FTA RESEARCH

FEDERAL TRANSIT ADMINISTRATION

Smart, Shared, and Social: Enhancing All-Hazards Recovery Plans with Demand Management Technologies

JANUARY 2020

FTA Report No. 0151
Federal Transit Administration

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U.S. Department of Transportation
Federal Transit Administration

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Metric Conversion Table

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: volumes greater than 1000 L shall be shown in m^3				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC

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13. ABSTRACT
This report summarizes the activities and results of a project to develop an all-hazards emergency transportation recovery plan for Portland, Oregon. The first phase of the project was to develop, test, and refine an integrated all-hazards emergency transportation recovery plan, working directly with organizations that are involved in transit and transportation demand management (TDM) in the Portland region. The key goal was to address the need for post-disaster access and mobility when infrastructure capacity has been reduced by both damage and the needs of emergency responders and recovery activities and to jumpstart the region on the road to social and economic recovery. The second phase of the project was to develop a training course on emergency transportation recovery planning using the Portland plan as a prototype. The course was offered in six locations across the country. This project provides examples and tools for other regions and agencies to develop a transportation recovery plan.

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Abstract

This report summarizes the activities and results of a project to develop an all-hazards emergency transportation recovery plan for Portland, Oregon. The first phase of the project was to develop, test and refine an integrated all-hazards emergency transportation recovery plan, working directly with organizations that are involved in transit and transportation demand management (TDM) in the Portland region. The key goal was to address the need for post-disaster access and mobility when infrastructure capacity has been reduced by both damage and the needs of emergency responders and recovery activities and to jumpstart the region on the road to social and economic recovery. The second phase of the project was to develop a training course on emergency transportation recovery planning using the Portland plan as a prototype. The course was offered in six locations across the country. This project provides examples and tools for other regions and agencies to develop a transportation recovery plan.

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EXECUTIVE SUMMARY

Natural disasters, acts of terrorism, and other emergency incidents can affect multiple jurisdictions simultaneously. Major disasters, such as earthquakes, create large-scale impacts that require outside assistance even for the most prepared local public safety and emergency management organizations. The cities, counties, non-governmental organizations, and business-sector stakeholders in a region recognize that they all can more effectively respond to emergencies and facilitate recovery of communities if they prepare together. Regional collaboration in building disaster preparedness capabilities is more cost-effective for taxpayers, develops roles and relationships needed for efficient disaster response and recovery, and increases the ability to involve the whole community in preparedness initiatives. During the past few decades, a number of natural disasters and other emergencies have occurred in various regions in the U.S., and the resulting impacts on the transportation system have been significant. In each case, transportation system impacts included damage to highway and transit infrastructure and significant disruption in travel. A vital component of an emergency management and recovery framework is the transportation network.

Transit agencies play an important part in all phases of emergency management. Transit has a role to play in mitigation by protecting its own assets and establishing redundant communication systems to help ensure continuity of service. It is crucial that transit agencies should be part of preparedness plans and represented in the emergency command structure. Transit also plays a vital role during the response phase, by both helping to evacuate those without access to a private vehicle and bringing emergency responders and equipment to the incident site. Finally, they can be involved in the recovery phase, reestablishing normal or alternate transit operations and bringing evacuees back to the area.

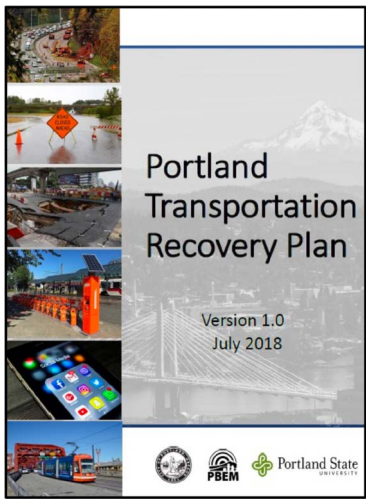
The Portland, Oregon, region has learned from past natural disasters and emergency events that there is a clear need for comprehensive emergency preparedness and recovery plans that include robust and coordinated transit and transportation demand management (TDM) elements for the response and subsequent recovery periods. The basic purpose of this project was to integrate organizations that are involved in transit, transportation planning, and TDM with entities that are traditional emergency responders to develop a fully-integrated emergency recovery plan that includes transit providers, TDM providers, social media, and ITS technologies.

The first phase of this project was to develop, test, and refine an integrated all-hazards emergency response and recovery transportation plan working directly with organizations that are involved in transit and TDM in the Portland region. The key goal was to address the need for post-disaster access and mobility when infrastructure has been damaged, causing reduced capacity in the system. This all-hazards recovery project looked to guide the City of Portland and TriMet to plan on how they need to think about how the city and region would deploy their human and physical capital with increased effectiveness before, during, and after

an emergency. The second phase was to develop a training course on emergency transportation recovery planning using the Portland plan as a prototype. The course was tested in Portland, refined, and then offered in six locations across the U.S. The project also included a phase for disseminating lessons learned through research, planning, and tabletop exercises.

Key Outcomes of the Project

Recovery is the process of reasonably restoring expected economic and social functions of a community following a natural or human-induced hazard event. The Portland Transportation Recovery Plan provides an integrated process and associated actions for the City of Portland to transition from emergency response procedures after a disaster event to mobility recovery strategies emphasizing the use of transit, TDM, social media, and intelligent transportation systems (ITS) technologies.



The Portland Transportation Recovery Plan was developed to focus on transportation recovery and was the first type of plan to focus on recovery in the region. As the City of Portland and the greater Portland metropolitan region develop broader regional recovery plans, it will be important to align future transportation recovery efforts with the vision and goals of those plans. One of key outcomes of the project was the acknowledgement that the fields of transportation planning and emergency management (personnel and departments) do not typically interact together. The planning process and trainings brought these individuals and departments together to work on recovery planning. A significant outcome of the project was the enhanced relationships with these agencies and individuals and increased understanding of the priorities, needs, and language used.

Going forward, the City of Portland will work with TriMet and other agencies to develop a broader infrastructure recovery framework and governance strategy based on changes in technology, internal capacity, and other factors that directly influence the ability to restore and improve the pre-event functioning of the city's transportation system. This will allow the Plan to take advantage of improved conditions and future investments, include actions that more explicitly integrate freight and goods movement, and integrate additional organizations from the not-for-profit and private sectors. Because of their regional scope, TriMet, Metro, and the Regional Disaster Preparedness Organization (RDPO) are ideal to lead the efforts outside of Portland and help create a regional transportation recovery plan.

Another goal was to disseminate the lessons learned from developing and testing Portland's plan and share the experience by training relevant partners in six U.S. cities. The purpose of the training was to provide participants with the tools, knowledge, skills, and resources to develop an emergency transportation recovery plan that includes coordinated public transportation services, TDM, and ITS strategies and recognizes the specific needs, resources, and relationships with emergency responders within each region. In total, 247 people participated in the trainings. A year after the training, two regions have made significant progress in developing transportation recovery plans and activities.

Key Findings in Transportation Recovery Planning

Based on a comparison of the content of existing regional transportation and emergency management plans and interviews with staff from agencies and organizations in the region and across the U.S., Federal guidance, and other research, several key findings from this project emerged:

- **Recovery is not clearly understood**. Most resources reviewed included a definition of recovery and discussed the differences between recovery and emergency response. The interviews and discussions with training participants demonstrated that the words "recovery" and "response" are often used interchangeably by many agency personnel. It is important that a plan clearly defines recovery and its place in the emergency management process while recognizing the overlap with response.
- **There are limited examples of transportation recovery plans and a need for training**. There are few examples of transportation recovery plans in place, and there is a demonstrated need shown by project participants for more guidance. Developing a database of recovery cases, examples, tools, and plans would help agencies, cities, and regions learn from others. In addition, there is limited training on the topic of transportation recovery planning.
- **Transit agencies need to be an important part of the planning**. During large-scale emergency events, transit plays a crucial role in the movement of people, especially those in underserved communities, and can play important roles in recovery after specific types of disasters in helping communities restore life-sustaining services and access to jobs. Transit effectiveness will depend upon, first, what these organizations do to fortify their internal continuity of operations; second, what transit do to anticipate and prepare effective responses to the consequences of multiple simultaneous threats; and third, how well recovery plans are implemented.
- **Different stages of recovery require different actions and protocols**. Multiple resources reviewed acknowledge that recovery is a longer process than response. A transportation plan should lay out the roles and responsibilities of all public and private organizations across the stages of

recovery and link to additional recovery activities such as housing, economic development, and utilities.

