



MGT-461

Evacuation Planning

Strategies and Solutions

Instructor Guide
December, 2018



FEMA



Table of Contents

Table of Contents.....i

Course Description.....1

Course Structure/Content Outline.....7

Course Design Matrix.....9

Course Agenda16

Example



Course Description

Overview

This eight-hour management-level course is designed to provide emergency managers, first responders, transportation professionals, security and safety professionals, and government administrators with the ability to utilize current tools and technologies to institute best practices and strategies to plan for and execute an emergency evacuation. This course discusses the hazard conditions for which an emergency evacuation could be an appropriate protective action and inform participants on resources and methods to help them better prepare for an emergency evacuation. This course will allow participants to explore data, modelling tools, and simulations that assist with the implementation of an emergency evacuation.

Core Capabilities

The terminal learning objectives of this course align with the following core capabilities:

- Planning
- Operational Coordination
- Threat and Hazard Identification
- Risk and Disaster Resilience Assessment
- Critical Transportation

Scope

This course is designed to equip participants with the knowledge and skills to assess evacuation options, choose appropriate tools and techniques, and employ strategies to plan for an emergency evacuation.

Target Audience

The target audience for this management-level and instructor-led course consists of different variations of:

- Citizen/Community Volunteer
- Emergency Management
- Emergency Medical Services
- Executive/Elected Officials
- Law Enforcement and Fire Service
- Government Administrative
- Public Works/ DOT Transportation Personnel
- Urban and Transportation Planners



Prerequisites

No prerequisites for this course

Course Length

Eight hours

Resources

The following equipment and materials are provided by NDPTC and are required to support instruction in this course:

- Instructor ID
- Instructor Guide (IG)
- Class roster
- Laptop with presentation software installed and CD-ROM capability
- Audio-visual (A/V projection unit)
- Projector screen
- Chalkboard (and chalk), whiteboard (and dry erase markers), or easel and easel paper (and permanent markers)
- Correction tape dispensers (two)
- Letter-size manila envelopes (four: one each for the course registration forms, pre-tests, post-tests, and Level 1 evaluations)
- One of each of the following items per participant:
 - Participant Guide (PG) available for download from <http://ndptc.hawaii.edu/>
 - Participant Handouts
 - Pre-test answer sheet corresponding to pre-test version
 - Post-test answer sheet corresponding to post-test version
 - Level 1 evaluation forms (with extras as needed)

The host agency will be required to provide the following classroom and logistical needs:

- 30-person, environmentally-controlled classroom, including classroom-style seating with room for laptops and/or tablet computers.
- Projection screen or area in classroom.
- At least eight power outlets in the classroom for A/V components and computers used by the instructional support personnel and participants during the course.
- Instructor access the day before the course's start date for classroom setup.
- Adequate participant and instructor parking.
- Internet access via Wi-Fi in the classroom for participants.



Testing/Certification

Validation of participants' completion of stated learning objectives will be accomplished through discussion-based participation within each module, and knowledge checks at the completion of the course. A pre-test will be administered in the first module to gauge participants' level of knowledge. The instructor will be responsible for assessing participant comprehension, understanding, and completion of learning objectives as determined through participation in participant activities. Post-testing will be administered in the final module. Assessment will involve multiple-choice questions, as well as questions based on presented scenarios.

