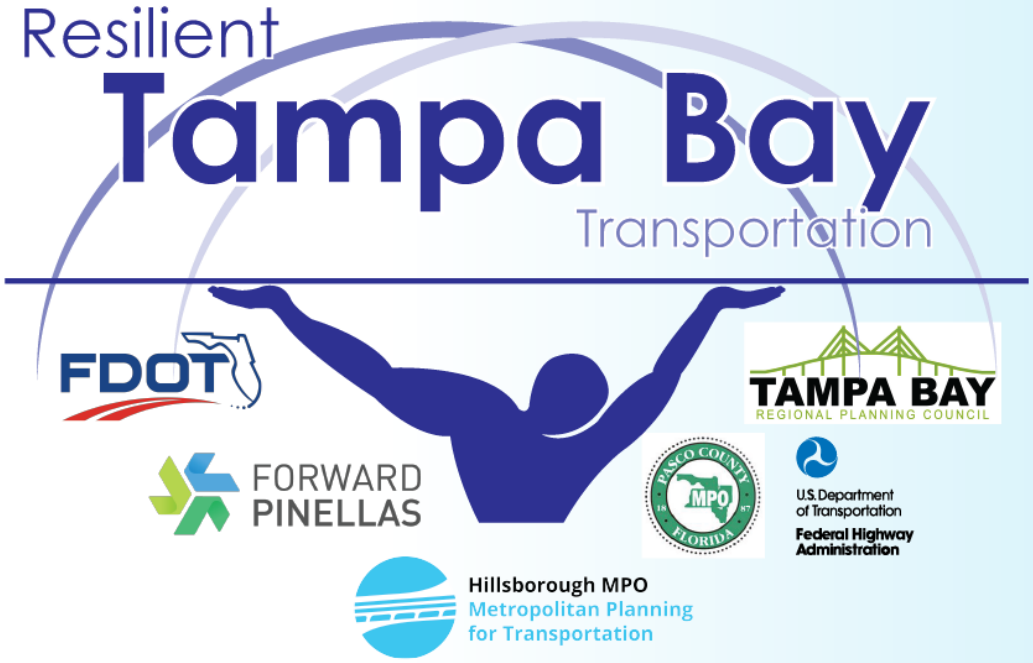


FHWA Resilience & Durability to Extreme Weather Pilot Program

Let's Talk Resiliency Session

presented to

AMPO Annual Conference

San Antonio, TX

presented by

Beth Alden, AICP

Hillsborough MPO

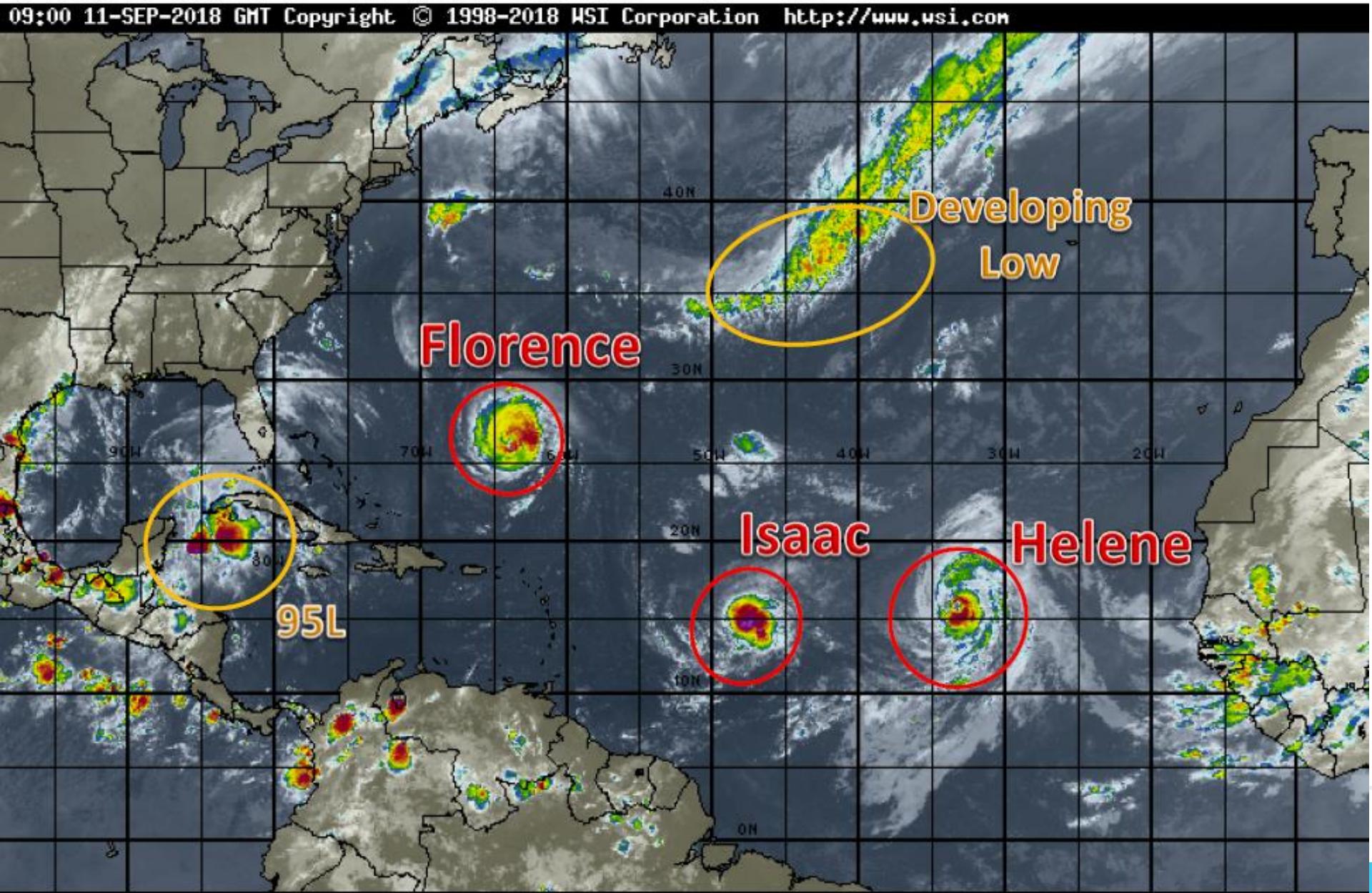
September 28, 2018


City of
Tampa


Sunday, June 16, 2013 | Tampa Bay Times
SWANN
ANOTHER SIGN OF THE TIMES
GREACEN


RIGHT NOW
CURRENT CONDITIONS ON THE ROADS
SOME NEIGHBORHOOD STREETS IMPASSABLE IN FLOODING
HERMINE
abc ACTION NEWS
5:08 76°

Atlantic Basin Satellite Image

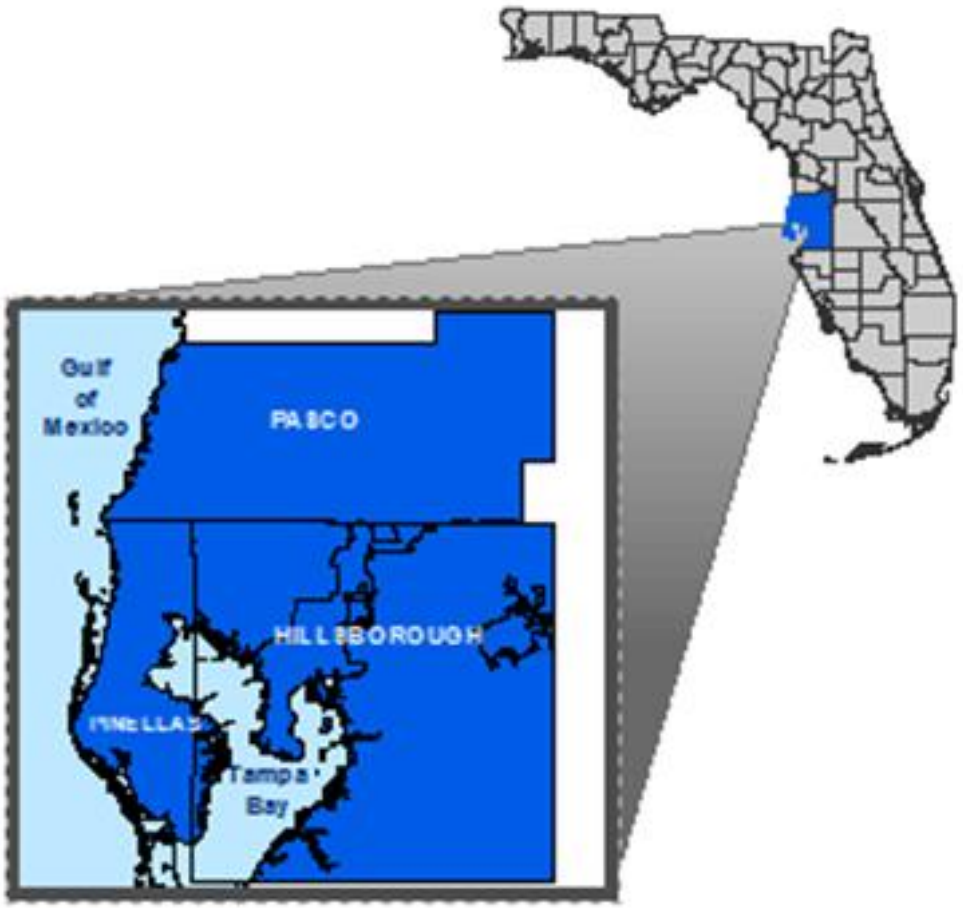


Transportation Policy

- Federal Fixing America's Surface Transportation (FAST) Act addresses planning for and expenditures on surface transportation system
  - *Added planning factor: Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation*
- Florida Transportation Plan is statewide plan guiding Florida's transportation future
  - *Agile, Resilient, and Quality Infrastructure Goal*
- Florida Statutes – Long Range Transportation Plans
  - *Metropolitan planning organizations are encouraged to consider strategies that integrate transportation and land use planning to provide for sustainable development and reduce GHG emissions*

Slide courtesy of Lois Bush, Florida Department of Transportation

Resilient Tampa Bay – Transportation: Background



- Tampa Bay TMA
  - 2.8M Population
  - 2nd largest pop. In FL.
  - 1000+ miles of shoreline
  - 39% pop. in flood zones
- Regional vulnerability assessment of surface transportation assets
  - Incorporate into LRTPs, hazard mitigation, emergency mgt, and PDRP plans

FHWA 2018-2020 Pilot Program : Resilience & Durability to Extreme Weather

- 1 of 11 Pilot projects looking at integrating into agency practices, tools & resources , or deployment & monitoring.