- **Long-range planning should be more prominent in transportation recovery**. Response planning is more closely aligned with emergency management, and recovery planning is more closely aligned with long-range planning. Departments of transportation and transit agencies should incorporate recovery as criteria in long-range plans so key infrastructure, corridors, and assets are made resilient for events. Often, existing transit routes can offer a network from which to build recovery efforts, and these routes need to be resilient and adaptable.
- **Performance measures need to be developed as part of the planning process**. Cities and regions that develop transportation recovery plans will want to consider how to evaluate their efforts. Performance measures for safety and operational/capital efficiency can be identified to gauge transit losses avoided due to institutional preparedness and to gauge community losses avoided due to transit preparedness to support recovery efforts.

The examples, tools, recommendations, and insights produced by this project may also provide inspiration and guidance to other regions and transportation and transit agencies in the U.S. that seek to develop their own transportation recovery plans. The work generated by the individuals in Portland can serve as an example for others to start working on this key component of emergency management. The challenges, barriers, and lessons learned detailed in this report and the associated documents are common to other regions, as noted during the trainings. This project can help move forward the much-needed efforts in the U.S of transportation recovery planning.

SECTION 1

Project Background

In 2013, the Federal Transit Administration (FTA) published a Notice of Funding Availability (NOFA) in the *Federal Register* that announced $29 million in funds for Innovative Safety, Resiliency, and All-Hazards Emergency Response and Recovery Research (SRER) projects of national significance [1]. In 2015, FTA awarded Portland State University $943,984 to develop and test a transportation recovery plan for the Portland metropolitan area. This funding was matched with $131,868 of local and in-kind effort. The objective of the project looked to help the City of Portland, TriMet (Portland's public transit agency), and other regional transportation and emergency management agencies to develop a plan to deploy transportation services and personnel with increased effectiveness after an emergency.

During the past few decades, a number of natural disasters and other emergencies have occurred in various regions in the U.S., and the resulting impacts on the transportation system have been significant. Examples of such incidents include:

- 9/11 attack (NY-NJ) – 2001
- Hurricane Katrina (LA) – 2005
- Hurricane Rita (TX) – 2005
- Hurricane Sandy (NY–NJ region) – 2012
- Boston Marathon bombing (MA) – 2012
- Northridge earthquake (CA) – 1994

In each case, transportation system impacts included damage to highway and transit infrastructure and significant disruption in travel. These events have led to short- and long-term changes in travel patterns and travel modes, including commute trips. Examples of the impacts of these disasters include the following:

- The 9/11 attack disrupted the transit system, including New York Metropolitan Transportation Authority (MTA), Port Authority Trans-Hudson (PATH), and New Jersey TRANSIT. Rebuilding has been underway since 2001. This event dramatically changed travel patterns for tens of thousands of people.
- Hurricane Katrina caused major damage to the transit system due to flooding on the light rail line and in rolling stock storage locations. The extensive damage to the transit system dramatically hindered recovery efforts for thousands of transit-dependent people.
- Hurricane Sandy caused major disruption due to flooding throughout the New York and New Jersey regional transit systems and at rolling stock storage and maintenance facilities. The New York subway is still dealing

with the damage caused by the event and has spent more than $5 billion on repairs and upgrades.

- Hurricane Rita prompted a directive from the Governor of Texas to the Houston region's Metropolitan Planning Organization (Houston-Galveston MPO) to take the lead among regional agencies to develop an emergency evacuation plan. This directive was issued after Hurricane Rita due to significant difficulties with evacuation of residents in preparation for the Hurricane.
- The Boston Marathon bombing caused immediate impacts on the transit system, and the subsequent manhunt caused even more substantial travel disruption.

FTA defines "all-hazards preparedness" as "integrated planning and capability building for safety, security, and emergency management to optimize and continuously improve the use of resources and the management of risks from hazards, threats, vulnerabilities, and adverse events or incidents" [2]. Because of past emergencies and the damage caused, transportation and transit agencies throughout the U.S. have efforts underway to improve system resiliency and better protect infrastructure during emergencies. Disaster and emergency events can have long-lasting impacts on transportation infrastructure and mobility in the impacted region and have reinforced the need for comprehensive emergency preparedness plans that include strong transportation elements for the immediate response and subsequent recovery period.

The National Disaster Recovery Framework constructs recovery efforts in to five phases: preparedness disaster (or adverse incident), short-term recovery, medium-term recovery, intermediate-term recovery, and long-term recovery [3]. The three post-event phases overlap as well as merge into each other; however, the division is used throughout recovery preparedness literature to describe certain discrete functions that vary during the recovery periods, such as assessment, debris removal, infrastructure repair, and operational planning.

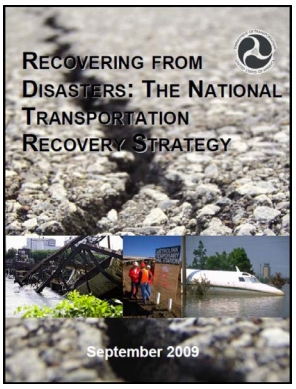
Transit agencies play an important part in all phases of emergency management. Transit has a role to play in mitigation by protecting its own assets and establishing redundant communication systems to help ensure continuity of service. It is crucial that transit agencies should be part of preparedness plans and represented in the emergency command structure. Transit also plays a vital role during the response phase, in both helping to evacuate those without access to a private vehicle and bringing emergency responders and equipment to the incident site. Finally, they can be involved in the recovery phase, reestablishing normal or alternate transit operations and bringing evacuees back to the area.

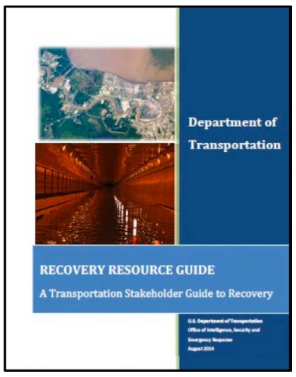
Many U.S. cities, regions, and states have developed emergency preparedness and response plans, but there have been only few examples of efforts focusing on recovery planning, especially transportation planning. In 2014, the Puget Sound Transportation Recovery Annex was developed as part of the Regional Cata-

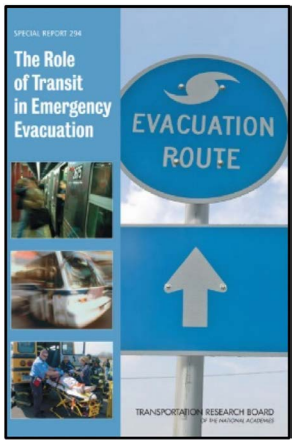
strophic Disaster Coordination Plan for the Puget Sound, Washington, region [4]. While providing recommended guidelines for coordinating multi-jurisdictional regional transportation system recovery after a major earthquake, it also includes guidance to local governments to develop their own plans and is applicable to all events that disrupt multiple modes of transportation. Nine appendices of the plan present detailed information on several topics, including alternative routing maps; prioritization of roadways for restoration and reconstruction; assessment and mitigation strategies for roadways, waterways, and airways; and recommendations for training capabilities and exercises to be conducted in advance of an event.

On July 1, 2013, Bay Area Rapid Transit (BART), the public transportation system in the San Francisco Bay Area, shut down as unionized workers began a strike due to the inability to reach an agreement with management on new contracts. As the fifth largest such system in the U.S., 400,000 commuters were forced to find new means of getting themselves to and from work, school, medical appointments, and other activities. Short-term contract extensions and intermittent stoppage in services continued through the better part of October 2013. The Metropolitan Transportation Commission (MTC), the MPO for the San Francisco Bay Area, produced a summary of the strike that included the events leading up to the strike, coordination conducted by MTC, responses by regional partners, the financial costs of the strike, and lessons learned. In addition, a "playbook" for transportation disruptions on the San Francisco–Oakland Bay Bridge Corridor was developed (MTC owns, maintains, and operates that bridge) [5]. The playbook helps agencies address an incident by identifying the type (human-induced or natural), selecting appropriate mitigation measures and public outreach tactics and tools for the specific incident, and providing guidance on how to implement the mitigation measures and public outreach. The playbook also includes information on resource and procurement challenges and a schedule for its update.

The U.S. Department of Transportation (U.S. DOT) has published two documents that were consulted during the project. *Recovering from Disasters* is a framework for transportation industry stakeholders, local governments, and state/tribal governments to employ following an incident that will result in more resilient transportation networks [6]. It includes thorough listings of funding resources from U.S. DOT and other Federal departments and the respective roles and responsibilities of federal agencies during recovery. *Recovery Resource Guide: A Transportation Stakeholder Guide to Recovery* [7] is cited by U.S. DOT as the update to its *Recovering from Disasters*. However, the bulk of the document updates statutory references to the Federal surface transportation authorization enacted in 2012 and builds on the original strategy through expanded discussions of Federal directives and U.S. DOT support functions.







