Port Authority Advisory Committee  
Meeting Agenda  

March 8, 2022  
9:00 am – 12:00 pm  
Galveston Wharves  
123 25th St., 8th Floor  
Galveston, Texas 77550  

Virtual Option:  
https://txdot.webex.com/txdot/j.php?MTID=m4681d6fc7ca5ef12516678186d433768  

1. Call to order.  
2. Introduction of committee members and TxDOT staff.  
3. Approval of the October 15, 2021 meeting minutes. (Action).  
4. Update on federal funding programs.  
5. Presentation on the functions of the TxDOT Rail Division.  
6. Update on the 2023 Texas Coastal Resiliency Master Plan.  
8. Update on the 2023 Texas Freight Mobility Plan.  
9. Presentation of final study “Creating a Resilient Port System in Texas: Assessing and  
   Mitigating Extreme Weather Events”  
11. Adjourn.  

***  

To request accommodations under the Americans with Disabilities Act, please contact  
the TxDOT Maritime Division at least three days prior to the meeting. The Maritime  
Division may be reached by phone at (512) 486-5600; by e-mail at  
Carolyn.Leal@txdot.gov, and by mail at 125 E. 11th Street, Austin, Texas 78701.  

I certify that I have reviewed this document and that it conforms to all applicable Texas  
Register filing requirements.  

CERTIFYING OFFICIAL: Becky Blewett, Deputy General Counsel, (512) 463-8630.
Federal Update – Port Authority Advisory Committee

Federico Rodriguez
TxDOT Federal Affairs
State of Play as of March 8, 2022.
The Infrastructure Investment and Jobs (IIJA) Act.

- On Monday, November 15th, 2021, the Infrastructure Investment and Jobs (IIJA) Act was signed into law by President Joe Biden.

- The IIJA includes $550 billion in new federal spending over a range of infrastructure categories, including broadband, the electric grid, drinking water, wastewater, and transportation.

- Transportation receives the largest amount of money at $274 billion, in part because the bill includes a five-year reauthorization of highway, transit, and rail programs. The $274 billion includes:
  - $110 billion for roads, bridges and major projects.
  - $66 billion for passenger and freight rail.
  - $65 billion for broadband.
  - $39 billion for transit.
The Infrastructure Investment & Jobs Act (IIJA) “Guidebook”

- Released by the White House on January 31st, 2022, as a resource to “help state, local, Tribal and territorial governments unlock the benefits from the historic investments in our nation’s infrastructure.”

- The “guidebook” is organized by issue or topic area, not agency, to ease navigation. It contains the following information for programs: a brief description, administering agency, funding amount and mechanisms, applicant eligibility, and eligible uses.

- Per the White House & USDOT, the “guidebook” will be continually updated, and include timelines for program implementation, best practices, case studies, and other resources. It is available at [www.build.gov](http://www.build.gov).
IIJA – New Grant Programs:

- Reducing Truck Emissions at Ports:
  
  - Establishes a new program to reduce idling and transportation emissions; also requires USDOT to:
    - Study how ports would benefit from electrification and to study emerging technologies that reduce emissions from idling trucks;
    -Coordinate and fund projects through competitive grants ($250 million over five years) that reduce port-related emissions from idling trucks; and,
    -Submit a report to Congress detailing the status and effectiveness of the program.
IIJA – New Grant Programs:

- Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) Program:
  - New grant program for projects that improve resilience (natural infrastructure: wetlands, floodplains, aquatic ecosystems) at the state and municipal levels.
  - Grants would provide planning and resiliency improvement funding to communities to assess vulnerabilities to current and future weather events or natural disasters. Per the IIJA, port authorities are eligible for the competitive grant program.
  - Funded at $1.4 billion in competitive grants, over FY 2022 – 2026, respectively.
IIJA:

- Improving State Freight Plans:
  
  - Under the IIJA, states must update freight plans every four years (instead of five). This section would require state freight plans to include:
    
    - Supply chain cargo flows.
    - An inventory of commercial ports.
    - Findings & recommendations from any multi-state freight compacts.
    - Impacts of “e-commerce” on freight infrastructure.
Sections of Interest – Infrastructure Investment and Jobs (IIJA) Act

- **IIJA:**
  - National Multimodal Cooperative Freight Research Program:
    - Under the IIJA, USDOT would be required to enter into an agreement with the National Academy of Science to create an advisory committee, which port authorities are eligible to sit on, to provide recommendations on methods to improve the efficiency and resiliency of freight movement.
### Port Infrastructure Development Program (PIDP)

