

Evacuation Station: The Use of Public Transportation in Emergency Management Planning

THIS FEATURE EXAMINES EMERGENCY TRANSPORTATION PLANNING PRACTICES AND THE ROLE THAT PUBLIC TRANSIT CAN PLAY. WHILE PUBLIC TRANSPORTATION OFTEN IS USED IN EMERGENCY SITUATIONS, THERE IS RARELY PLANNING OR COORDINATION, LEADING TO CONFUSION, INEFFICIENCY AND RISK. RECOMMENDATIONS PROVIDED IN THIS FEATURE CAN HELP TRANSPORTATION PROFESSIONALS BETTER PREPARE FOR EMERGENCIES.

“Hope for the best but prepare for the worst.”

INTRODUCTION

In the fall of 2005, two major hurricanes—Katrina and Rita—rocked the Gulf Coast of the United States, requiring mass evacuations and other emergency transportation services.¹ This experience indicated serious shortcomings in current emergency transportation planning and management.

In New Orleans, LA, USA, many people were unable to flee the city as instructed because they lacked transportation. After Hurricane Katrina hit, there were severe problems evacuating victims and delivering emergency supplies and services. In Houston, TX, USA, fuel shortages and excessive traffic congestion created significant delay, frustration and risk during evacuation. In both cities, inadequate emergency transportation planning and service coordination reduced efficiency and contributed to avoidable problems.

Inadequate professional guidance results in mistakes being overlooked and repeated. For example, in 2002, New Orleans transportation engineers and public officials were aware that many residents lacked evacuation transportation, but little was done to address this gap, resulting in severe problems beginning with Hurricane Ivan in 2004 and then during Hurricane Katrina in 2005.² New Orleans officials failed to implement transit agency policies to deploy buses to help evacuate non-drivers from the city and protect equipment from flooding.³

Similarly, many of the problems encountered in 1999 during the evacuation of South Carolina before Hurricane Floyd were repeated in 2005 during the Houston area evacuation. Hurricane Rita

revealed a lack of coordination within the city of Houston’s emergency management plan, which designates the Metropolitan Transit Authority of Harris County, TX, as having primary responsibility for transportation in the event of an emergency, but designates the police as having primary responsibility in an evacuation.⁴

Prior to Hurricane Rita, there was uncertainty as to whether the mayor had called for an evacuation or merely a mobilization of residents in higher-risk areas. This reflected an unclear chain of command, resulting in inadequate coordination among agencies. These are just a few examples of emergency transportation planning failures that caused avoidable confusion, delay and damage.

It is important for transportation professionals to learn from these mistakes. Effective management of transportation resources is essential during emergencies. Transit agencies are in the unique position to efficiently provide emergency services to people who lack transport options because agencies already have most of the required resources. Proper planning and coordination can prevent many problems and save lives.

This feature examines current emergency response transportation planning, particularly the role of public transit services in evacuation. It summarizes a survey of emergency transport planning practices in major U.S. cities and provides recommendations for improving transportation services in emergencies. It is hoped that this information will help stimulate reflection, planning and action on these critical issues by transportation practitioners.

EXISTING LITERATURE

Although most people likely would agree that transportation is an essential emergency service, relatively little research or practical guidance exists for emergency transport man-

BY MICHAEL A. SCHWARTZ AND TODD A. LITMAN

Table 1. Selected transit agencies and related cities.

