

Needs Assessment for Multi-Modal Emergency Transportation Operations with a Focus on an Aging Population



Center for Accessibility and Safety for an Aging Population

Florida State University
In Partnership with Florida A&M University and University of North Florida
2525 Pottsdamer Street, Rm. 129, Tallahassee, FL 32310-6046
Phone: (850) 410-6153 Fax: (850) 410-6142
<http://utc.fsu.edu>



Eren Erman Ozguven¹, Mark Horner², Ayberk Kocatepe¹, Jean Michael Marcelin², Yassir Abdelrazig¹, Thobias Sando³, Ren Moses¹

¹ Department of Civil and Environmental Engineering, Florida A&M University - Florida State University College of Engineering

² Department of Geography, Florida State University

³ Department of Civil Engineering, University of North Florida



Motivation

In the aftermath of disasters, evacuating aging victims and maintaining an optimal flow of critical resources to affected areas to serve their needs becomes problematic. For example, during and/or after Hurricane Katrina, the fatalities were mostly aging people, with 71% of the victims older than 60, and 47% over the age of 75, who were not willing or able to escape. This highlights the vulnerability of the aging population to disasters and clearly indicates that emergency transportation plans and operations should consider providing them necessary assistance. Moreover, 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 indicates the need for a robust emergency multi-modal transportation planning and decision-making framework that enables safe and accessible evacuation of a maximum number of aging people, and optimizes the flow of critical resources into the affected disaster region to satisfy the needs of those who remain.

Decision-Making Framework

The decision making framework will provide:

- An extensive knowledge base as a result of the review of existing studies, data sets, tools and models and presentation of the knowledge extracted from these reviews.
- Clear directions for evaluating multi-modal transportation networks with a focus on the evacuation of the aging victims and supply of vital commodities to serve the needs of those who remain
- A multi-modal transportation management approach on transporting aging victims and vital supplies (food, water, medicine, etc.) accounting for the difficulty in handling emergency operations and disaster relief response.
- An overview of the needs for fast, safe, reliable and accessible emergency transportation operations for aging victims where different transportation modes can meet the speed and reliability criteria to varying degrees
- Focus on providing an efficient distribution of emergency supply flow to the shelters or local distribution centers in support of the disaster relief efforts for the aging population

Objectives

Our objective is twofold:

- **Emergency Evacuation:**
To understand the critical components and requirements of the proposed framework focusing on the emergency evacuation of the aging population in the aftermath of a disaster.
- **Vital Supply Distribution:**
To focus on providing an efficient distribution of emergency supply flow to the shelters or local distribution centers in support of the disaster relief efforts for the aging population.