- **Competitive Grant Program:**
  - Funded at $2.25 billion (or $450 million over five years).
  - PIDP NOFO 2/23/22—Application deadline 5/16/22.
  - These IIJA supplemental funds will allow for improvements to port facilities and port infrastructure, including intermodal connections.
  - Eligible uses include projects that “improve the safety, efficiency, or reliability of the movement of goods into, out of, around, or within a port.”
Port Infrastructure Development Program (PIDP)

- Key differences from FY 21 PIDP:
  - New eligibility for projects that advance “the safety, efficiency, or reliability of operational improvements,” including projects to improve port resilience.
  - The IIJA expands the list of eligible projects to those that eliminate port-related pollutants or greenhouse gas emissions, including:
    - Port electrification and electrification master planning, workforce training to support electrification technologies, harbor craft or equipment replacements and retrofits, and idling reduction infrastructure projects.
Sections of Interest – Infrastructure Investment and Jobs (IIJA) Act

- **Marine Highway Program (MHP):**
  - **MHP:**
    - Funded at $25 million (or $5 million over five years).
    - Supplemental funds will allow to expand the use of America’s navigable waters, expand marine highway service options and facilitate their integration into U.S. transportation systems.
    - Eligible applicants are those that USDOT has previously designated as Marine Highway Projects or “substitute applicants.” Per NOFO, eligible projects are those that “support the development and expansion of vessels... or port and landslide infrastructure.” Grants may also be used for eligible project planning activities.
Other Highlights – Infrastructure Investment and Jobs (IIJA) Act

- Other notable sections of the IIJA include:
  - National Electric Vehicle Infrastructure (NEVI) Formula Program:
    - $5 billion program for states to deploy EV charging infrastructure; TxDOT is in early stages for drafting an EV Infrastructure Deployment Plan, which incorporates public involvement.
  - Grants for Charging and Fueling Infrastructure:
    - $2.5 billion (over five years) discretionary grant program, divided into two programs: the Corridor Charging Grant Program and the Community Charging Grant Program. Port authorities are eligible.
    - Per USDOT, guidance and NOFOs “will be forthcoming.”
Other Highlights – Infrastructure Investment and Jobs (IIJA) Act

- Other notable sections of the IIJA include:
  - RAISE Grant Program:
    - $1.5 billion in FY 22; Port infrastructure investments (including inland ports) are eligible.
  - INFRA Grant Program:
    - $1 billion in FY 22 (plus $3.2 billion, over five years, in supplemental appropriations); Freight projects within the boundaries of a public or private freight rail, water (including ports), or intermodal facilities are eligible.
TxDOT Rail Division 101

Port Authority Advisory Committee
Jeff Davis, Rail Division Director
Rail Division New Director
Rail Division Formation

Planning & Programming Section

Rail—Highway Section

Rail Safety Section
Section Spotlights: South Orient
State ownership fostering local economic opportunity.

$140M public & TXPF invested since 2004 for Class 3 track over much of line

Carloads reached 44K in 2017
Section Spotlights: South Orient

Next growth phase is international, with track improvements last year in Big Bend Country
Section Spotlights: South Orient

Existing customers out there:
Section Spotlights: South Orient

Track work, bridges, grade crossings, international bridge reconstruction
Section Spotlights: South Orient

Planning & Programming Section

Example Non-Intrusive Inspection Equipment (NII).

2021

Design, Environment, Property Issues

2022

2023

Non-Intrusive Inspection Equipment Procurement and Installation

2024

Construction

What’s left? train inspection facility.
Funding secure, design in progress.
Section Spotlights: Section 130

5-yr, $100M plan for Section 130 improvement locations
Section Spotlights: Section 130

From priority ranking, to diagnostics, to design and agreements, to funding construction
Section Spotlights: Section 130

Focus on humped crossing mitigation
Section Spotlight: Inspection
Rail Division Formation

Rail Safety Section
Planning statewide and local
Planning statewide and local

Advancing plans, will look at Tower 55 future, Houston East End public concerns, passenger rail options.
2022 Priorities: Interconnected Signals
2022 Priorities: Shortlines, ports, and economic development
2022 Priorities: The BIL

FRA charged with handling $100B+ in 5 yrs
Many new discretionary grants
RRD assessing state and local application strategies
The BIL and Grade Separations

Potential for $50M/yr to TX crossings

RRD working on list of grade separation candidates for grant applications
Questions?

