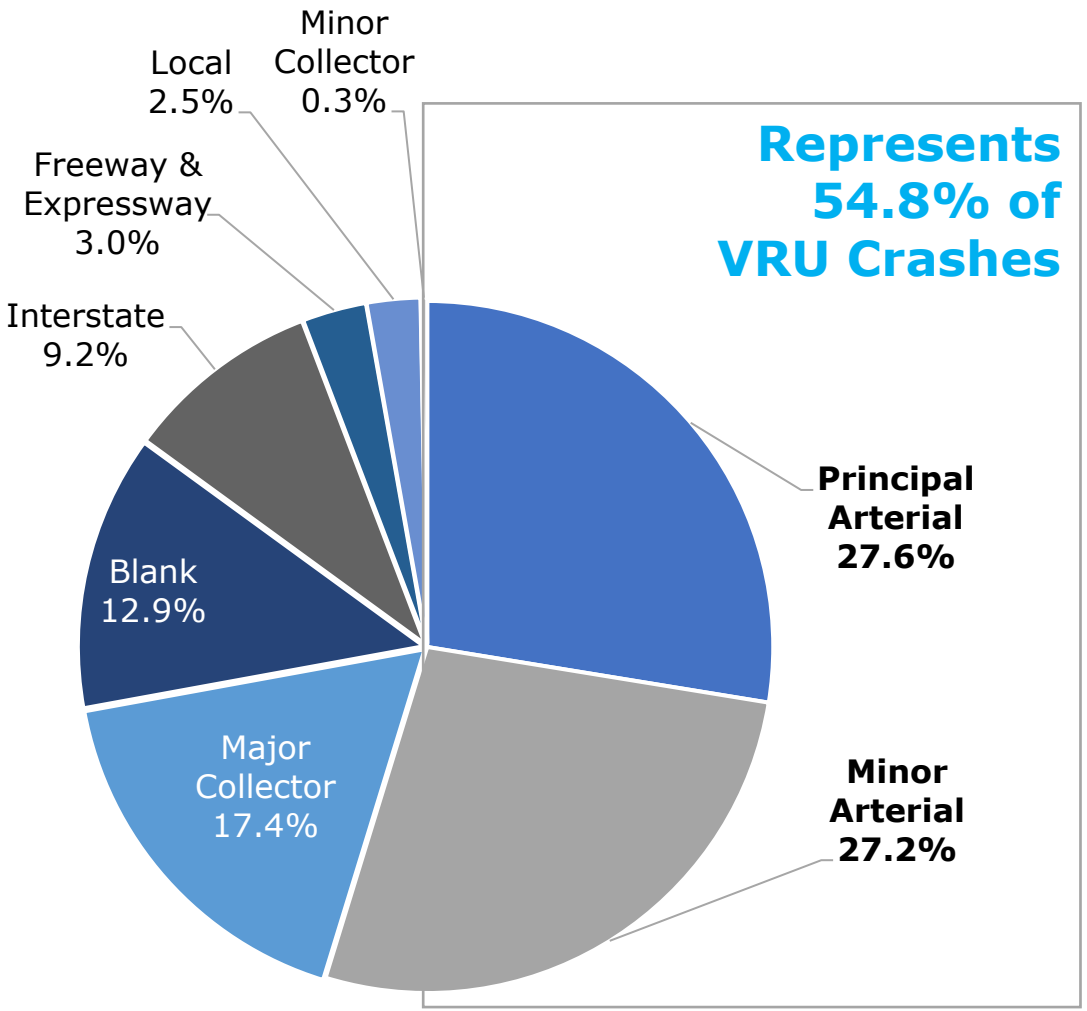
Time of Day



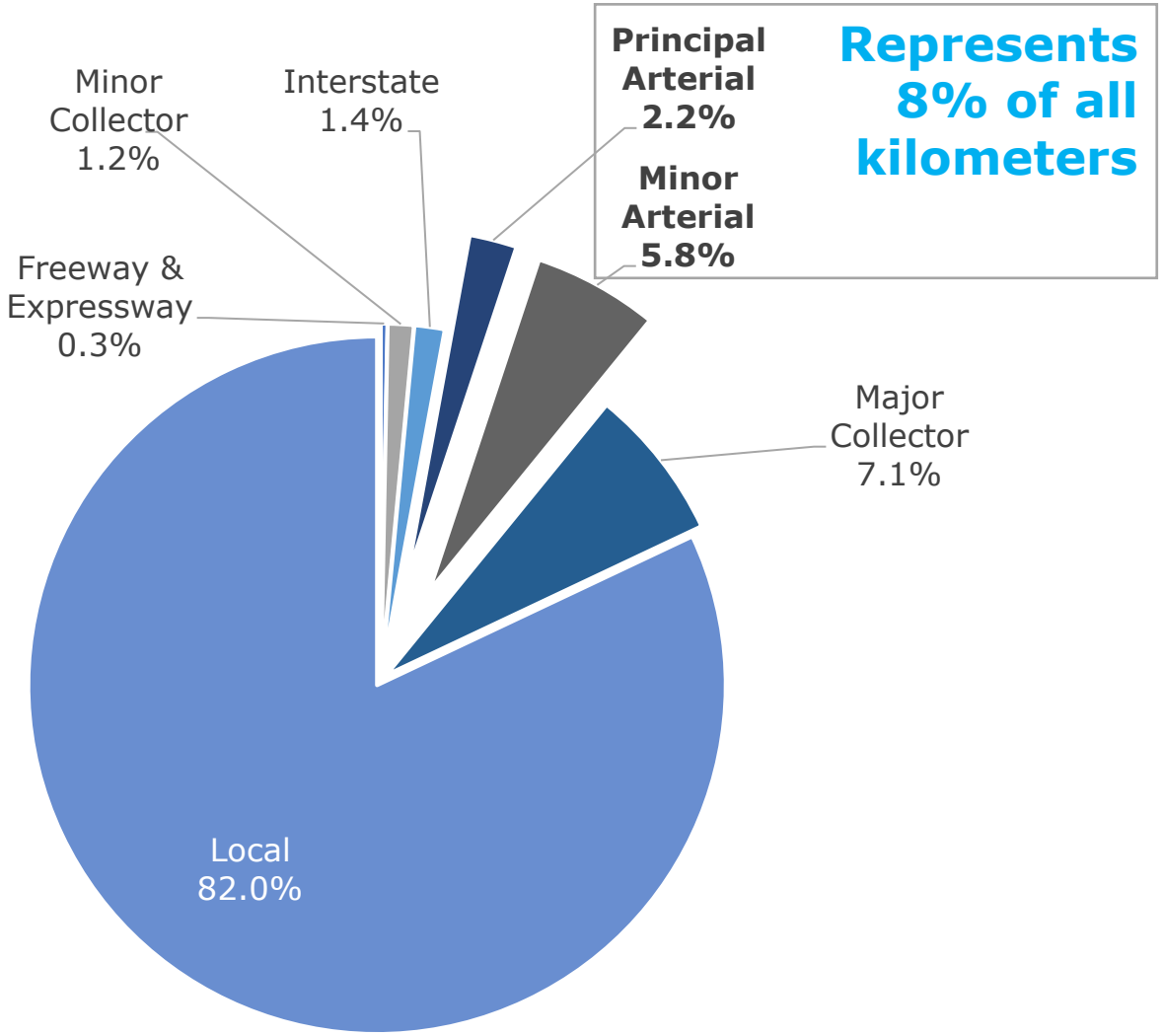
59% of VRU Fatal and Severe occurred from 6:00pm to 6:00am (i.e., nighttime conditions)

Roadway Functional Classification

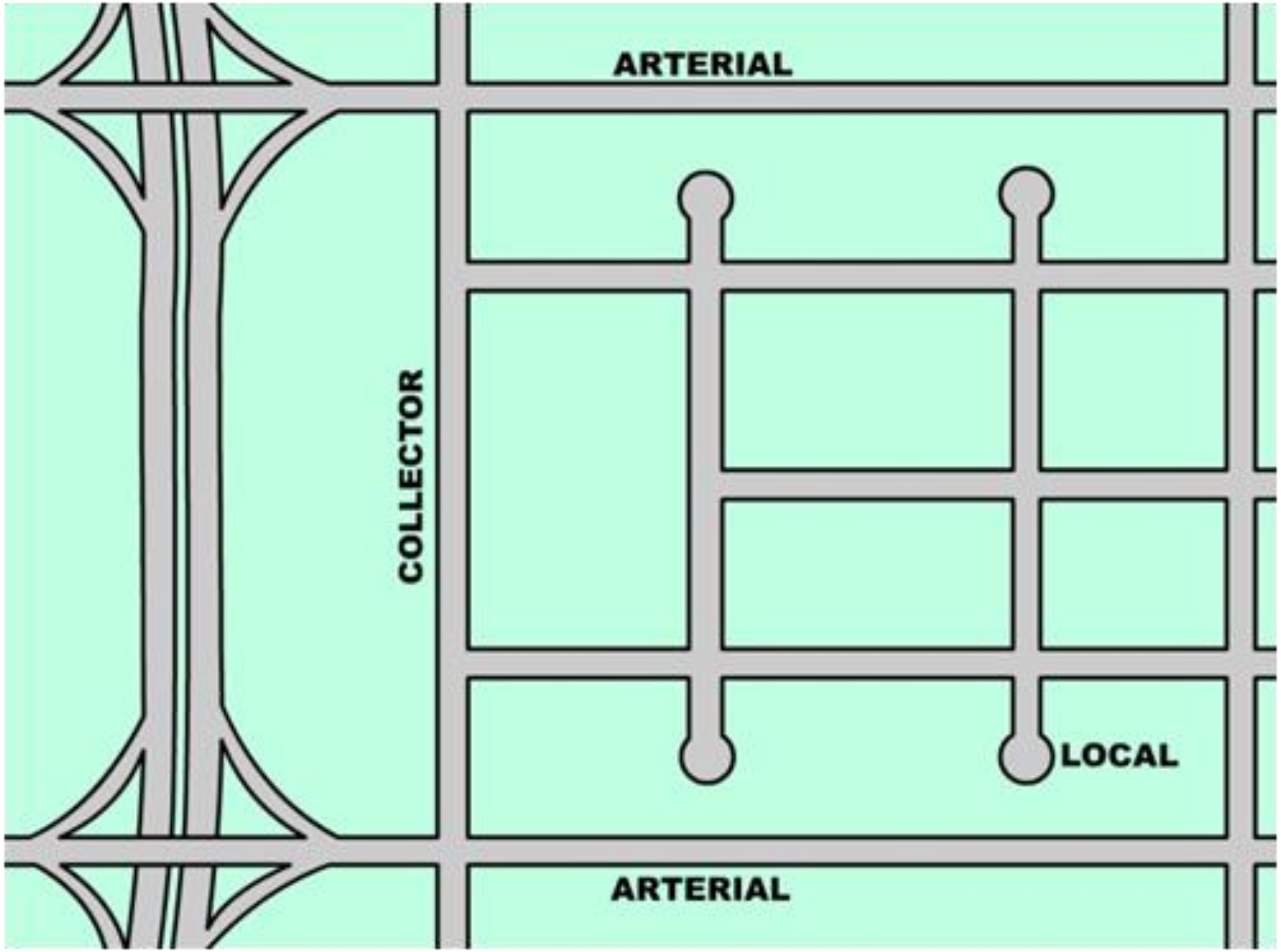
VRU Crash Percentage vs Functional Classification