- **Tampa Bay TMA**
- Caltrans
- MassDOT
- PennDOT
- Atlanta Regional Commission
- Corpus Christi MPO
- Mid-America Regional Council (Kansas City, MO & Johnson Co, KS)
- UDOT
- Quad Cities - Iowa/Illinois MPO
- Houston-Gaveston Area Council
- Navel Facilities Engineering Command (East and Gulf Coast)

Resilient Tampa Bay – Transportation: Project Team

Hillsborough MPO
Metropolitan Planning for Transportation

FDOT

FORWARD PINELLAS

TAMPA BAY REGIONAL PLANNING COUNCIL

PASCO COUNTY MPO FLORIDA 18 87

CAMBRIDGE SYSTEMATICS

Work Plan

Climate & Weather

- Obtain Data
- Identify Vulnerable Areas
- Identify at risk Transportation

Fall 2018

Critical Linkages

- Stakeholder Engagement
- Quantitative Analysis of Critical links

Fall 2018
Winter 2019

Adaptation Strategies

- Econometric Analysis
- Adaptation/ Mitigation Strategies
- Include in Decision Making

Winter/ Spring 2019

Final Report

Summer/Fall 2019

Criticality Determination

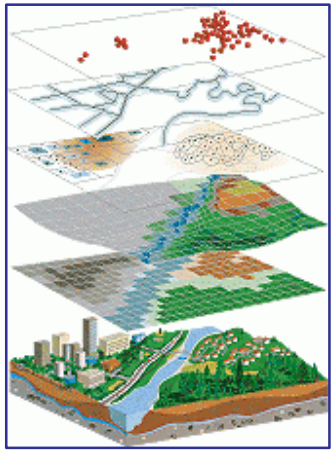
- Stakeholder and practitioner input
- Persistent flooding locations
- Leveraging prior planning work (Current LRTP, hazard mitigation and local mitigation strategies)

Qualitative Assessment

Incorporating stakeholder input into quantitative assessment

Weighting facilities/locations based on stakeholder input

Quantitative Assessment



- GIS-based Quantitative Analysis
- Context Sensitive Criticality Construct (Transportation disadvantaged population, social & economic importance)
- Sensitivity, exposure level and adaptive capacity

Supporting Image Sources: Sustainable Convos, Northern Arizona Healthcare

Data/Information Coordination

One Bay

Tampa Bay RPC

Local Government Public Works

Hillsborough County Perils of Flood Act Matrix of Impacts Initiative

Pinellas County Restore Act Vulnerability Assessment

Tampa Sea Level Rise Vulnerability Assessment

Local Mitigation Strategies
Post Disaster Redevelopment Plans

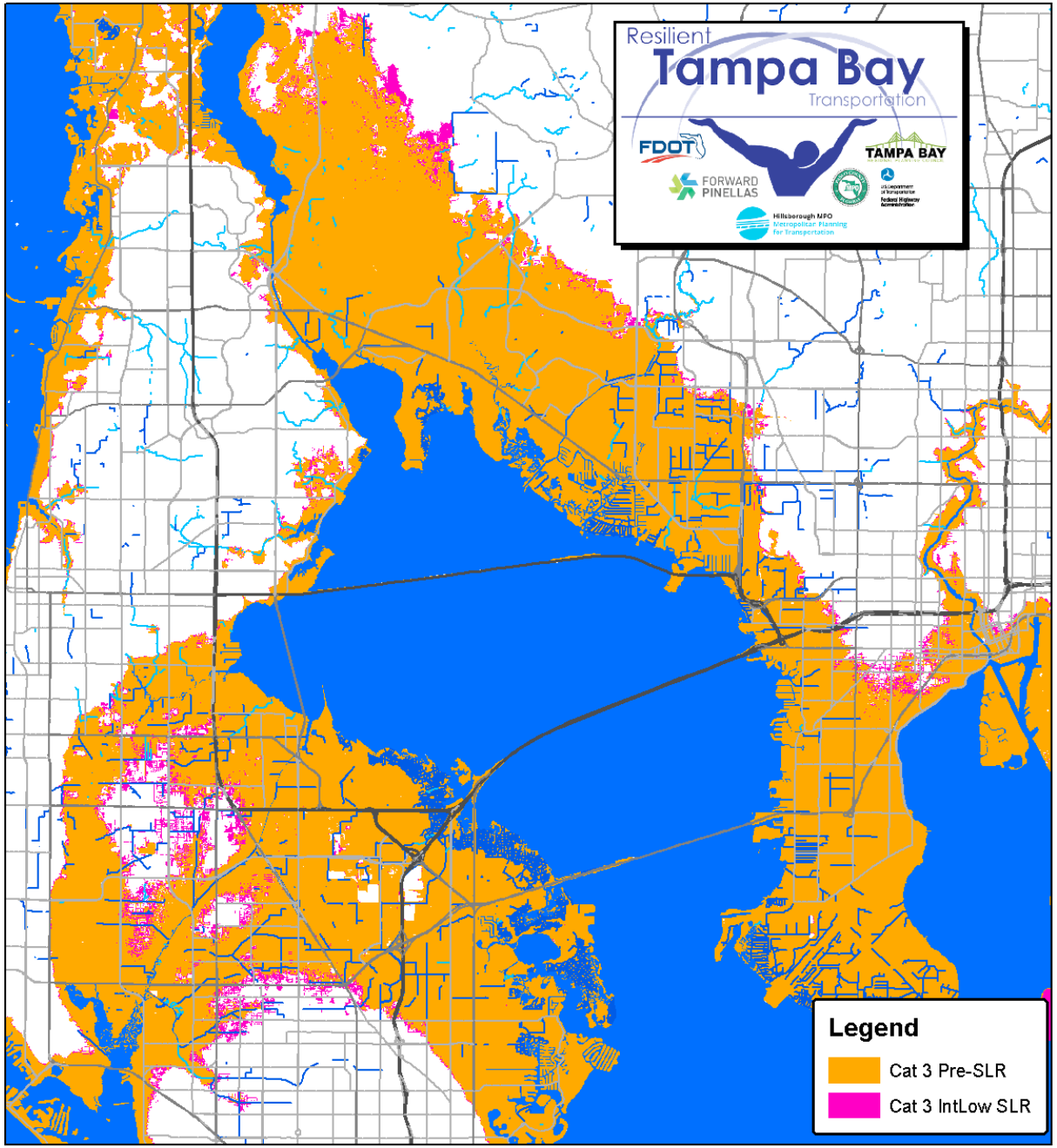
Resilient Tampa Bay Transportation: Vulnerability Assessment and Adaptation Pilot Project