Jeff Davis  Jeffrey.davis@txdot.gov

TxDOT
Rail Division
Austin
The Texas Coastal Resiliency Master Plan

March 2022 PAAC Meetings
Overview

- The TCRMP outlines a vision to protect coastal communities, infrastructure, and ecological assets from coastal hazards

- Moving to four-year planning cycle and focus on implementation leading to 2023 TCRMP

- Building on the 2019 TCRMP, the 2023 TCRMP will engage, educate, and empower
Goals and Objectives

1. Identify, select, and fund projects that address the coastal vulnerabilities and restore, enhance, and protect the Texas coast.

2. Develop an adaptable Plan that accommodates changing coastal conditions.

3. Communicate the environmental and economic value of the Texas coast to local, state, and national audiences.
Technical Advisory Committee

- Involved throughout
- Inform and being informed by resilience planning
- Planning partners
Vulnerabilities Survey Results

- Total of 82 TAC member responses

- Vulnerabilities scored, highest to lowest:
  1. Gulf Shoreline Change
  2. Degraded or Lost Habitat
  3. Storm Surge
  4. Bay Shoreline Change
  5. Degraded Water Quality
  6. Inland Flooding
  7. Tidal Flooding
  8. Degraded Water Quantity
TCRMP Project Identification

**Willow Lake Shoreline Stabilization (Project ID: R1-2)**

**Project Description**
The project would construct approximately 6,000 linear feet of shoreline structures along the GLO Resilience Master Plan (GLO RMP). The project goals include constructing new or rehabilitated structures along the shore. The shoreline structures would be designed to provide improved habitat for wildlife and vegetation, and to reduce erosion and sedimentation.

**Project Need**
The existing shoreline and wetlands along the Willow Lake shoreline are deteriorating due to increased storm frequency and intensity. The project aims to stabilize the shoreline and improve the ecological function of the wetland.

**Project Benefit**
The project would enhance the ecological function of the wetland by providing improved habitat for wildlife and vegetation, and by reducing erosion and sedimentation.

**Estimated Total Project Cost:** $6,600,000

Texas General Land Office
George P. Bush, Commissioner
Planning Enhancements – Expanded Benefits

- Develop more comprehensive understanding of resilience projects in the Plan, as applicable
  - Social
    - New for the 2023 Plan, incorporates social vulnerability and other societal co-benefits
    - Will better position Tier 1 projects for a wider range of funding streams
  - Environmental
    - Builds off of the ecosystem services work previously covered for hazard mitigation
    - Also considers long-term benefits (carbon, emissions, water quality, etc)
  - Economic
    - Direct costs, avoided impacts, fiscal impacts, and funding opportunities
TCRMP Planning Process

**Begin Plan**
- September 2019

**2020**
- Enhance Planning Framework
- Solicit Updated Information from Project Sponsors
- Progress Projects to Implementation
  - Conceptual Projects
  - Funding Strategies
  - Resilient Design Guides
- TAC Meetings on Plan Enhancement and Project Updates

**2021**
- Technical Analyses and Modeling
  - Data-Driven Action Assessments
  - Enhanced Modeling
  - Ecosystem Services
  - Economic Benefits
- Project Identification and Screening
- TAC Coastal Vulnerability Updates
- TAC Review of Actions and Project Identification

**2022**
- We’re Here
- TAC Project Evaluations

**2023 Plan**
- Progress Projects to Implementation
- Begin 4-Year Planning Cycle for the 2027 Resiliency Plan

**Next Steps**

Texas General Land Office
George P. Bush, Commissioner
Project Evaluation Meetings

- Project submittals are due by Friday March 18, 2022
- The next TAC Meetings will be held in June 2022
- Evaluate existing and newly proposed projects and concepts for inclusion as Tier 1 priorities in 2023 TCRMP
Thank you

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Tony Williams
Deputy Director
Coastal Planning and Field Operations
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01 2024-2025 Port Mission Plan Overview
02 Port Connectivity Report
03 Port Capital Program Report
04 Ship Channel Improvement Report
05 Schedule
01

2024-2025 Port Mission Plan Overview
2024-2025 Port Mission Plan

Landside Connectivity
Port Connectivity Report

Port Facilities
Port Capital Investment Report

Ship Channel Improvement
Ship Channel Report

Port Mission Plan
02
Port Connectivity Report
Connectivity Report – Status Update