Kilometers % vs Functional Classification



Roadway Functional Classification



Principal and Minor Arterials:

- Mid-high volume roads
- 2 or more lanes
- Major intersections some with signal controlled
- Direct vehicular access to properties from the road
- Some sidewalk presence
- No cycling infrastructure

Roadway Functional Classification

PR 2 – Manati Source: Google Maps

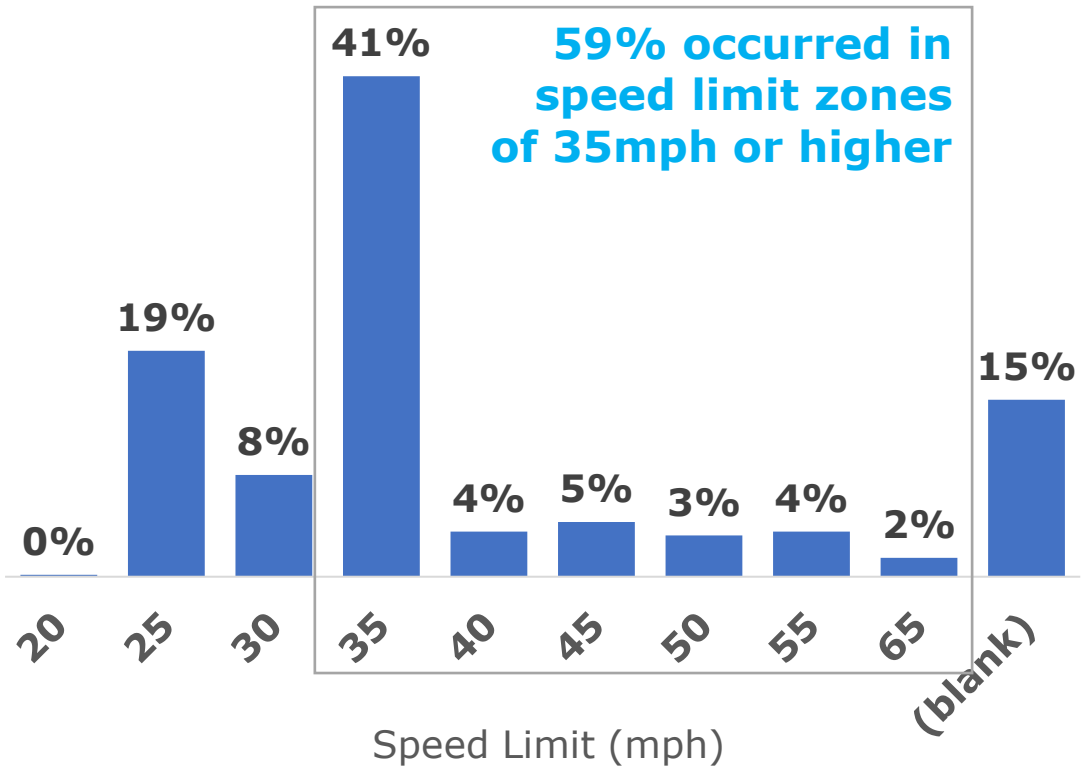
PR 3 – Carolina Source: Google Maps

PR 866 – Toa Baja Source: Google Maps