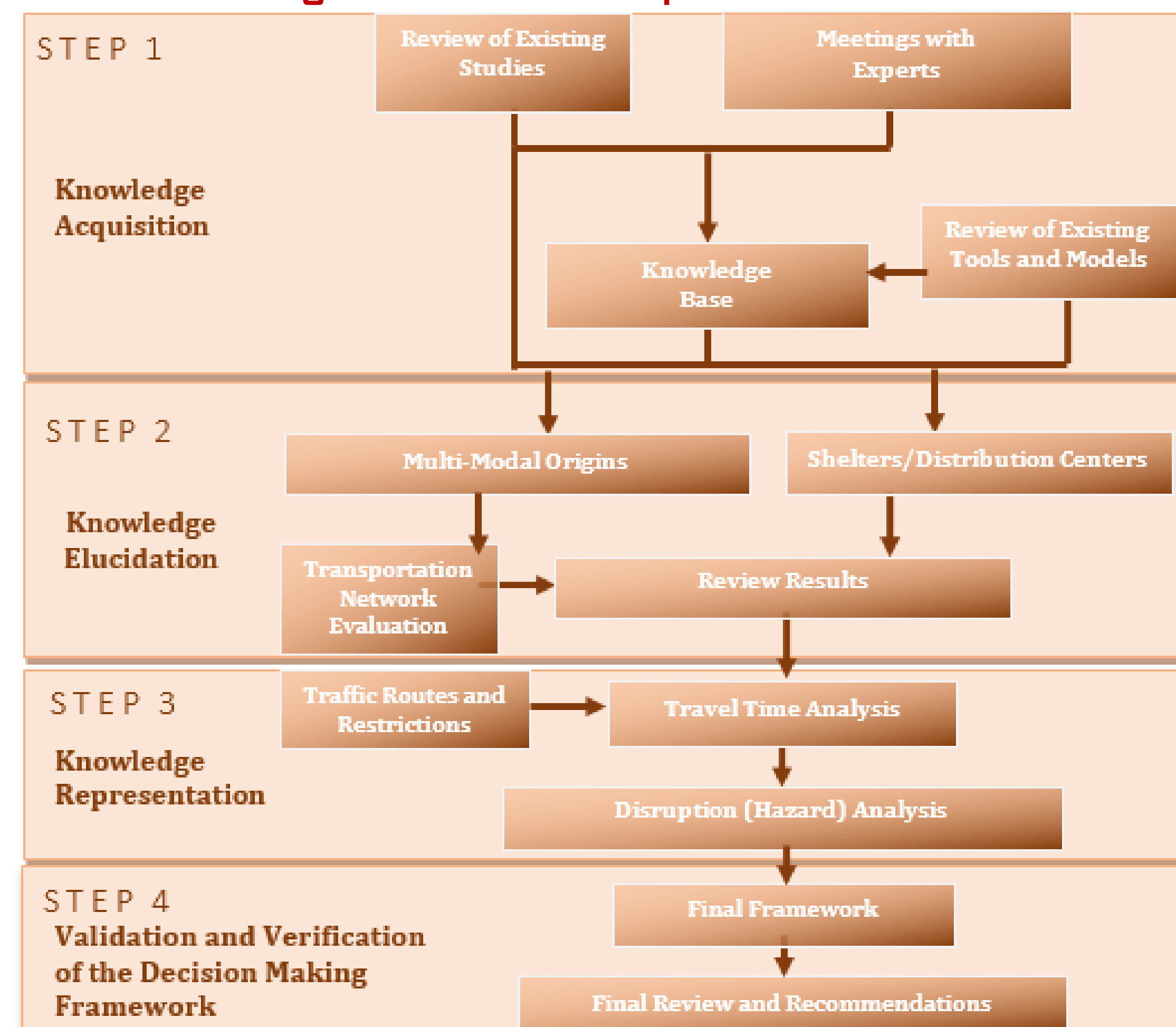
Methodology

The main challenge is to develop an effective methodology to extract the vast amount of knowledge from available sources and to incorporate them into an aging population-focused emergency management framework.

This knowledge extraction process may be achieved using a proven scientific methodology tested for this kind of problem which is called '**Knowledge Base Development**' following these steps:

- Knowledge Acquisition
- Knowledge Elucidation
- Knowledge Representation
- Validation and Verification of the Framework