Tampa Bay RPC

Transit Agency Asset and Operational Plans

MPO Long Range Transportation Plans

Resilient Tampa Bay Transportation


Resilient
Tampa Bay
Transportation
FDOT
TAMPA BAY
FORWARD PINELLAS
Hillsborough MPO
Metropolitan Planning for Transportation
Legend
Cat 3 Pre-SLR
Cat 3 IntLow SLR

It's TIME TAMPA BAY
Transportation • Innovation • Mobility for Everyone

2045 Transportation Plan

We Want to Hear from You!

Hillsborough MPO
Metropolitan Planning for Transportation

FORWARD PINELLAS

PASCO COUNTY MPO FLORIDA

BEASLEY MEDIA GROUP INC.

What's Important to You?
Consider these priorities

Storm Vulnerability

Traffic Jams

Open/Green Spaces

Alternatives to Driving

Equal Opportunity

Shorter Commutes

Public Service Costs

1

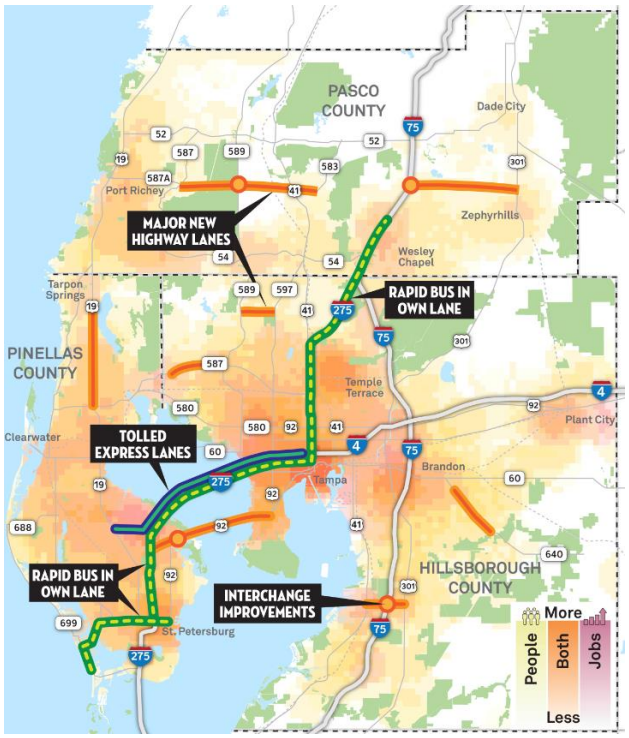
Rate Scenario A
Technology Focus

DRIVERLESS CARS

RAPID BUS ON SHOULDERS

EVERY VOTE COUNTS

It's TIME TAMPA BAY
Transportation • Innovation • Mobility for Everyone



Rate this Scenario: 1 2 3 4 5

Least Appealing — *Most Appealing*

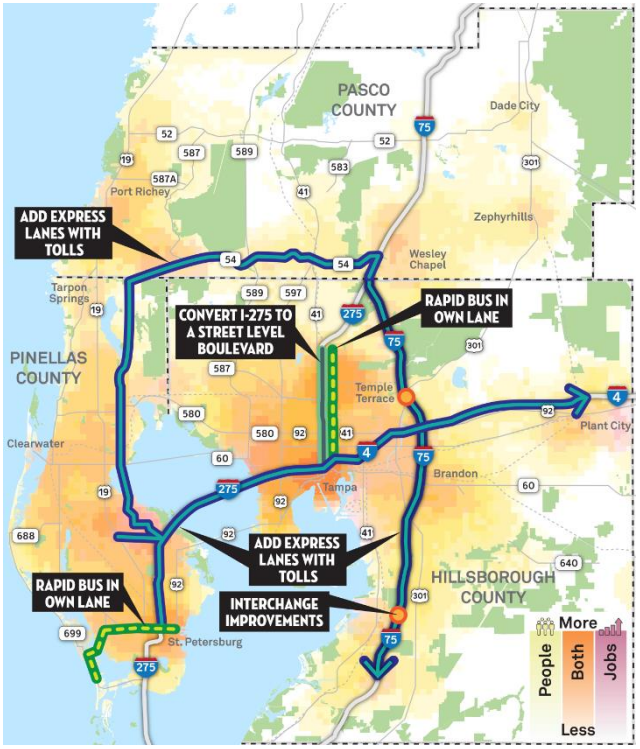
Results on priorities:	By 2045, Worse than Today	By 2045, Better than Today
Storm Vulnerability	←	
Traffic Jams	←	
Open/Green Space	←	
Alternatives to Driving		→
Equal Opportunity	←	
Shorter Commutes	←	
Public Service Costs		