Reference List

- Bailey, D., S. Swiacki, A. Byrnes, J. Buckley, D. King, V. Piper, M. Marino, S. Mundle, G. Pierlott, and A. Lynd (2007). "Transportation Equity in Emergencies: A Review of the Practices of State Departments of Transportation, Metropolitan Planning Organizations, and Transit Agencies in 20 Metropolitan Areas." Final Report. FTA-PA-26-8001-2007. Milligan and Company, LLC, and Mundle and Associates, Philadelphia, PA. May 2007.
- CNN (2017). Transcripts. Accessed January 2018.
<http://transcripts.cnn.com/TRANSCRIPTS/1708/27/cnr.02.html>
- Deborah et al. (2013). "Final Research Report: A Transportation Guide for All-Hazards Emergency Evacuation. Final Research Report NCHRP 20-59(32)." Transportation Research Board; National Cooperative Highway Research Program.
- FDOT (2018). Hurricane Irma Emergency Evacuation Report and Recommendations
- Federal Emergency Management Agency (2013). "Comprehensive Preparedness Guide (CPG) 201." Second Edition. Accessed July 2018.
https://emilms.fema.gov/IS0230d/assets/cpg_201_thira_guide.pdf
- FEMA. (2010). *Developing and Maintaining Emergency Operations Plans: Comprehensive Preparedness Guide (CPG) 101. Version 2.0*. November 2010. Accessed July 2017.
<https://www.fema.gov/media-library/assets/documents/25975>.
- FEMA. (2011). National Preparedness System. Accessed July 2017.
<https://www.fema.gov/national-preparedness-system>
- FEMA. (2013). National Response Framework. Accessed September 2017.
<https://www.fema.gov/media-library/assets/documents/32230>
- FEMA. (2015). National Preparedness Goals. Accessed July 2017.
<https://www.fema.gov/national-preparedness-goal>
- FEMA. (2016). National Mitigation Framework. Accessed September 2017.
https://www.fema.gov/media-library-data/1466014166147-11a14dee807e1ebc67cd9b74c6c64bb3/National_Mitigation_Framework2nd.pdf
- Haddow, G., A. Bullock, D. Coppola (2008). "Introduction to Emergency Management." 3rd Ed, Elsevier, Burlington, MA.
- Hess, Daniel Baldwin and Gotham, Julie C. (2007). "Multi-Modal Mass Evacuation in Upstate New York: A Review of Disaster Plans." *Journal of Homeland Security and Emergency Management*. Vol. 4 : Iss. 3, Article 11. Available at:
<http://www.bepress.com/jhsem/vol4/iss3/11>



Reference List (continued)

- Jones, J.A., F. Walton, and B. Wolshon (2011). "Criteria for the Development of Evacuation Time Estimate Studies." U.S. Nuclear Regulatory Commission Division of Preparedness and Response, NRC Report No. NUREG/CR-7002, Sandia National Laboratories Report No. SAND2010-0016P, Washington, DC, November, 2011.
- National Academies of Sciences, Engineering, and Medicine. (2009). *Transportation's Role in Emergency Evacuation and Reentry. (NCHRP) Synthesis 392*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/14222>.
- National Academies of Sciences, Engineering, and Medicine. (2011). *Communication with Vulnerable Populations: A Transportation and Emergency Management Toolkit. (TCRP) Report 150*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/22845>.
- National Academies of Sciences, Engineering, and Medicine. (2011). *Communication with Vulnerable Populations: A Transportation and Emergency Management Toolkit. (TCRP) Report 150*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/22845>.
- National Academies of Sciences, Engineering, and Medicine. (2013). *A Transportation Guide for All-Hazards Emergency Evacuation. (NCHRP) Report 740*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/22634>.
- National Academies of Sciences, Engineering, and Medicine. (2013). *Final Research Report: A Transportation Guide for All-Hazards Emergency Evacuation*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/22586>.
- National Academies of Sciences, Engineering, and Medicine. (2014). *A Guide to Regional Transportation Planning for Disasters, Emergencies, and Significant Events. (NCHRP) Report 777*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/22338>.
- NOAA. (2018). What have been the costliest tropical cyclones in the United States? Accessed February 2018. <http://www.aoml.noaa.gov/hrd/tcfaq/E13.html>
- Pierlott, and A. Lynd (2007). "Transportation Equity in Emergencies: A Review of the Practices of State Departments of Transportation, Metropolitan Planning Organizations, and Transit Agencies in 20 Metropolitan Areas." Final Report. FTA-PA-26-8001-2007. Milligan and Company, LLC, and Mundle and Associates, Philadelphia, PA. May 2007.
- Transportation Research Board (2008). "The Role of Transit in Emergency Evacuation." Special Report 294. Washington, DC: The National Academies Press. <https://www.nap.edu/catalog/12445/the-role-of-transit-in-emergency-evacuation-special-report-294>
- Transportation Research Board. (2004). *Convertible Roadways and Lanes: A Synthesis of Highway Practices*, National Cooperative Highway Research Program Synthesis 340. Washington D.C., The National Academies Press. <https://www.nap.edu/read/23331/chapter/1>



