



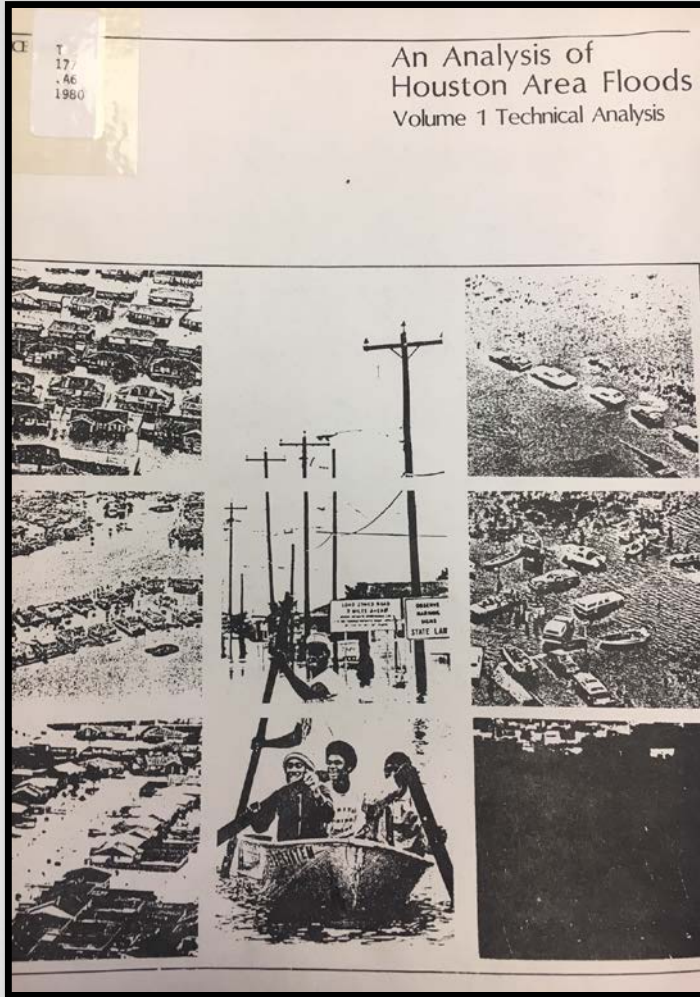
Planning for a Resilient Houston - Galveston Region

Addressing Resiliency in Regional Transportation Plans Workshop



Kristina Ronneberg
June 26, 2019

Resiliency Planning



June 1980

Regional Planning

- Regional Flood Management Council
- Hazard Mitigation Plans
- Our Great Region 2040
- Foresight Panel on Environmental Effects
- **Transportation**