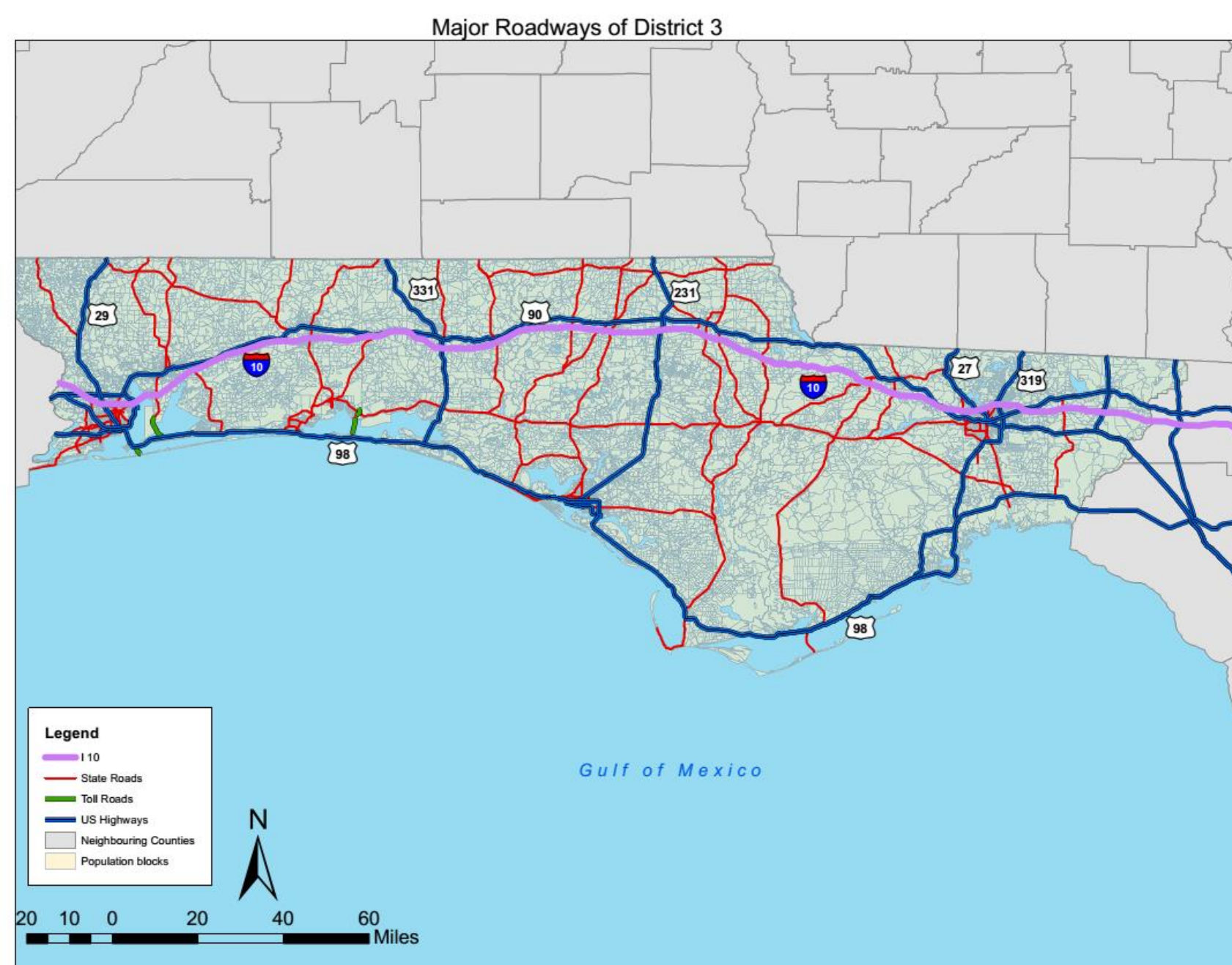
Knowledge Base Development



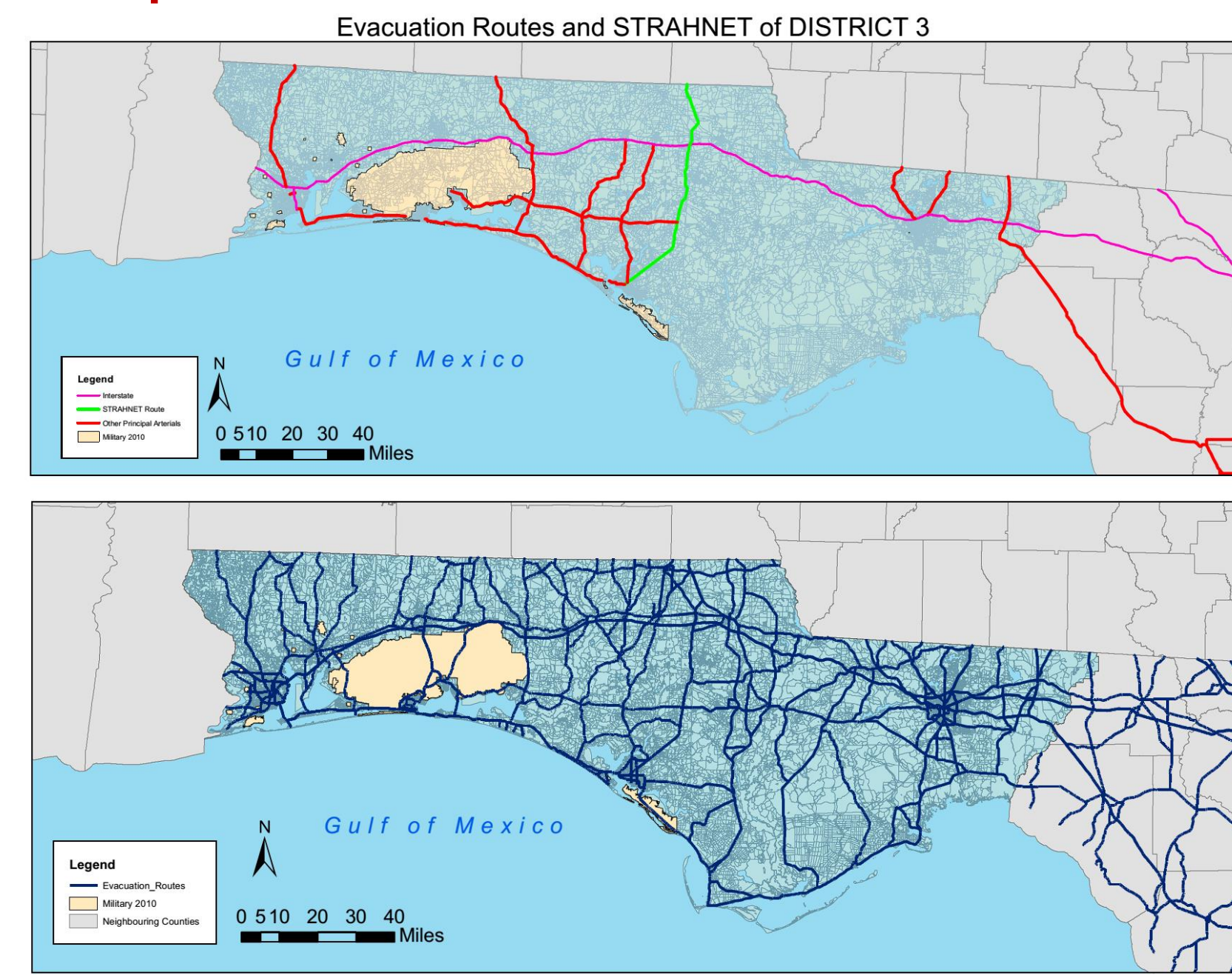
Knowledge Acquisition & Elucidation

- A large domain of knowledge between literature and practice is being surveyed with a focus on the needs of the aging population in order to acquire and process existing practice, review documents and other resources to clarify the diversity of available knowledge.
- A meta-analysis and an extensive review of existing knowledge is being conducted including the following sources: previous studies, generic tools, transportation planning models, and relevant published data.
- Location, accessibility and capacity attributes for intermodal origins (airports, watersports, railway terminals, intermodal connection terminals) and destinations (staging areas, distribution centers, points of distribution, shelters) in the affected region are identified for the decision making framework. This information will be presented in GIS-based maps/compatible database formats so that planner/official could access these attributes to evaluate the facility for emergency use.
- Data sources (transportation infrastructure, facility locations, truck routes/restrictions, real-time traffic and disaster data) will be clearly identified.

