

Resilience and Durability to Extreme Weather Pilot Program

Houston-Galveston Region Work Plan

Updated on December 13, 2018

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Phase 0, Initiation

Task 1, Identify objectives

Project objectives will be identified through internal discussions with H-GAC leadership and at the project kick-off meeting with partner stakeholders. Elements of project scope to narrow in on include geography, decision timeframe, types of assets, and climate variables.

- **Data needed:** N/A
- **Deliverables:** List of questions posed internally at H-GAC and kick-off meeting materials including agendas, background information, questions for consideration, etc.
- **Timeline:** October 2018 – February 2019

Task 2, Establish transportation resilience taskforce

The resilience and durability to extreme weather pilot project will rely on expertise and data from many entities including cities, counties, flood control districts, universities, non-profits, the Texas Department of Transportation, and others. Participation from all of these groups is essential to the project's success; thus creating a regional transportation resilience taskforce must be one of the project's first steps. The project kick-off meeting will be attended by taskforce members and will help identify project objectives, vulnerability indicators, existing data, data needs, available data sets, and what role each participating member will play.

- **Data needed:** N/A
- **Deliverables:** Expectations for taskforce members, taskforce bylaws, resiliency taskforce website
- **Timeline:** December 2018 – February 2019

Phase I, Data Collection

The objective of Phase I is to identify, assemble, and synthesize all data and studies that will be needed to perform the vulnerability analysis. Needed information includes previously conducted resiliency studies, climate data (precipitation, flooding, heat, storm surge, sea level rise, etc.), and transportation asset data. All collected data—from tasks 2 and 3—will be mapped using GIS.

Task 1, Compile resiliency recommendations from regional plans

Compile information from previous and ongoing regional resiliency planning efforts including but not limited to hazard mitigation plans, emergency management plans, Our Great Region 2040, Houston-Galveston Area Council (H-GAC) Foresight Panel on Environmental Effects, etc. Previously developed resiliency recommendations can provide insight on the region's resilience priorities.

- **Data needed:** Existing reports
- **Deliverables:** Summary of previously proposed resiliency recommendations
- **Timeline:** January – June 2019

Task 2, Collect and process climate data

Scaled down climate data and projections will be collected from national, state, and local agencies, partners, and universities including the US Army Corp of Engineers (USACE), TxDOT, FEMA, and the state Climatologist. Examples of data needed are FEMA flood zone maps, sea level rise (SLR) inundation maps, temperature, LIDAR, and other appropriate data inputs. Data is needed for all climate variables being evaluated by the vulnerability assessment. Projection time horizons will have been determined during *Phase 0, Task 1*.

- **Data needed:** FEMA flood zone maps, SLR inundation maps, flooding data, high resolution flood projections, high water locations, climate hazard sites, temperature projections, etc.
- **Deliverables:** GIS maps and inputs for the VAST tool
- **Timeline:** February – June 2019

Task 3, Inventory transportation assets to be assessed

A high-level vulnerability assessment will be conducted on the full transportation system which includes roads, bridges, transit routes, rail lines, and connections to airports. All transportation assets will be inventoried and mapped in GIS. H-GAC GIS staff from its Transportation (TR) and Community and Environment (C&E) Departments will be responsible for aggregating all transportation system information.

- **Data needed:** Sources from cities, counties, TxDOT, Transtar, etc.
- **Deliverables:** Shapefiles of transportation assets
- **Timeline:** January – May 2019

Phase II, Assessment

Due to the size of the 8-county Houston-Galveston region, a high-level system-wide vulnerability assessment will be conducted under the Resilience and Durability to Extreme Weather Pilot Program. Assessing vulnerability is comprised of three components: 1) exposure, 2) sensitivity, and 3) adaptive capacity. In addition to the vulnerability assessment, risk—which considers the probability that an asset will experience a particular impact—will be incorporated into the vulnerability assessment. After conducting the assessment and identifying vulnerabilities, measures to address the vulnerabilities will be proposed in Phase III.

Task 1, Define critical regional transportation assets

Critical transportation assets are those defined as serving high demand and providing important connectivity linkages. H-GAC's travel demand model (TDM) will be used to evaluate daily traffic conditions under current normal conditions, for the LRTP horizon year (2045), and other planning horizons if chosen. The TDM model will be run to compare the impacts to the system if critical assets are disrupted or removed via climate variables.

In addition to conducting TDM model runs, critical assets will be reviewed and confirmed by project stakeholders. To achieve this qualitative identification of critical assets, a second stakeholder workshop will be held. The stakeholder group will refer back to assets and areas previously identified in resilience-related studies and reports, and can ensure that functional, economic, and quality of life aspects of the transportation assets are factored into an asset's criticality determination. If needed, the qualitative review may be supplemented by surveys and/or interviews depending on turnout at the stakeholder meeting.