Transportation Resiliency Efforts



2018 Call for Projects

2045RTP

REGIONAL TRANSPORTATION PLAN

Moving Our Region into Tomorrow

Long Range Plan



Coordination

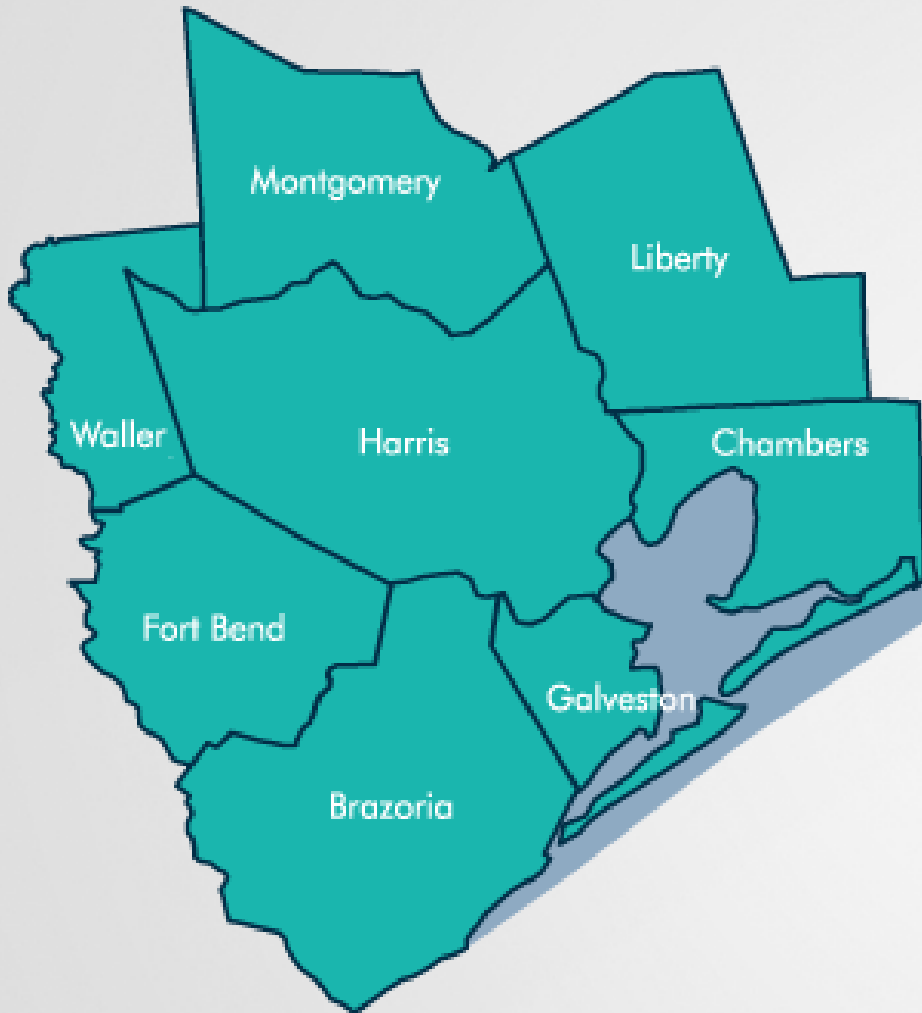
Vulnerability Assessment and Adaptation Framework

THIRD EDITION

FEDERAL HIGHWAY ADMINISTRATION
OFFICE OF PLANNING, ENVIRONMENT, & REALTY

Resilience and Durability Pilot

Resilience and Durability Pilot



- Use VAST tool + risk analysis + economic analysis to identify most vulnerable assets/ road segments
- Develop recommendations for most vulnerable assets/ road segments
- Update H-GAC publications and project selection criteria

