

Intermodal Needs Assessment for Transporting Vital Supplies in the Aftermath of a Disaster

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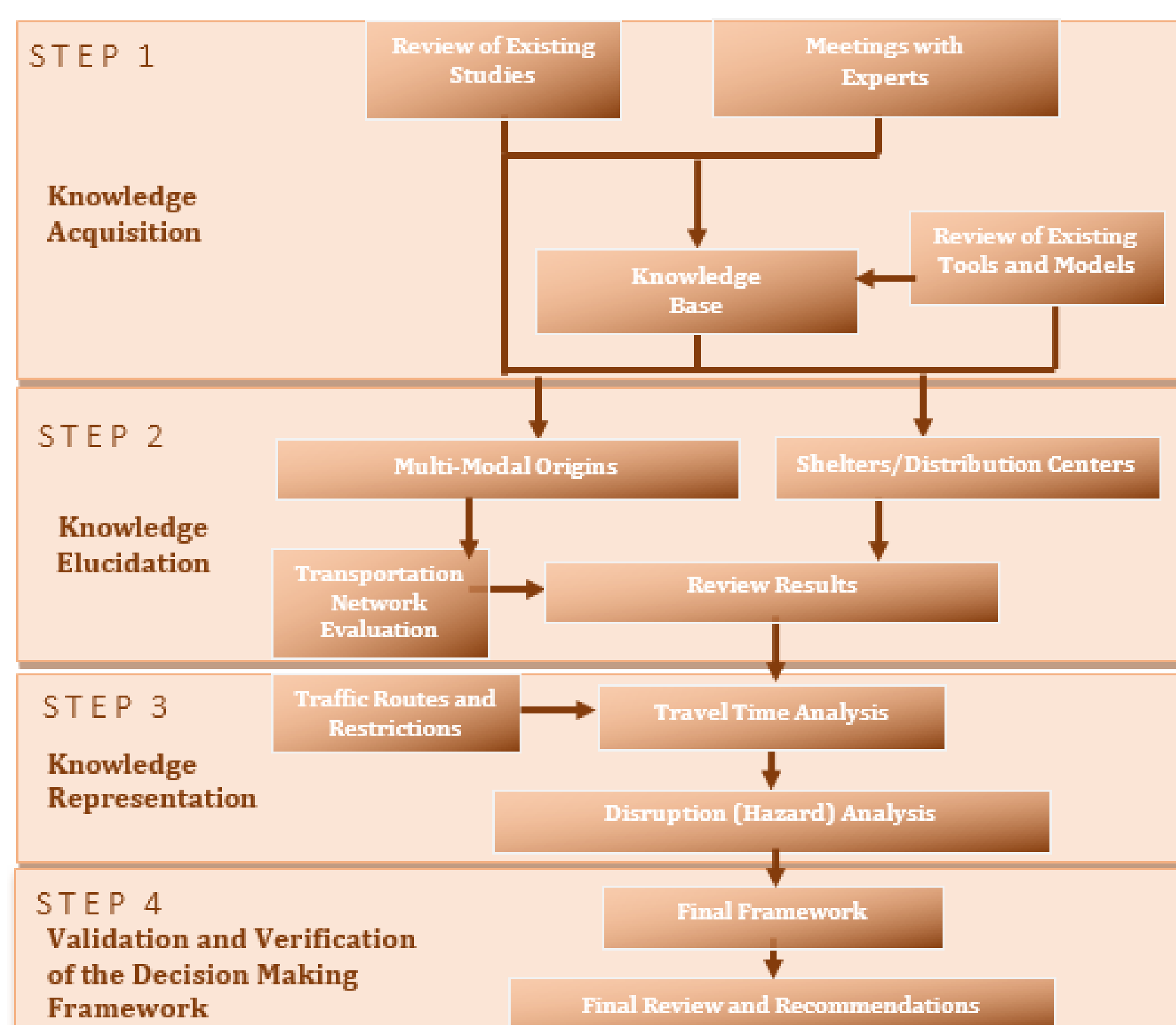
Motivation

In the aftermath of disasters, maintaining an optimal flow of critical resources to affected areas to serve the needs of victims becomes problematic. During Katrina, food shortages and power outages enveloped a very large region from Louisiana to Florida, which happened mainly due to disruptions in the transportation infrastructure system as well as due to random and highly dynamic changes in affected populations' service demands, and unavailability of critical resources due to a lack of planning. This highlights our vulnerability to disasters and clearly indicates that emergency transportation plans and operations should consider methodologies for efficient supply transportation. This indicates the need for an emergency intermodal transportation planning and decision-making framework that focuses on the optimal flow of critical resources into the affected disaster region to satisfy the needs of victims.

Objectives

- The first objective is to understand the critical components that form the proposed research methodology focusing on the safe and optimal transportation of vital supplies to the affected disaster region as well as the evaluation of the existing intermodal transportation network with respect to disasters.
- The second aim is to highlight the operational issues involved with the optimal location/allocation of distribution centers/warehouses, and efficient distribution of emergency relief goods/commodities supply flows to these locations in support of the disaster relief efforts for the victims.
- The third is to create realistic case study applications in Florida that emphasizes GIS-based emergency supply transportation scenarios that can help planners and emergency officials for better decision making.