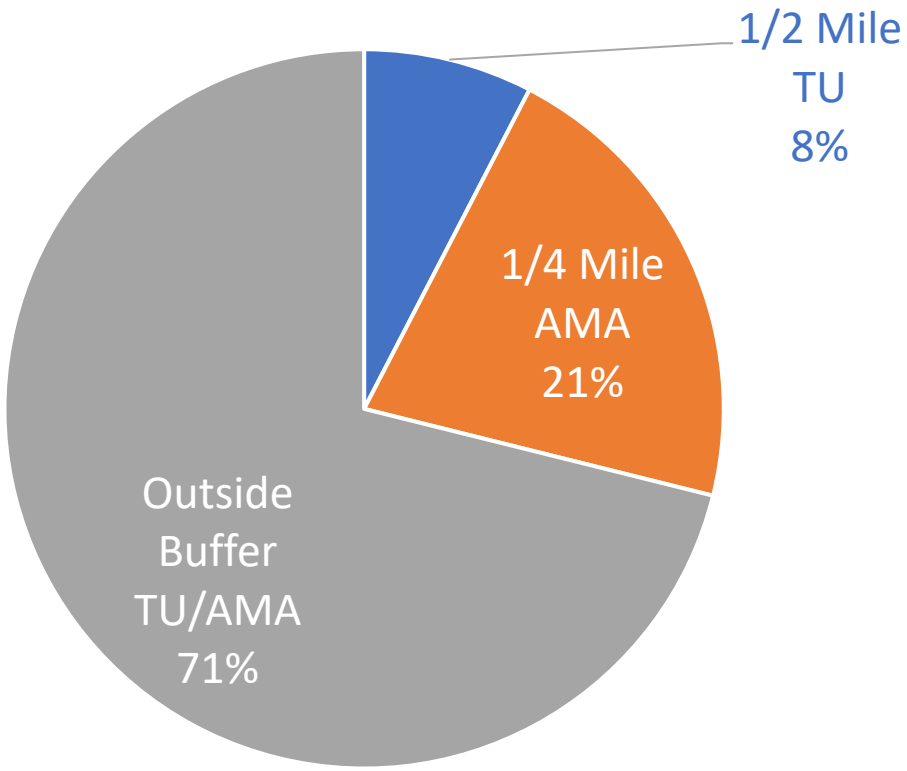
PR 27 – San Juan Source: Google Maps

Speed Limit and Transit

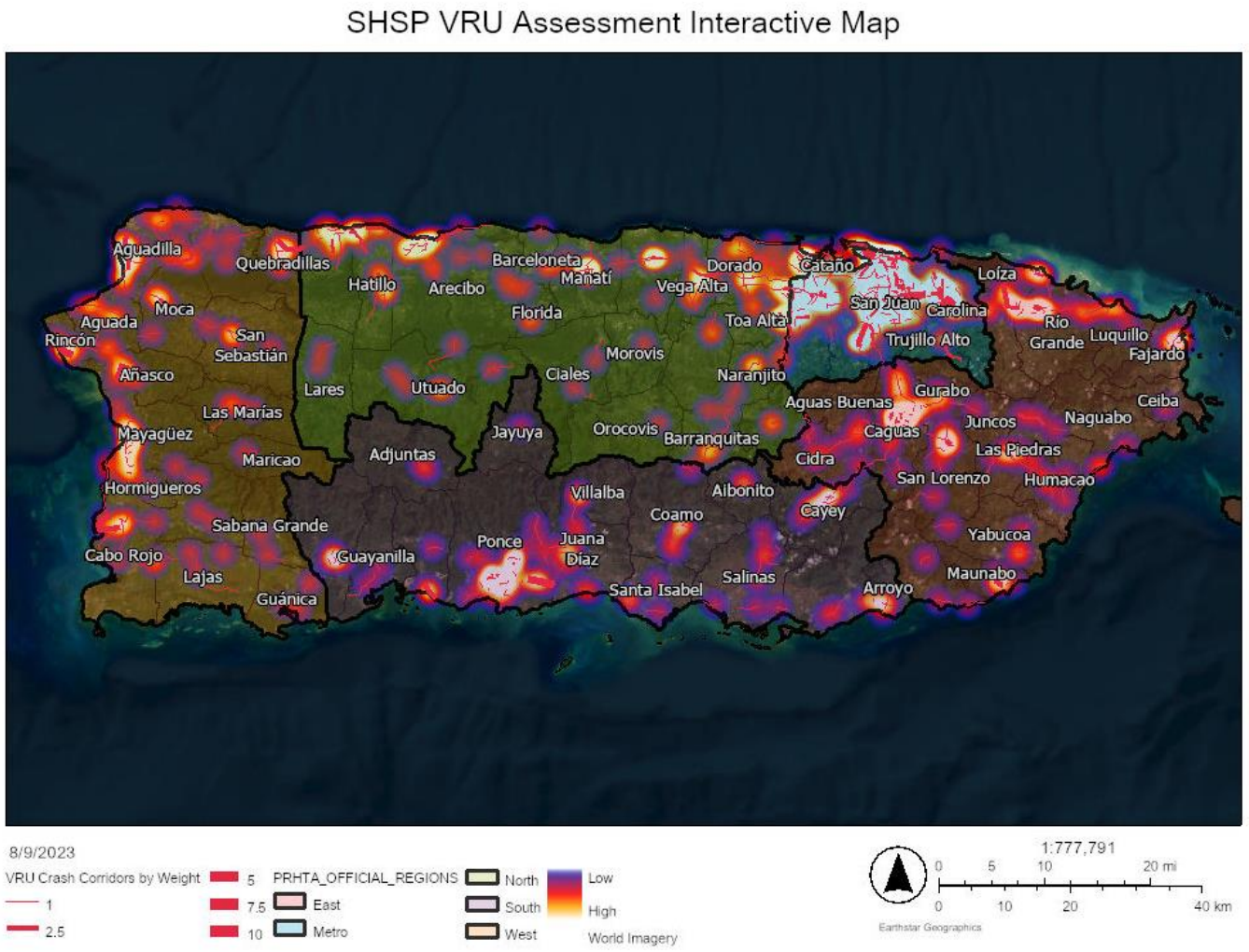
VRU Crash Percentage by Speed Limit



VRU Crashes and Transit Stops



VRU High-Risk Areas



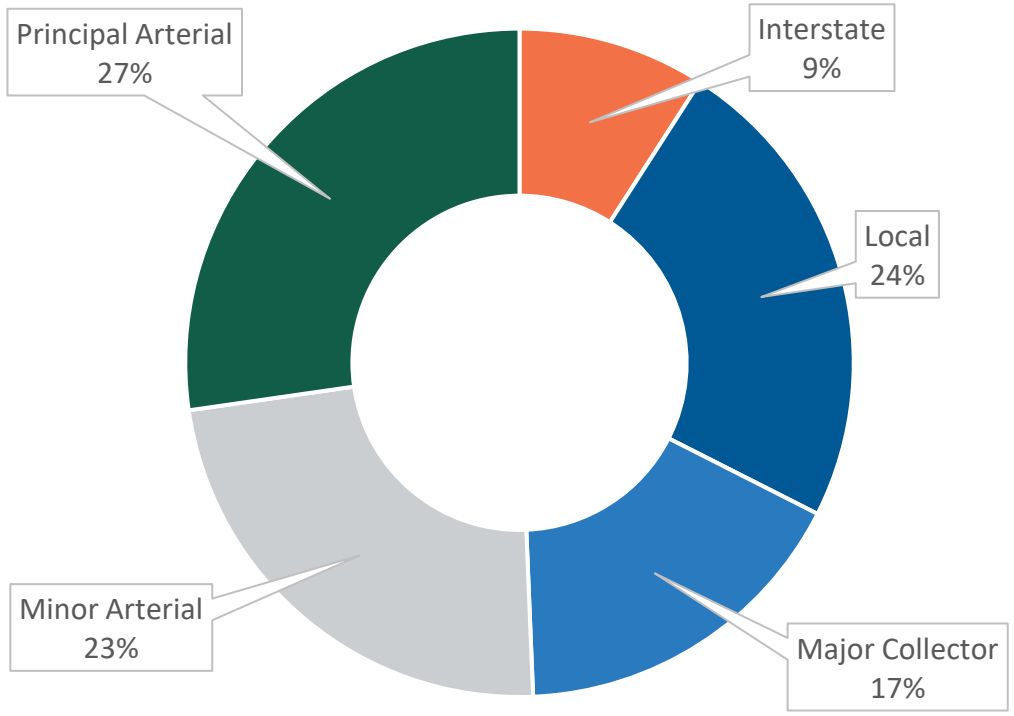
Areas

- By PRHTA Region
- Population
- Kilometers
- Hundred Million Vehicle Miles Travel

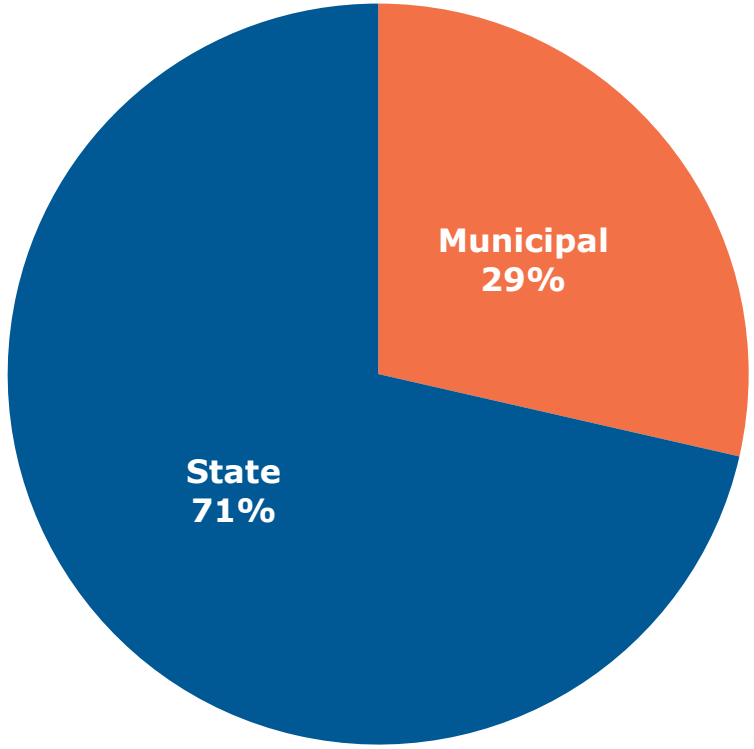
[SHSP VRU Assessment Interactive Map (arcgis.com)]