Geography

- 8-County Region

Extreme Weather Threats

- Coastal Flooding
- Inland Flooding

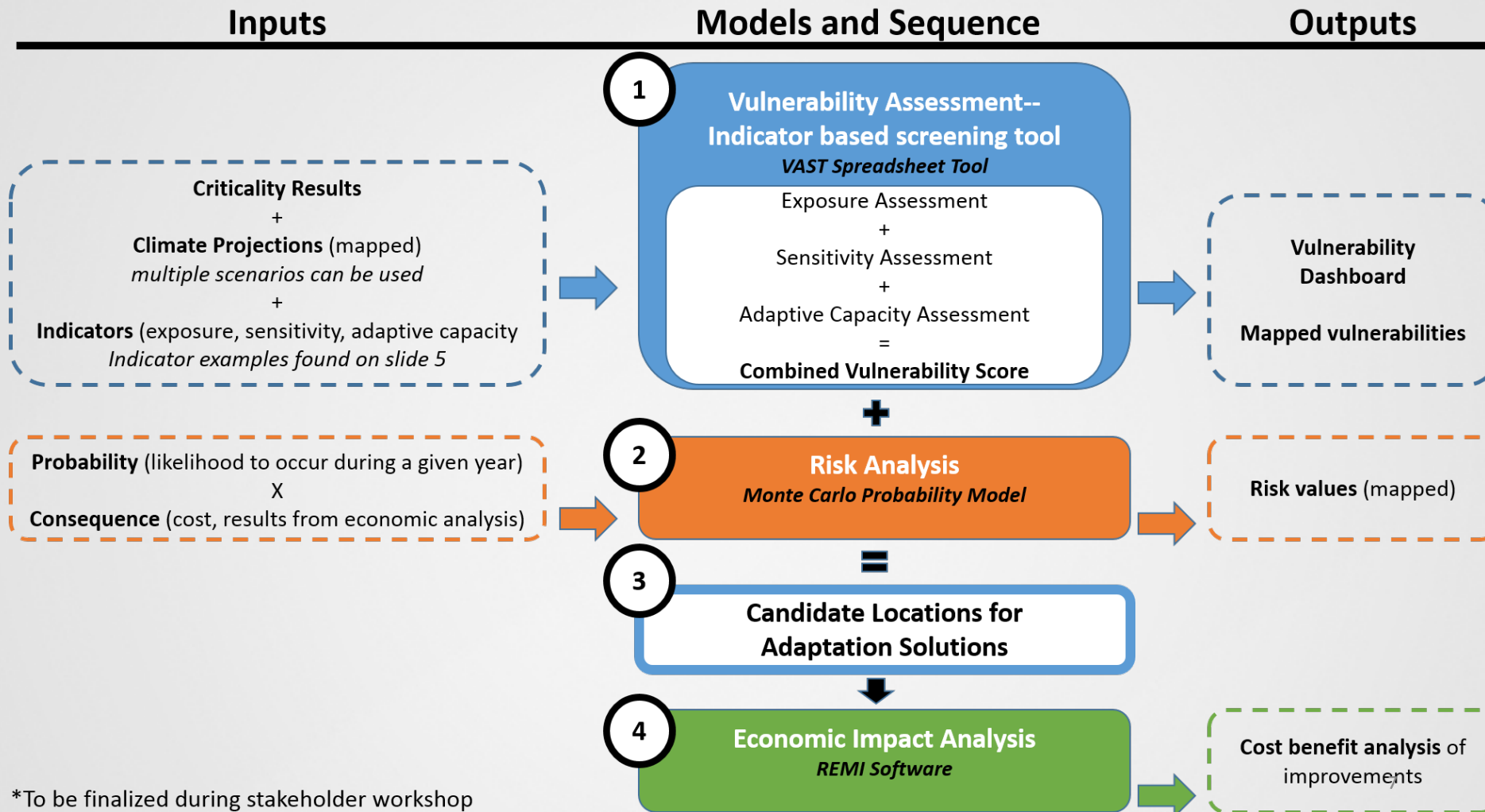
Time Horizons

- Current
- 2030 (~ 10-year plan)
- 2045 (Long range plan)

