



# U.S. DOT Gulf Coast Study, Phase 2

## Task 1: Assessing Criticality

*Support for Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study Phase 2* developed methodologies for evaluating vulnerability and adaptation measures for local transportation systems. These transferrable methodologies were pilot tested in Mobile, Alabama. The project team evaluated the impacts on six transportation modes (highways, ports, airports, rail, transit, and pipelines) from projected changes in temperature and precipitation, sea level rise, and the surges and winds associated with more intense storms.

The first task of this project involved conducting a criticality assessment of Mobile's transportation system. The large number of transportation assets made it infeasible to evaluate the vulnerability of all assets; nor was an evaluation of every asset necessary to develop an understanding of system-level vulnerabilities. Therefore, a criticality assessment was performed to identify which assets are most critical to Mobile. These assets were the focus of later steps of the study.

## Objectives

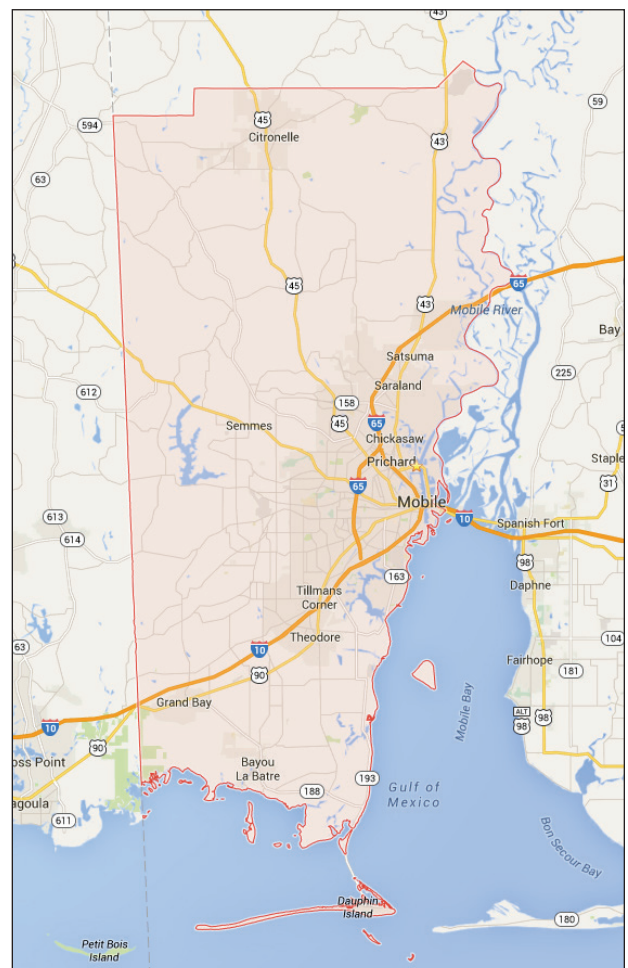
- Develop and pilot test methodologies for systematically evaluating the criticality of assets within each transportation mode
- Identify the specific transportation assets within Mobile that are most critical to Mobile from a socioeconomic, operational, and health and safety standpoint

## Approach

**Define “criticality.”** Defining criticality is an exercise that depends on many factors, including local priorities based on the characteristics that the stakeholders value, data availability, and even the definition of each “asset”. Evaluation criteria were developed for the following categories:

- Socioeconomic importance
- Use and operational characteristics
- Health and safety role in the community

Table 1 lists a few example criteria developed for each mode.



Map of Study Area.