VRU North Region

PRHTA North Region Functional Classification

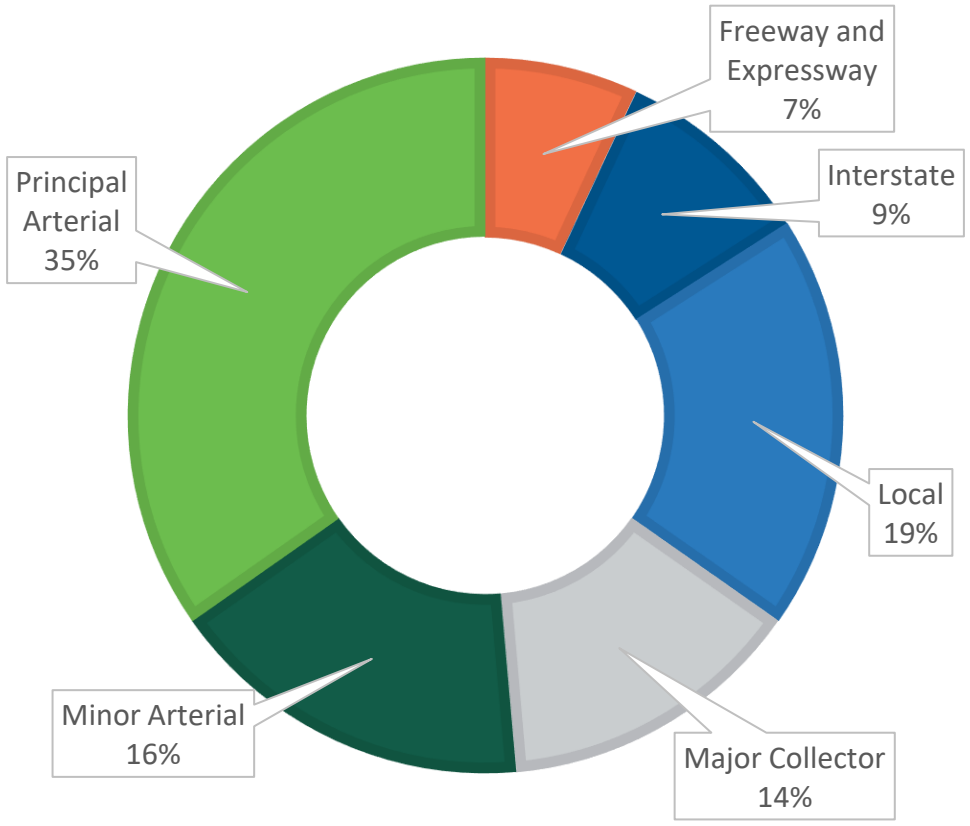


PRHTA North Region Jurisdiction

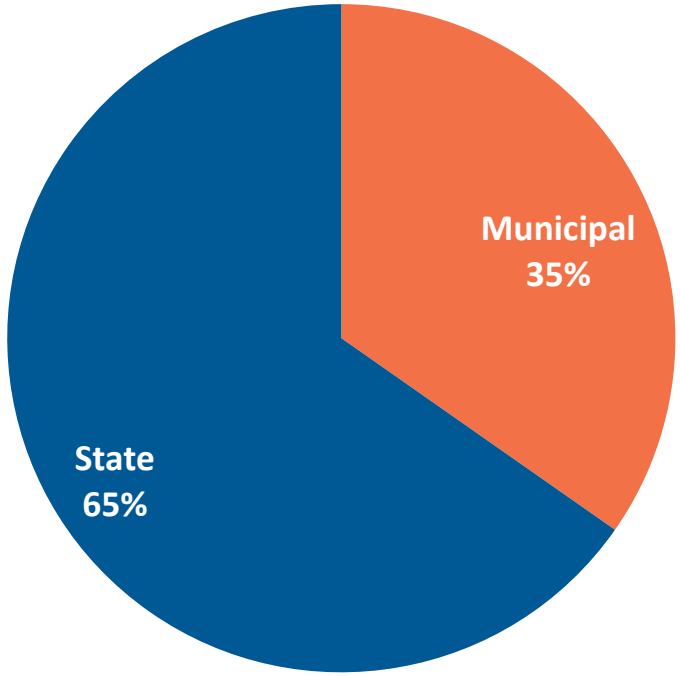


VRU Metro Region

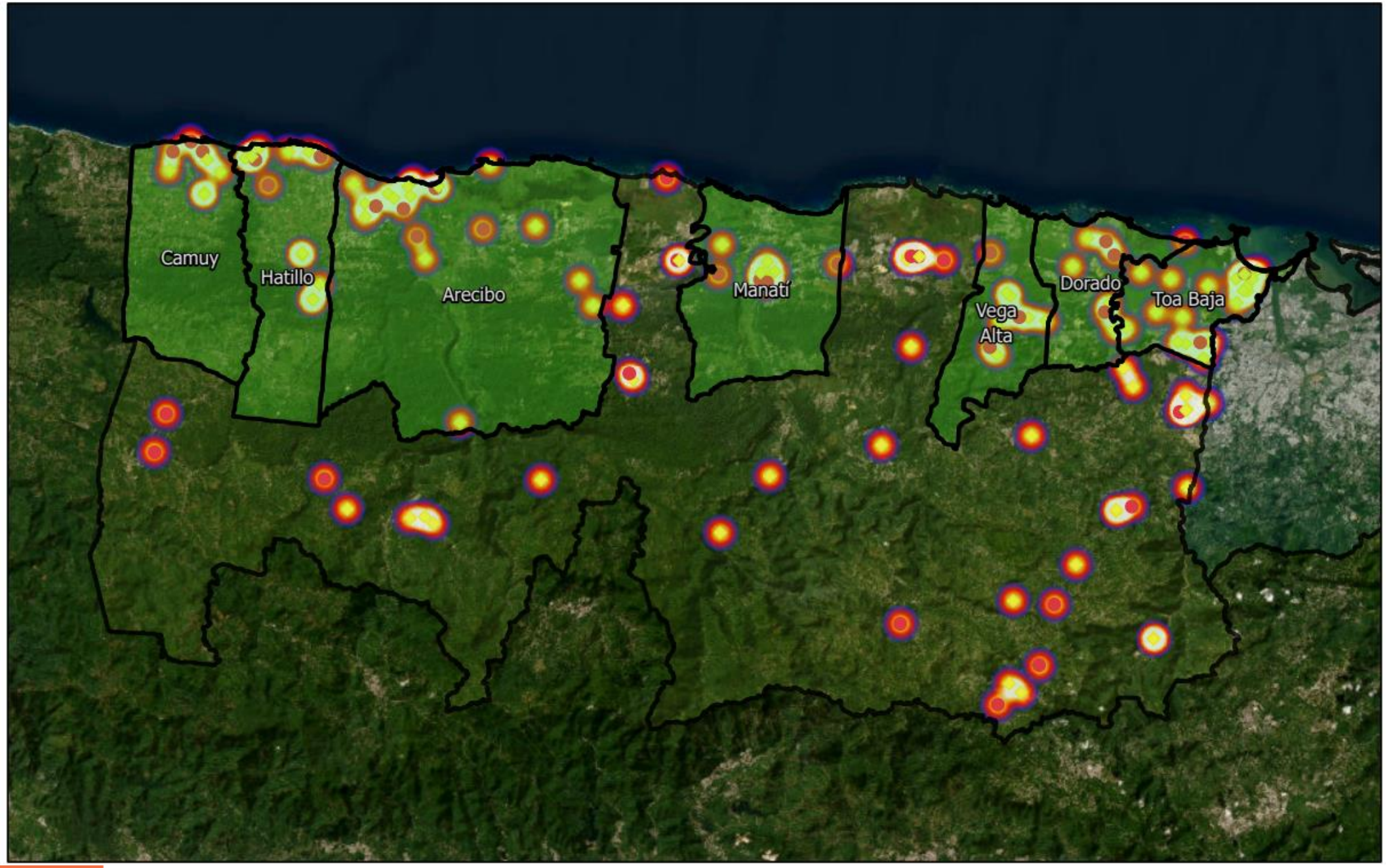
PRHTA METRO REGION FUNCTIONAL CLASSIFICATION



PRHTA Metro Region Jurisdiction



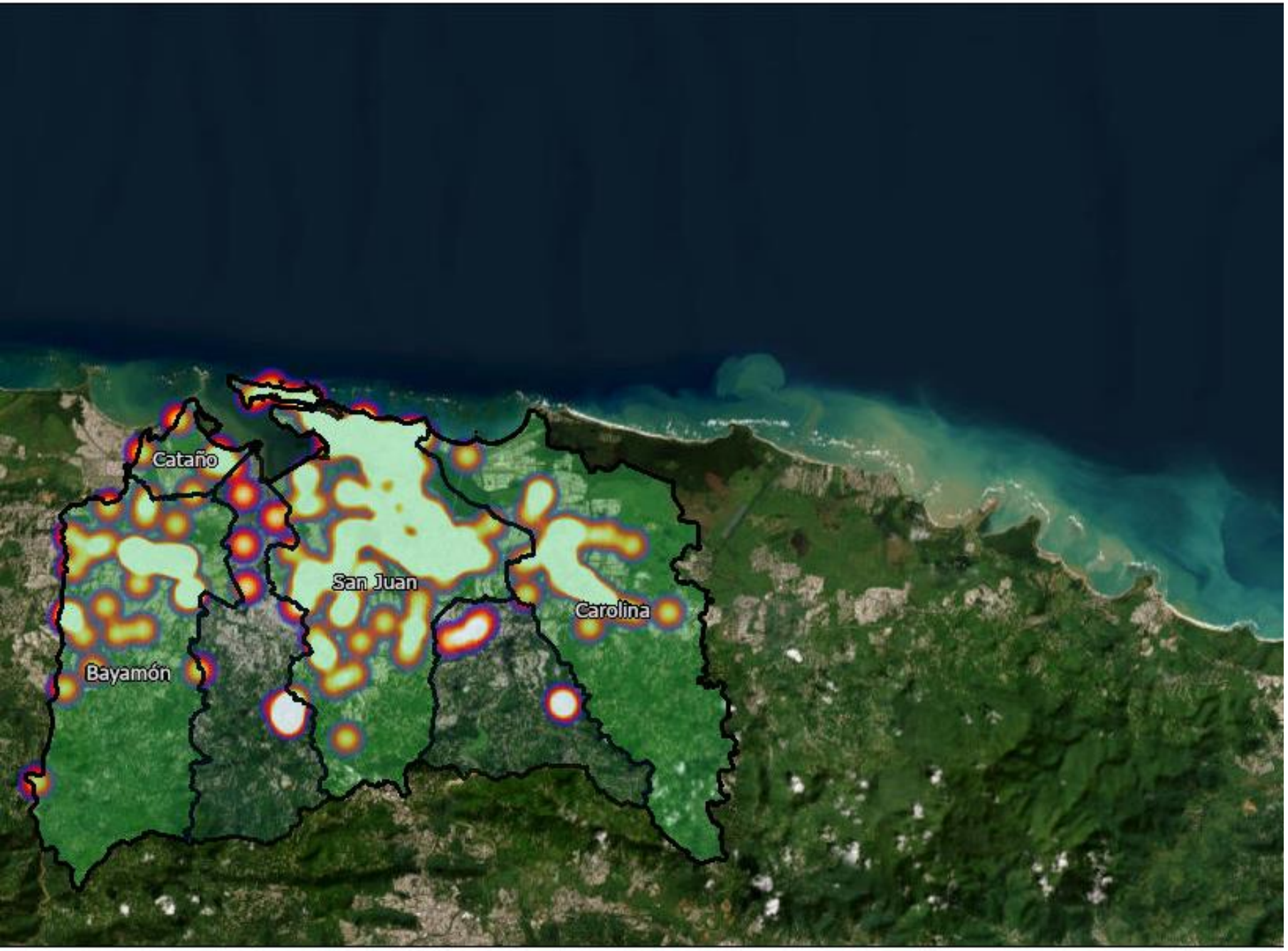
SHSP VRU Assessment Interactive Map



VRU North Region

SHSP VRU Assessment Interactive Map (arcgis.com)

