



### Needs Assessment for Multimodal Emergency Transportation Operations With a Focus on an Aging Population

In the aftermath of disasters, evacuating aging victims and maintaining an optimal flow of critical resources to affected areas to serve victims' needs becomes problematic. For example, with Hurricane *Katrina*, fatalities were mostly aging people, with 71% of victims older than 60, and 47% over the age of 75. Figure 1 shows a mandatory evacuation order based on lessons learned from Hurricane *Katrina*, where authorities ordered all residents of Galveston, Texas, to leave the city immediately. This led to a wide-scale evacuation of the hospitals and nursing homes within the city using buses, ambulances, and helicopters. From a transportation perspective, this problem becomes even more challenging when we consider roadway disruptions that can drastically affect emergency transportation operations.



Reuters - Tim Johnson

Figure 1. A line of elderly wheelchair-bound citizens in Galveston, Texas, waiting to board a bus to evacuate the city in preparation for Hurricane *Rita*, Sept. 21, 2005.<sup>1</sup>

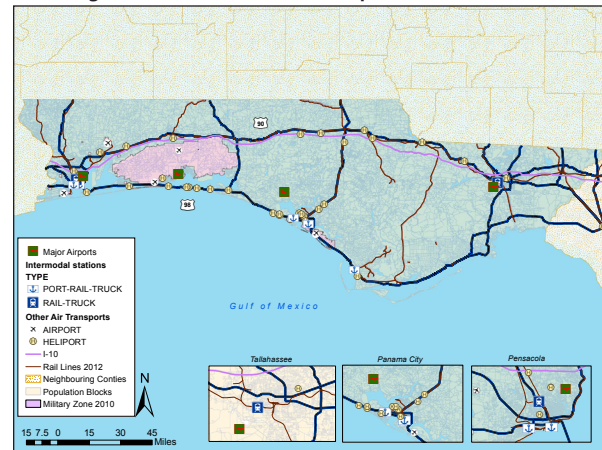
Scanning the literature, there is no comprehensive prior work that has synthesized the requirements for a detailed multimodal operational emergency needs

assessment that could facilitate safe and accessible evacuation of aging populations and optimize the flow of critical resources into the affected disaster region to satisfy the needs of those who remain. This project describes the conceptual foundation and components necessary to create such a knowledge base with importance given to both ensuring the resiliency of the transportation infrastructure and meeting the needs of the aging population. Evaluating this comprehensive knowledge base, this project focuses on an aging victim-focused and Geographic Information Systems (GIS)-based case study application set in the District 3 Region of the Florida Department of Transportation.

Location, accessibility, and capacity attributes for intermodal

<sup>1</sup> Tim Johnson, Reuters, <http://www.sfgate.com/news/article/IT-SCARY-REALLY-SCARY-A-million-people-2606666.php>.

High Accessible Intermodal Transportation of District 3



2014 Shelter Demand for District 3 Florida

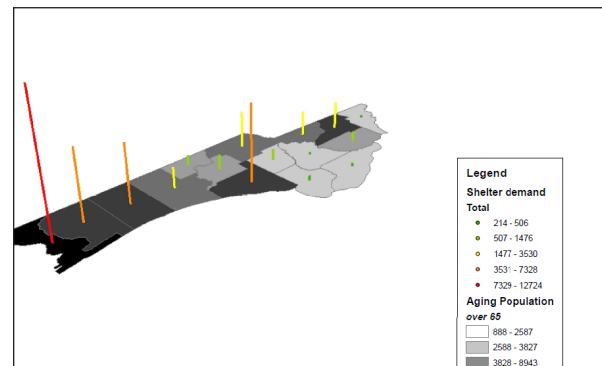


Figure 2. Multimodal GIS-Based Representation for District 3 With a Focus on an Aging Population--Multimodal Locations (top), Aging Population (65+) by County and Shelter Demand (bottom)

origins and destinations in the affected region are identified in GIS-based maps/compatible database formats (figure 2).

Figure 3 represents an interdisciplinary action plan with an operational perspective that integrates the joint work of public, private, military, and humanitarian agencies along with research institutes and universities.