Multi-modal Transportation

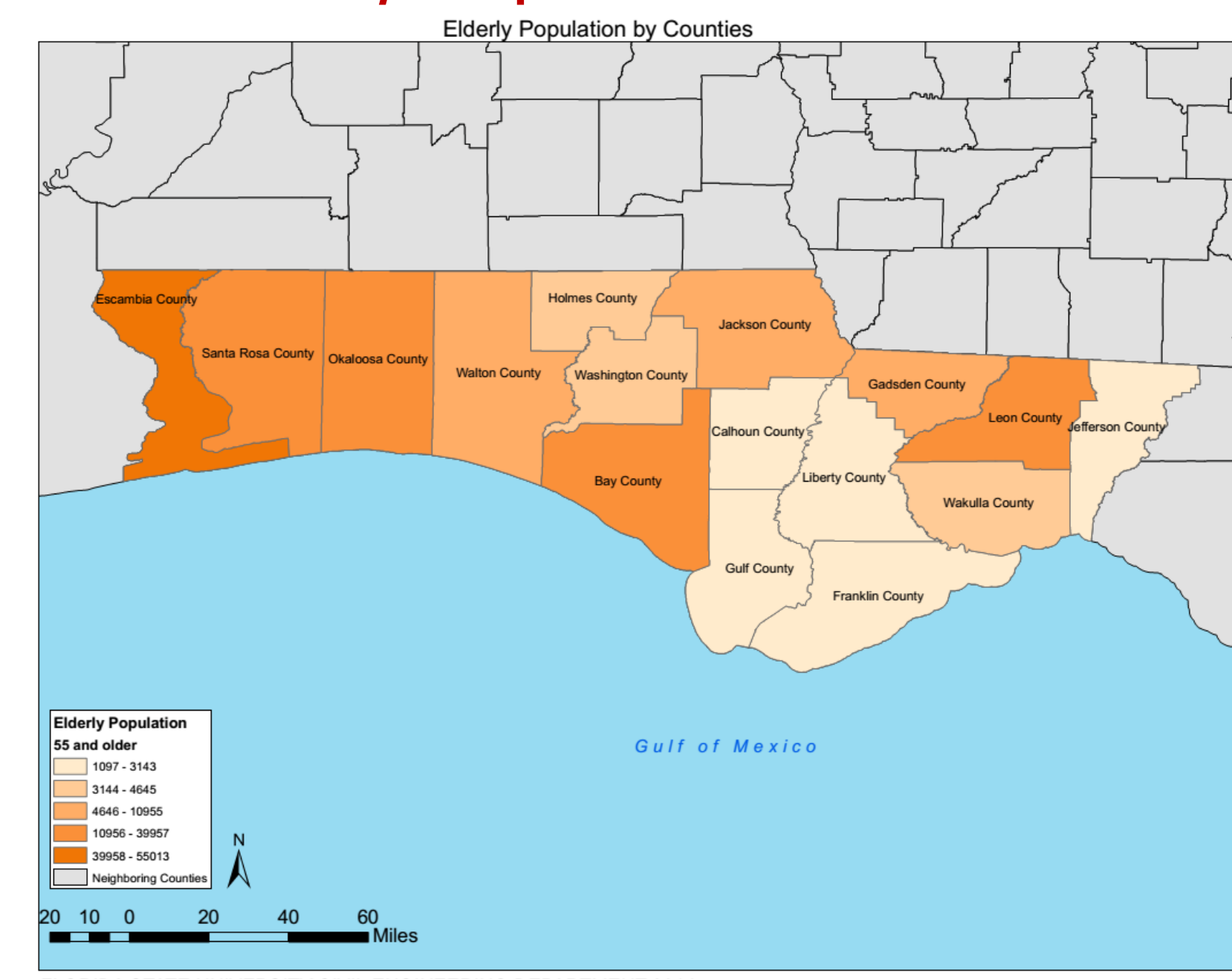


Major Roadways in Florida DOT District 3



Evacuation Routes in Florida DOT District 3