Additional resources used in the development of the framework of the plan were *TRB Special Report 294: The Role of Transit in Emergency Evacuation* [8] and *National Cooperative Highway Research Program Report 753: A Pre-Event Recovery Planning Guide for Transportation* [9]. TRB 294 focuses on the evacuation of urban areas after major incidents and how transit agencies could play a significant role in an emergency evacuation, particularly in transporting carless and special-needs populations. The report provides a framework and recommendations for transit and other public transportation providers in such an incident. NCHRP 753, published in 2013, is a technical guidance for the preparation of a transportation recovery plan. Whereas it provides an overview of Federal frameworks and directives and discusses funding programs, its greatest utility is in its identification of pre-incident recovery planning principles, effective practices following previous incidents, key tasks of recovery planning, and communication and collaboration models.

In the last decade, social media has emerged as a powerful, real-time communications tool that can transform how people travel. Additionally, ITS technologies have become increasingly sophisticated and are an integral part of the investment portfolio of transportation and transit agencies. ITS technologies have vastly improved the operations and management capabilities of transportation system managers and provide valuable data that can be used in planning activities and in analyzing system performance.

The Portland region has learned from past natural disasters and emergency events that there is a clear need for comprehensive emergency preparedness and recovery plans that include robust and coordinated transit and TDM elements for the response and subsequent recovery periods. The basic purpose of this project was to integrate organizations that are involved in transit, transportation planning, and TDM with entities that are traditional emergency responders to develop a fully-integrated emergency recovery plan that includes transit providers, TDM providers, social media, and ITS technologies.

SECTION 2

Project Description

Project Summary

The purpose of this project was two-fold. The first phase was to develop, test, and refine an integrated all-hazards emergency response and recovery transportation plan working directly with organizations that are involved in transit and TDM in the Portland region. The key goal was to address the need for post-disaster access and mobility when infrastructure has been damaged, causing reduced capacity in the system. This all-hazards recovery project looked to guide the City of Portland and TriMet to plan on how they need to think about how the city and region would deploy its human and physical capital with increased effectiveness before, during, and after an emergency.

The second phase was to develop a training course on emergency transportation recovery planning using the Portland plan as a prototype. The course was tested in Portland, refined, and then offered in six locations across the U.S. The project also included a phase for disseminating lessons learned through research, planning, and tabletop exercises.

Portland State University and Sarah J. Siwek Associates led the project, with the Portland Bureau of Emergency Management (PBEM) as the local coordinating a partner because of its role in emergency management for the Portland metropolitan region.

The overall effort included TriMet, Metro (the MPO), City bureaus, County and State agencies, transportation management associations (TMAs), and traditional emergency responders (e.g., PBEM and Multnomah County). By including these regional agencies in this project, the intent was to ensure that a coordinated plan was developed. Many agencies have a role in emergency planning and recovery; this project helped to ensure that the plan was developed with buy-in by each entity to their respective roles and responsibilities in emergency recovery efforts.

The project addressed all modes, with particular attention paid to local active modes and transit, including bus, light rail, and commuter rail. Although TriMet is the dominant transit operator in the region, the services of other transit operators will be relevant in case of an event—the City of Portland's streetcar, C-TRAN's bus service to Clark County and Vancouver in southwest Washington, SMART's bus service that links Portland to Wilsonville and other communities south of the region, and paratransit and other demand-responsive transit operations.

The project team consisted of the Transportation Research and Education Center (TREC) at Portland State University and Sarah J. Siwek Associates. The team contracted with T.Y. Lin International and Go Lloyd (Lloyd Transportation District TMA) for specific tasks described below. The project used a Technical Advisory Committee to help guide the planning and training development. The Technical Advisory Committee comprised members from the following organizations:

- Portland Bureau of Emergency Management
- TriMet (Safety and Planning departments)
- Portland Bureau of Transportation
- Metro
- Regional Disaster Preparedness Organization (RDPO)
- Multnomah County (Emergency Management and Transportation divisions)
- Oregon Department of Transportation (ODOT) – Region 1

The project team and Technical Advisory Committee are listed in Appendix A.

Tasks

Recovery is the process of reasonably restoring expected economic and social functions of a community following a natural or human-induced hazard event. The Portland Transportation Recovery Plan provides an integrated process and associated actions for the City of Portland to transition from emergency response procedures after a disaster event to mobility recovery strategies emphasizing the use of transit, TDM, social media, and ITS technologies.

Task One: Lessons Learned

The goal of Task One was to collect and synthesize the state of knowledge and practice of transportation recovery planning, specifically regarding the use of public transportation, demand management, and the value of ITS and social media during emergency response and recovery. The task included a literature review and the development of case studies, which helped framed Task Two and the development of the plan.

Literature Review: The team synthesized the literature related to transportation and recovery, the use of TDM strategies in pre- and post-disaster management, and communication during recovery related to transportation and traveler information.

Case Studies: The team conduct in-depth, interview-based case studies with an emphasis on recent events such as Superstorm Sandy, Hurricane Katrina, the New Zealand Christchurch earthquake, the London Tube bombings, the New England snowstorm in 2015, and the BART strike.

Deliverables (see https://trec.pdx.edu/research/project/1185):

- Literature Review Technical Memorandum
- Case Study Technical Memorandum

Task Two: Plan and Test

The goal of this task was to develop, test, and finalize the Portland All-Hazards Transportation Recovery Plan. An associated goal was the institutionalization of relationships between transportation and emergency management agencies and personnel. A key outcome of Task One and noted in stakeholder discussion was the acknowledgment that these fields (personnel and departments) do not typically interact together. The Technical Advisory Committee brought these individuals and departments together to work on the plan. A significant outcome of the project was the enhanced relationships with these agencies and individuals, increased understanding the priorities and needs, and language.

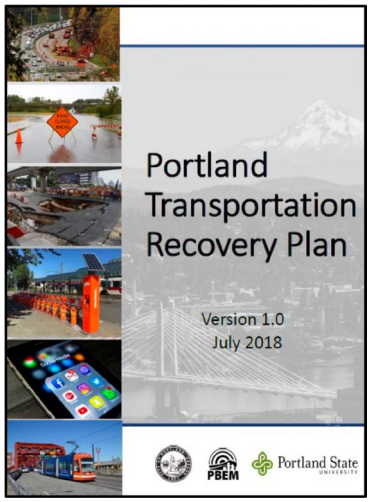
Plan Development: A transportation planner, embedded with PBEM for the duration of the project, oversaw the development of the planning process and coordinated activities with the Technical Advisory Committee, the project team, and the consultant. T.Y. Lin International was contracted to lead the development of the plan. Go Lloyd was contracted to develop an employer emergency response and recovery TDM guide. In addition to the Technical Advisory Committee, the project team interviewed staff from agencies and organizations that will play important roles during emergency recovery, including TMAs, Washington County and Clackamas County emergency management and transportation planners, Oregon Health & Science University (transportation planning and emergency management), Portland State University (transportation planning and emergency management), and the Port of Portland.

Several key plans were reviewed as part of the development of the Plan. The purpose was twofold—to determine the extent that transportation recovery was considered in existing plans and to identify any data elements, needs assessment, or other information that would be applicable to the Plan and its development. Multiple workshops and committee meetings were held with the Plan's Technical Advisory Committee members in the development of the draft plan. In addition to the Plan, the project team developed a Transportation Recovery Alternatives Prioritization Tool, an easy-to-use, straightforward application to inform the selection of highway, bridge, and rail investments following a hazard event.