SHSP VRU Assessment Interactive Map

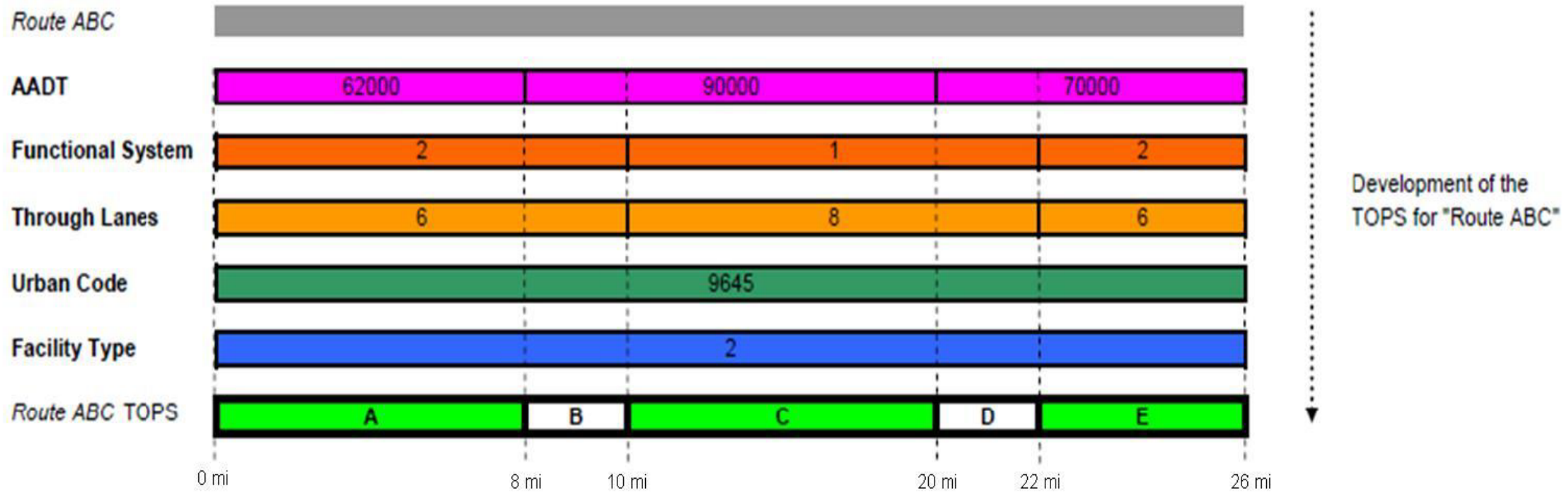


VRU Metro Region

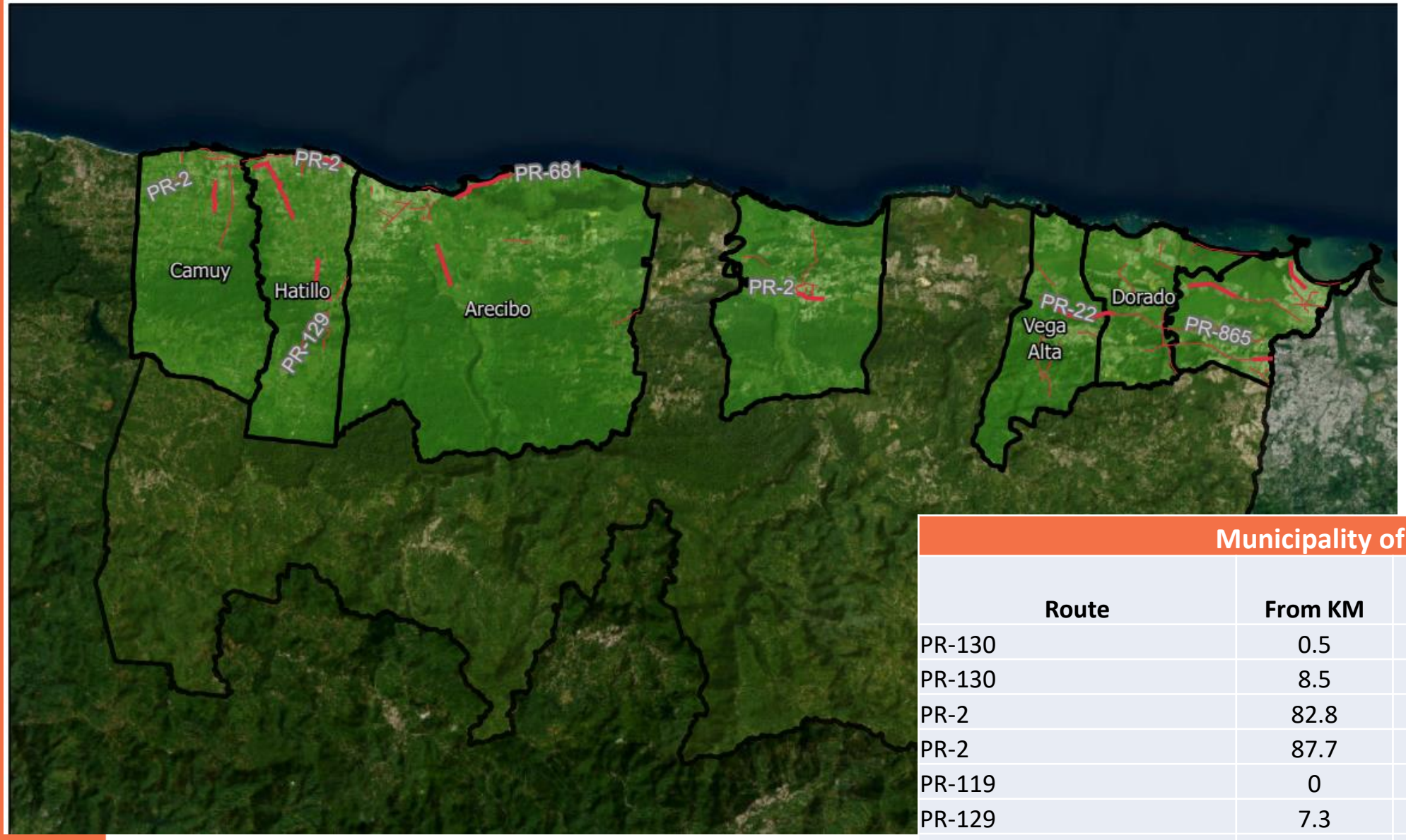
SHSP VRU Assessment Interactive Map (arcgis.com)

VRU Corridor Selection - HPMS

Figure 6.1 TOPS Development Process



SHSP VRU Assessment Interactive Map

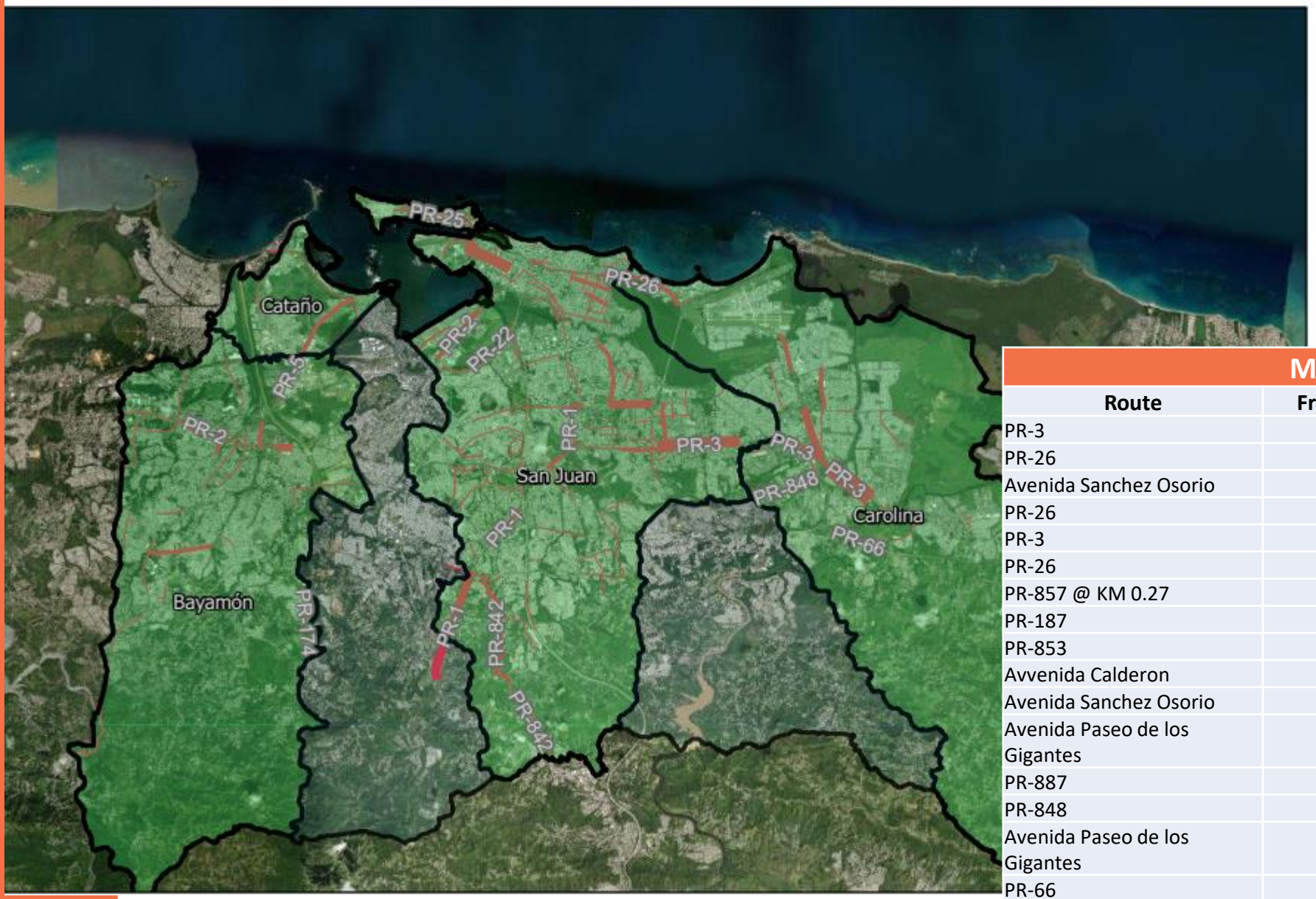


VRU North Region

[SHSP VRU Assessment Interactive Map (arcgis.com)]

Municipality of Hatillo					
Route	From KM	To Km	Length KM	Fatal	Severe
PR-130	0.5	4.85	4.35	2	
PR-130	8.5	11.8	3.30		2
PR-2	82.8	86.2	3.40	1	1
PR-2	87.7	88.8	1.10		2
PR-119	0	3	3.00		1
PR-129	7.3	9	1.70		1
PR-129	10	15.2	5.20		1
PR-134	14.2	17.5	3.21		1
Calle Mangotin			1.00		1

SHSP VRU Assessment Interactive Map



VRU Metro Region

[SHSP VRU Assessment Interactive Map (arcgis.com)]

Municipality of Carolina					
Route	**From KM**	**To Km**	**Length KM**	**Fatal**	**Severe**
PR-3	8.8	10.6	1.80	5	1
PR-26	13.6	15.5	1.90	3	
Avenida Sanchez Osorio	1.12	2.55	1.40	2	
PR-26	4.44	7.34	2.90	1	1
PR-3	6.6	8.8	2.20	2	
PR-26	11	12.35	1.35	1	1
PR-857 @ KM 0.27	0	0.6	0.60	1	
PR-187	0	0.95	0.95		1
PR-853	0	1.3	1.30		1
Avvenida Calderon	0	1.56	1.56		1
Avenida Sanchez Osorio	0	1.12	1.10	1	
Avenida Paseo de los Gigantes	0.96	1.68	0.53	1	
PR-887	1.2	1.8	0.60		1
PR-848	2.3	4.7	2.38		1
Avenida Paseo de los Gigantes	2.98	3.88	0.93		1
PR-66	3.1	5	1.90	1	
PR-3	10.9	11.8	0.90		1
Avenida El Comandante			1.70	1	
Plaza Escorial/Entrada Sams			0.64	1	

4

VRU Assessment: Strategies, Implementation Examples and Potential Projects

SHSP
STRATEGIC HIGHWAY SAFETY PLAN

Safe System Approach

SAFE ROADS: AVOIDING CRASHES

Elements of the Safe System Approach

Avoiding crashes involves:

Separating users in space

Separating users in time

Increasing attentiveness and awareness

Source for all images: Fehr & Peers

Safe System Approach

SAFE ROADS: CRASH KINETIC ENERGY

Elements of the Safe System Approach

Managing crash kinetic energy involves:

Source: Fehr & Peers

Managing speed


Source: City of Carmel, IN

Managing crash angles


Source: FHWA

Managing crash energy distribution

Safety Countermeasures

Pedestrian/Bicyclist

Bicycle Lanes

Crosswalk Visibility Enhancements

Leading Pedestrian Interval

Medians and Pedestrian Refuge Islands in Urban and Suburban Areas

Pedestrian Hybrid Beacons

Rectangular Rapid Flashing Beacons (RRFB)

Road Diets (Roadway Configuration)

Walkways

References: Proven Safety Countermeasures | FHWA (dot.gov)
Pedestrian Safety Guide and Countermeasure Selection System (pedbikesafe.org)