Rate Scenario B
Expressway Focus

TOLLED EXPRESS LANES

I-275 CONVERTED TO BOULEVARD

It's TIME TAMPA BAY
Transportation • Innovation • Mobility for Everyone



Rate this Scenario: 1 2 3 4 5

Least Appealing — *Most Appealing*

EVERY VOTE COUNTS

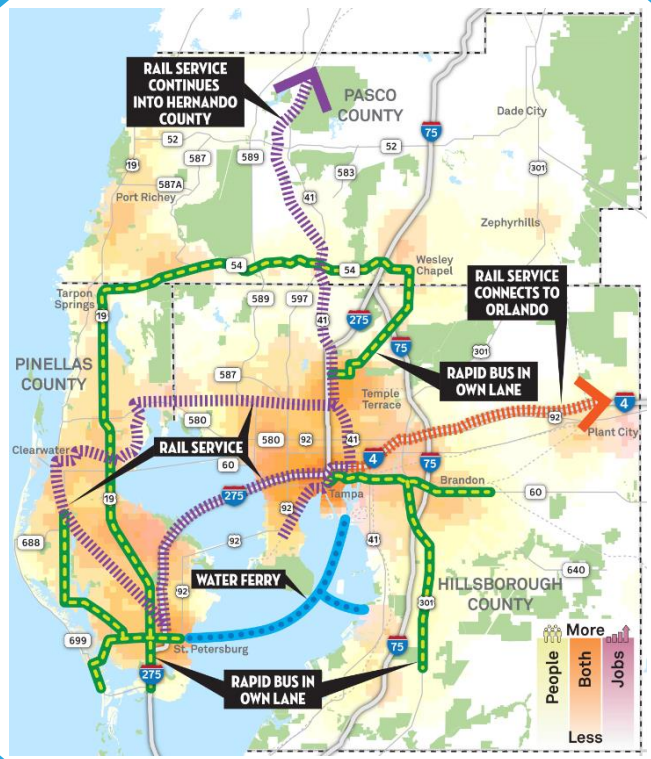
Results on priorities:	By 2045, Worse than Today	By 2045, Better than Today
Storm Vulnerability	←	
Traffic Jams	←	
Open/Green Space	←	
Alternatives to Driving		→
Equal Opportunity	←	
Shorter Commutes	←	
Public Service Costs		

Rate Scenario C
Transit Focus

REGIONAL & STATEWIDE RAIL

RAPID BUS

WATER FERRY



Rate this Scenario: 1 2 3 4 5

Least Appealing — *Most Appealing*

Results on priorities:	By 2045, Worse than Today	By 2045, Better than Today
Storm Vulnerability		
Traffic Jams	←	
Open/Green Space	←	
Alternatives to Driving		→
Equal Opportunity	←	→
Shorter Commutes		→
Public Service Costs		

What's in the current *Hillsborough Imagine 2040 Plan?* (Adopted 11/12/14)

It's TIME TAMPA BAY
Transportation • Innovation • Mobility for Everyone

Preserve System

Reduce Crashes & Vulnerability

Minimize Traffic for Drivers & Shippers

Real Choices when not Driving

Major Capacity Projects For Economic Growth

Hillsborough MPO
2040 LRTP Performance Measures

Preserve the System

- ❑ Road resurfacing schedule
- ❑ Bridge repair schedule
- ❑ Vehicle replacement schedule

Reduce Crashes & Vulnerability

- ❑ Total crashes, fatal crashes, and walk/bike crashes
- ❑ Economic impact of a major storm

Manage Traffic for Drivers & Shippers

- ❑ Peak-hour travel time reliability
- ❑ Affected truck trips

Real Choices for Non-Drivers

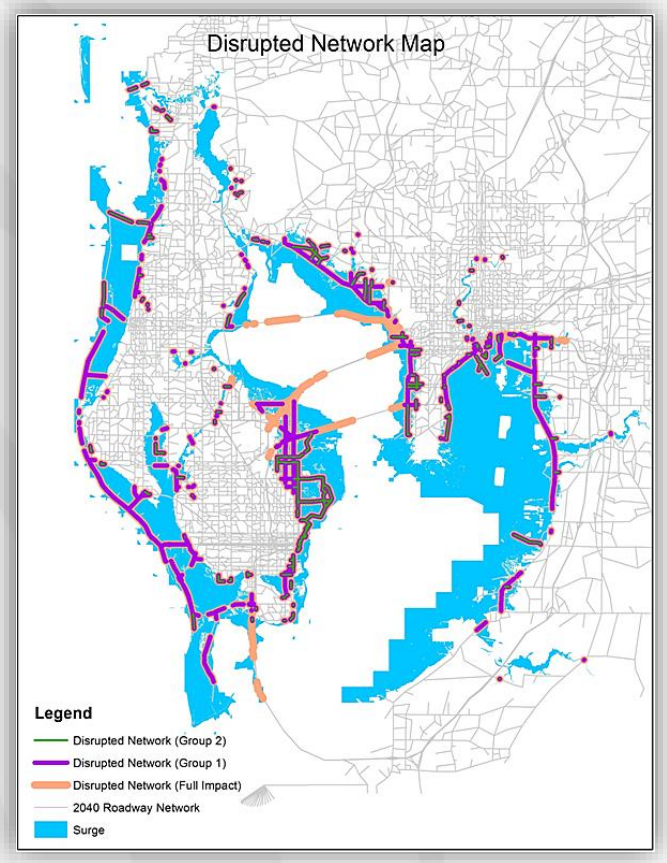
- ❑ People & jobs served by the bus system and trail/sidepath network

New for 2045 - Major Capacity Projects for Economic Growth

Vulnerability Reduction Investment Assumed in 2040 Plan

Investment Level	Benefits and Costs
	$31 Million per year
Scenario 1 **Level 1**	Continue today's stormwater drainage improvement programs
	Category 3 storm impacts: - 8 weeks major roads may be unusable - $266 million economic loss
	$39 Million per year
Scenario 8b **Level 3**	Continue today's stormwater drainage, plus: raise road profiles, enhance base, protect shorelines from wave damage
	Category 3 storm impacts: - 3 weeks major roads may be unusable - $119 million economic loss (cut in half!)