- New York City Transit (NYC Transit): New York, NY, USA
- Chicago Transit Authority (CTA): Chicago, IL, USA
- Los Angeles Metropolitan Transportation Corporation (LAMTC): Los Angeles, CA, USA
- Washington Metropolitan Area Transit Authority (WMATA): Washington, DC, USA
- Massachusetts Bay Transportation Authority (MBTA): Boston, MA, USA
- Southeastern Pennsylvania Transportation Authority (SEPTA): Philadelphia, PA, USA
- San Francisco Municipal Railway (MUNI): San Francisco, CA, USA
- New Jersey Transit Corporation (NJ Transit): Hoboken/Newark, NJ, USA
- Metropolitan Atlanta Rapid Transit Authority (MARTA): Atlanta, GA, USA
- Maryland Transit Administration (MD Transit): Baltimore, MD, USA
- San Francisco Bay Area Rapid Transit (BART): San Francisco, CA
- Miami-Dade Transit (MDT): Miami, FL, USA
- The Port Authority of New York and New Jersey Trans-Hudson Corporation (PATH)
- Metropolitan Transit Authority of Harris County, Texas (METRO): Houston, TX, USA
- Broward County Transit: Ft. Lauderdale, FL
- Hillsborough Regional Transit Authority (HARTline): Tampa, FL
- Jacksonville Transportation Authority (JTA): Jacksonville, FL
- Pinellas Suncoast Transit Authority: St. Petersburg, FL

agement, particularly regarding the provision of evacuation services for non-drivers.

Scanlon found that “although it appears public and specialized transit often plays an important role in emergency response, both the disaster literature and case studies tend to skim over that. There appears to be no definitive material showing how this fits into planning and response and how problems are dealt with.”⁵ Similarly, evacuation of people without a vehicle “is an area which has been largely unaddressed by Department of Transportation officials planning for evacuation.”⁶

Scanlon provides numerous case studies involving specialized and public transit’s successful involvement in emergency situations, particularly evacuations.⁷ These examples indicate a lack of planning and coordination. Many officials minimize the importance of planning for emergencies, apparently assuming that such events are too unpredictable to allow specific preparation. As one Washington, DC, USA, city official explained, “It is highly unlikely that city officials would evacuate the entire city.”

However, Wachtendorf and Quarantelli point out that while improvisational leadership was essential in the evacuation of lower Manhattan, NY, USA, on September 11, 2001, it should inspire agencies to research and pre-plan for emergency events because better preparation can increase the possibility of success.⁸

A survey of more than 90 transit agencies by the Transportation Research Board found that “32 percent of systems were concerned that public transportation may not be fully used as an evacuation system (in comparison to reliance on automobiles).”⁹ The lack of formal guidelines and best practices diminishes transit agencies’ ability to respond effectively during emergencies. The survey found that many systems have thought about emergency operations (90 percent) and have plans in place (66 percent).¹⁰

However, fewer of these agencies (57 percent) have plans that coordinate with “others outside the system.” Similarly, only 36 percent of the systems that provide only bus transportation conduct regular emergency operations training; 52 percent report that they have not run a drill in the last six months; and 40 percent report that they have not trained all personnel according to their responsibilities on how to respond to emergencies.

EVACUATION PLAN EVALUATION METHODOLOGY

To evaluate current emergency transportation planning practices, the information provided on emergency transportation at emergency management and transit agency Web sites in major U.S. cities was surveyed.

The peer selection function on the Integrated National Transit Database Analysis System program software, which manipulates data from the National Transit Database, was utilized to select case cities and agencies. The 10 largest agencies (rail and bus) were selected based on the number of unlinked passenger trips in 2002 (the most recent year with available data). These peers attempt to account for the size of the system and overall utilization.

Another set of 10 peer systems was selected based on the number of unlinked passenger trips per service area capita in 2001 (full data on this measure were not available for 2002). This was intended to account for transit usage and dependence.

In addition, four Florida transit agencies were selected from the largest cities outside Miami, FL, USA. This selection was to account for cities that might be more experienced in evacuation (due to the frequency of hurricanes in Florida) to determine if this was influential in incorporating transit into their plans. Table 1 shows the resulting transit agencies and their related cities.

Transit Agency Web Site Evaluation

Transit agency Web sites were searched for answers to the following two questions:

1. Is there an emergency evacuation plan addressed on the transit Web site? This could include emergency evacuation from transit vehicles or from the city. This question is designed to address whether the agency is emergency-conscious. Does it prioritize emergency safety and/or recognize its role in emergency management?
2. Does the Web site refer to emergency management agencies? These could include local, state, or federal agencies. This question measures the strength of relationship between the transit agency and the emergency management agency or department.