- **Data needed:** List of previously identified critical infrastructure, inputs for TDM model
- **Deliverables:** Summary of methodology of determining asset criticality and list of critical assets
- **Timeline:** February - June 2019

Task 2, Conduct vulnerability assessment using U.S. DOT's VAST Tool

The U.S. DOT's Vulnerability Assessment Scoring Tool (VAST) will be used to perform an indicator-based vulnerability assessment. Indicator-based reviews can provide a big-picture understanding of system-wide vulnerabilities and are appropriate for the region's first full vulnerability assessment. Using the VAST tool, vulnerability is calculated based on the compilation of a system or asset's exposure, sensitivity, and adaptive capacity. Assessments will be performed for each vulnerability dimension and

will be converted into a comprehensive vulnerability score. Establishing a comprehensive scoring approach and weighting system will allow decisionmakers to easily review and compare vulnerability rankings.

- **Data needed:** Indicators for exposure, sensitivity, and adaptive capacity. Future climate projections.
- **Deliverables:** VAST tool output, list of indicators used, methodology for determining comprehensive vulnerability score
- **Timeline:** April – August 2019

Task 3, Risk analysis

In addition to considering exposure, sensitivity, and adaptive capacity, the analysis will incorporate risk. Risk is a measure that includes both the probability that an asset will experience a particular impact and the consequence (or severity) of that impact. The Monte Carlo method, Urban Sim, or a similar tool for calculating the probability of a given impact, is recommended for performing the risk analysis.

- **Data needed:** Climate variables (current and future), disruption scenarios
- **Deliverables:** *[Not sure what this output will look like since it will be the output from 100s of model runs]*
- **Timeline:** June – October 2019

Task 4, Economic & criticality analysis

Use of a criticality assessment to determine which transportation assets are most important for the functioning for the transportation system, as well as for the region's economy.

- **Data needed:** Freight routes, average daily traffic counts, location of other critical infrastructure (ex: schools, hospitals, etc.), travel demand model outputs
- **Deliverables:** GIS map of most critical assets and road segments
- **Timeline:** July – October 2019

Task 5, Workshop with project stakeholders

Vulnerability and risk scores will be presented to project stakeholders to ensure they reflect local conditions and realities. The workshop will also serve as an opportunity to adjust the scoring approach, if needed. Different stakeholders will likely have varying opinions on how to score assets and climate variables, so it is important for them to review the results to identify places where the ratings could be incomplete or skewed.

- **Data needed:** Findings from previous tasks to be presented
- **Deliverables:** Presentation summarizing results from previous tasks
- **Timeline:** September 2019

Task 6, Prepare vulnerability assessment summary report

Informed by tasks 2, 3, and 4, the summary report will provide an overview and ranking of transportation asset and system vulnerabilities. It should include outputs from the VAST tool and more narrative content from the stakeholder meeting. Material from this summary report will be included in the pilot's final report.

- **Data needed:** N/A
- **Deliverables:** Summary report
- **Timeline:** August – October 2019

Phase III, Strategy recommendations

Recommendations will be developed for how resiliency of transportation infrastructure can be improved. A mixture of policy, infrastructure, or ecosystem-based recommendations will be developed on how to address current and future climate conditions. Recommendations will be integrated into H-GAC planning documents and programs such as the Transportation Improvement Program, Regional Transportation Plan, and environmental documents.

Task 1, Develop strategy recommendations

Recommendations should be made based on outcomes from Phase II and should be organized by recommendation type. Types of recommendations could be to elevate high risk roadway segments, revise development standards, and create incentives to encourage open space preservation to decrease storm water runoff.

- **Data needed:** N/A
- **Deliverables:** List of resiliency recommendations
- **Timeline:** September 2018 – March 2019

Task 2, Integrate recommendations into H-GAC documentation

Findings from the vulnerability assessment will be incorporated into a number of H-GAC documents and programs including the Transportation Improvement Program (TIP), the long-range transportation plan, Our Great Region, and the Foresight Panel on Environmental Effects. Integrating pilot findings into these official documents will help elevate resilience as an important regional issue.

- **Data needed:** N/A

- **Deliverables:** List of resiliency recommendations
- **Timeline:** November 2018 – February 2019

Phase IV, Information Dissemination and Closeout

During the final project phase, the final report, case study, and any other close-out documentation will be developed. H-GAC will develop a strategy for sharing pilot project findings, and will ensure that data and processes are documented and presented so that the vulnerability assessment can be updated and/or replicated.

Task 1, Final report

A final report and case study will be developed presenting the vulnerability assessment process, findings, lessons learned, and next steps. Final report will include data sets, maps, and resources to be used for subsequent studies.