- Inland connectivity needs assessment
  - Roadway, rail, pipeline, and airport connections
  - Completed interviews with 18 ports
  - Completed technical review of connectivity conditions
  - Draft needs assessment undergoing tech review

- Connectivity solutions evaluation
  - Roadway, rail, and other improvements
  - Evaluate and prioritize potential solutions for each port
  - Developing robust evaluation framework with TxDOT

- Funding options and implementation strategy
Connectivity Stakeholder Involvement – Status Update

- Port Administration Interviews
  - Needs identification complete
  - Solutions review in late Spring
- TxDOT Involvement
  - Solutions evaluation framework workshop
  - Solutions development interviews
Port Capital Program Report
Port Capital Program Report (PCPR) Process

- **INTRODUCTION**
  - *Capital* projects commonly characterized as inside the gates, however not always the case

- **CAPITAL STATUS**
  - Met with the ports and navigation districts to discuss previous and future capital projects
    - *Thank you to all who took time to assist in this*
  - Projects from 14 ports and navigation districts, compared to 8 last year
  - Estimated 57 projects for this iteration, nearly double the capital projects last year
Next Steps for PCPR Development

- Follow up questions on projects (March 2022)
- Start and edit project writeups (March and April 2022)
- Begin project scoring process Q2 2022
- Begin developing the PCPR in May 2022
- Final PCPR submitted in late June 2022

NEXT STEP

Contact Ports and Navigation Districts for follow up questions on projects
04

Ship Channel Report
Ship Channel Report – Status Update

Status Update

- Overall goal of the report is capitalization for the Ship Channel Improvement Revolving Fund (SCIRF)
- Meetings with each port were held in December/January 2022 to discuss projects
- Draft profiles for projects are ready for review
- Draft report narrative is ready for review
Port Reviews

- PMP will be requesting reviews from all ports with projects (federal/non-federal):
  - Markups on project profiles
  - Confirm project costs
  - Confirm local/federal allocations to date
  - Send total $ your port/nav district plans to spend on improvements in 2024-2025
Thank you.
Agenda

- Critical Rural Freight Corridors
- Critical Urban Freight Corridors
- Role of the Supply Chain in Texas Delivers 2050
- Resiliency Case Study Review
Final THFN

2018 THFN Mileage: 21,861
Additional 2023 THFN Mileage: 1,709
Total 2023 Mileage: 23,570

- From stakeholder feedback: SH36, SH115, SH18, SH17, SH207, SH176, FM1450, SH63, US377, SH20, +12 others
- Remove passenger terminal access road at DFW airport

Changes from 2018
- Addition: Stakeholder Recommendation
- Addition: Updated Analysis
- Removal: Stakeholder Recommendation
- No change
Freight Highway Network Terminology

Texas Highway Freight Network (THFN)
- Designated by TxDOT – Based on stakeholder input
- No mileage limitation
- No direct funding eligibility implications

National Highway Freight Network (NHFN)
- Designated by FHWA
- Includes Primary Highway Freight System (PHFS)
- Includes non-PHFS Interstates*
- Includes DOT/MPO designated Critical Urban/Rural Freight Corridors
- Directly affects funding eligibility

*Includes non-PHFS Interstates and DOT/MPO designated Critical Urban/Rural Freight Corridors.
CRFCs and CUFCs are important freight corridors that provide critical connectivity to the NHFN. By designating these important corridors, States can strategically direct resources toward improved system performance and efficient movement of freight on the NHFN.

*Federal Highway Administration*
Designating Critical Rural Freight Corridors

- Designated by TxDOT
- Limited to 745.55 miles and outside of urbanized areas
  - No additional mileage from Infrastructure Investment and Jobs Act (IIJA)
- Meets one or more of seven criteria

- Principal arterial with trucks at least 25 percent of traffic
- Provides access to energy exploration or production
- Connects PHFS and Interstate System to major facilities
- Provides access to grain, agriculture, mining, forestry, or intermodal
- Connects to international port of entry
- Provides access to significant air, rail, water, or other freight facilities
- Determined by the state to be vital to efficient freight movement
Designating Critical Urban Freight Corridors