Corresponding City Emergency Management Web Site, Plan and Public Interface Evaluation

To answer the following questions, Internet-based research was conducted. First, the office/department of emergency management Web site for the corresponding primary city of each transit agency was

read thoroughly, if available. The only cities that did not have an emergency management Web site (or even a department) were Hoboken, NJ, USA and Newark, NJ, corresponding with New Jersey Transit and the Port Authority of New York and New Jersey. At the time of writing, Hoboken was in the process of creating its first full-time emergency management position.¹¹

If there was an emergency plan, it was read. Any related links were followed to best answer the following questions. No searches outside of the city and/or department Web sites were made.

3. Are non-drivers addressed directly in the corresponding city's emergency plan as shown on the Web site? The answer to this question was considered affirmative only if the Web site, a preparedness guide, or a plan meant for public consumption (text encouraging a citizen to read a plan section) addressed someone who did not own a car. This could be in the form of a suggestion of an alternative mode of evacuation or a section of a plan dedicated to disabled individuals, elderly, or those without vehicles.
4. Does the corresponding city or office of emergency management have an evacuation plan on its Web site? This question was answered affirmatively if evacuation plans were accessible through links internal to the city or office of emergency management Web site. This question was used to evaluate how prepared the area is for emergencies in general.
5. Is transit discussed on the city's corresponding emergency management Web site? Any mention of mass transit on this site made the answer an affirmative. This question attempts to evaluate if emergency officials are explicitly using transit in their thinking and plans.

Finally, the Federal Emergency Management Agency (FEMA) disaster archive (www.fema.gov/library/drcys.shtml) was used to research survey question 6.

6. How many FEMA disasters were declared from 2000–2004? Only major disaster declarations in corresponding counties were recorded. This question attempts to evaluate if past

Table 2. Answers to survey questions 1–3.

	Ranking in Trips	Ranking in Trips/Service Area Population	1. Is there an emergency plan addressed on transit website?	2. Does transit website refer to Emergency Management Agencies?	3. Are non-drivers addressed in corresponding city's Emergency Plan?
Jacksonville Transportation Authority	18	18	No	No	Yes
Broward County Transit	15	15	Yes	Yes	Yes
Harris County (Houston)	13	12	No	No	Yes
Miami-Dade	12	11	No	Yes	Yes
BART	11	3	No	No	Yes
MUNI (SF)	7	2	Yes	Yes	Yes
NYC (MTA)	1	1	Yes	No	Yes
Pinellas Suncoast (St. Petersburg)	16	17	No	No	Yes
SEPTA (Philadelphia)	6	7	Yes	No	Yes
WMATA	4	6	No	No	Yes
PATH (NYC/Newark/Hoboken)	14	14	No	No	n/a
HARTline (Tampa)	17	16	No	No	No
LA County	3	10	No	No	No
MD Transit (Baltimore)	10	9	No	No	No
MBTA	5	8	Yes	Yes	No
MARTA	9	5	No	No	No
CTA	2	4	Yes	No	No
NJ Transit (NYC/Hoboken/Newark)	8	13	No	No	n/a

Table 3. Answers to survey questions 4–6.