Reference List (continued)

- Transportation Research Board. (2004). *Convertible Roadways and Lanes: A Synthesis of Highway Practices*, National Cooperative Highway Research Program Synthesis 340. Washington D.C., The National Academies Press.
<https://www.nap.edu/read/23331/chapter/1>
- Transportation Research Board. (2008). *The Role of Transit in Emergency Evacuation: Special Report 294*. Washington, DC: The National Academies Press.
<https://www.nap.edu/catalog/12445/the-role-of-transit-in-emergency-evacuation-special-report-294>.
- U.S. Government Accountability Office (2006). Transportation-Disadvantaged Populations: Actions Needed to Clarify Responsibilities and Increase Preparedness for Evacuations." GAO-07-44 . Accessed July 2017. <https://www.gao.gov/new.items/d0744.pdf>.
- Wolshon B., A. Catarella-Michel, and L. Lambert (2006). Louisiana Highway Evacuation Plan for Hurricane Katrina: Proactive Management of Regional Evacuations. *ASCE Journal of Transportation Engineering*, January 2006, Volume 132, Issue 1, pp. 1-10.
- Wolshon B., D. Matherly, P. Murray-Tuite (2016). Traffic Management During Planned and Unplanned Emergency Events." Chapter 16, *Traffic Engineering Handbook – Seventh Edition*, John Wiley and Sons, Inc., New York, 2016.
- Wolshon, B. (2006). Planning and Engineering for the Katrina Evacuation. *The Bridge*, National Academy of Sciences and Engineering, Spring 2006, Vol. 36, No. 1, pp. 27-34.
- Wolshon, B. (2009). Transportation's Role in Emergency Evacuation and Reentry. National Cooperative Highway Research Program, NCHRP Synthesis 392, Washington DC, 2009.
- Wolshon, B., J. Lefante, H. Naghawi, T. Montz, V. Dixt, J. Renne, P. Haughey, and W. Dufour (2009). *Application of TRANSIMS for the Multimodal Microscale Simulation of the New Orleans Emergency Evacuation Plan - Draft Final Report*. Federal Highway Administration United States Department of Transportation, Washington, DC, 2009. 163 pp.
- Wu, H. Lindell, M. Prater, C. (2012). Logistics of hurricane evacuation in Hurricanes Katrina and Rita. *Transportation Research Part F* 15, pp 445–461.
- Zhang, Z., K Spansel, and B. Wolshon (2014). Effect of Phased Evacuations in Megaregion Highway Networks. *Transportation Research Record: Journal of Transportation Research Board*, No. 2459, 2014, pp. 101-109.
- Zhang, Z., K Spansel, and B. Wolshon (2014). Megaregion Network Simulation for Evacuation Analysis. *Transportation Research Record: Journal of Transportation Research Board*, No. 2397, 2014, pp. 161-170.
- Zhang, Z., K. Spansel, V. Dixit, and B. Wolshon (2014). Performance Characteristics of Megaregion Traffic Networks During Mass Evacuations. *International Journal of Transportation*, Vol. 2, No. 3, 2014, pp 53-72.



Evaluation Strategy

Level 1 evaluation will be performed at the completion of the course in order to assess participants' impressions of content, delivery method, and instructor knowledge and abilities. This will allow for the improvement of future course delivery. Evaluation will be accomplished through the use of the DHS/FEMA/NP Participant Assessment of Course and Instructors form, which will be distributed and collected by the instructor at the conclusion of the eight hours of instruction. Level 1 Evaluation instruments will be collected in a manner that ensures the anonymity of respondents.

Level 2 evaluation will be performed to assess the ability of course participants to achieve the stated course objectives, primarily for the purpose of providing a measurement standard for certification of course completion.

The Level 2 evaluations will also help to improve the course content as it pertains to capacity of knowledge transfer, allowing SMEs to identify those areas where knowledge retention or comprehension across all evaluated participants is below expectations or otherwise incomplete. Evaluation will measure audience-wide outcomes of the testing methods described in the section above titled "Testing/Certification," and includes interim testing at the conclusion of each module and post-testing at the conclusion of all course instruction.