Portland Transportation Recovery Plan

The Portland Transportation Recovery Plan provides an integrated process and associated actions for the City of Portland to transition from emergency

response procedures after a disaster event to mobility recovery strategies emphasizing the use of transit and active transportation, TDM, communications and social media, and ITS technologies. The goal of the Plan is to restore the economic and social functions of the city as quickly as possible. The Plan is based on the acknowledgment of three key factors: 1) recovery is distinct from response; 2) recovery presents opportunities to increase safety, reliability, resilience, and equity; and 3) the exact severity and extent of specific incidents cannot be anticipated, described in more detail as follows:



- **Recovery vs. response** – A major difference between recovery and response is the transition from a command and management framework to a management and planning framework. Although this distinction exists, there is some overlap between the later stages of emergency response and initial emergency recovery actions, especially in shorter timeframe incidents, such as a winter storm. A common example is the continued clearance and restoration of emergency transportation routes, as not all routes may be open during the response phase.
- **Rebuilding better** – As the City of Portland conducts recovery, an important consideration will be to restore existing elements of the transportation system (infrastructure and services) that functioned as desired prior to the incident and implement planned improvements whenever possible. This will ensure that opportunities to increase safety, reliability, efficiency, resiliency, and equity are fully maximized. The net result of recovery should be a transportation system that works better and serves the community better than before the disaster.
- **Applicability of the Plan to all hazards** – The Plan is intended to be flexible enough to adapt to recovery needs resulting from a variety of types of incidents. Four incidents were selected as examples due to risk and likelihood of occurrence—earthquakes, floods, landslides, and homeland security incidents. Using these incidents to develop an approach and actions to address the recovery activities that will likely be required ensures the adequacy of the Plan to the maximum extent practicable, irrespective of the incident that occurs. Incidents, whether predicted or occurring without warning, pose challenges that cannot be anticipated, so a degree of flexibility needs to be integrated into the process.

Portland Alternatives Prioritization Tool

As part of the Plan, the Portland Alternatives Prioritization Tool (PDX APT) was developed, an easy-to-use, straightforward decision support tool for use during recovery. Decision-makers can use it to create an initial ranking of transportation projects for further analysis and discussion prior to funding and implementation based on predetermined criteria weightings for usage, access, and equity. The tool was designed to be adaptive, performance-based, and user-friendly. The PDX APT will provide a prioritized list of more than 1,000 segments that encompass all major roadways and passenger rail lines (TriMet MAX and Portland Streetcar) in Portland. It is intended to rank potential actions based on their impact in attaining the greatest benefit to the traveling public; in this sense, it is similar to any capital (or service or operations) programming process—it should assess and arrange the inputted transportation improvements in order of their contribution to the safe, efficient, and reliable movement of people of freight.

Employer All Hazards TDM Guide

The Portland Transportation Recovery Plan is a guide for prioritizing and restoring critical transportation systems in the weeks or months following a hazard event. A key element of transportation recovery will be TDM. A robust suite of TDM strategies will make a region and its businesses more resilient following a post-hazard event or anything else that disrupts the transportation system.

As part of the project, an Employer All Hazards TDM Guide was designed to help employers and government agencies plan for recovery efforts following a hazard event. This TDM plan provides guidance to employers of all sizes, from large corporate offices to small independent restaurants, because every business can benefit from TDM programs. Established businesses already thinking about emergency preparedness or continuity of business plans can use this guide to inform those planning processes, whereas less-established businesses can use it as a starting point for broader emergency planning efforts with particular focus on employee transportation. Each section of the guide comes with a corresponding set of suggested action items to help the organization develop procedures and practices.

Drill and Test the Plan: The project team held two tabletop exercises that were conducted to assess the ability of the Plan to effectively provide the necessary direction to agencies during the recovery period. The exercises involved discussions about the needs, existing programs, and available resources for the process of restoring operations and services and (where appropriate) improved functionality to Portland's surface transportation system (i.e., roadways, bridges, and passenger rail systems). The exercises were vital in not only vetting the Plan's contents and receiving feedback from Technical Advisory Committee members and regional professionals but also for building relationships

among agency staff in the context of recovery. The details incorporated into the tabletop simulations provided the insights required to revise the recommended actions contained in the Plan.

Deliverables (see https://trec.pdx.edu/research/project/1185):

- Portland Transportation Recovery Plan
- Employer All-Hazards TDM Guide
- Portland Transportation Recovery Alternatives Prioritization Tool

Task Three: Transfer and Train

The goal of Task Three was to disseminate the lessons learned from developing and testing Portland's plan and to share the experience by training relevant partners in six U.S. cities. The project team created a two-day training course on the development of a transportation recovery plan, the purpose of which was to provide participants with the tools, knowledge, skills, and resources to develop an emergency transportation recovery plan that includes coordinated public transportation services and TDM and ITS strategies and recognizes the specific needs, resources, and relationships with emergency responders within each region.

The primary audience for the training was transit and transportation planners from MPOs and institutions that have responsibilities for creating, reviewing, funding, implementing, and/or executing emergency operations and transportation recovery plans. This includes personnel with the direct responsibility for emergency management as well as other personnel including representatives from transit agencies, city and state departments of transportation, major employers, paratransit providers, developers, and existing TDM entities.

Training Development: The project team, led by Sarah J. Siwek Associates, developed the two-day training workshop (based on National Transit Institute standards). A prototype two-day training workshop was tested and piloted in Portland in December 2017. The course objectives of the training were to ensure that participants will be able to:

- Define all-hazards recovery planning:
  - Understand the relationship between hazard mitigation planning, emergency response planning, and transportation recovery planning
  - Understand the role of travel demand management, ITS, and transit in transportation recovery
  - Identify affected parties and assemble an all-hazards recovery planning team

- Identify processes for:
  - Defining a region's transportation system and vulnerabilities
  - Conducting a risk assessment, identifying hazards and their risks and impacts
- Understand operations and communications tools and methods for recovery prioritization
- Learn the key elements of developing an all-hazards recovery plan that includes transit, TDM technologies, including ITS
- Explore ways to optimize social media as part of a communications strategy
- Develop and implement a strategy for developing, training, and testing the plan

Highly-interactive presentations and class exercises coupled with numerous individual and small-group practice activities helped participants develop a high level of mastery in the class and facilitated the transfer of the relevant skills and knowledge. The course comprised the following key topics areas:

- Regional Emergency Plans and Transportation System
- Transportation Recovery: What It Is and Isn't
- Roles and Responsibilities
- Communications
- Vulnerability Assessment
- Transportation Recovery Strategies – multimodal recovery plans including operations, communications, transit, TDM, ITS, and leveraging use of social media
- Prioritizing Post-Disaster Investment (alternatives prioritization tool)
- Funding, Contracting, and Legal Considerations.

Trainings: The project team worked with the Association of Metropolitan Planning Organizations (AMPO) to solicit potential regions to participate in trainings. The following regions (8 MPOs) were selected from the 20 MPOs in 15 states that applied to participate in this project:

- Broward MPO, Fort Lauderdale, Florida
- Coastal Region MPO, Savannah, Georgia
- El Paso MPO, El Paso, Texas
- Hillsborough MPO and Sarasota/Manatee MPO, Tampa, Florida (both applied and agreed to join together to host the training)
- Lake Charles MPO, Lake Charles, Louisiana
- Strafford Regional Planning Commission, New Hampshire and Southern Maine Planning and Development Commission, Scarborough, Maine (jointly applied to host the training).

A key objective of the training was for the region to initiate the development of an emergency recovery transportation plan tailored using the skills and resources provided in the training. The project team worked with each local host MPO to the fullest extent possible to maximize the benefits of this training. Key stakeholders were invited to the training, including other regional MPOs, transit agencies, other transportation providers (both public and private, such as vanpool providers, shuttle companies, paratransit, school, college, etc.), state DOTs, ITS operations personnel, TMAs, representatives from major employers in the region, and representatives from agencies in charge of emergency response (e.g., county governments, state emergency management agencies, departments of human services, etc.).

The two-day training courses were offered in Spring 2018. In total, 247 people participated in the 7 trainings. It is the hope that these trainings create a new professional development course to accelerate the institutionalization of these dynamics around the country. The project team has been in discussions with various organizations to continue the training to other interested regions.

Deliverables (see https://trec.pdx.edu/research/project/1185):

- Training modules and notes

Task Four: Evaluation

The Center for Urban Transportation Research (CUTR) at the University of South Florida conducted a formal independent evaluation of the project as required under the grant. The detailed Independent Evaluation report is presented in Appendix B. This evaluation assessed the overall effectiveness of the project in accordance with the FTA evaluation requirements for innovative SRER Program projects. In addition to examining deliverables from each project phase, the evaluators observed and provided feedback for the prototype two-day course held for emergency response and transportation agencies in the Portland area. The evaluators also observed training for the Hillsborough and Sarasota/ Manatee MPOs, one of the six subsequent training courses held in Spring 2018.

Overall, the evaluations of the training were very positive. The project trainers provided evaluations to all participants based on National Transit Institute criteria and used 11 evaluation criteria. The average rating on all criteria in all locations was 4.6 on a scale of 1 to 5, and 98.7% of the reviewers felt that the training met their expectations.