Elderly Population & Clusters



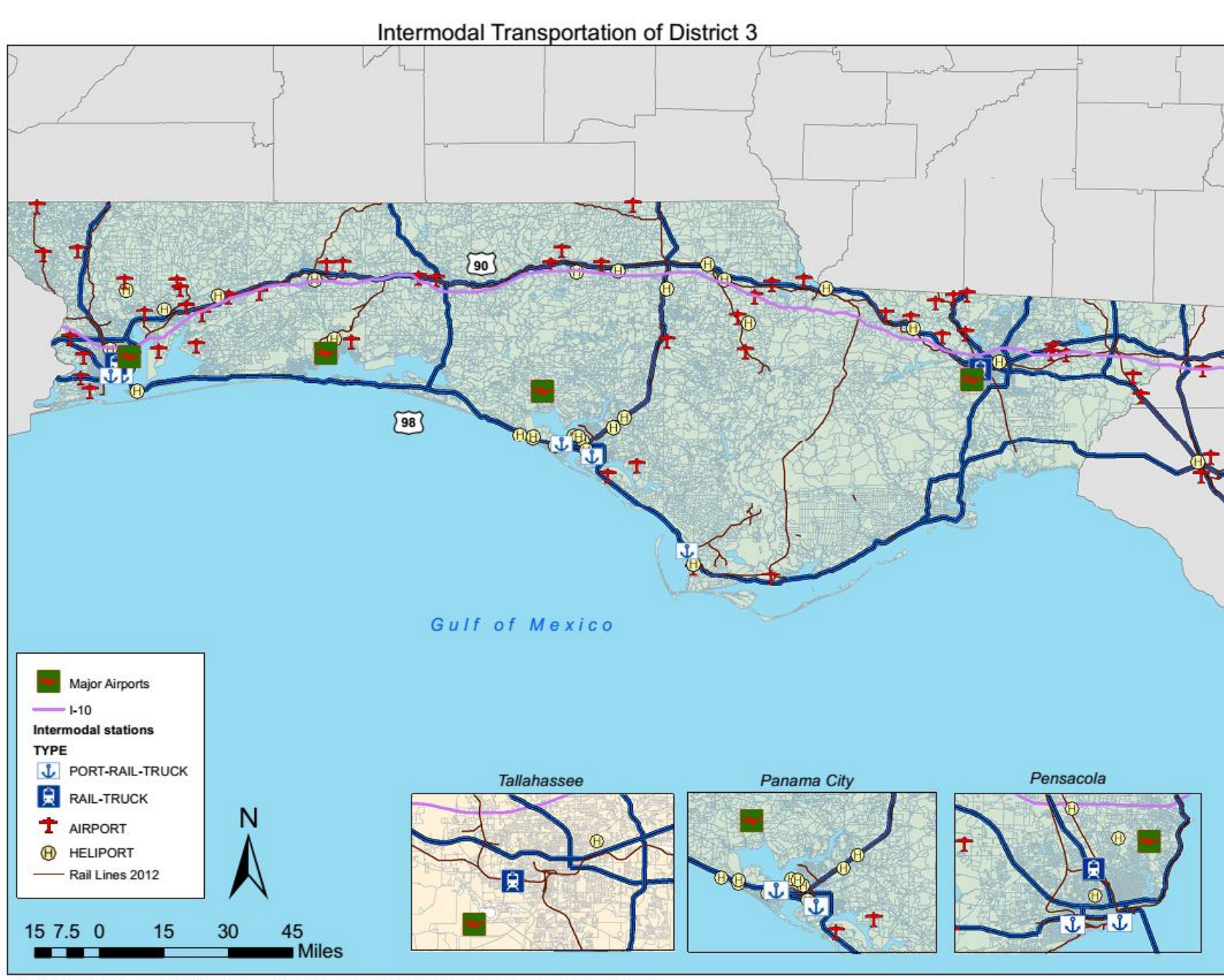
Elderly Population by Counties in Florida DOT District 3