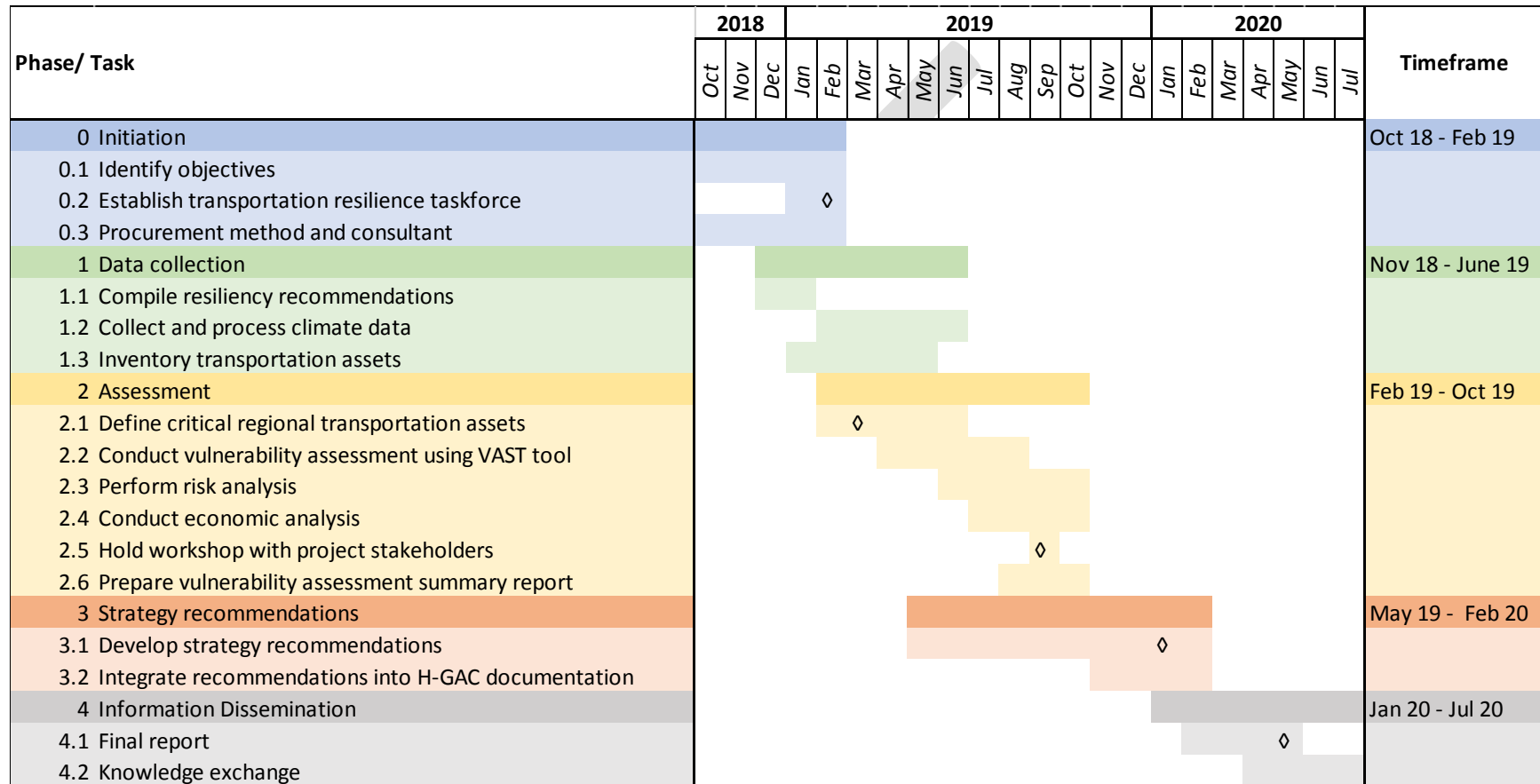
- **Data needed:** N/A
- **Deliverables:** Final report and case study
- **Timeline:** February – May 2020

Task 2, Knowledge exchange

H-GAC and project stakeholders will be able to effectively disseminate the report and findings throughout the region and state. H-GAC recognizes the importance of messaging to the community and decision makers to gain acceptance for resiliency planning and will work with its public outreach team to provide a number of avenues for knowledge exchange including MPO committees and boards, social media platforms, state and national conferences, environmental organizations, etc. The report and findings will additionally be made available on H-GAC's website.

- **Data needed:** N/A
- **Deliverables:** Content for social media posts, presentations to be given to various public, private, and nonprofit groups.
- **Timeline:** April – July 2020

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◇ Meeting with stakeholders



H-GAC work product