- Led by MPOs when population exceeds 500k
- Led by TxDOT in smaller urbanized areas (above 50k)
- Limited to 372.78 miles (no change)
- In 2018 TxDOT chose to begin with:
  - 288 miles in large urban areas
  - 84 miles in small urban areas
- Meets one or more of four criteria
- MPOs currently working on designation

**Corridor Criteria:**

- Connects intermodal facility to PHFS, Interstate, or intermodal facility
- Provides an alternative route along the PHFS
- Serves a major freight generator, logistic center, or manufacturing and warehouse industrial land
- Determined to be important to freight movement by MPO or state
Next Steps

- Integrate TxFAC input on TMFN
- Finalize DOT Designated Critical Freight Corridors
- Obtain MPO designated CUFCs
- FHWA certification
Industries for Supply Chain Analysis

- **Petroleum**
  - Oil and gas production
  - Petrochemical manufacturing
  - Rubbers and plastics

- **Agriculture**
  - Cotton
  - Wheat
  - Cattle
  - Food processing

- **Advanced Manufacturing**
  - Computers, electronics, and electrical components
  - Transportation equipment

- **Construction**
  - Lumber and wood products
  - Structural steel
  - Cement and concrete

- **Warehousing and Distribution**
  - General retail
  - Cold storage - Grocery
  - E-commerce
Documenting the Role of the TMFN in Supporting Key Industry Supply Chains

- Estimation of structural flows for supply chains
  - Examine sourcing, production, distribution, reverse logistics
    - Commodity flows
    - Modal usage upstream and downstream
  - Generate outputs
    - Graphical depiction of supply chain structures
    - Supply chain flows on the TMFN

- Stakeholder vetting and validation
  - TxFAC
  - Supply Chain Working Group

- Finalization of supply chain diagrams and TMFN flows
Purpose: To assess the ability for the TMFN to absorb the consequences of disruptions, to reduce the impacts of disruptions and maintain freight mobility

- Criteria for selecting case studies
  - Potential impact on TMFN
  - Geographic coverage
  - Data availability
  - TxFAC input on disruptions
Selected Case Studies

Statewide - COVID-19
Statewide - Winter Storm 2021
Gulf Coast - Hurricane Harvey

Border Region - Farmers’ protest
Texas Triangle - 2011 draught and wildfires
Energy Regions - Pipeline cyber attack
Statewide- COVID-19

- Initial disruption - delivery of medical protective equipment and supplies
- Continuity of regular shipments of medicines and medical supplies remains critical
- As the effects of the virus continue into a second year, gaps in delivery of goods and services are impacting all CRITICAL supply chains

How were freight movements for your businesses/organizations impacted? What are long-term consequences?
Statewide: Winter Storm, 2021

- Extreme cold temperatures created periods of freezing rain beginning February 7, 2021
- Produced dangerous roadway conditions halting transit for goods
- Many terminals and warehouses were closed
  - Texas long-haul deliveries dropped 36% week over week
  - National truck load spot prices went from $2.48 per mile, to $2.68 per mile in two weeks
- Generated an energy crisis due to power outages

How were freight movements for your businesses/organizations impacted? What were notable multimodal impacts?
Gulf Coast: Hurricane Harvey

- Over 60 inches of rain, resulting in more than $125 billion damages
- 10% of ALL U.S. trucking was impacted by flooded roads and damaged infrastructure
- Over 30,000 people were displaced for more than a week, and more than 17,000 had to be rescued
- Workers (drivers, operators, labor, administrators) unable to get to Ports, due to extensive flooding of major State and Interstate arterials

How were freight movements for your businesses/organizations impacted? What must we include in case study with regards to freight movement?
Energy Producing Regions: Pipeline Cyber Attack, May 2021

- Multiple days of Colonial Pipeline shutdown
- Spike in gasoline prices
- Panic buying resulting in localized fuel shortages
- Impacts from the east coast used to inform Texas case study

How might a Texas disruption differ from Colonial Pipeline example? What are most significant impacts likely to be?
Border Region: Farmers’ Protest

- Mexican farmers shut down the Presidio Bridge from June 7th -10th 2020
- Farmers were protesting the diversion of water from the Conchos River in Chihuahua to fulfill Mexico’s obligation to the United States under an international water treaty
- The blockade prevented all passenger and vehicular traffic for three days
- Freight traffic forced to reroute

How were freight movements for your businesses/organizations impacted? What must we include in case study with regards to freight movement?
Texas Triangle: 2011 Drought and Wildfires