Deliverables:

- Independent Evaluation Report (Appendix B)

SECTION 3

Conclusion

Natural disasters can occur at any moment, and the transportation system needs to be prepared to withstand them and to provide needed transport for fuel, essential supplies, and medical transport. For example, the Pacific Northwest is in a highly seismically-active region. In addition to the risk posed by the three shallow, crustal fault lines that intersect Portland, geologists believe that there is a 24% chance of a magnitude 8.0 or greater earthquake occurring in the Cascadia Subduction Zone within the next 50 years. A signal event could cripple the region's transportation system and causing substantial economic loss. Additional threats that face the region include landslides, wildfires, flooding, volcanic activity, extreme snow and ice, and potential homeland security events. The transportation system must be resilient to facilitate emergency response and recovery activities. In addition, cities and regions need to have recovery plans in place to help to restore the social and economic operations of these communities as effectively and expediently as possible. Creating a transportation recovery plan that is foundationally based on transit and TDM allows for a more resilient and adaptable response in providing access for all during the stages of recovery.

Moving Forward

The Portland Transportation Recovery Plan was developed to focus on transportation recovery and is the first type of plan to focus on recovery in the region. As the City of Portland and the greater Portland metropolitan region develop broader regional recovery plans, it will be important to align future transportation recovery efforts with the vision and goals of those plans. A key outcome of the project was the acknowledgment that the fields of transportation planning and emergency management (personnel and departments) do not typically interact together. The planning process and trainings brought these individuals and departments together to work on recovery planning. A significant outcome of the project was the enhanced relationships with these agencies and individuals and increased understanding of the priorities, needs, and language used.

Going forward, the City of Portland will work with TriMet and other agencies to develop a broader infrastructure recovery framework and governance strategy based on changes in technology, internal capacity, and other factors that directly influence the ability to restore and improve the pre-event functioning of the city's transportation system. This will allow the Plan to take advantage of improved conditions and future investments, include actions that more explicitly integrate freight and goods movement, and integrate additional organizations from the not-for-profit and private sectors. Because of their regional scope, TriMet, Metro, and RDPO are ideal to lead the efforts outside of the City of Portland and help create a regional transportation recovery plan.

One of the major findings in the development of the Portland Plan was the regional emergency transportation routes (ETRs) had not been updated for more than 10 years and that some key connections were not designated. From this finding, RDPO and Metro are coordinating efforts with the transportation, emergency management, and public works departments of each county and TriMet, the City of Portland, Oregon DOT, Washington DOT, the Metro Council, the Joint Policy Advisory Committee on Transportation, the Southwest Regional Transportation Council, SMART, C TRAN (Vancouver transit agency), and the Oregon Department of Geology and Mineral Industries. The regional ETRs project will update the existing regional ETRs for the five-county Portland–Vancouver metropolitan region. The project will also make recommendations on elements to be included in an updated Memorandum of Understanding, mutual aid, or other written agreements needed to implement ETRs and will provide information to support future planning work related to regional transportation recovery, resiliency, and emergency management.

Another key project that began in the last year is the Regional Recovery Framework, led by RDPO. The framework will guide rebuilding, redevelopment, and recovery efforts in the weeks, months, and years after a disaster. The goal is to seize the opportunity to creatively re-design the region to be even stronger and more resilient in the future. The efforts of the Portland Transportation Recovery Plan are being incorporated in the framework.

A major barrier facing the city and region is getting the resources to work on the Plan. Often, this work is not funded within normal activities, and staff do not have the time or resources to fully devote to working on these activities. Although there are regional efforts being coordinated by RDPO, moving projects forward can be slow and require significant coordinated efforts and partnerships. Federal and State assistance would help regional governments start the process in developing recovery plans.

Key Findings in Transportation Recovery Planning

Based on a comparison of the content of existing regional transportation and emergency management plans and interviews with staff from agencies and organizations in the region and across the U.S., Federal guidance, and other research, several key findings from this project emerged:

- **Recovery is not clearly understood**. Most resources reviewed included a definition of recovery and discussed the differences between recovery and emergency response. The interviews and discussions with training participants demonstrated that the words “recovery” and “response” are often used interchangeably by many agency personnel. Some of this is to be expected, as the later phases of response and the early phases of recovery overlap. It is

important that a plan clearly defines recovery and its place in the emergency management process while recognizing the overlap with response.

- **There are limited examples of transportation recovery plans and a need for training**. The Puget Sound Annex is the only regional transportation recovery plan that would generally be considered comprehensive and proactive. Many transportation recovery lessons learned and effective practices from the resource documents are derived from actions put into place after specific incidents and have limited transferability to other types of incidents or events. Developing a database of recovery cases, examples, tools, and plans would help agencies, cities, and regions learn from others. Because transportation recovery planning is usually multi-jurisdictional, MPOs could be a logical lead in coordinating the planning efforts. These activities do not fall under normal activities and would additional funding and resources to move forward recovery planning activities. In addition, there is limited training on the topic of transportation recovery planning.
- **Transit agencies need to be an important part of the planning**. During large-scale emergency events, transit plays a crucial role in the movement of people, especially those in underserved communities, and can play important roles in recovery after specific types of disasters in helping communities restore life-sustaining services and access to jobs. For example, transit can ensure that all hospital employees, recovery workers, or City staff have transportation to work when system capacity may be severely diminished. During a prolonged crisis, the use of transit may support reopening and continuation of some level of business and commerce while enabling more people to stay home and out of harm's way or by reducing or rerouting necessary travel away from closed zones. After life-sustaining services are restored, transit can support community needs during clean-up and recovery and accelerate a return to normalcy. Transit effectiveness will depend upon, first, what these organizations do to fortify their internal continuity of operations, second, what transit does to anticipate and prepare effective responses to the consequences of multiple simultaneous threats, and third, how well recovery plans are implemented.
- **Different stages of recovery require different actions and protocols**. Multiple resources reviewed acknowledge that recovery is a longer process than response. Combined with the overlap with the later stages of response, transportation recovery actions have a degree of differentiation that needs to be acknowledged. The Portland Plan presents transportation recovery activities across four stages, acknowledging that there is a progression that occurs in restoring and improving transportation infrastructure and services. A transportation plan should lay out the roles and responsibilities of all public and private organizations across the stages of recovery and link to additional recovery activities such as housing, economic development, and utilities.

- **Long-range planning should be more prominent in transportation recovery**. Response planning is more closely aligned with emergency management, and recovery planning is more closely aligned with long-range planning. This is because incidents (particularly significant ones) represent "accelerated depreciation" that allows communities the opportunity to restore their transportation networks in a manner that better serves their stated goals and objectives than the current networks. The Alternatives Prioritization Tool developed as part of the plan uses Portland Bureau of Transportation (PBOT) classifications for how roads should function, BPS corridors and centers from the 2035 Comprehensive Plan, and the continuous emphasis on equity that Portland emphasizes in all of its decision-making. Departments of transportation and transit agencies should incorporate recovery in long-range plans so key infrastructure, corridors, and assets are made resilient for events. Often, existing transit routes can offer a network from which to build recovery efforts, and these routes need to be resilient and adaptable.
- **Performance measures need to be developed as part of the planning process**. Cities and regions that develop transportation recovery plans will want to consider how to evaluate their efforts. Performance measures for safety and operational/capital efficiency can be identified to gauge transit losses avoided due to institutional preparedness and to gauge community losses avoided due to transit preparedness to support recovery efforts. The following performance measures to could be used in the recovery planning development:
  - Return on investment (ROI) from emergency recovery planning, such as the value of losses avoided minus the cost of plan development (plan preparation, readiness training, pre-event mitigation and preparation, recovery activities); safety improvements and operational/capital efficiency should be included within the calculation of ROI
  - Safety improvements
  - Reduction in injuries and fatalities
  - Operational/capital efficiency
  - Minimization of service disruptions (e.g., improved communications and interagency coordination reduces the number of service disruptions and improves public understanding of recovery efforts)
  - Reduced post-disaster recovery time (e.g., each day of recovery costs lost workdays, school days, etc.)
  - Regional economic savings (e.g., each day of recovery reduced benefits the regional economy)

APPENDIX

A

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APPENDIX

B

Independent Evaluation

Independent Evaluation CUTR-2019-09

Smart, Shared and Social: Enhancing All-Hazards Recovery Plans with Demand Management Technologies

Independent Evaluation Report

Project Number
Subcontract 205MAC531 Amendment No. 5

Prepared For
Portland State University

September 2019

CUTR CENTER FOR URBAN TRANSPORTATION RESEARCH
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INTRODUCTION

The purpose of this research project has been the development of a two-day course that will equip participants in six host cities to embark on the development of their own all-hazards transportation recovery plans. These plans include coordinated transit and transportation demand management elements, in addition to leveraging social media and ITS applications to improve recovery time and travel options. This course was developed through the creation and testing of an Emergency Recovery Transit/Travel Demand Management (TDM) Recovery Plan for Portland, Oregon, which served as a template for the two-day course. The two-day course contents drew upon previous tasks of this project, including the Phase One literature review and case study development, and the Phase Two table top exercises testing the Portland Plan.