Reporting of Level 2 evaluation will allow for analysis in the following three categories:

- Participant Comprehension/Certification – a measure of each participant's ability to answer the test questions correctly, measured by the individual grade of each participant on a scale of zero to 100.
- Instructor Abilities – a measure of the average test grades of all participants in the class as compared to instructors teaching the same content.
- Course Content – a measure of the rate at which participants are able to answer a question correctly calculated across all participants in all classes.



Course Structure/Content Outline

Module 1: Welcome, Introduction, and Administration

Terminal Learning Objective:

Participants will be able to state the course goals and its major objectives.

Enabling Learning Objectives

At the conclusion of this module, participants will be able to:

- 1-1 State the course agenda
- 1-2 State the course goals
- 1-3 Explain how performance will be evaluated

Module 2: Assessing Risk in Relation to Evacuation

Terminal Learning Objective:

Participants will be able to recognize evacuation needs during disasters and threat characteristics of different hazards.

Enabling Learning Objectives:

At the conclusion of this module, participants will be able to:

- 2-1 Describe evacuations related to disasters
- 2-2 Describe hazard and threat characteristics of different hazards
- 2-3 Review risk assessment and vulnerability analysis in evacuation planning

Module 3: Module 3: Key Concepts in Evacuations

Terminal Learning Objective:

Participants will be able to describe key concepts and assess the need for evacuation in their communities.

Enabling Learning Objectives:

At the conclusion of this module, participants will be able to:

- 3-1 Explain key concepts for evacuation planning
- 3-2 Prepare risk assessment for evacuation



Module 4: Evacuation Planning Considerations

Terminal Learning Objective:

Participants will be able to describe the evacuation planning process and transportation considerations in evacuation planning.

Enabling Learning Objectives:

At the conclusion of this module, participants will be able to:

- 4-1 Explain framework for evacuation planning
- 4-2 Identify evacuation population and communication needs
- 4-3 Identify transportation modes, transportation providers, options for evacuation, and reentry

Module 5: Evacuation Decision-Making and Strategies

Terminal Learning Objective:

Participants will be able to evaluate the evacuation decision-making process, apply evacuation strategies, best practices, and lessons learned by examples of recent evacuation plans.

Enabling Learning Objectives:

At the conclusion of this module, participants will be able to:

- 5-1 Describe evacuation decision-making process
- 5-2 Identify traffic management and control strategies, tools, and methods
- 5-3 Describe evacuation traffic modeling and simulation tools, methods, and output
- 5-4 Describe examples of recent evacuations to identify successes and areas for improvement in evacuations

Module 6: Course Summary and Administration

Terminal Learning Objective:

Participants will successfully complete a post-test and all final administrative tasks for the course.

Enabling Learning Objectives:

At the conclusion of this module, participants will be able to:

- 6-1 Identify additional resources and training opportunities
- 6-2 Provide an evaluation of the course materials and instruction
- 6-3 Complete a post-test



Course Design Matrix

Module 1: Welcome, Introduction, and Administration

Scope Statement

In this module, the instructor will welcome participants to the course, explain how instruction will take place, and provide an agenda. The instructor will discuss the course purpose, goals, and objectives; describe the course content; and wrap up any administrative details that remain. The instructor will introduce him- or herself and lead a round of introductions among the participants. Finally, the instructor will assess the participants' existing comprehension of course materials by conducting a pre-test.

Terminal Learning Objective (TLO)

Participants will be able to state the course goals and its major objectives.

Enabling Learning Objectives (ELO)

At the conclusion of this module, participants will be able to:

- 1-1 State the course agenda
- 1-2 State the course goals
- 1-3 Explain how performance will be evaluated

Lesson Topics

Lessons in this module will include the following:

- Welcome
- Introductions
- Course goal
- Course agenda
- Course registration
- Pre-test

Instructional Strategy

- Lecture-based instruction
- Classroom discussions



Assessment Strategy

- Instructor observation of participant involvement in classroom discussion
- Instructor-led discussion to gauge participant grasp of the subject matter and to ensure participants understand both how performance will be evaluated and how evaluation will impact participant outcomes
- Instructor administration of objectives-based pre-test to assess the knowledge and experience participants bring to the class

Practical Exercise (PE) Statement

Not applicable

Module 2: Assessing Risk in Relation to Evacuation

Scope Statement

In this module, the instructor will review recent and past hazard and disaster events involving evacuation to highlight the importance of evacuation planning and preparedness. The module will also cover risk and hazard vulnerability analysis and how it relates to evacuation planning. In this module, the instructor will summarize hazard and threat characteristics of different hazards. Among the key topics covered will be Threat and Hazard Identification Risk Assessment (THIRA) and information sources required for evacuation planning.