- Dry fall and winter started in October 2010
- By April wildfires had begun in the western portion of Texas
- June 2011 was the hottest June on record between 1895 and 2011
- Numerous factors contributing to worst wildfire season in state history
- $32.4 million expended by the Texas Department of Transportation primarily related to pavement maintenance directly attributable to the drought

How were freight movements for your businesses/organizations impacted? What must we include in case study with regards to freight movement?
Next Steps

Complete event overview and data collection

Conduct analysis for performance measures

Conduct stakeholder interviews

Document findings

Develop TMFN resiliency risk indices
Texas delivers 2050 Schedule

**ACCESSING CRITICAL SUPPLY CHAINS, UNDERSTANDING THE TEXAS MULTIMODAL FREIGHT NETWORK**
Freight and Economic Profiles; Supply Chain Analysis, Network Designation; Trends, Disruptors & Opportunities

**ASSESSING CURRENT & FUTURE FREIGHT NEEDS**
Commodity Flow Forecasts and Scenarios; Needs Assessment

**DEVELOPING STRATEGIES**
Policy, Program, and Project Strategies

**DRAFT FINAL PLAN**

**STAKEHOLDER OUTREACH**

**STAKEHOLDER WORKSHOPS #1**
Goals, Freight Profiles, Freight System

**STAKEHOLDER WORKSHOPS #2**
Forecasts, Needs, Strategies

**TxFAC Meetings**
Thank you!

Sherry Pifer
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Creating a Resilient Port System in Texas: Assessing and Mitigating Extreme Weather Events

Zhanmin Zhang, Ph.D.
The University of Texas at Austin
Emily Hampton
Texas Department of Transportation
Research Goals

- Systematic investigation of the resilience of the Texas Port System by assessing network-level and port-level exposure, risks, vulnerabilities, and resilience capacity.
- The specific objectives are:
  - Identify and characterize potential extreme weather events.
  - Identify the network- and port-level vulnerabilities of Texas ports and supporting infrastructure.
  - Quantify the physical and economic risks posed by extreme events to Texas ports.
  - Develop metrics and evaluate the resilience of Texas ports.
  - Provide recommendations for improving Texas port system resilience.

Relationship between hazard, exposure, vulnerability, risk and resilience.
Identify and Characterize Potential Extreme Weather Events

Texas coast storm surge flood exposure by hurricane intensity, inundation depth raster (data from NHC)
Identify and Characterize Potential Extreme Weather Events (Contd.)

- Earthquakes, tornadoes, wildfires also examined but occurrences are either infrequent, low-severity, or non-natural in origin
- Analyses under the study primarily focus on hurricane storm surge and sea level rise
Enhance the Inventory of Port System and Supporting Infrastructure

Identify and extract network-level information on existing port infrastructure

- Port facilities (deep- and shallow-draft) and connected transportation systems (roadway, railway, water channels)
- Supporting infrastructure (pipelines and electric grid)

Collect port trade data

- Port-level trade data categorized based on imports and exports, commodity type, and value for quantifying economic impacts
GIS Dataset Tool
Gather Information on Port Vulnerability and Resilience

Conduct workshops, surveys, and interviews with relevant stakeholders to fill knowledge gaps and identify vulnerabilities and resilience capabilities for port infrastructure, focusing on:

- The existing status of resilience in the Texas port environment.
- Inherent inadequacies that could amplify physical or functional damages.
Gather Information on Port Vulnerability and Resilience (Contd.)

Summary of port stakeholder outreach activities

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<thead>
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<th>Activity</th>
<th>No. of Participants</th>
<th>No.</th>
<th>Activity</th>
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<td>Texas trucking online Qualtrics survey</td>
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<td>Public sector stakeholder interview</td>
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<td>Trucking interviews</td>
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</table>
Quantify Physical Risks on Texas Port System

Developed a framework to assess the risk of the physical infrastructure systems in a port environment.

Analysis focuses on network level impacts but could be adopted for an individual port.

- Stakeholder input from surveys and workshops are included where necessary.
- Case study for Houston-Galveston-Beaumont region was performed to demonstrate implementation.