This Third Party Independent Evaluation constitutes the Final Project Evaluation Report, in completion of the Portland State University (PSU) Scope of Work Task 3. This evaluation assessed the overall effectiveness of the project, in accordance with the FTA Evaluation Requirements for Innovative Safety, Resiliency, and All-Hazard Emergency Response and Recovery Program (SRER) Program projects. In addition to examining deliverables from each project phase, the evaluators observed and provided feedback for the prototype two-day course held for emergency response and transportation agencies in the Portland, Oregon area. The evaluators also observed one of the six subsequent training courses, held for the Hillsborough and Sarasota/Manatee MPOs in the spring, 2018.

The following four project outcomes were identified at the beginning of the project.

1. Develop and test an emergency recovery plan using transit and TDM for the Portland, Oregon region.
2. Develop a training course that will equip six other regions in developing comprehensive emergency recovery plans that maximize use of transit, social media, TDM strategies, and Intelligent Transportation System (ITS) technologies.
3. Provide training using the above course materials, conduct two-day training workshops in six cities/regions
4. Enhance capacity of FTA to provide technical assistance for emergency recovery planning that includes transit, TDM, ITS and social media

EVALUATION APPROACH

To assess the project's success, the evaluation team researched several avenues for potential performance measures for return on investment (ROI), safety, and operational/capital efficiency as applied to emergency recovery planning and training. An initial search on the web site of the Portland Bureau of Emergency Management, at the beginning of this research project, found no performance measures currently applied to preparedness planning and training in Portland. Other research included examining the Department of Homeland Security's (DHS) Ready.gov web site and the State of Florida Loss Avoidance Assessment for Flood Mitigation Projects. Evaluators spoke directly with the Grants Program Administrator of the FDOT Public Transit Office who serves as a primary contact with the DHS for emergency planning. Evaluators also engaged members of the Transportation Research Board (TRB) Standing Committee ABR20 on the Logistics of Disaster Response and Business Continuity, who have in turn reached out to their contacts at the Federal Emergency Management Agency (FEMA) and elsewhere. Our investigation concluded that few performance measures for ROI, safety and efficiency have been used for the actual emergency recovery planning and training itself.

Computing a reliable ROI from the use of TDM, transit, ITS and social media in recovery planning and training requires data on the value of past losses suffered by communities, to compare against the value of losses avoided after recovery plan implementation. While post-disaster recovery impacts of the training are beyond the scope of this project, the underlying assumption is that the individual and organizational decisions to participate in the workshop are based upon the premise that they believe there will be a resulting positive ROI from utilizing the knowledge gained through the training and implementing that in their local programs. The team concluded, therefore, that the performance measures that can be applied within the period of this project can gauge cost efficiency of knowledge transfer, participant learning success and satisfaction with plan preparation and training. The following summarizes the metrics of these three performance measures.

Efficiency of Knowledge Transfer

- Number of agencies and stakeholders represented in each region in training workshops (e.g. number of stakeholders participating per dollar spent)
- Value of knowledge transfer using Portland as pilot then transferring lessons learned to six other regions (e.g. cost of training development in Portland divided by six other regions = value of knowledge transfer per dollar spent)
- Cost of training if participants had to pay vs. grant paying (e.g. dollars saved due to grant)

Participant Learning Success

- Pre-training/post-training knowledge transfer score, based upon scenario-based "What would you do if…" questions posed to participants before and after training

Participant Satisfaction

- Evaluation of the training by participants (e.g. ratings from participants on evaluation form at conclusion of training on a one to five scale)
- Percentage of partners approving of value of process of developing a plan
- Rating of the plan developed in Portland
- Rating of the training in knowledge transfer

The evaluation included results from the pilot workshop held at PSU, in concert with the Regional Disaster Preparedness Organization (RDPO), the City of Portland Bureau of Emergency Management, and numerous public agency and private sector partners. After evaluating the results from the Portland pilot workshop, the evaluation instruments were refined and then administered for the All-Hazards Workshops held in the spring 2018 for the following eight MPOs from six regions.

- Strafford Regional Planning Commission with the New Hampshire and Southern Maine Planning and Development Commission, Maine
- Hillsborough MPO and Sarasota/Manatee MPO, Florida
- Broward MPO, Florida
- Coastal Region MPO, Savannah, Georgia
- El Paso MPO, Texas
- Lake Charles MPO, Louisiana

The training, developed and conducted by Sarah Siwek & Associates, was a multi-day workshop consisting of several modules that included information, case study examples, exercises, and group discussions. The exercises were designed to be useful takeaways to jump start essential activities as part of the all-hazards recovery planning process after the workshop and maintain ongoing collaboration. Key inputs in the development of the training workshops included a literature review, case studies, stakeholder interviews, the development of a Portland Transportation Recovery Plan, table top exercises held in Portland in September 2017, a pilot of the workshop in Portland in December, 2017, and surveys and discussion with workshops participants from the eight selected MPOs.

The purpose of the training workshops were to provide participants with the tools, knowledge, skills, and resources to develop a transportation recovery plan for implementation after the emergency response phase is complete. The transportation recovery plan would include coordinated transit, TDM and ITS strategies and recognizes the specific needs, resources and relationships with emergency responders within each region. The training was intended to equip the six host regions to establish agreed upon next steps in developing recovery plans that are tailored to each region's individual needs.

Training objectives were the following.

- Define all-hazards recovery planning
    - Understand the relationship between hazard mitigation, emergency response, and transportation recovery planning activities
    - Understand the role and potential of travel demand management, ITS, and transit in transportation recovery
    - Understand the potential use of social media in recovery efforts
- Identify processes to:
    - Identify affected parties and assemble an all-hazards recovery planning team
    - Define a region's transportation system and vulnerabilities
    - Conduct a vulnerability assessment, identifying risk factors and their impacts
    - Prioritize asset repair/replacement during recovery
- Understand critical role of communications strategies and protocols
- Learn the key elements that should be included in an all-hazards recovery plan
- Explore ways to optimize use of social media as part of a communications strategy

- Develop and implement a strategy for developing, training, and testing the plan

RESULTS

Participant Learning Success

The instructor directed participants to create a unique self-identification code and place it on both the pre- and post-training knowledge transfer survey sheets. They were asked to rate nine questions on their ability on a four point scale as to the extent they agreed with a series of nine statements. The scale ranged from "1-not at all," "2- a small extent," "3 - to some extent," and "4 - very great extent." Each of the questions was developed based upon the training objectives stated at the beginning of each course module. The means of the survey responses were calculated across all participants regardless of location. There were 125 forms submitted by participants with 53 sets having a code to allow pairing with pre- and post-workshop surveys. The surveys showed four of the nine questions had means that had a statistically significant difference between the pre- and post-workshop surveys. The remaining 72 responses were unable to be processed due to the lack of any code or only one code (e.g., person may have attended only one of the two days). The diverse background of the attendees may have contributed to a high degree of confidence of some to carry out the proposed task, as indicated in their responses to the pre-workshop survey. As a result, the mean scores of the pre-workshop surveys for some questions were relatively higher to start with. This may explain the smaller increment of improvement as indicated in the post-workshop surveys, resulting in a difference that was not statistically significant.