Terminal Learning Objective (TLO)

Participants will be able to recognize evacuation needs during disasters and threat characteristics of different hazards.

Enabling Learning Objectives (ELO)

At the conclusion of this module, participants will be able to:

- 2-1 Describe evacuations related to disasters
- 2-2 Describe hazard and threat characteristics of different hazards
- 2-3 Review risk assessment and vulnerability analysis in evacuation planning

Lesson Topics

Lessons in this module will include the following:

- Evacuation lessons learned from recent disaster events
 - Hurricane Harvey, Irma, Katrina, and Rita
 - California Wildfire
 - Tennessee Floods
 - Louisiana Chemical Spill
- Hazard and threat characteristics of different hazards
- Understanding the relationship of hazard and vulnerability
- Threat and Hazard Identification Risk Assessment (THIRA)
- Information sources required for evacuation planning



Instructional Strategy

- Lecture-based instruction
- Classroom discussions

Assessment Strategy

- Instructor observation of participant involvement in classroom discussion
- Instructor-led discussion to gauge participant grasp of the subject matter

Practical Exercise (PE) Statement

Not applicable

Module 3: Key Concepts in Evacuations

Scope Statement

In this module, the instructor will highlight the role of transportation in evacuations and introduce the participants to key terms used for evacuations and evacuation planning. The module will also include risk and hazard vulnerability analysis of the participants' communities.

Terminal Learning Objective (TLO)

Participants will be able to describe key concepts and assess the need of evacuation in their communities.

Enabling Learning Objectives (ELO)

At the conclusion of this module, participants will be able to:

- 3-1 Explain key concepts for evacuation planning
- 3-2 Prepare risk assessment for evacuation

Lesson Topics

Lessons in this module will include the following:

- Role of transportation in evacuations
- Key concepts in evacuation
 - Evacuation
 - "Types" of Evacuation
 - Voluntary Evacuation
 - Mandatory or Directed Evacuation
 - Contraflow
 - Fixed Route
 - Reentry
- Evacuation Decision
 - Type of Hazard
 - Factors Affecting Evacuation Decision



Instructional Strategy

- Lecture-based instruction
- Classroom discussions
- Hands-on activity

Assessment Strategy

- Instructor observation of participant involvement in classroom discussion
- Instructor-led discussion to gauge participant grasp of the subject matter
- Instructor observation of participant involvement in practical exercises

Practical Exercise (PE) Statement

Participants will engage in a group activity and classroom discussion regarding considerations when planning for an emergency evacuation. This activity will ask participants to analyze an event that could require an evacuation, and assess the needs of that community. They will also explore planning needs for vulnerable populations and assets.

Module 4: Evacuation Planning Considerations

Scope Statement

In this module, the instructor will highlight and summarize several of the foundational principles of evacuation planning, specifically the formation and interaction of teams for collaborative work in plan developments including identification of stakeholders, committees, and/or organizations. Among the key topics covered will be steps in the planning process and identification of evacuation population and infrastructure and system needs during evacuation.

Terminal Learning Objective (TLO)

Participants will be able to describe the evacuation planning process and transportation considerations in evacuation planning.

Enabling Learning Objectives (ELO)

At the conclusion of this module, participants will be able to:

- 4-1 Explain framework for evacuation planning
- 4-2 Identify evacuation population and communication needs
- 4-3 Identify transportation modes, transportation providers, options for evacuation, and reentry



Lesson Topics

Lessons in this module will include the following:

- Evacuation Planning Process
 - Steps in the Planning Process
 - Collaborative Partners
- Evacuation Population and Communication Needs
 - Assisted Evacuation
 - Evacuee Groups and Travel Needs
 - Communication Needs
- Transportation Modes, Providers, and Systems
 - Transportation Modes and Providers
 - Supportive Transportation Infrastructure
 - Reentry Consideration

Instructional Strategy

- Lecture-based instruction
- Classroom discussions
- Hands-on activity

Assessment Strategy

- Instructor observation of participant involvement in classroom discussion
- Instructor-led discussion to gauge participant grasp of the subject matter
- Instructor observation of participant involvement during the practical activity

Practical Exercise (PE) Statement

Participants will engage in a group activity and classroom discussion about applied strategies to make evacuation planning decisions for a local community.