Economic losses cut in half



Saffir-Simpson Hurricane Wind Scale

(1 = least extreme; 5 = most extreme)

Category 1

- Winds range from **74 to 95 mph**
- Minor damage to property (roof damage)
- Injuries to humans are isolated
- Short-term power outages

Category 2

- Winds range from **96 to 110 mph**
- Significant property damage, flooding
- Increased threat to humans due to falling debris
- Extensive, multi-day power outages

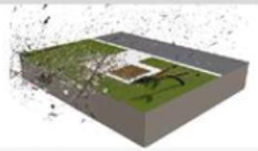
Category 3

- Winds range from **111 to 130 mph**
- Mobile and frame homes destroyed, extensive flooding
- Evacuation necessary for human safety
- Electricity, water unavailable for up to several weeks

Category 4

- Winds range from **131 to 155 mph**
- Houses, shopping centers irreparably damaged
- Humans at serious risk of death in certain areas
- Long-term power outages, water shortages

Category 5



- Winds of **155 mph+**
- Complete destruction of homes, shopping centers
- Trees uprooted, extreme flooding
- Power and water potentially out for months

Source: National Hurricane Center

Vox

What can we get if we invest in Reduced Vulnerability

Based on illustrative Cat 3 storm occurring in next 20 years

Investment Level 1 – $988 M (current spending trend x 20 years, in YOE $)

- ❑ Routine drainage improvements
- ❑ Up to 8 weeks of road network disruption with sample Cat 3 storm
- ❑ Economic loss to Hillsborough County: $266 M

Investment Level 2 - $1,025 M (in YOE $)

- ❑ Interstates only: drainage improvements, shoreline armoring & wave attenuation
- ❑ Up to 6 weeks of road network disruption with sample Cat 3 storm
- ❑ Economic loss to Hillsborough County: $153 M or 42% less
- ❑ $31 M investment results in $113 M benefit

Investment Level 3 – $1,159 M (in YOE $)

- ❑ Interstates & arterials: drainage improvements, shoreline armoring & wave attenuation
- ❑ 3 weeks of road network disruption with sample Cat 3 storm
- ❑ Economic loss to Hillsborough County: $119 M or 55% less
- ❑ $112 M investment results in $147 M benefit

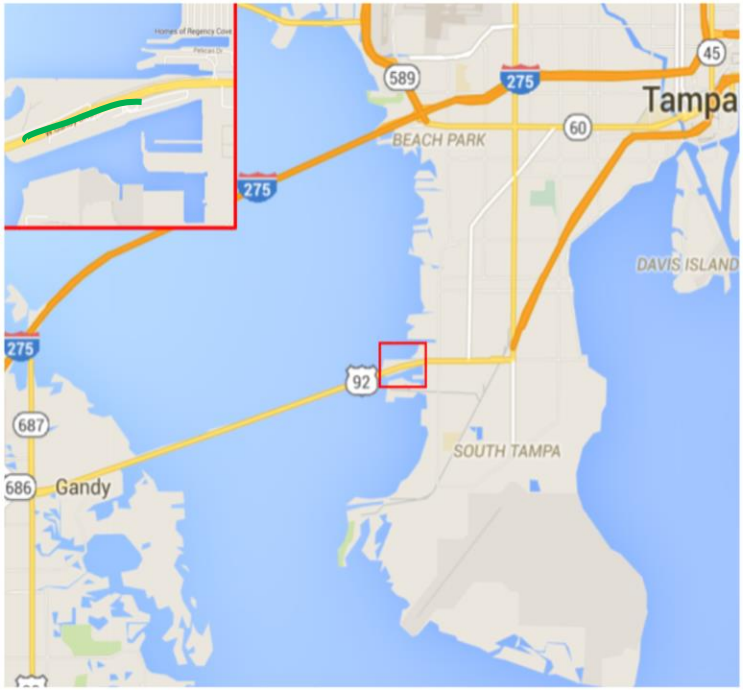
Estimated avoided losses are based on making highway segments less vulnerable to storm & flood damage

Typical Costs for Reduced Vulnerability

Risk Mgmt. Strategy	Unit	Unit Cost	Base/Low	Medium	High
Raise profile/ strengthen base*	Lane mile	$268,883	$268,883	$20,854,540	$68,807,075
Wave attenuation (WADs)	1 Unit	$750	$750	$3,887,400	$17,628,600
Shoreline protection (riprap)	Lin. ft.	$350	$350	$5,442,360	$24,680,040
Drainage improvements*	CL mile	$14,737	$14,737	$816,566	$816,566
TOTAL				$31,000,866	$111,932,281
TOTAL plus contingency	20%			$37,201,039	$134,318,738