On-going Research

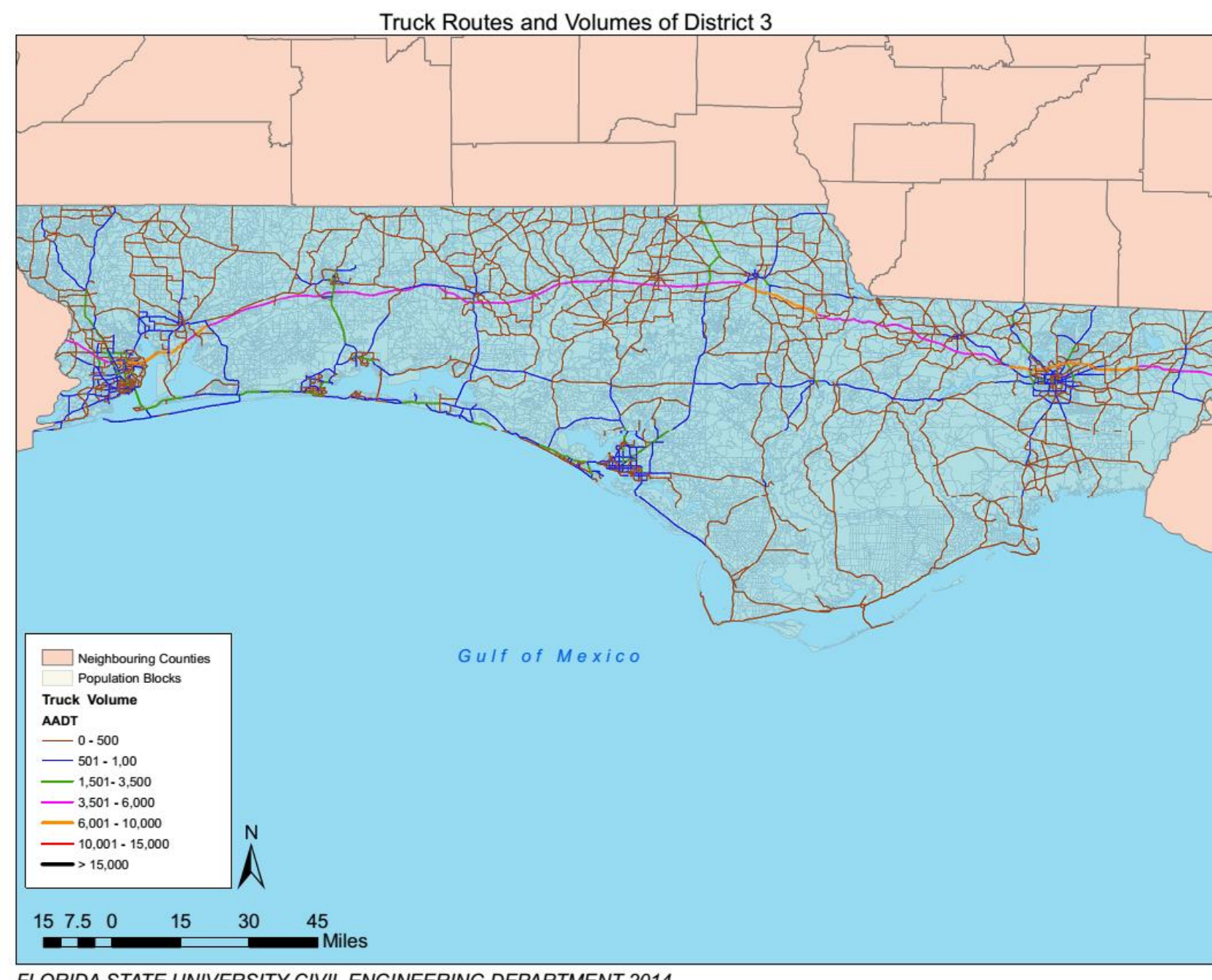
- Identifying the critical issues of the emergency transportation needs of the aging population.
- Identifying the critical issues related to the logistics and flow of vital commodities and sheltering
- Identifying the research directions in solving emergency operations problems critical for the safety and survival of elderly victims.