Safety Countermeasures

Pedestrian/Bicyclist

Bicycle Lanes

Cycle Track

Pavement Marking

Raised Island

Traffic Delineator

Pavement Marking

Additional reference: Pedestrian Safety Guide and Countermeasure Selection System (pedbikesafe.org)

Safety Countermeasures

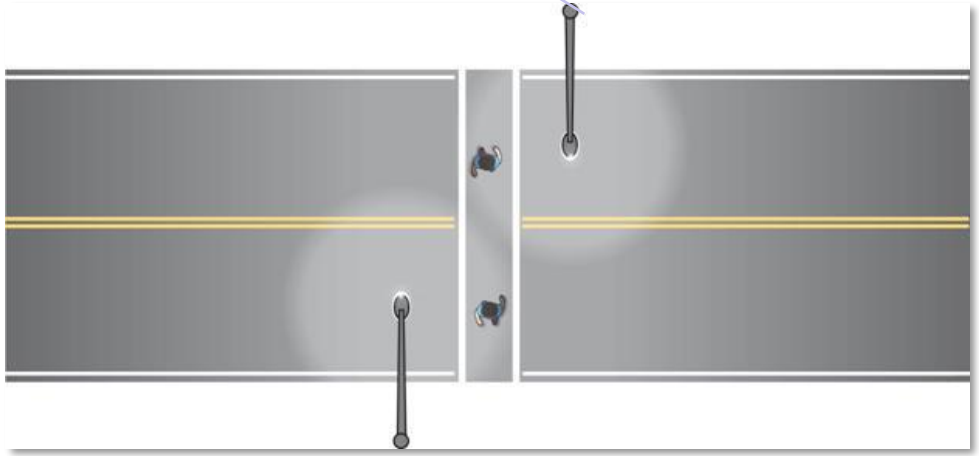
Crosswalk Visibility Enhancements

Pavement Marking

Curb Extension

Limit Parking at Intersections

Pedestrian Lighting



Signage “Stop here for pedestrians”

Safety Countermeasures

Leading Pedestrian Interval

Traffic Signals APS and Peds Signals

Safety Countermeasures

Medians and Pedestrian Refuge Islands in Urban and Suburban Areas

Safety Countermeasures

Pedestrian Hybrid Beacons

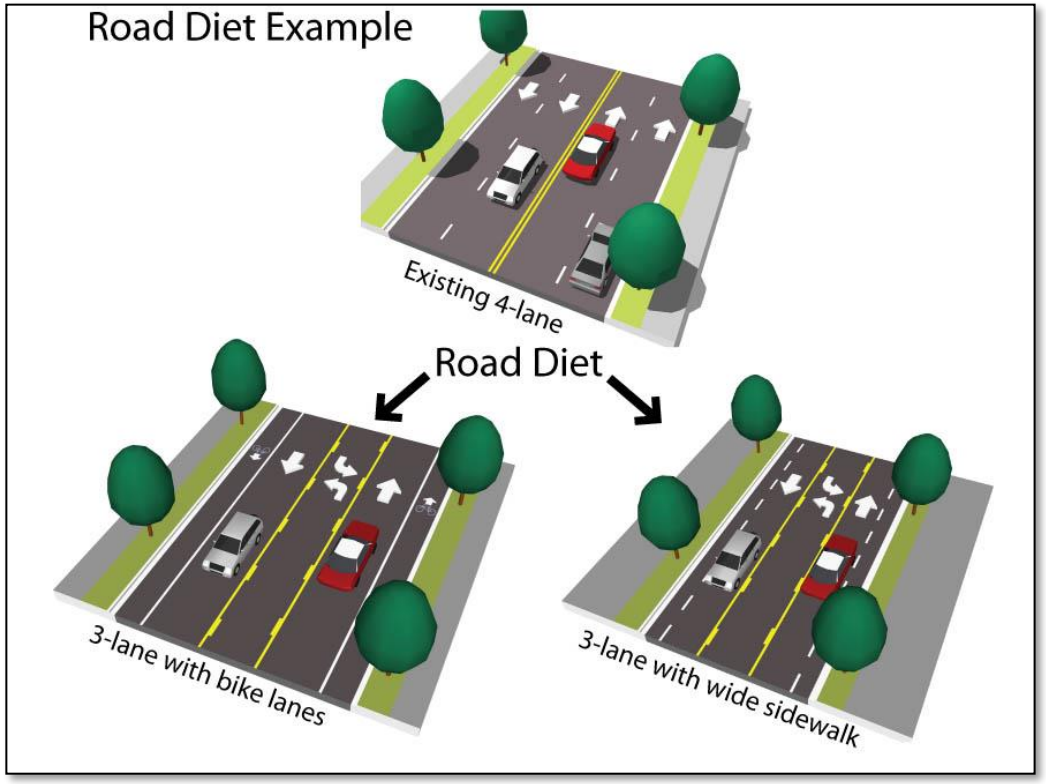
Rectangular Rapid Flashing Beacons (RRFB)

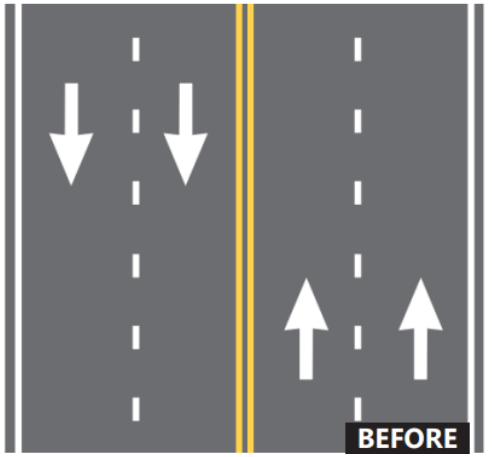
PHB

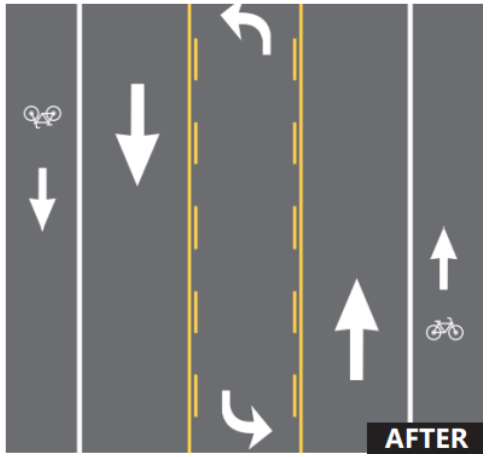
RRFB

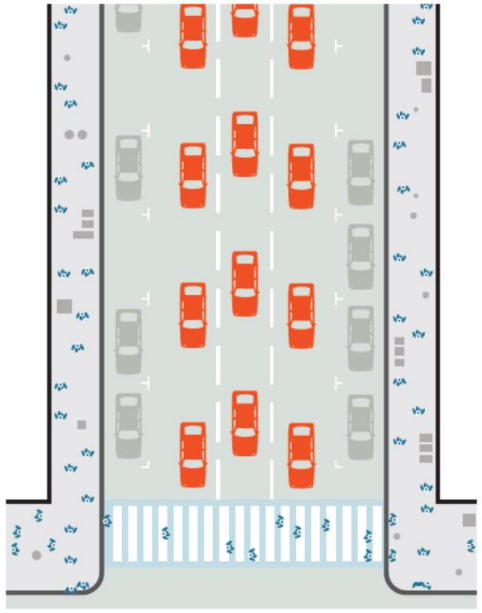
Safety Countermeasures

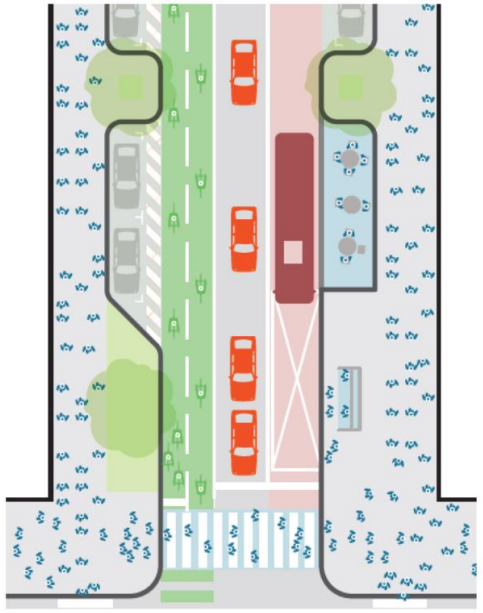
[Road Diets (Roadway Configuration)]