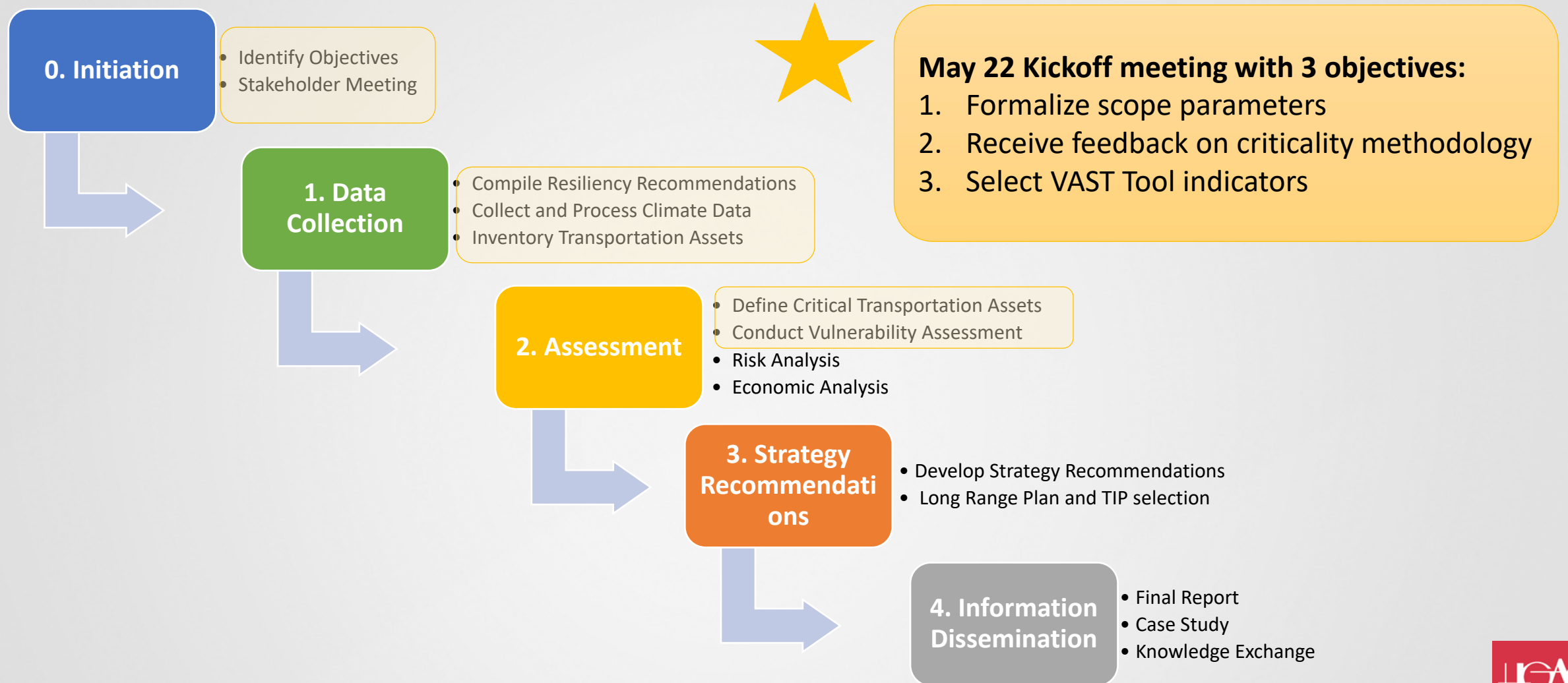
Assets to Consider

- Roads (freeways and major streets)
 - Bridges
- TxDOT on-system*

Project Analysis, Methodology



Project Phases & Timeline



Scope, Climate/ Weather Threats

Declaration Date	Incident Type	Title
9/26/2002	Coastal Storm	TROPICAL STORM FAY
6/9/2001	Coastal Storm	TX-TROPICAL STORM ALLISON-06-06-2001
9/9/2011	Fire	WILDFIRES
7/1/2011	Fire	WILDFIRES
1/11/2006	Fire	EXTREME WILDFIRE THREAT
6/11/2016	Flood	SEVERE STORMS AND FLOODING
4/25/2016	Flood	SEVERE STORMS AND FLOODING
3/19/2016	Flood	SEVERE STORMS, TORNADOES, AND FLOODING
10/21/1998	Flood	TX-FLOODING 10/18/98
10/18/1994	Flood	SEVERE THUNDERSTORMS AND FLOODING
3/20/1992	Flood	SEVERE STORMS & FLOODING
12/26/1991	Flood	SEVERE THUNDERSTORMS
7/18/1989	Flood	TROPICAL STORM ALLISON
10/30/1984	Flood	SEVERE STORMS & FLOODING
9/25/1979	Flood	SEVERE STORMS & FLOODING
7/28/1979	Flood	STORMS & FLASH FLOODS
6/19/1976	Flood	SEVERE STORMS & FLOODING
7/11/1973	Flood	SEVERE STORMS & FLOODING
8/25/2017	Hurricane	HURRICANE HARVEY
9/13/2008	Hurricane	HURRICANE IKE
9/24/2005	Hurricane	HURRICANE RITA
7/17/2003	Hurricane	HURRICANE CLAUDETTE
8/19/1983	Hurricane	HURRICANE ALICIA
9/28/1967	Hurricane	HURRICANE BEULAH
2/9/2016	Severe Storm(s)	SEVERE WINTER STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING
11/25/2015	Severe Storm(s)	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS, AND FLOODING
5/29/2015	Severe Storm(s)	SEVERE STORMS, TORNADOES, STRAIGHT-LINE WINDS AND FLOODING
10/2/2007	Severe Storm(s)	TROPICAL STORM ERIN
6/29/2007	Severe Storm(s)	SEVERE STORMS, TORNADOES, AND FLOODING
9/23/1998	Severe Storm(s)	HURRICANE GEORGES - TEXAS
8/26/1998	Severe Storm(s)	TROPICAL STORM CHARLEY
4/12/1991	Severe Storm(s)	SEVERE STORMS, TORNADOES & FLOODING
5/2/1990	Severe Storm(s)	SEVERE STORMS, TORNADOES & FLOODING
5/19/1989	Severe Storm(s)	SEVERE STORMS, TORNADOES & FLOODING
4/26/1979	Severe Storm(s)	SEVERE STORMS, TORNADOES & FLOODING
12/4/1992	Tornado	SEVERE THUNDERSTORMS & TORNADOES