Expected Benefits

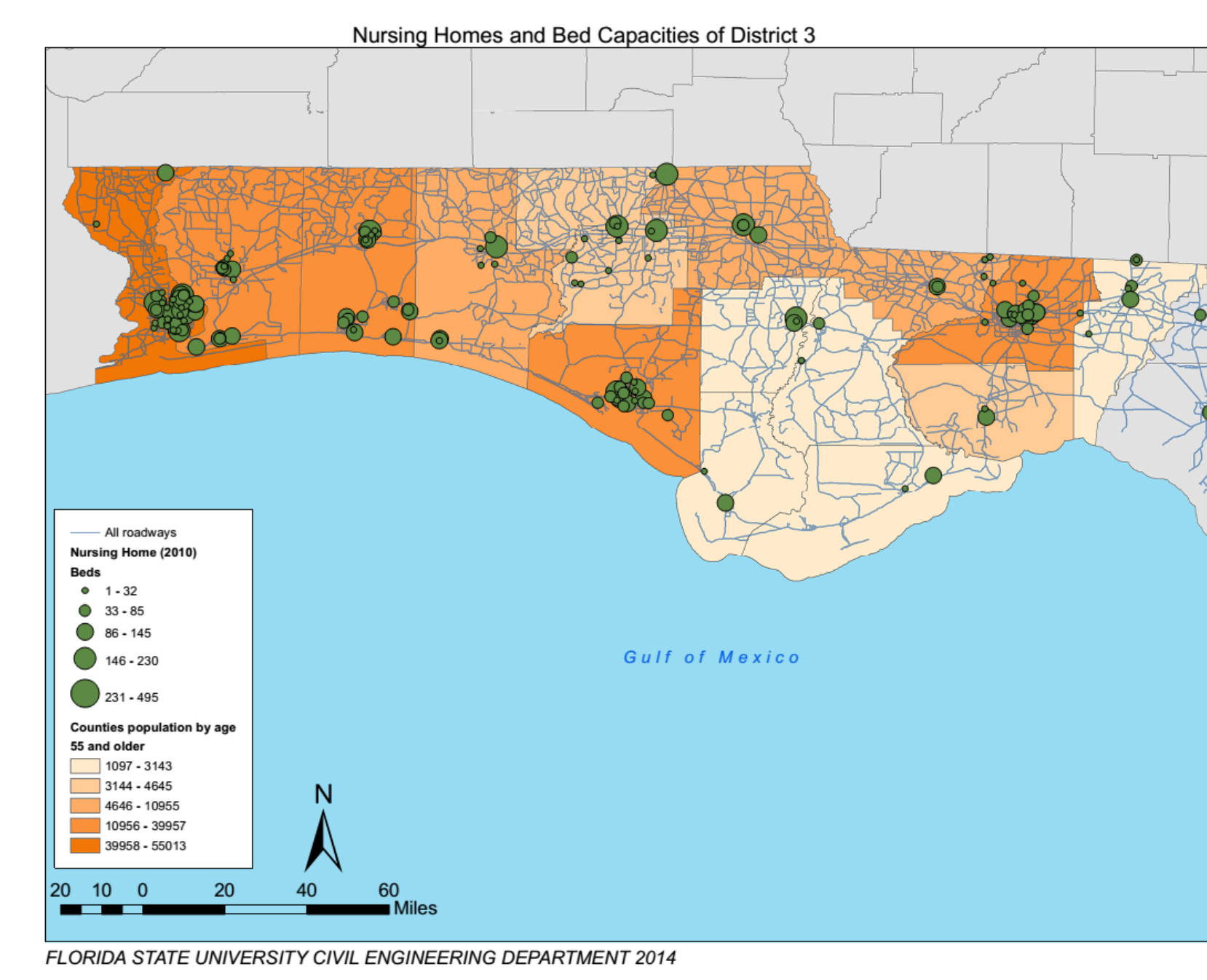
- This research will provide a detailed transportation needs assessment focusing on the emergency assistance that should be provided to the aging population supported by real-life experiences and practices.
- Since aging victims need special assistance both during the emergency evacuation and sheltering, public and/or private humanitarian agencies will clearly benefit from this research by including the assessment results of this research in their disaster plans specifically on how these needs can be addressed and how related problems can be solved for different situations.
- Evaluation of the multi-modal capabilities of the studied region will also provide suggestions on the usage of different transportation modes to create safe, accessible and fast emergency operations for the aging population.



Intermodal Transportation Facilities (Airports, Heliports, Water ports, Railway Terminals) of Florida DOT District 3



Truck Routes and Volumes of Florida DOT District 3



Distribution of Nursing Homes in Florida DOT District 3