Risk assessment framework
Quantify Economic Risks of Port System Disruptions

Direct-microeconomic risks: Direct losses incurred by the port due to damaged components and revenue losses

Indirect-macroeconomic risks: Losses incurred by industries that are dependent on goods transported through ports as a result of destroyed or unavailable commodities due to port disruptions
Quantify Economic Risks of Port System Disruptions (Direct Impact)

Daily revenue multiplied by shutdown durations to obtain expected losses for hurricanes by storm Category

<table>
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<tr>
<th>Port</th>
<th>Daily Operating Revenue ($ Thousands)</th>
<th>Losses from disruption to port operations ($ Thousands)</th>
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<td>Orange</td>
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## Quantify Economic Risks of Port System Disruptions (Indirect Impact)

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<td>125.83</td>
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<table>
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<tr>
<th>Port</th>
<th>Case B Indirect Losses (in $Million)</th>
<th>Cat +0</th>
<th>Cat +1</th>
<th>Cat +2</th>
<th>Cat +3</th>
<th>Cat +4</th>
<th>Cat +5</th>
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Develop Port Resilience Metric

• Assessing resilience by the 4R dimensions for resilience improvements
• Organizing user input questions along the four steps of the emergency management (EM)
• Developing Port Resilience and Economic Impact Assessment Tool (PortRESECO)

<table>
<thead>
<tr>
<th>Resilience Dimension</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port Robustness</td>
<td>The physical aspects of a port that could potentially reduce the impact of extreme weather events</td>
</tr>
<tr>
<td>Port Redundancies</td>
<td>The pre-disaster arrangements for substituting port operations and components in case of a port failure</td>
</tr>
<tr>
<td>Port Resourcefulness</td>
<td>The pre-disaster arrangements for mobilizing resources for restoration and recovery actions</td>
</tr>
<tr>
<td>Port Response Rapidity</td>
<td>The preparations to speed up restoration and recovery actions</td>
</tr>
</tbody>
</table>
PortRESECO – Resilience Module
PortRESECO – Economic Impact Module

**Economic Impact Assessment**

**Input**
- Port of Interest: Houston
- Hurricane Category: Cat 1
- Daily Operating Revenue in $Million (Optional): A default value of $1120.31M is used
- Year: 2021

**Output**
- Direct Loss: $2,207,009,000
- Indirect Loss: Case A: $1,543,965,000, Case B: $1,211,377,000

1. Case A is estimated under the assumption that all imported goods impact domestic production
2. Case B is estimated under the assumption that all imported goods have no impact on domestic production

[Exit]
Assessing Network-level Resilience

Network criticality is assessed using betweenness centrality of both nodes and links.
Assessing Network-level Resilience (Contd.)

Network vulnerability is assessed using total graph diversity (TGD)

Path diversity measures the number of disjoint links in an alternate path between a given node pair as compared to the shortest path for the given node pair

<table>
<thead>
<tr>
<th>Network</th>
<th>Total Graph Diversity (TGD)</th>
<th>Vulnerability Indicator ($V_i$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadway</td>
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</tr>
<tr>
<td>Railroad</td>
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<tr>
<td>Navigation Channel</td>
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<td>1.00</td>
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</table>
Provide Recommendations for Improving Port System Resilience

• Document appropriate resilience best-practices that could improve the resilience of Texas port system
• Provide recommendations for improving the resilience of critical components in Texas ports and supporting infrastructure
• Prioritize recommendations categorized by intended stakeholder:
  1. TxDOT (7 recommendations)
  2. Texas legislature (2 recommendations)
  3. Port authorities and port tenants (4 recommendations)
• Provide generic recommendations for port hurricane preparedness and response (20 recommendations)
• Finalize recommendations are available in the project final report (R1)
Provide Recommendations for Improving Port System Resilience

• Recommendation for Texas Legislature to Act on:
  ➢ The Texas legislature should designate the larger port authorities as agencies responsible for emergency management in Texas Government Code Chapter 418.
  ➢ The Texas legislature should consider appropriating funds to be disbursed to Texas port authorities for enhancing port resilience.

• Recommendations for Port Authorities and Tenants
  ➢ Ports should consider climate change and extreme weather events in the planning, design, and construction of new port facilities.
  ➢ Port authorities should prioritize the preservation of life following a storm event by first conducting window assessments to gauge safety conditions, followed by an initial damage assessment of port facilities and finally formal damage assessment as per FEMA regulations.
  ➢ Port authorities should establish means to enhance communications with the U.S. Army Corps of Engineers (USACE) and the U.S. Coast Guard (USCG).
  ➢ Port authorities should not only utilize past data to assess current risks but also consider “worst-case” scenarios that have not occurred.
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