Methodology



Research Needs Identified

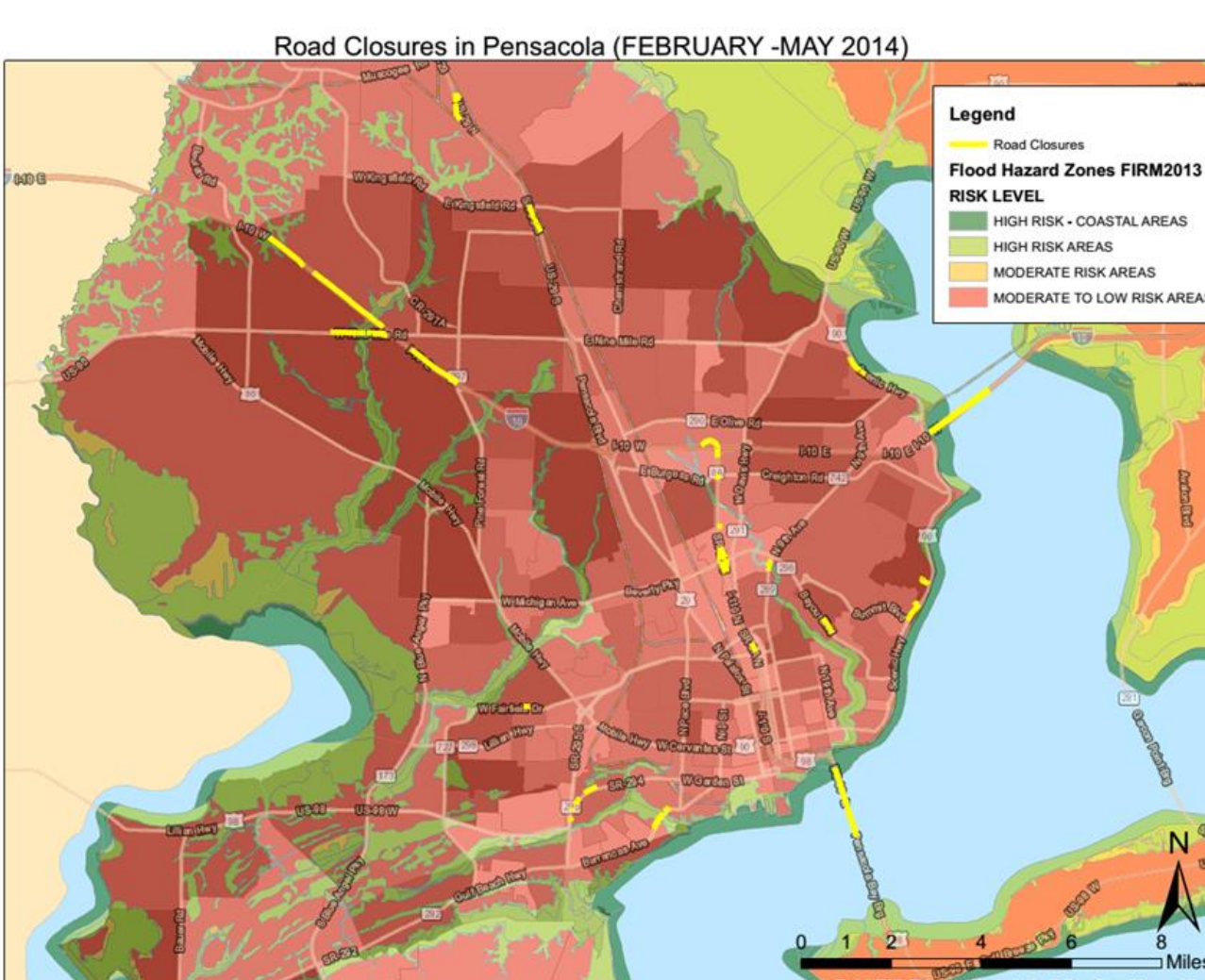
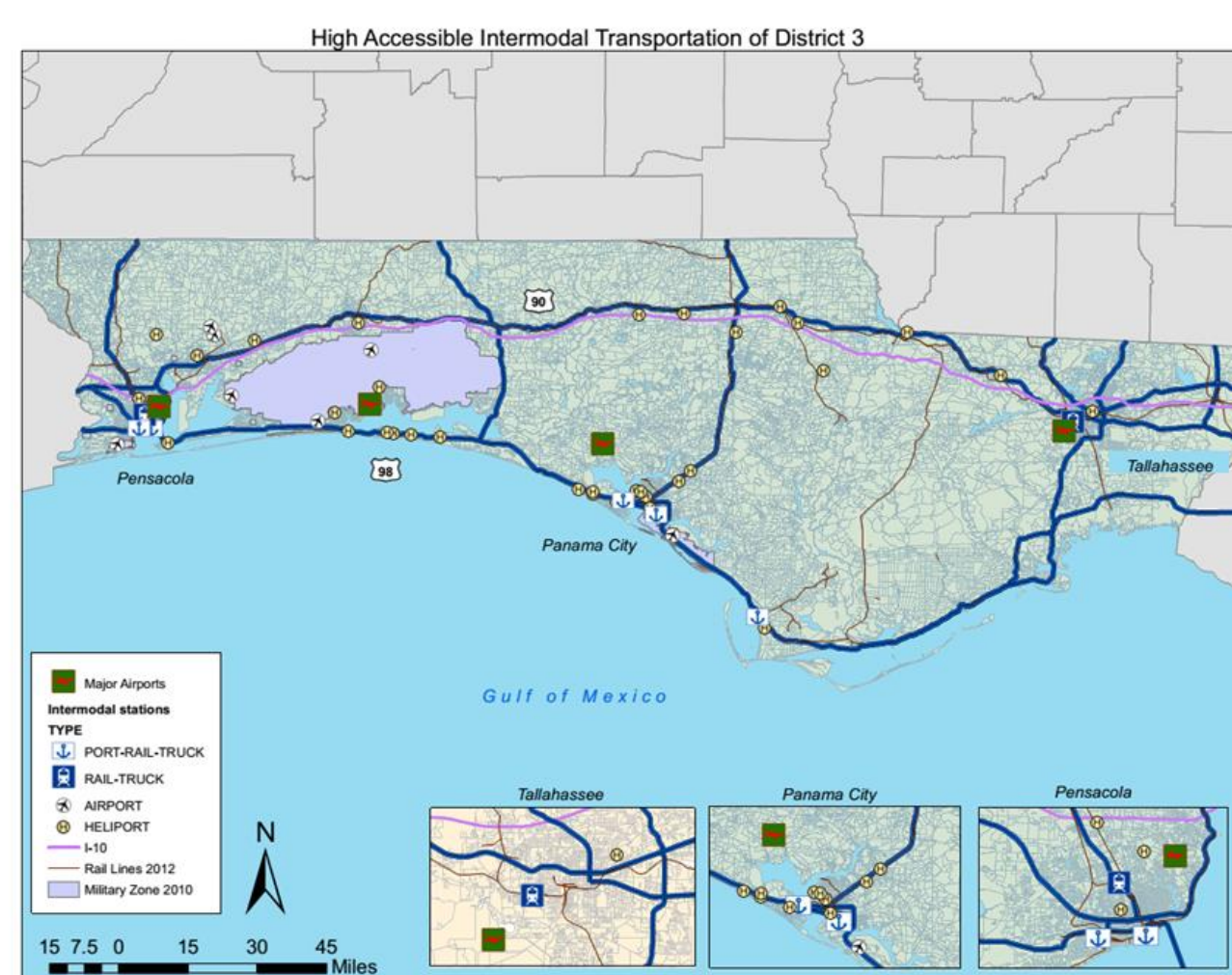
- It is critical for the agencies to develop and back up plans based on (a) practices that have been proven to be working in actual disaster situations and ones that need improvement, and (b) pros and cons of the individual components of emergency practices.
- There is a need for research that investigates the effects of transportation infrastructure availability, intermodal origins and destinations, and roadway disruptions. This will also require the extensive use of mapping/transportation network models. Therefore, an efficient disaster plan should include strategies to minimize the impacts of unforeseen disruptions, or address the problem at hand as quickly as possible to facilitate vital supply transportation.
- An efficient inventory planning and supply transportation system becomes a must to ensure the survival of victims since their needs can drastically change during disaster relief operations. During the recovery period after the disaster, the emergency, rescue and commodity supply activities should be able to continue even if the transportation network is heavily damaged/degraded.

Knowledge Representation

□ Hurricanes and floods, being the most frequent hazardous events in Florida, are continuing to be the major focus areas. Thus, this application discusses potential issues resulting from disruption of highways in District 3 (Northwest Florida) due to disasters, with a more detailed focus on the affected counties and cities. For this analysis, storm surge and flood zones were used to assess the vulnerability of the roadways due to tropical storms, hurricanes and heavy rains.

□ Figures present such an analysis focusing on District 3 and Escambia County. They present a substantial amount of data including the available roadway network, intermodal transportation facilities and roadway disruptions.

□ The GIS-based maps (especially the proximity of the closed roadways to the highly populated areas) can help facilitate decision making for planners and emergency officials.



Conclusions

□ This paper describes the conceptual foundation and components necessary to create a knowledge base with importance given to both ensuring the sustainability and resiliency of the transportation infrastructure for supply flow.

□ Public and/or private humanitarian agencies will clearly benefit from this research by including the assessment results of this research in their emergency transportation plans.

□ Evaluation of the GIS-based intermodal capabilities of the studied region will provide suggestions on the usage of different transportation modes to ensure the sustainability of the transportation infrastructure.

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