	Ranking in Trips	Ranking in Trips/Service Area Population	4. Does the corresponding city have an evacuation plan on their website?	5. Is transit discussed on City's corresponding emergency management website or plan?	6. How many FEMA disasters declared in the city from 2000–2004?
Jacksonville Transportation Authority	18	18	Yes	Yes	5
Broward County Transit	15	15	Yes	Yes	3
Harris County (Houston)	13	12	Yes	Yes	3
Miami-Dade	12	11	Yes	Yes	3
BART	11	3	No	Yes	0
MUNI (SF)	7	2	No	Yes	0
NYC (MTA)	1	1	Yes	Yes	1
Pinellas Suncoast (St. Petersburg)	16	17	No	No	3
SEPTA (Philadelphia)	6	7	No	No	2
WMATA	4	6	Yes	No	0
PATH (NYC/Newark/Hoboken)	14	14	n/a	n/a	0
HARTline (Tampa)	17	16	No	No	3
LA County	3	10	No	No	0
MD Transit (Baltimore)	10	9	No	No	2
MBTA	5	8	No	No	2
MARTA	9	5	No	No	2
CTA	2	4	No	No	0
NJ Transit (NYC/Hoboken/Newark)	8	13	n/a	n/a	0

disasters have influenced emergency management officials to consider utilizing transit.

This methodology is admittedly limited. Every effort was made to look at all Web sites related to emergency planning, evacuation and transportation. However, there is the possibility that documents could exist offline or in back pages of the Web sites. In addition, many transit-dependent residents lack Internet access, making the study not fully representative of the dissemination of plan information to this population. Still, the Internet is one of the most common ways for agencies to interface with the public and is a strong indication of how much agencies are reaching out to this population and what information is included.

FINDINGS AND DISCUSSION

The results of Web site and evacuation plan findings are summarized in Tables 2 and 3. While slightly more than half (56 percent) of emergency management plans address non-drivers, less than half of emergency management Web sites or plans (47 percent) discuss the use of transit. In addition, less than half of transit agency Web sites discuss emergency plans (33 percent) or emergency management agencies (22 percent). This implies a general lack of coordination between offices of emergency management and transit agencies and indicates that more can be done to better utilize transit in emergency situations.

If an office of emergency management refers to a transit agency, it does not necessarily mean the transit agency refers to the office

Table 4. Sample of best practices.

- **Include disaster response as part of all transportation planning** (local, regional, national, transit, etc.). Consider the widest range of possible disasters and stresses on the transport system and consider the widest range of possible solutions.
- **Identify exactly who will do what during disasters.** Coordinate regionally so that there is a clear chain of command during emergency events.
- **Update emergency response plans regularly,** particularly after a disaster tests its effectiveness.
- **Establish a system to prioritize evacuations** based on factors such as geographic location (evacuate the highest risk areas first) and individual need and ability.
- **Create communication and support networks that serve the most vulnerable people.** Establish a system to identify and contact vulnerable people, provide individualized directions for their care and evacuation and establish a chain of responsibility for caregivers. Provide instructions on pick-up locations and what evacuees should bring. This information should be distributed regularly, not just when major emergencies occur.
- **Give buses and other high-occupancy vehicles priority** where critical resources (road space, ferry capacity, fuel, repair services, etc.) are limited.
- **Be ready to quickly deploy buses, vans and trains.** This requires an inventory of such vehicles and their drivers and clearly established instructions for their use.
- **Coordinate fuel, emergency repair and other support services.**
- **Run regular practice drills to assess preparedness.**
- **Train employees to know what is required of them in the event of an emergency.** Make sure they are prepared psychologically as well as physically.
- **Communicate to ensure the public is aware of the resources available to them** in the event of an emergency.

of emergency management, nor does it mean the agency publicizes evacuation plans.

Of the seven offices of emergency management that refer to transit agencies on Web sites, only three of the corresponding transit agencies refer to an office of emergency management and only three discuss an evacuation plan. This suggests that initiative for the use of transit in emergency planning likely comes from emergency management officials instead of from transit agencies. Although this is logical because it is usually the office of emergency management's responsibility to coordinate emergency transportation, it highlights a missed opportunity for agencies to take a more expanded and prominent role in a vital city function.

Number of passenger trips and number of passenger trips per service area capita do not seem to affect whether transit is mentioned in office of emergency management plans.