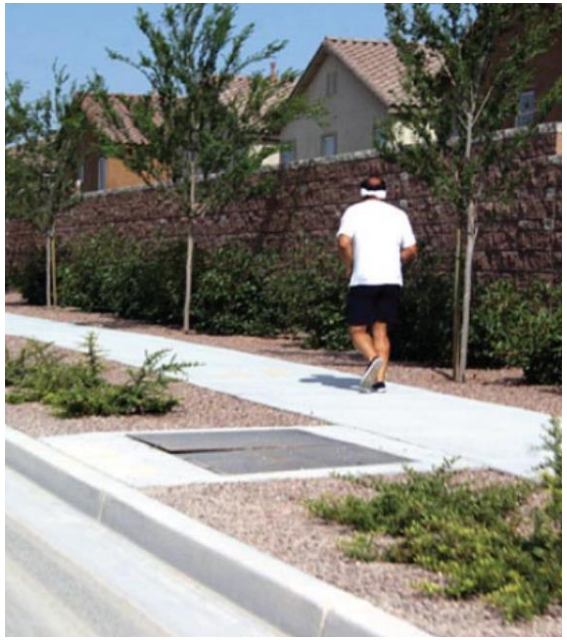


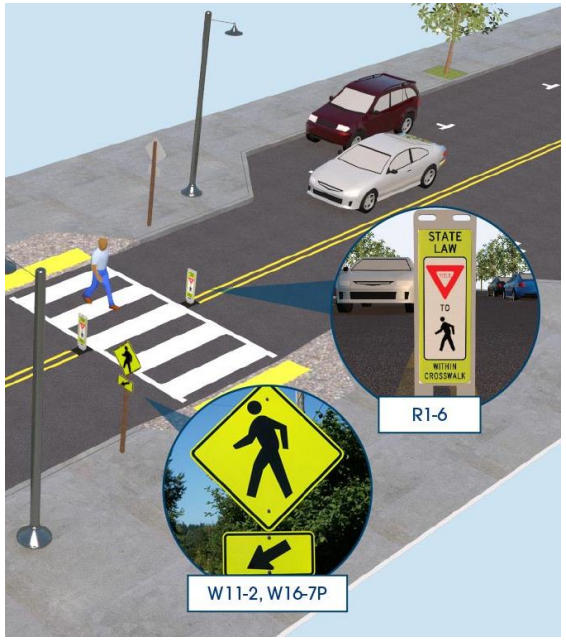


Safety Countermeasures

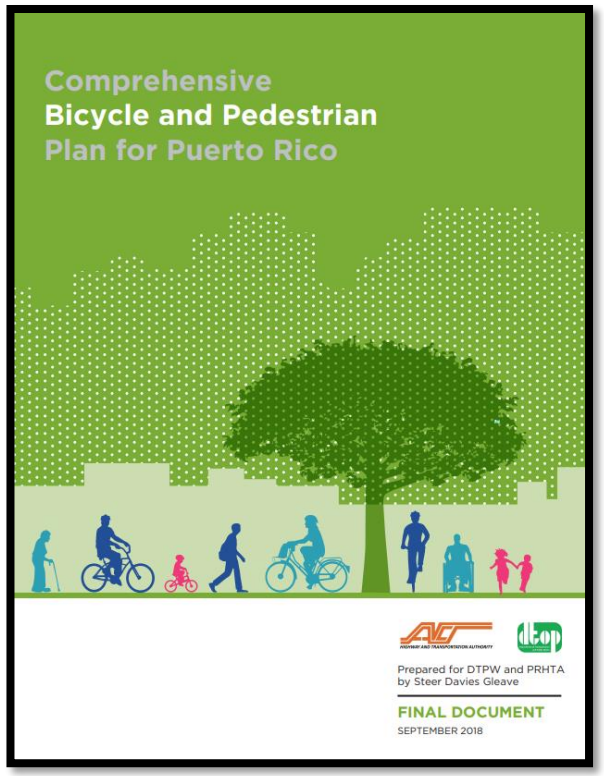
Walkways

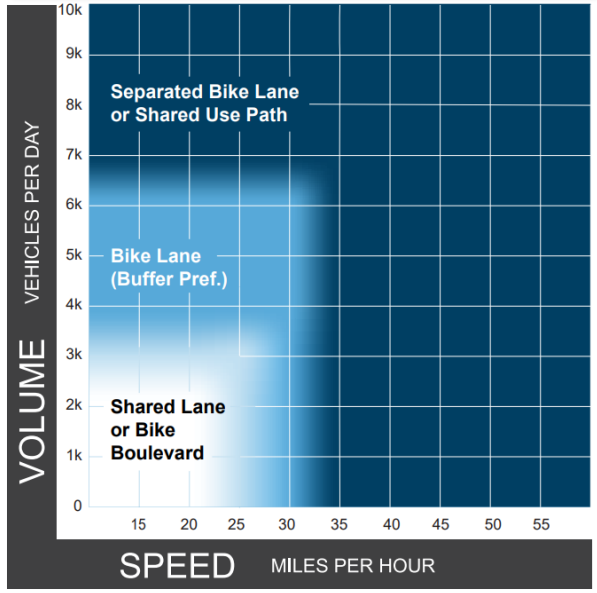
Pedestrian Crossings & Walkways



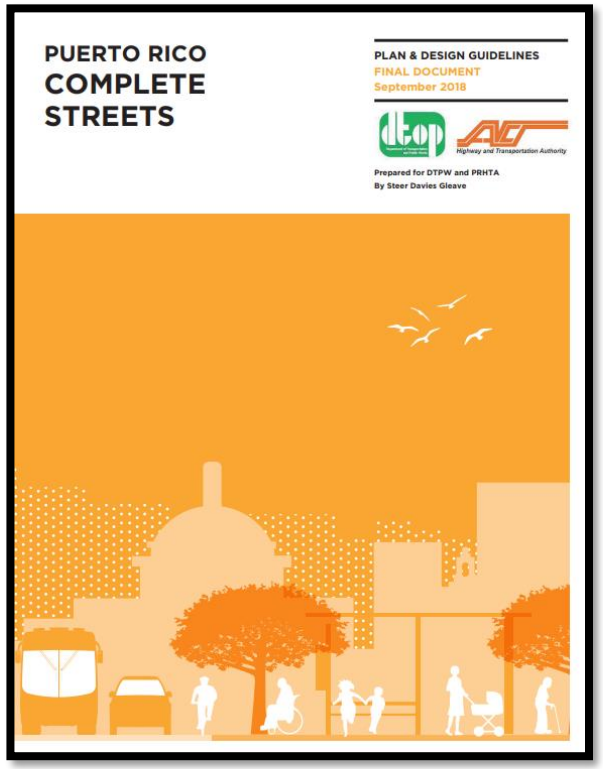


VRU Assessment Strategies





Source: FHWA bikeway selection guide



Source: PR Complete Streets Plan & Design Guidelines

Complete Street Vision

Successful urban roads should provide reliable major routes through cities with vibrant, safe, secure and well maintained urban environments, and make shops and services easily accessible. Urban Streets Complete Street vision includes:

- Maintain automobile priority but improve provisions for other modes;
- Reduce width of travel lanes where appropriate;
- Comfortable and sheltered waiting areas for transit users;
- Comfortable sidewalk width of 1.5 - 2.1 meters /5-7 feet;
- Crossings to match wider pedestrian network, including at mid-block where appropriate;
- Buffered, separated or off-road bikeways (Class I, II or IV – for Class definitons see Bikeways, Section 3 Part B);
- High quality landscape character;
- Provide shade trees along sidewalks and bikeways; and
- Provide street lighting that relates to pedestrians and cyclists.

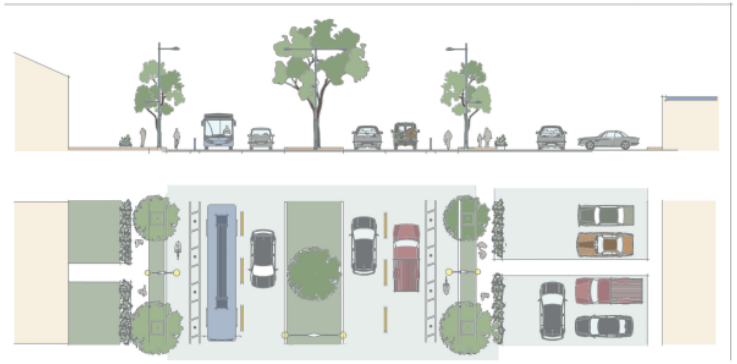
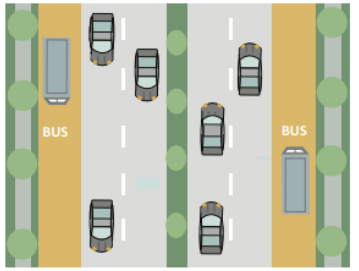
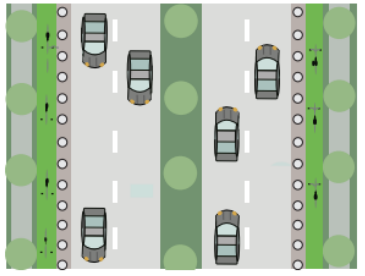


Figure 2.5: Urban Road Complete Street Vision

Source: SDG



Transit priority



Non-motorized priority

VRU Assessment Strategies

Project Development

Bicycle and pedestrian considerations a full component of Puerto Rico project planning and development.

Pedestrian and Bicycle data consideration

Include ped and bike **performance measures** as part of project selection processes

Advanced implementation plan from pedestrian and **bicycle plan and complete streets** guidelines

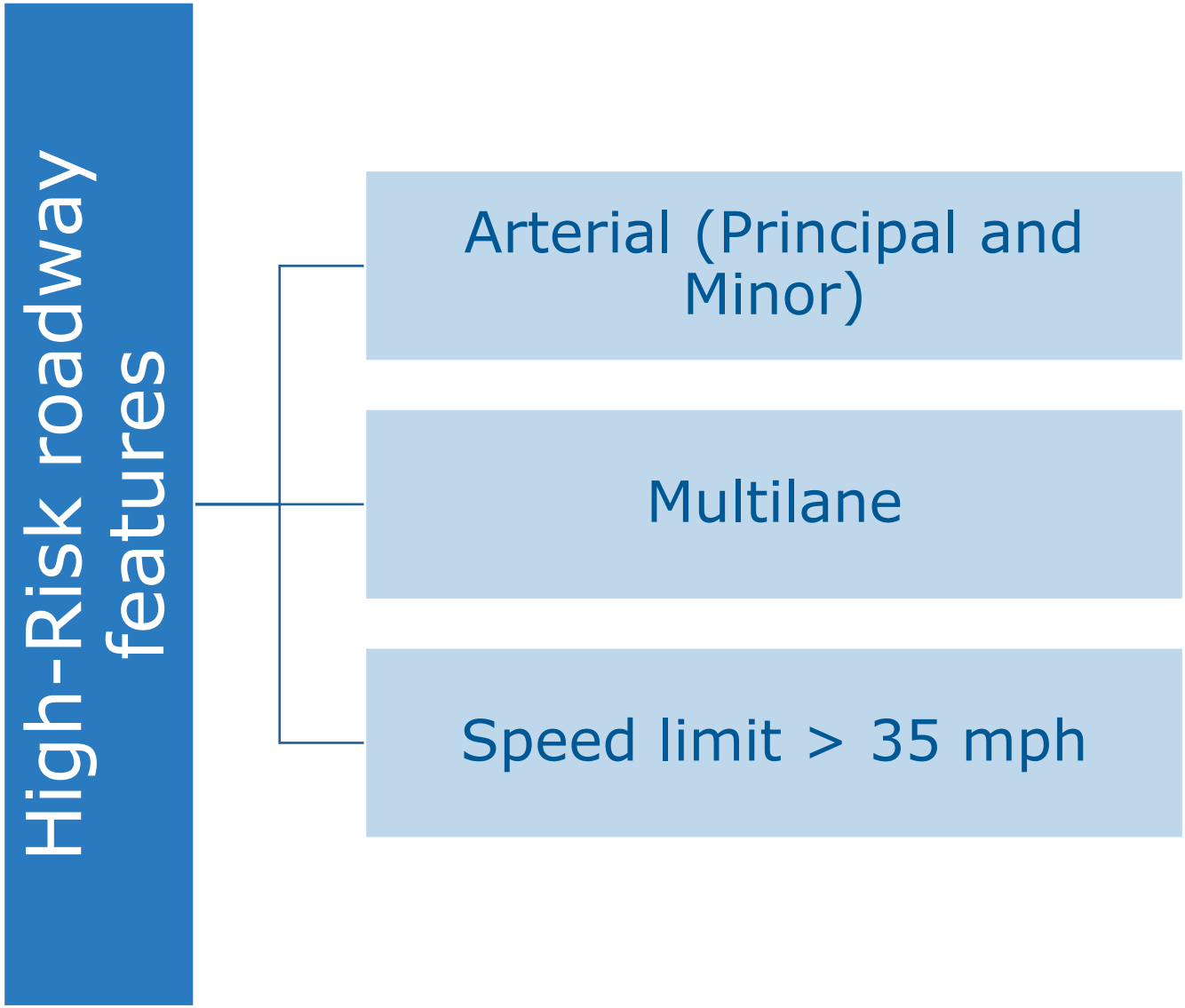
Design directives to include ped and bike criteria and potential measures