This project also provides examples and case studies of evacuation and sheltering plans specifically addressing the needs of the aging. Figure 4 shows such a case study: an aging-focused evacuation for Panama City in Florida.

Regarding the high percentage of aging populations that may need evacuation and sheltering in Florida, this study highlights



Figure 3. Aging-Focused Interdisciplinary Components

the following research needs that should be investigated thoroughly in order to develop solutions for aging-related emergency transportation problems:

- It is critical to develop plans based on (a) practices that have worked in past disaster situations and ones that need improvement, and (b) pros and cons of the individual components of emergency practices that address the specific needs of the aging urban and rural populations.
- The use of paratransit services for evacuations can be an efficient and flexible tool within the emergency disaster plans in the State of Florida. This research need is critical specifically for those aging victims that remain in the affected region, as they are most likely to be located at the emergency shelters.
- There is a need for special needs-oriented shelters (SPNS) that provide medical care for aging populations.
- It is vital to evacuate the aging victims out of the affected disaster zone in the shortest amount of time with the most optimal route available. Therefore, there is a need for research that investigates the effects of transportation

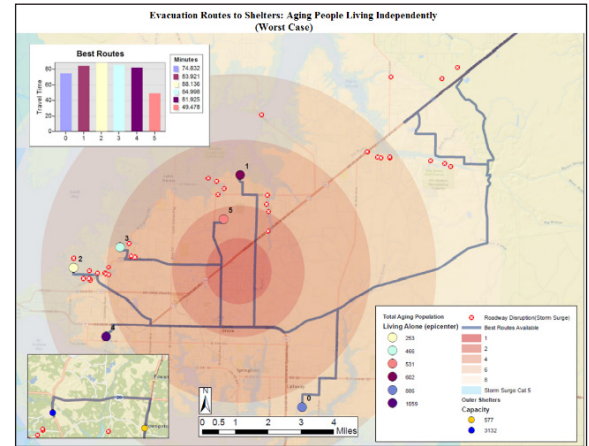
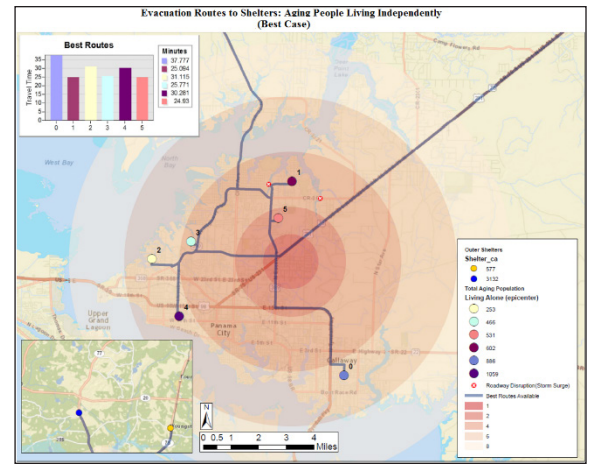


Figure 4. Evacuation Scenarios for Panama City With a Focus on Aging Populations Living Alone—Best Case (top), Worst Case (bottom)

infrastructure availability, multimodal origins and destinations, and roadway disruptions with a focus on the needs of aging populations. This will require the extensive use of mapping and transportation network models.

- An efficient inventory planning and supply transportation system becomes a must to ensure the survival of aging populations, as their needs can drastically change during disaster relief operations.

Because aging victims need special assistance during emergency operations, it is expected that public and/or private humanitarian agencies will clearly benefit from this research.

For more information on this project, please visit <http://www.utc.fsu.edu>.

### About This Project

This research project was led by the principal investigator Eren Erman Ozguven (eozguven@fsu.edu), Ph.D., of the FAMU-FSU College of Engineering at the Florida State University, in cooperation with the co-principal investigators Mark Horner, Ph.D., at the Florida State University, Yassir Abdelrazig, Ph.D., and Ren Moses, Ph.D., P.E., of the FAMU-FSU College of Engineering, and Thobias Sando, Ph.D. from the University of North Florida.



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