Table 1- Results of Post Workshop Survey

Question (n=53)	Before		After		
	Mean	Standard Deviation	Mean	Standard Deviation	Statistically Different?
1. I can describe the differences between Hazard Mitigation Planning, Emergency Response Planning and All Hazards Recovery Planning	2.44	0.850	3.49	0.541	Yes
6. I can list six strategies that should be considered in a transportation recovery plan including transit, TDM, ITS and ways to use social media in recovery.	2.09	0.741	3.53	0.575	Yes
8. I can describe at least two tools that can be used to help prioritize investments after a disaster	2.00	0.899	3.48	0.671	Yes
9. I can list the most important components of an All-Hazards Transportation Recovery Plan	1.72	0.818	3.30	0.668	Yes
2. I can identify three different types of hazards that could impact my region.	3.19	0.810	3.77	0.423	No

3. I can identify at least five agencies in my region that should be included in the development of an All-Hazards Transportation Recovery Plan	3.21	0.817	3.75	0.434	No
4. I can identify three methods of communication that should be integrated into a recovery plan	2.94	0.818	3.72	0.455	No
5. I understand the roles and responsibilities of the key agencies in recovery planning in my region.	2.55	0.722	3.43	0.605	No
7. I can explain what a vulnerability assessment is and why it is an important part of a recovery plan.	2.55	1.011	3.57	0.636	No

Participant Satisfaction

- Evaluation of the training by participants (e.g. ratings from participants on evaluation form at conclusion of training on a one to five scale)
- Percentage of partners approving of value of process of developing a plan
- Rating of the plan developed in Portland
- Rating of the training in knowledge transfer

Table 2 summarizes ratings for several metrics across all sites. The ratings were very favorable with nearly all metrics scoring at least 4.5 out of a possible 5 points. Table 3 provides the mean scores for questions participants answered relating to evaluation of instructors.

Table 2 - Course Evaluation Summary

	Course Evaluation/Course Rating (n=77)	Average Score (1 – Strongly Disagree to 5 - Strongly Agree)
1	Content was organized and consistent with course objectives	4.69
2	Learning activities aided in my comprehension of course content	4.55
3	Class discussions enhanced my understanding of the course materials	4.61
4	Presentation corresponded with handout	4.74
5	Training materials can be helpful in developing a transportation recovery plan	4.70
6	Pace of instruction was appropriate; the course was the right length	4.45
7	I can describe a transportation recovery plan and its importance to my region	4.49
8	I can identify other agencies and private/non-profit partners in recovery planning	4.51
9	I understand my agency's potential role during recovery and after initial response	4.59

10	I can identify several transportation strategies for implementation during recovery	4.62
11	The course prepared me to participate effectively in Recovery Plan development	4.49

Scale: 1-Strongly disagree | 2-Disagree | 3-Neutral | 4-Agree | 5-Strongly agree

Table 3 - Evaluation of Instructors

Instructor		Rating
Instructor #1: Sarah Siwek		
12	Kept the discussion relevant to the course topics	4.79
13	Related the course materials to real-life examples	4.76
14	Provided opportunities for participant to ask questions	4.79
15	Encouraged participants to engage in class discussions	4.74
16	Demonstrated subject matter expertise	4.79
17	Made effective use of time	4.67
Instructor #2: varied		
18	Kept the discussion relevant to the course topics	4.78
19	Related the course materials to real-life examples	4.69
20	Provided opportunities for participant to ask questions	4.77
21	Encouraged participants to engage in class discussions	4.72
22	Demonstrated subject matter expertise	4.73
23	Made effective use of time	4.76

Scale: 1-Strongly disagree | 2-Disagree | 3-Neutral | 4-Agree | 5-Strongly agree

Table 4 summarizes participants' responses regarding their course expectations. Over 97% of the attendees agreed that the course met their expectations.

Table 4- Did the course meet attendees' expectations

Did the course meet your expectations?	Number of Responses	Percentage
No	1	1.4%
Somewhat	1	1.4%
Yes	71	97.3%

Summarization of Responses to Open-Ended Evaluation Questions

Word clouds are a type of text analysis, commonly used to analyze responses to open-ended questions in surveys or in comments. The result of the analysis is a display of the most commonly used words, aggregated across all the feedback, depicted in a cloud-shaped graphic. The more commonly the word is used by respondents, the larger the font size displaying the word in the word cloud. Figures 1 and 2 illustrate word clouds generated from responses to participant comments on what they liked about the course and what the instructors were most effective at conveying to participants, respectively. Clearly, the provision of examples of the use of transportation strategies featuring transit and TDM by other regions recovering from disasters, were appreciated by course participants. Tables 5 and 7 provide a listing of the specific responses of the participants.

Figure 1 - Word cloud of participant comments on what they like about the course

Figure 2 - Word cloud of participants' comments about what Instructors were most effective at conveying to participants

Table 5 - What participants liked about the course

What did you like about the course?
Course provided a lot of useful info in short time period
Stepping through planning process
Very intelligent/knowledgeable participants, good handout package
Great handouts & examples
Breakout discussions with members from different agencies/orgs
Great info
Examples used elsewhere/ Lessons learned
Robust discussion of systems involved in recovery, craft professional discussions & ideas
Other local agencies, MPOs attended, met people
Very well explained
Good overview of emergency planning
Very informative, timely, well organized, group involvement
Interactive & Discussions
Broad scope of alternative transport resources
Resource examples
Real life studies and lessons learned
Real examples of effective application of strategies
I liked all of the examples and resources that were provided to us.
Attended by a lot of people w/ knowledge of subject matter
Good info and interaction with participants
Presented many considerations for recovery that I did not consider
The course moved at a good pace but didn't feel rushed
Concrete examples, precise steps (instead of vague approaches)
Interaction with other agencies
Thinking outside the box
Interacting with other agencies
Blended experts of planners, operators and emergency personnel

What did you like about the course?
presentations informed and formed discussions
interactions, dialogue
I liked the simplicity in which this was delivered to us, knowing that the info is somewhat complicated.
Information in how to scope emergency operation + action!
Highlighted current shortfalls in area trans. Plans
One-on-one interaction
Plenty of discussion, opportunities to learn. Great course!
Learning about the amount of agencies, I was unaware of.
Good examples
Well thought out approach
Group exercises and other agencies input
Getting stakeholders to focus and see possibilities
Student participation and experience/expertise
Using examples to understand subject matter
Excellent hosts (including coffee, lunch)!!
Very informative, examples given
great information
It was a refresher on some parts, but new ideas for the area
The information provided and the importance of mitigation
Examples of recovery plans
Very good, comprehensive content. Very useful and I got information I was looking for.
Excellent exercises
Lots of examples from other cities.
I walked in not knowing much, walked out more informed
Lot of excellent examples, great guidance
Informational & lot of group exercises
Like to see what other areas do.
I enjoyed the examples given

What did you like about the course?
Participants opportunity to speak any time
topic of strong interest
Focus on transportation, but applied to other areas I work.
I learned something new and relevant to my work.
Brought together public sector & MPO
Break out

The length of the course was one of the most frequently mentioned responses from workshop participants who answered the question, "What did you dislike about the course?" (Table 6). Though several indicated the two-day workshop was too long, others indicated they could have used more time. Many more either left blank or inserted N/A. Many others replied "Nothing." Given the varying levels of relevant expertise across attendees, this could be expected.

Table 6 - What did you dislike about the course?

What did you dislike about the course?
I wish there were more (and more effective) simulation exercises
Could have used more direction for exercises
Too much intro; Need sample of legal agreements for private providers addressing insurance & indemnification (don't just raise it as issue to address). Sarah is looking for & will share.
A bit boring at times. Break outs too long. If audio recording the training, our permission should have been granted first.
Short on time for material covered
Examples were all from large cities; not pertinent to our region
Too long
With many agencies present, difficult to get into detail of each agencies responsibilities.
Almost too short-could have used 1 more day
Broad, national focus re: content
I would have liked more opportunities for interactive activities-there was a lot of PowerPoint slide presentation
A lot of lecture
Would have liked lessons learned from real events
Nothing
it was fantastic, nothing bad to say

The exercises often turned to complaint sessions on what we don't have here but other places do. Report outs were not helpful.
Some conversations became dominated by emergency operations, not always focused on planning/preparation
that it is over and we have lots to do
Nothing I can think of
too long
Should be longer, Perhaps 2.5 or 3 days
Nothing, although I had difficulties with acronyms I was unfamiliar with.
It was long but would be hard to shorten.
Participants did not know a Reg. plan; area plan seems to not following
length of time
Key leadership is missing, also transit agencies
Not too many things that applied to the city
Need more breaks for day 2.
nothing
A little long, repetitive
Graph were not clear; Vertical axis ambiguous on what is being measured (level of impacts? Level of activity?)
wish we had more attendance
No Certificate!
Nothing

Table 7 - Instructor effectiveness

Instructors were most effective at:
Facilitating discussion
Sharing Portland or examples of planning
Providing excellent resources & references.
Encouraging discussion
provide literature review, access to resources