Module 5: Evacuation Decision-Making and Strategies

Scope Statement

In this module, the instructor will focus on evacuation decision-making process, specific strategies to use during an evacuation, and tools to assess and analyze evacuations. The field of traffic modeling and simulation for evacuation analysis, including how to assess and interpret output results, will be discussed. The instructor will also discuss two examples of evacuation plans, exploring strategies employed, lessons learned, and ways to apply those strategies.

Terminal Learning Objective (TLO)

Participants will be able to evaluate the evacuation decision-making process, apply evacuation strategies, best practices, and lessons learned by examples of recent evacuation plans.



Enabling Learning Objectives (ELO)

At the conclusion of this module, participants will be able to:

- 5-1 Describe evacuation decision-making process
- 5-2 Identify traffic management and control strategies, tools, and methods
- 5-3 Describe evacuation traffic modeling and simulation tools, methods, and output
- 5-4 Describe examples of recent evacuations to identify successes and areas for improvement in evacuations

Lesson Topics

Lessons in this module will include the following:

- Evacuation decision making process and steps
 - Incident Notification and Evacuation Decision
 - Evacuation Destinations and Requirements
 - Evacuation Process
 - Mass Care and Re-entry
- Transportation operational strategies
 - Contraflow
 - Evaculanes
 - Variable message signs
- Models and simulations for evacuation planning
 - Model input and output
 - Specific models for evacuation planning
- New Orleans Evacuation Plan
 - Use of contraflow and a citizen assisted evacuation plan
 - Benefits and alternatives
- Florida Keys Evacuation Plan
 - Models and simulations to increase clearance time
 - Hurricane Irma impact in evacuation traffic

Instructional Strategy

- Lecture-based instruction
- Classroom discussions

Assessment Strategy

- Instructor observation of participant involvement in classroom discussion
- Instructor-led discussion to gauge participant grasp of the subject matter

Practical Exercise (PE) Statement

None



Module 6: Course Summary and Administration

Scope Statement

In this module, instructors will lead a short discussion to review the course goal and content. Participants will complete an objectives-based post-test. Participants must score at least 70% to receive a Certificate of Completion. Participants will complete a course evaluation form and provide feedback on the course instruction, content, and materials. Additional information will be provided about other FEMA training opportunities.

Terminal Learning Objective (TLO)

Participants will successfully complete the post-test and all final administrative tasks for the course.

Enabling Learning Objectives (ELO)

At the conclusion of this module, participants will be able to:

- 6-1 Identify additional resources and training opportunities
- 6-2 Provide an evaluation of the course materials and instruction
- 6-3 Complete a post-test

Lesson Topics

- Course summary
- Additional information and resources
- Post-test administration
- Course evaluation

Instructional Strategy

Administration of post-test and course evaluation

Assessment Strategy

- Instructor observation of participant involvement in classroom discussion
- Instructor-led discussion to gauge participant grasp of the subject matter, and to ensure that participant understands both how performance will be evaluated and how evaluation will impact participant outcomes
- Instructor administration of objectives-based post-test to assess the knowledge participants have gained in each module

Practical Exercise (PE) Statement

Not applicable



Course Agenda

Module Title	Duration
Module 1: Welcome, Introduction, and Administration	50 Minutes
Module 2: Assessing Risk in Relation to Evacuation	60 Minutes
Module 3: Key Concepts in Evacuations	75 Minutes
Module 4: Evacuation Planning Considerations	75 Minutes
Module 5: Evacuation Decision-Making and Strategies	90 Minutes
Module 6: Course Summary and Administration	40 Minutes
<i>90 minutes of breaks (three 10-minute breaks, one 60-minute lunch break)</i>	90 Minutes
Total	8 Hours