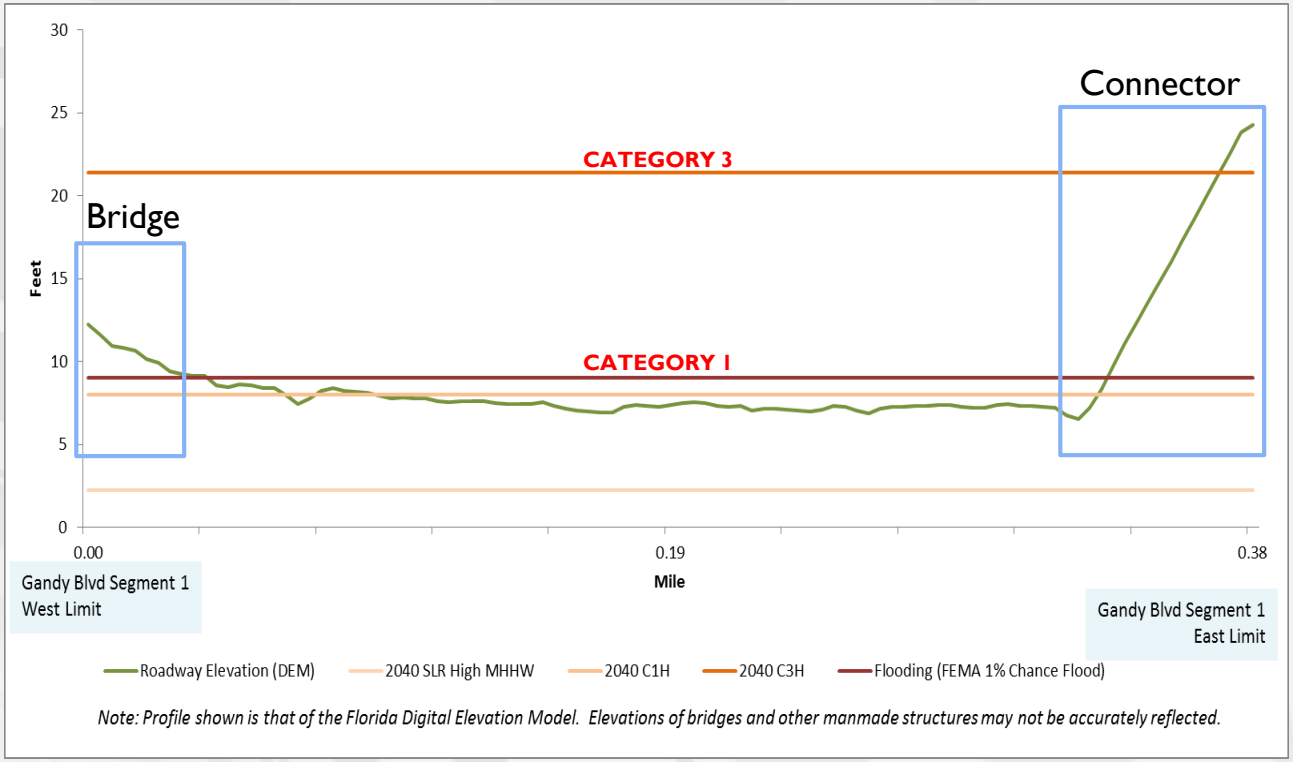
* Counts marginal costs only. All costs are approximate

Pilot Project Follow-Up Study (2016)

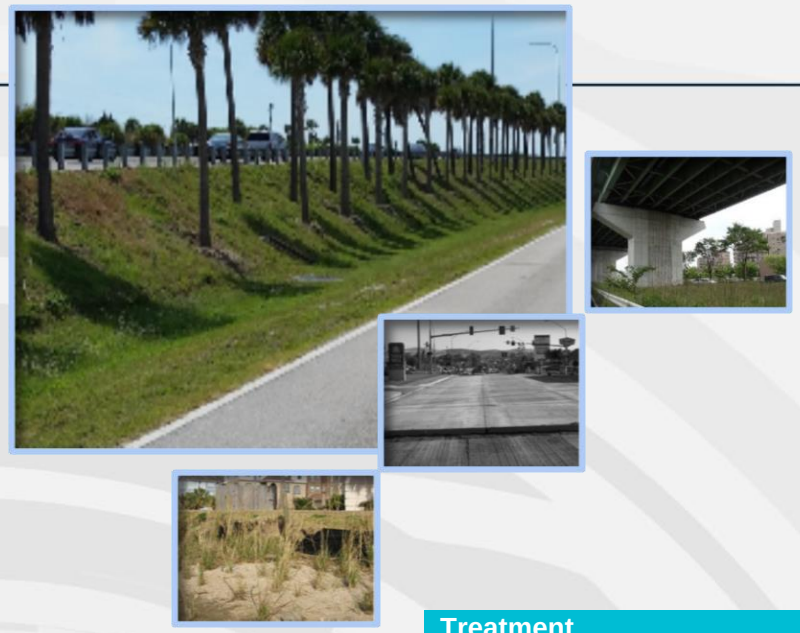


- Gandy Boulevard critical segment in 2014 Vulnerability Assessment
  - » 1/3-mile segment connecting bridge to planned expressway
  - » $1.9M estimated for strategies

Inundation Profile – Gandy Blvd (segment)



