

ASSESSMENT OF AUTONOMOUS VEHICLE SHARING FOR  
EVACUATION AND DISASTER RELIEF

# Technology Transfer Activities

by

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## TECHNOLOGY TRANSFER ACTIVITIES

### 1 Outputs

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Outputs include dissemination to a wide audience, research products (data and code), and an MS thesis.

#### 1.1 Output #1

Dissemination of research results was accomplished through three means:

1. A technical report submitted to C<sup>2</sup>M<sup>2</sup>: Shirley, T., B. Padmanabhan, P. Murray-Tuite, N. Huynh, G. Comert, J. Shen, H. Tadesse, and T. Wofford. (2020) Assessment of Autonomous Vehicle Sharing for Evacuation and Disaster Relief. Final report for Center for Connected Multimodal Mobility (C<sup>2</sup>M<sup>2</sup>) University Transportation Center.
2. A webinar held by C<sup>2</sup>M<sup>2</sup>: Murray-Tuite, P. *Sharing Self-Driving Autonomous Vehicles for Evacuation*. C<sup>2</sup>M<sup>2</sup> Distinguished Speaker Series. March 2021.
3. A manuscript under review by a peer reviewed journal: Shirley, T., B. Padmanabhan, P. Murray-Tuite, N. Huynh, G. Comert. A Future Evacuation Assistance System Based on Temporarily Shared Autonomous Vehicles. Submitted to *Journal of Advanced Transportation* (submitted May 6, 2021)

#### 1.2 Output #2

The research led to two research products:

1. Survey data from over 1000 residents of South Carolina, capturing qualitative assessments of willingness to share future self-driving AVs in evacuation and disaster relief scenarios. This data will be available from the PI upon request after the team has finished publishing with it.
2. Simulation code was used to determine the number of households in need of transportation assistance during a hurricane evacuation that could be aided with the proposed system. These items are available from [https://drive.google.com/drive/folders/1rG01mAOyuLSR95OADOnn4nA\\_8DH3mrq-?usp=sharing](https://drive.google.com/drive/folders/1rG01mAOyuLSR95OADOnn4nA_8DH3mrq-?usp=sharing)

#### 1.3 Output #3

An MS thesis resulted from this research.

Shirley, T., (2020) Sharing is Caring: Assessing Willingness to Share Autonomous Vehicles for Evacuation and Disaster Relief. MS Thesis, Civil Engineering, Clemson University.

### 2 Outcomes

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The outcomes of this study are related to student training and exploring the potential for changing the modes of transportation by which evacuation assistance is provided.

#### 2.1 Outcome #1

This project helped train three graduate students and two undergraduate students. These students learned to collect and analyze focus group and survey data, develop models based on

this data, and develop heuristics to apply the outcomes of the models to answer a societally relevant question.

One of the undergraduate student participants from Benedict College has completed an internship at Microsoft during summer 2020, and she is currently interning at IBM.

### 2.2 Outcome #2

This project illustrated the potential for an evacuation transportation assistance program to be based on self-driving autonomous vehicles rather than the currently planned buses. It has increased the body of knowledge of how AVs could be used to respond to disasters once driverless vehicles become more widely accepted. This project also assisted in understanding the public's comfort in vehicle-sharing, feelings on AV implementation, and demographics/characteristics associated with sharing. These findings can assist officials today and in the future for using the sharing economy to support evacuees and those recovering from natural disasters.

### 3 Impacts

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The impacts of the research would occur in the future, aftermarket penetration of self-driving autonomous vehicles has increased to at least 20% of the public's fleet and coordination of government agencies and the public occurs. The benefits pertain to society, particularly households who lack a reliable vehicle to self-evacuate.

This project investigated the potential of using future, privately-owned, self-driving vehicles to evacuate households without the ability to self-evacuate from a hurricane impacting the coast of South Carolina. The research demonstrated that these vehicles have the potential to be used in place of buses, which are in the current evacuation plans. While additional autonomous vehicle development and adoption, as well as sharing system development, are needed before such a system can be implemented, the potential exists to facilitate evacuation. The flexibility offered by such a system could encourage some people to evacuate who would be reluctant to do so by bus or who would have difficulty reaching pre-defined pick-up locations.