In terms of number of unlinked passenger trips per service area capita, transit agencies ranked 1, 2, 3, 11, 12, 15 and 18 all had corresponding offices of emergency management that referred to them. In terms of number of unlinked passenger trips, those agencies ranked 1, 7, 11, 12,

13, 15 and 18 had corresponding offices of emergency management that referred to them. This suggests that size of the transit agency and relative dependence of the population on transportation does not affect its utilization in evacuation plans.

Salience of disasters declared by FEMA might affect transit agency usage in emergency management.

Of the cities that mentioned transit agencies on office of emergency management Web sites, all had three declared disasters or more in the last five years except San Francisco, CA, USA, which had four between 1995 and 2000 and many more since 1955, and New York, whose lone disaster was the high-profile terrorist attacks of September 11, 2001.¹² This indicates that cities with more recent experience with major emergencies are more likely to develop emergency plans that include transit.

Many cities lack effective emergency transportation plans.

Except for cities that recently experienced hurricanes or other disasters, few major U.S. cities have emergency plans on Web sites with detailed guidance for mass evacuations that include mobility services for people who lack transportation.

EFFECTIVE EXAMPLES

New York City's Metropolitan Transportation Authority implemented emergency response during and after the attacks of September 11, 2001. Although when the planes first struck the World Trade Center towers, "it was not clear ... whether there was a terrible accident or a terrorist incident, the command center leadership made the decision to respond to the situation as a terrorist attack. As a result, the NYC transit authority immediately evacuated all trains, passengers and transit employees from the World Trade Center area—and there were no transit-related deaths or serious injuries and no equipment losses as a result of the collapsed building."¹³

Since September 11, New York has continued to expand its emergency management plan, integrating transit into both evacuation and intra-city mobilization plans. One example is the Emergency Management Online Locator System. This is a geographic information system-based Web site that helps people determine if they live in an evacuation zone; where their corresponding emergency reception center is located; and how to get there via either subway or bus.

Recognizing that it might be dangerous to drive in an emergency situation, the site encourages people to take the subway or the special bus service that would be provided. By coordinating the designated reception centers by zone, people will better be able to find loved ones in the event of an emergency.

In addition, training is available to both the public and the employees of New York City transit on what to do to evacuate transit in emergency situations. Office of emergency management employees help businesses develop their own preparedness plans and offer education and training on what to do in the event of an emergency. Some of the studied cities have preparedness guides available through the Internet, and the Washington, DC, USA office of emergency management recently mailed a revised family preparedness guide to every district household.

The Strategic Emergency Plan in London, England, outlines strategies for a variety of situations and assigns specific roles to agencies involved in each one. The London Underground, Transport for London, the Network Rail and Port Authority of London are four of 19 agencies that

would arrive at the Strategic Coordination Center upon the formal declaration of a catastrophic incident.

They also would be called in for “level 2” meetings. These meetings coordinate the response to an emergency across a region. They are likely to prove particularly useful in the consequence (crisis) management effort and the recovery phase of an emergency. By having a transit leader take part in strategic discussions, the city will be better prepared to fully utilize transit services.

Similar to New York, London also has predetermined public transport loading points (known as hubs). People will be expected to walk short distances to these locations; from there, they will be transported to unloading points (known as heads). In this way, people can be more easily found if communication goes down.

BEST PRACTICES AND RECOMMENDATIONS

Several recent articles have evaluated transportation problems experienced during Hurricanes Katrina and Rita and have suggested ways to improve preparations and operations for future emergencies.^{14–16} Table 4 contains recommended best practices based on these suggestions. Additional professional guidance on emergency response transportation planning is available from various sources.^{17–20}

It may be necessary to establish standards that specify what level of emergency planning is required in various types of communities. For example, it may be appropriate to require that cities of a certain size or that are exposed to specific risks (hurricanes, earthquakes, terrorist attacks, etc.) be independently audited on their emergency preparation in order to qualify for services from FEMA or other insurance benefits.