Adaptation Options

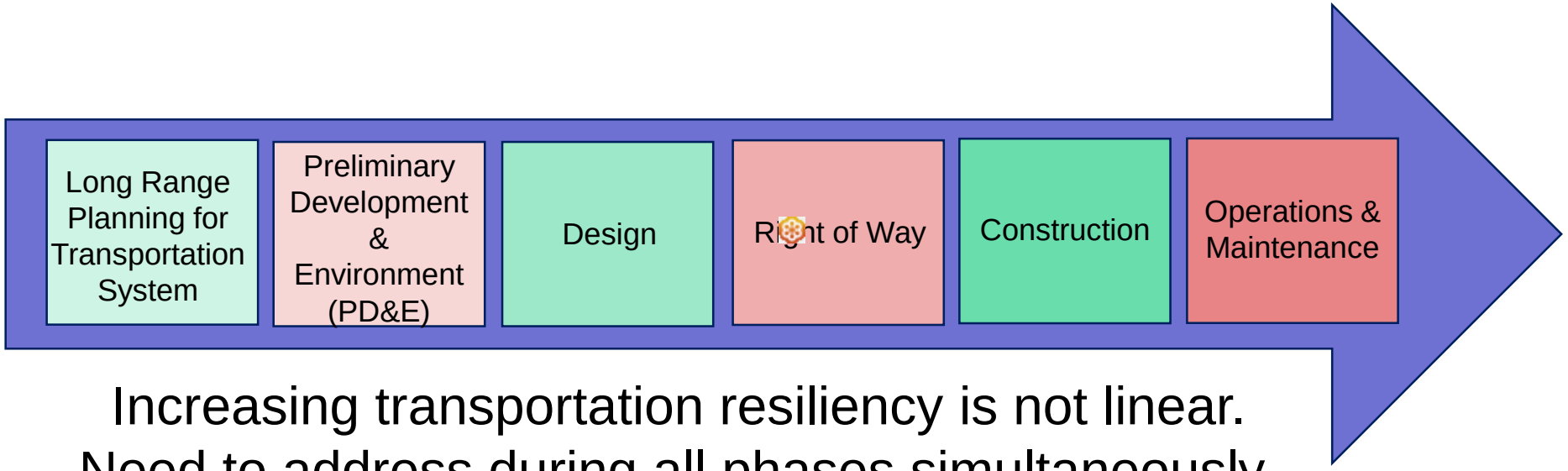


Treatment	Cost Differential	Level of Risk
Do nothing	None initially. Reconstruction cost is $3,312,000	Highest Risk. Required if roadway is destroyed.
Upgrade to full-depth concrete pavement	$676,000	Medium Risk. Road damage possible if inundation occurs.
Raise Profile	$1,119,000	Low Risk. Inundation from storm surge, rain or tide related flooding.
Erosion control via vegetation	$104,544	Low Risk. Embankment damage or washout if inundation occurs.
Pier protection via vegetation	$30 per pier (total depends on design)	Low Risk. Pier scour or damage possible if surge occurs.

Strategy Refinement for Implementation

- Refined strategies appropriate Selmon Elevated extension at Gandy Blvd.
- Developed conceptual designs & specific pre-engineering cost estimates
  - » Within limit of $1.9M budget
  - » Assume strategy mainstreaming as part of a project
- Offer low-risk, high benefit solutions to incorporate into elevated expressway extension PD&E proposal.

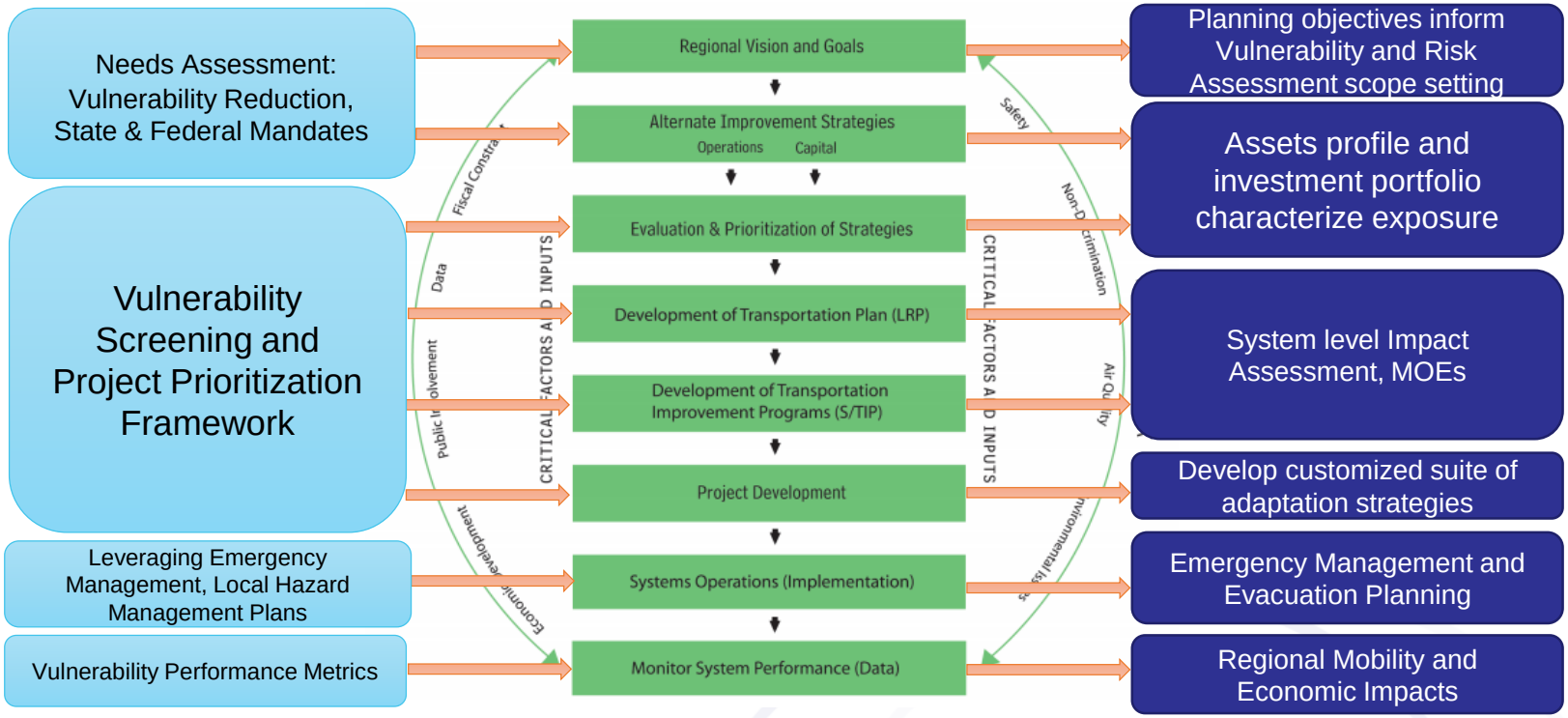
Planning for Transportation System and Transportation Project Development Phases



Increasing transportation resiliency is not linear.
Need to address during all phases simultaneously.

Slide courtesy of Karen Kiselewski, Cambridge Systematics, Inc.

Linkages to the Long Range Planning Process



Contact Information

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Hillsborough MPO
Metropolitan Planning
for Transportation

Thank you!