Table 1: Example Criticality Criteria

	Socioeconomic	Use/Operational	Health/Safety
<b>Highways</b>	<ul style="list-style-type: none"> <li>Locally identified priority corridors</li> <li>Serves area economic centers</li> </ul>	<ul style="list-style-type: none"> <li>Functional classification (Interstate, etc.)</li> <li>Usage (Average Daily Traffic)</li> </ul>	<ul style="list-style-type: none"> <li>Evacuation route</li> <li>Component of disaster relief and recovery plan</li> </ul>
<b>Ports</b>	<ul style="list-style-type: none"> <li>Provides multi-modal linkages</li> </ul>	<ul style="list-style-type: none"> <li>Port capacity</li> <li>Port cargo value</li> </ul>	<ul style="list-style-type: none"> <li>Hazardous materials transfer point</li> </ul>
<b>Airport</b>	<ul style="list-style-type: none"> <li>Plays a role in national/international commerce system</li> <li>Serves as community connector</li> </ul>	<ul style="list-style-type: none"> <li>Status (commercial use airport, military airport, general aviation public airport, or private airport)</li> </ul>	<ul style="list-style-type: none"> <li>Component of evacuation plans</li> <li>Role in provision of support to offshore facilities</li> </ul>
<b>Rail</b>	<ul style="list-style-type: none"> <li>Serves local economic centers</li> </ul>	<ul style="list-style-type: none"> <li>Main track classification</li> <li>Annual gross tonnage</li> </ul>	<ul style="list-style-type: none"> <li>Hazardous materials transfer point</li> </ul>
<b>Transit</b>	<ul style="list-style-type: none"> <li>Serves transit-dependent populations</li> </ul>	<ul style="list-style-type: none"> <li>Type/Variety of services (e.g., fixed-route, demand-response)</li> </ul>	<ul style="list-style-type: none"> <li>Access to major medical, health, and safety facilities</li> </ul>
<b>Pipelines</b>	<ul style="list-style-type: none"> <li>Serves as local supply pipeline</li> </ul>	<ul style="list-style-type: none"> <li>Operation of local pumping and/or compression facilities</li> </ul>	<ul style="list-style-type: none"> <li>Chemical facility anti-terrorism standards compliant</li> </ul>

**Score and rank assets.** Each asset’s criticality was evaluated by scoring the criteria using statistics on use (e.g., volume of cargo throughput at a port); traffic modeling (to determine impact on the system if a particular segment were to become inaccessible); expert judgment; and other metrics.

Each asset was given an overall criticality score of High, Medium, or Low.

## Key Results & Findings

The criticality assessment resulted in the following findings:

Table 2: Summary of the findings from the criticality assessment for all modes

	# of Total Assets	# of Critical Assets
<b>Highways</b>	630 bridges 644 miles	Bridges: 71 bridges Miles: 152 miles
<b>Ports</b>	61 ports	23 ports
<b>Airport</b>	17 airports	2 airport
<b>Rail</b>	14 facilities 590 rail miles	7 facilities 347 rail miles
<b>Transit</b>	2 facilities 75 buses, vans, and maintenance vehicles	3 elements
<b>Pipelines</b>	652 miles	426 miles

Figure 1: Rail asset in the study area.  
Photo credit: Emmett Tullos III



Figure 2: Highway asset in the study area.  
Photo credit: Infrogmation



## Lessons Learned

**Rigid adherence to a scoring system could leave out areas of local or cultural importance** that might not otherwise score highly against the other criteria. There may be locations that provide important but difficult-to-quantify benefits. In Mobile, the city of Bayou la Batre scored low in multiple criteria, but in meetings with local stakeholders, the project team learned the importance of this community to the local fishing industry and Mobile's identity; the criticality of assets in this area was subsequently revisited. This example also highlights the **importance of vetting the results of the quantitative analysis with a variety of stakeholders** to ensure that essential assets are being captured.

It may be appropriate to identify characteristics that **automatically confer a high criticality score**. In this study, all criteria were weighted equally. However, future analyses could consider characteristics, such as role in emergency evacuation plans, to be automatic qualifiers for a designation of highly critical.

**A criticality assessment is not an assessment of vulnerability.** If an asset is considered to not be highly critical, it will not be evaluated for vulnerability, but this does not mean that it isn't vulnerable.

## Tools and Resources for Conducting Criticality Assessments

There are two key resources available for conducting transportation criticality assessments:

- A complete list of the criticality evaluation criteria used in the Gulf Coast Study for each transportation mode is available in the report Task 1: Assessing Criticality in Mobile, AL.<sup>1</sup>
- A step-by-step guidance on Assessing Criticality in Transportation Adaptation Planning, including scoping and defining criticality and applying criteria and ranking assets.<sup>2</sup>

<sup>1</sup> Available at [http://www.fhwa.dot.gov/environment/climate\\_change/adaptation/ongoing\\_and\\_current\\_research/gulf\\_coast\\_study/](http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/gulf_coast_study/)

<sup>2</sup> Available at [http://www.fhwa.dot.gov/environment/climate\\_change/adaptation/publications\\_and\\_tools/assessing\\_criticality/](http://www.fhwa.dot.gov/environment/climate_change/adaptation/publications_and_tools/assessing_criticality/)

## For More Information

### Resources:

#### Gulf Coast Study:

[http://www.fhwa.dot.gov/environment/climate\\_change/adaptation/ongoing\\_and\\_current\\_research/gulf\\_coast\\_study/](http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/gulf_coast_study/)

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