CONCLUSION

Emergency response planning must include effective management of transportation resources, including public transit services. Failure to do this often leads to significant problems and risks, resulting in huge costs to society. This study shows that although some cities and transit agencies have made sincere efforts to address these problems, there is an overall lack of guidance and resources for practitioners. Case studies, best practices and further

research should be shared with transportation and emergency planners, transit agencies and decision-makers to direct the formation of these guidelines.

Transit managers must recognize that emergency response falls within their mandate and must work closely with emergency management planners. Transit planners should be involved in inter-agency emergency plans and develop emergency plans for their own agencies. Just as firemen became a symbol of heroes surrounding the events of September 11, 2001, transportation and transit professionals can be a symbol of service and security during future emergencies.

ACKNOWLEDGMENTS

The authors would like to thank Jennifer Wieland and Daniel Rodriguez for their helpful comments on this manuscript. ■

References

1. Litman, T. *Lessons From Katrina and Rita: What Major Disasters Can Teach Transportation Planners*. Victoria Transportation Policy Institute (VTPI), 2005.
2. Wolshon, B. “Planning for the Evacuation of New Orleans,” *ITE Journal*, Vol. 72, No. 2 (February 2002).
3. Litman, note 1 above.
4. *City of Houston Emergency Management Plan*. Houston, TX, USA: City of Houston, 2005.
5. Scanlon, J. “Transportation In Emergencies: An Often Neglected Story.” *Disaster Prevention and Management*. Vol. 12, No. 5 (2003).
6. Urbina, E. and B. Wolshon. “National Review of Hurricane Evacuation Plans and Policies: A Comparison and Contrast of State Practices.” *Transportation Research Part A: Policy and Practice*, Vol. 37, No. 3 (March 2003).
7. Scanlon, note 5 above.
8. Wachtendorf, K. T. and E.L. Quarantelli. “The Evacuation of Lower Manhattan by Water Transport on September 11: An Unplanned ‘Success.’” *Joint Commission Journal on Quality and Patient Safety*, Vol. 29, No. 6 (June 2003).
9. *Public Transportation Security: Volume 7: Public Transportation Emergency Mobilization and Emergency Operations Guide*. Washington, DC, USA: Transportation Research Board (TRB), 2005.
10. Ibid.
11. Friedman, B. “Full-Time OEM Job Slated for Hoboken.” *The Jersey Journal* (November 2005).
12. *Disasters Affecting the San Francisco Bay*

Area from 1950–2000. San Francisco, CA, USA: Association of Bay Area Governments, 2004.

13. VTPI. Evaluating Transportation Resilience. Online TDM Encyclopedia. Accessible via www.vtpi.org/tdm; and Emergency Response Transport Management. Online TDM Encyclopedia. Accessible via www.vtpi.org/tdm.

14. Litman, note 1 above.

15. TRB, note 9 above.

16. *The Federal Response to Hurricane Katrina. Lessons Learned*. Washington, DC: The White House, 2006.

17. VTPI, note 13 above.

18. *Resources on Emergency Evacuation and Disaster Preparedness*. Washington, DC: Access Board, 2005.

19. *Checklists for Emergency Response Planning and System Security*. Washington, DC: American Public Transit Association, 2001.

20. Safety and Security Web site. Accessible via transit-safety.volpe.dot.gov.



MICHAEL A. SCHWARTZ

is a graduate student at the University of North Carolina in Chapel Hill, NC, USA. He is pursuing concurrent master's degrees in the departments of city and regional planning and health behavior/health education. His research areas include evacuation for car-less individuals; physical and financial access to healthcare for rural HIV-positive patients; bike-to-transit programs; and the effects of land use plans and policies on physical activity.



TODD A. LITMAN

is founder and executive director of the Victoria Transport Policy Institute, an independent research organization in Victoria, British Columbia, Canada,

dedicated to developing innovative solutions to transport problems. His work helps expand the range of impacts and options considered in transportation decision-making; improve evaluation techniques; and make specialized technical concepts accessible to a larger audience. His research is used worldwide in transport planning and policy analysis. He is a member of ITE.