Include **ped and bike contract** language for all design and construction projects (**RFPs**)

Include ped and bike needs in traffic control plans (**MOT & detours**)

VRU Assessment Strategies

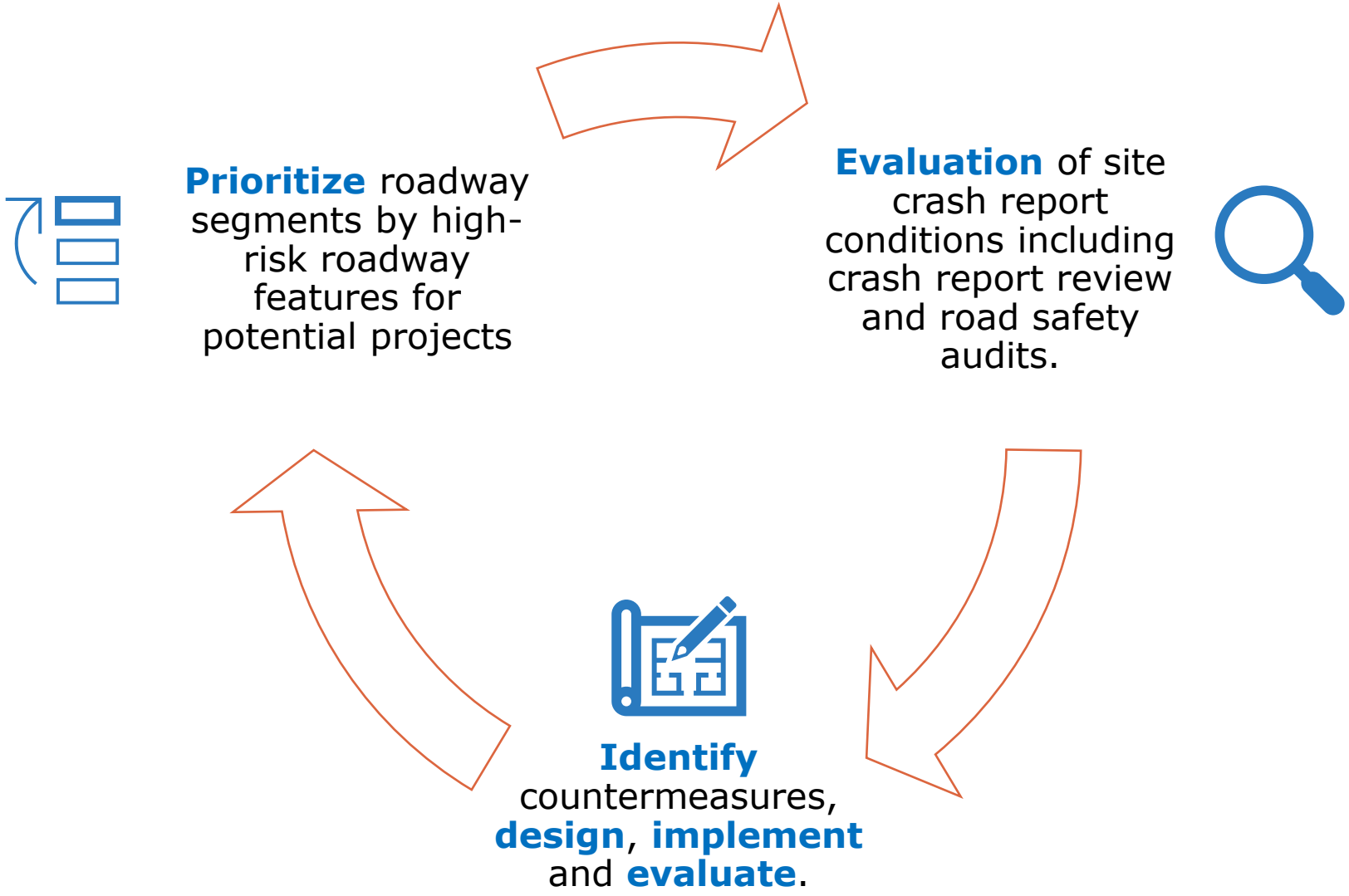
Systemic approach



Intersection – (i.e., pedestrian push buttons and proper time to cross, ADA ramps, sidewalks)

Segments – Road diets, speed management such as traffic calming, roundabouts, mid block crossings, sidewalks repairs, protected bike lanes, shared use path, and pedestrian and bikes signage

VRU Potential Projects



The Safe System Approach

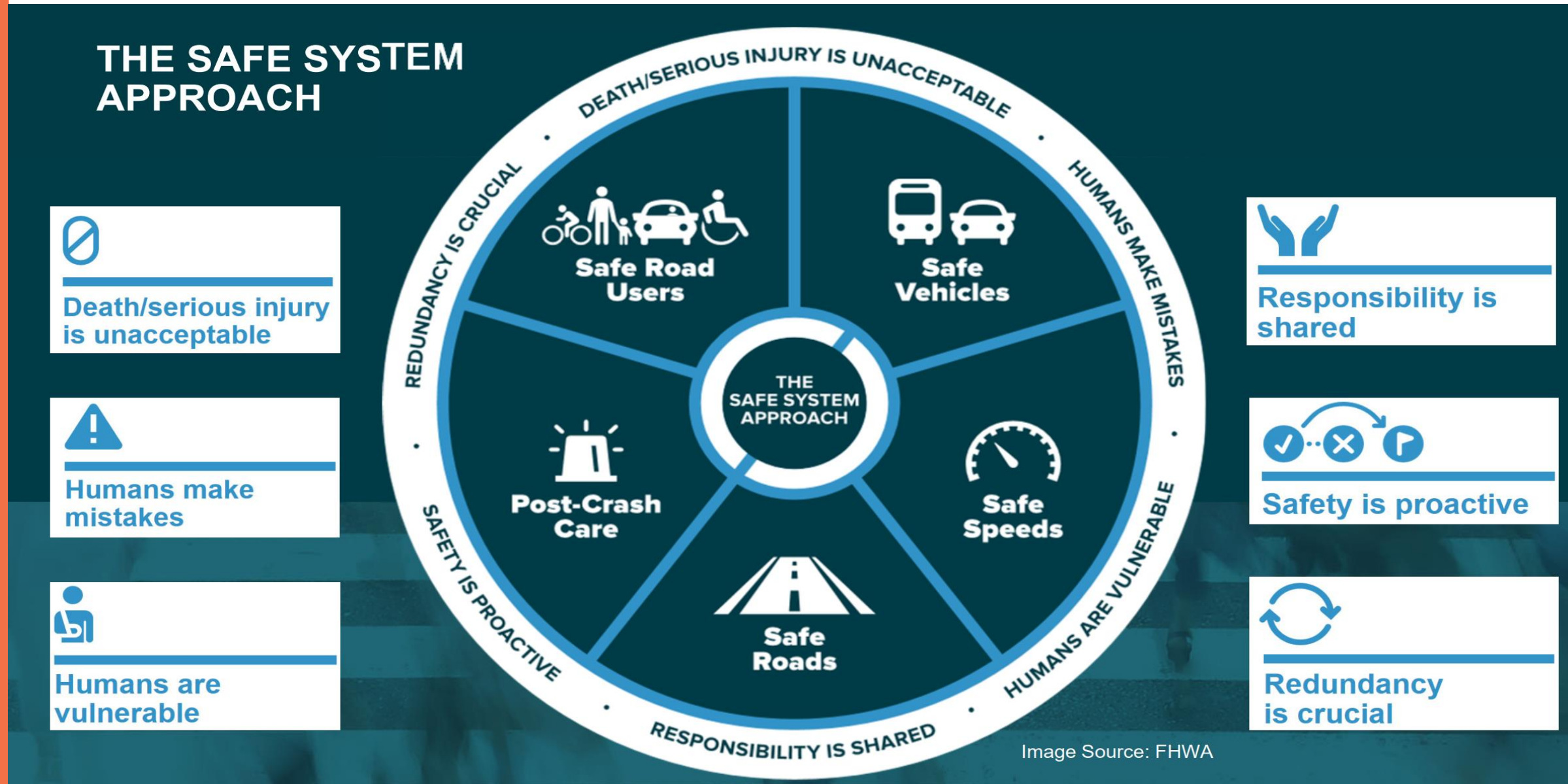


Image Source: FHWA

Responsibility is Shared

15 MINUTES BREAK

SHSP
STRATEGIC HIGHWAY SAFETY PLAN

Encuesta - Grupos consultivos en seguridad vial (Región Norte y Metro)

Thank You!

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STRATEGIC HIGHWAY SAFETY PLAN