13

Floods



11

Severe Storms



6

Hurricanes



3

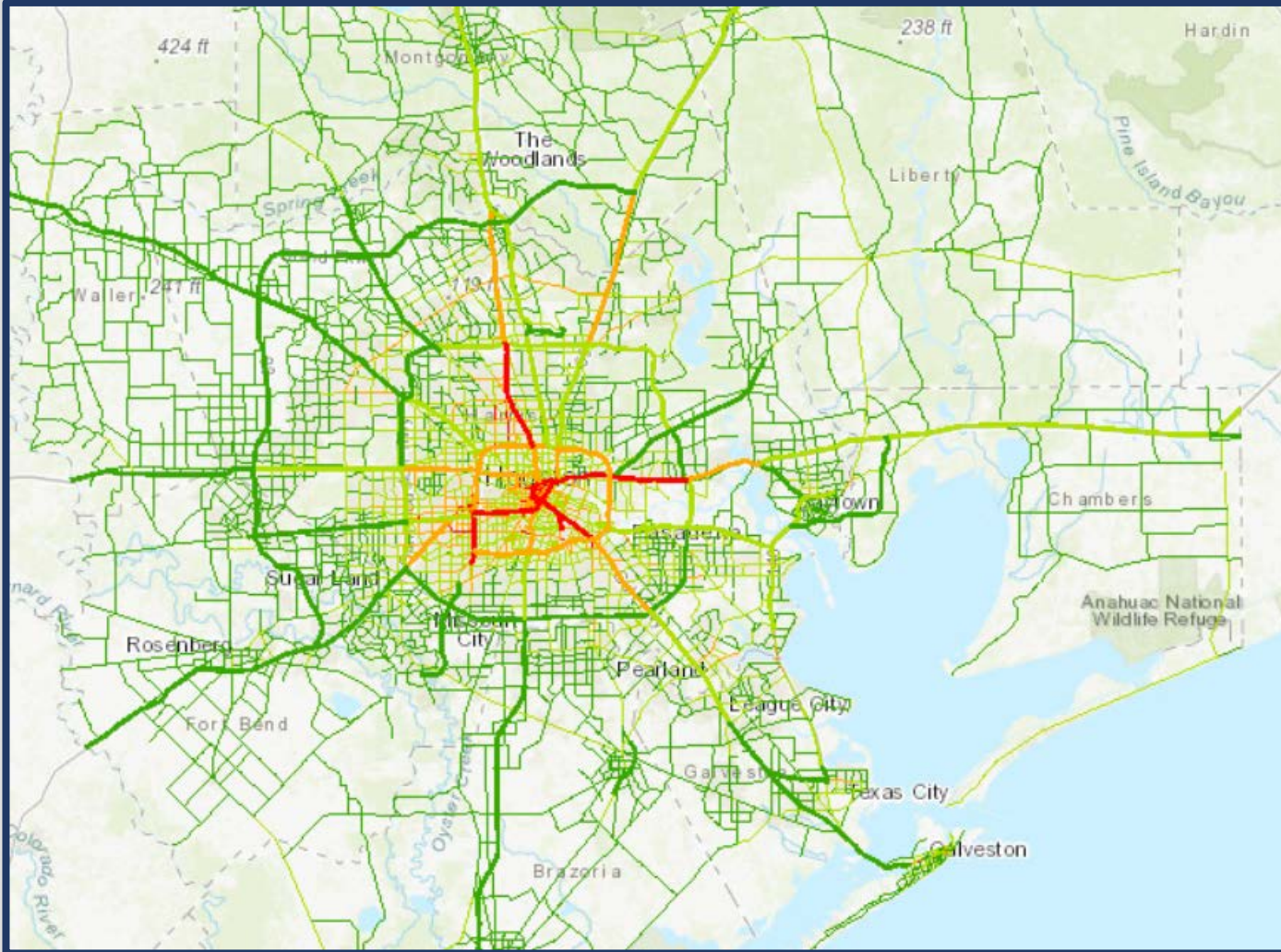
Fires



2

Coastal Storms

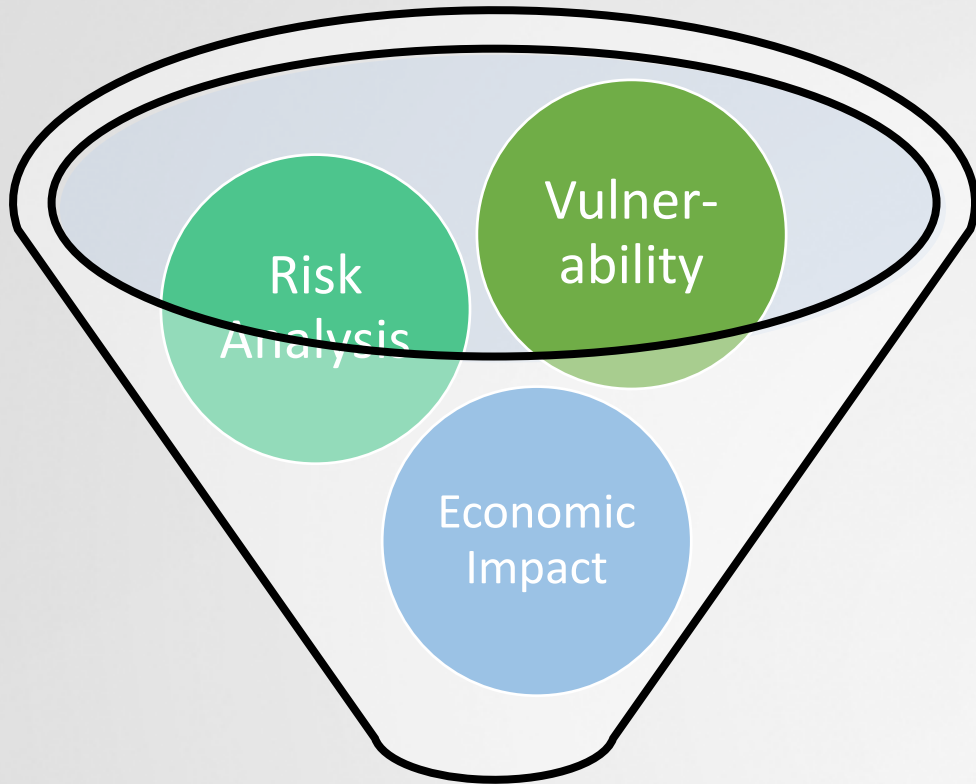
Criticality, Preliminary Results



H-GAC Regional Resilience Tool-

<http://arcgis02.h-ga.com/resilience>

Proper approach?

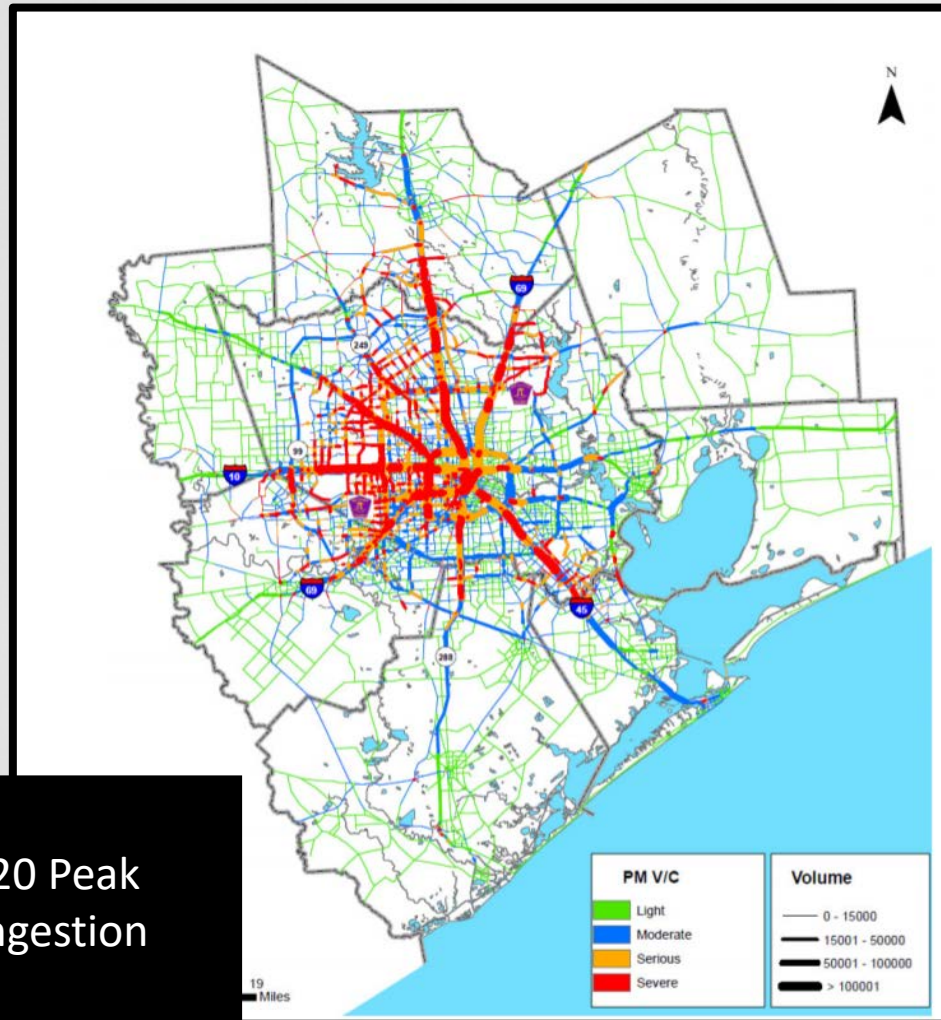


Candidate Locations for
Adaptation Solutions

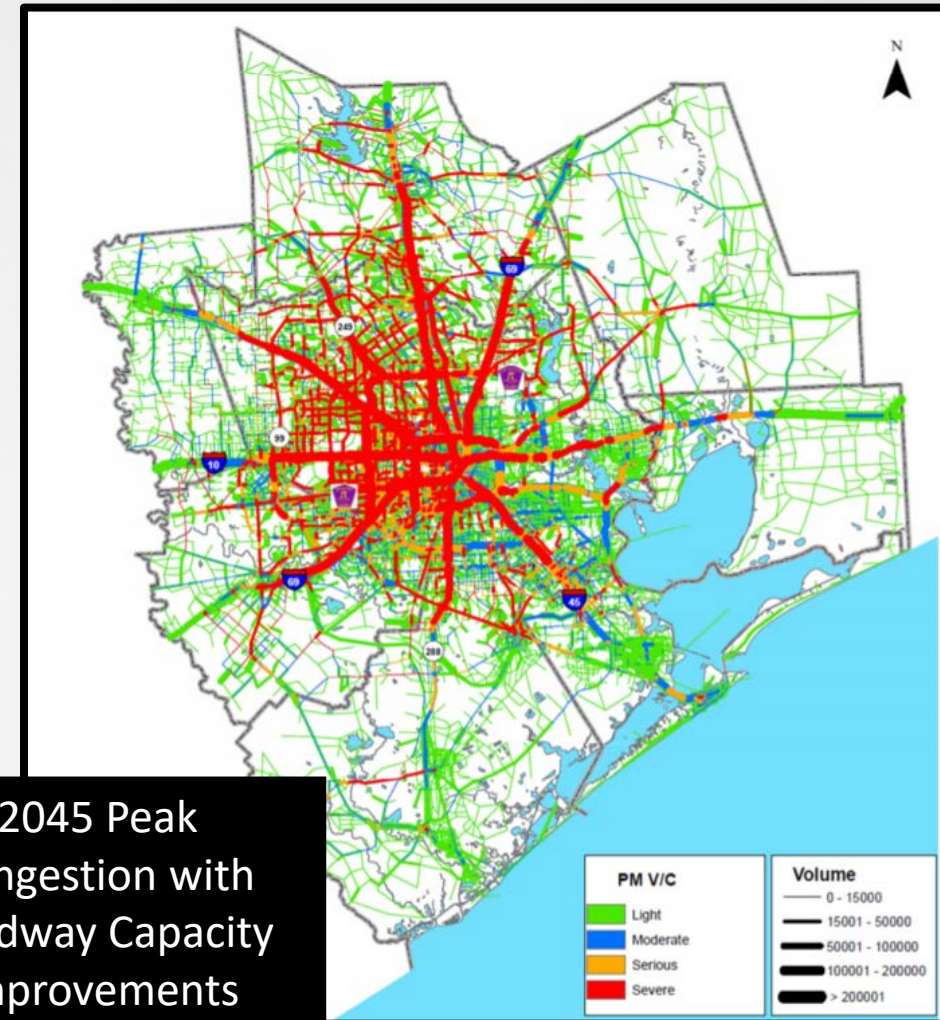
Transportation Resilience

“a system’s ability to continue to function at an acceptable level of efficiency in the face of disruptive or unexpected conditions”

Congestion



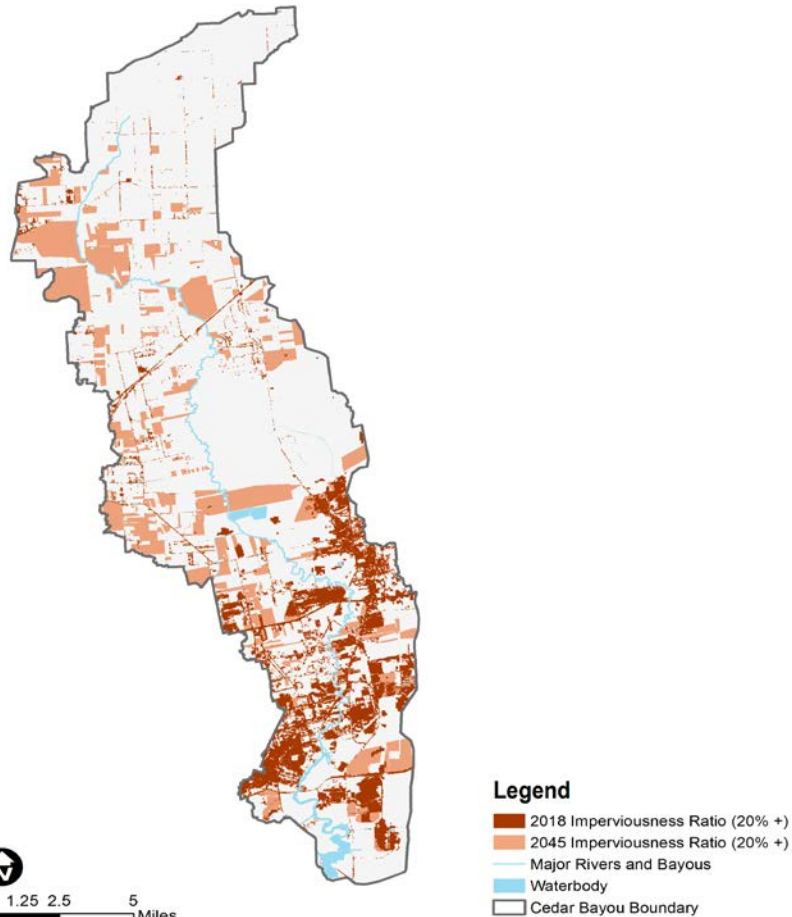
2020 Peak
Congestion



2045 Peak
Congestion with
Roadway Capacity
Improvements

Cedar Bayou Initiative, Land Use

Imperviousness Change (acres)



Estimated Imperviousness Ratio by Land Use

	Average Imperviousness Ratio
Commercial	35
Industrial	50
Residential	55
Gov/Med/Edu	45
Multiple	30

Imperviousness ratio represents urban impervious surfaces as a percentage of developed surface over every 30-meter (98.4252 feet) pixel.

Imperviousness Change (2018-2045)

	2018	2045	Change	%
Impervious Surfaces	8,823	18,221	9,398	107%
Area of Imperviousness Ratio (20% +)*	14,663	32,901	18,239	124%

* 20% + is one of criteria for determining US Census Urbanized Area

Source: 2016 NLCD Percent Developed Imperviousness, MRLC; 2018 10 Class Land Cover Data Set, H-GAC

Cedar Bayou Initiative, Back to Basics

- Channel and drainage ditch maintenance
- Jurisdictional authority and ownership
- Major upstream detention



Takeaways



- Off to a good start
- The multimodal perspective
- Back to basics
- Big challenges ahead
- A role for MPOs

Contact/ Resources

Kristina Ronneberg

713-993-2443, Kristina.Ronneberg@h-gac.com

Resources

Links

Houston-Galveston Area Council

h-gac.com

Resiliency and Durability Pilot Website

<http://www.hgacmpo.com/resiliency>