Instructors were most effective at:
Telling about examples around the country.
Speaking/explaining
Time management, information, allowing constant questions and discussions, very patient.
Presenting the course materials & explaining it
Staying on topic/ group involvement (individuals)
Speaking, engaging breakout group sessions
Engaging and citing examples relevant to local area
Dissemination of proven methodologies
Keeping everyone on task and on time
Making the course interesting
Providing info
Relaying information in an engaging manner
staying on target
Facilitating discussion
Presenting information
Guiding discussions-introducing topics to consider during recovery that aren't forefront considerations.
informing/keeping things moving
on track/details/ex's
PowerPoint and realistic examples and booklet to follow-better read info.
Exploring the Portland Mode and comparing it to this area
Gathering group
Presenting the material. Organizing discussion/participation.
Presentation of materials, great job!
Examples
Sharing a lot of information , providing resources kit
Matt well versed and helpful, Sarah-real examples; Tanya-keeping focused
Blending all information
Listening to class input

Instructors were most effective at:
Citing examples from other regions
All topics
Very well informed and would adapt to our area for the class
Incorporating our region into what if scenarios
Explaining material through real life examples
Presenters were awesome.
Knowledge, course experts
Good presentation, understandable, flow.
Instruction phase
Giving examples; explained topics accurately
Engage, questions, activities
inspiring the participants
Great instructions for all items
Describing the examples and relating to material
Keeping on schedule, giving examples
Examples
Examples from other cities/agencies
Explaining by giving examples
Very good training
Keeping course on track
Entire class

Table 8 - Instructors' Areas for Improvement

Instructors were least effective at:
Guiding Breakout sessions
Sharing concrete examples of recovery experience to strengthen planning knowledge.
Staying on time. Presenting info in a way that will ingrain in our minds.
Too many acronyms, especially challenging because 2 states in attendance don't use same acronyms or have same state agencies
Being efficient - sometimes too many examples (not related to our region were used)
Helping identify region-specific actions to pursue
Integration of long range transport plan & resiliency plan integration
Nothing
Facilitating small group discussion.
All very good
Very effective, cannot think of one negative.
Knowing the specific Broward/Miami Dade region
Getting people back from breaks.
It was a lot of information-could be more concise.
Know what we have here, but that is expected. Every area has different way of transit.
Slides a bit wordy.
No complaints
Nothing

CONCLUSIONS

The developers of the two-day course revised and strengthened the course modules, as a direct result of their experience and participant feedback from the initial Portland workshop. The course modules provided to the Hillsborough and Sarasota/Manatee MPOs in Bradenton, Florida included increased interactive exercises and more case study examples than those presented during the initial Portland course. The end product of this project, a two-day course for all-hazards transportation recovery planning, provides a strong foundation on which other cities and regions can jump start their own transportation recovery planning processes.

At both the Portland workshop and the Bradenton workshop, there was an initial round robin opportunity for participants to introduce themselves and state what they hoped to get out of the course. In both instances, it seemed there were as many different objectives for course participation as

there were participants. This was in spite of a fairly structured and specific course outline provided to participants in advance. Perhaps this is to be expected since the make-up of both groups was a combination of emergency management professionals, transportation professionals, and representatives of multiple arms of government, including city, county, regional and state levels. In Portland, there also were representatives of large private sector employers. Their differing affiliations mean they will each be in a position to assume different roles in transportation recovery and so it makes sense for there to be a wide range of questions, objectives for attending, and expectations for the course. Because the topic is broad with respect to all hazards, differing geographies and institutional frameworks and capacities, differing vulnerabilities, and recovery aimed at the spectrum of transportation modes, trip purposes, and populations, no two-day course can possibly address all topics.

The participants all had varying knowledge and experience. The challenge of such a course is gauging the right balance of course content breadth, depth, and specifics for each region. The participants who likely got the most out of the course were those who were most active in applying the course material to their particular circumstances, as well as those who took it upon themselves to use the course as an opportunity to network and start necessary conversations relating to coordination. The course interactive group exercises encouraged participants to reach out.

Both the Portland and the Bradenton workshops generated an abundance of good ideas for problem solving, and in some cases, solving one another's recovery challenges. It is hoped that a key takeaway for the participants is the recognition that the other attendees at their course may be asking for assistance and vice versa, during recovery after a disaster. This recognition should heighten a sense of urgency about pursuing professional relationships and continuing collaboration beyond the course.

One challenge observed during the Bradenton workshop was the desire, particularly by emergency management professionals, to fall back upon discussion about topics that relate more to disaster response, rather than the phase after response. Future courses delivering this content should consider additional ways to help participants transition their attention beyond the stage when life or death emergencies have been resolved, and toward the stage when the disaster has progressed into the recovery phase to get the community functioning back to normal.

Due to the fast pace of technology change in the transportation arena, future courses will require a review to ensure it includes the latest developments. It also is suggested to invite registered participants, in advance, to be prepared to share more about the recovery planning efforts they are presently engaged in. Local transportation management associations, such as Go Lloyd that actively participated in the Portland course, and regional commuter assistance programs, could be asked to give a brief presentation, as a means to ensure their attendance and participation in the course.

Based upon comments shared by a participant who has relatives in hurricane-ravaged Puerto Rico, it is suggested also to explore how transportation recovery planning can empower smaller units of society, such as communities, subdivisions, and neighborhoods. The Puerto Rico experience suggests that resourcefulness borne of necessity often resides within the community itself, particularly in circumstances where the nature of the disaster, usually characterized by simultaneous or cascading problems, may stymie even the best laid recovery plans by government agencies.

Cities and regions that develop transportation recovery plans, will want to consider how to evaluate their efforts. Beyond this project, participants could apply the following FTA performance measures to the actual implementation of their training and recovery planning products.

- ROI from emergency recovery planning = value of losses avoided minus cost of (plan preparation, readiness training, pre-event mitigation and preparation, recovery activities). Safety Improvements and Operational/Capital Efficiency are included within the calculation of ROI.
- Safety Improvements (tied to $ value – use ValueOfStatiscalLife_guidance.doc)
- Reduction in injuries and fatalities
- Operational/capital efficiency
- Minimization of service disruptions (e.g., improved communications and interagency coordination reduces # of service disruptions and improves public understanding of recovery efforts, etc.)
- Reduced post-disaster recovery time (e.g. each day of recovery costs lost workdays, school days, etc.)
- Regional economic savings (e.g. each day of recovery reduced = $ to the regional economy)

The most appropriate performance measures of use to participating cities may emerge during their ongoing processes of developing their individual recovery plans.

By beginning with an understanding of the potential roles that transit and TDM can play in recovery after specific types of disasters, this could set the stage for the participating individuals in plan development and training, to develop loss avoidance performance measures of relevance to them, and associated programs of data collection. This could support their organizations' justification to invest in emergency planning and preparation in the future.

Potential loss avoidance estimates to gauge the training's effectiveness will be influenced by the range of emergencies addressed and the aspects that need to be considered (See figure 3**Error! Reference source not found.** for partial view of some of the considerations). For example, during many wide-scale disaster recoveries like hurricanes, communities first restore life-sustaining services such as restoring power to hospitals. With the need to prioritize the responses, the question becomes: What role can transit and TDM serve to support life-sustaining services? For example, the ability of transit/TDM to ensure that all hospital employees have emergency transportation to work may be an example of a measurable loss avoidance relating to safety. Hospitals may have statistics relating to staffing shortages.

During a prolonged crisis, the use of TDM/transit may support resumption and continuation of some level of business and commerce while enabling more people to stay home and out of harm's way, or by reducing or rerouting necessary travel away from danger zones. Enabling traffic reduction or rerouting away from areas undergoing clean up and reconstruction also improves safety of emergency workers and can accelerate recovery. In an analysis of recovery stages, ROI of TDM/transit strategies could be expressed as loss avoidance (reduction in lost wages and business revenue losses) by reducing recovery time.

After life-sustaining services are restored, transit and TDM services can support community needs during clean up and recovery and accelerate a return to normalcy. There are stages of recovery and

different responses according to disaster type and according to the combination of problems that can compound each other. Considering all hazard types would entail a wide range of responses and disasters often result in multiple problems simultaneously, such as power and communications outages, road blockages, and fuel shortages.

Transit and TDM effectiveness will depend upon, first, what these organizations do to fortify their internal continuity of operations; second, what transit and TDM providers do to anticipate and prepare effective responses to the consequences of multiple simultaneous threats; and third, how well recovery plans are implemented.

Performance measures for safety and operational/capital efficiency can be identified first, to gauge transit/TDM service provider losses avoided due to institutional preparedness; and second, to gauge community losses avoided due to transit/TDM service provider preparedness to support recovery efforts.

Participating cities do not appear to have developed cost estimates of losses. This could be part of plan preparation. For example, in a tabletop flood scenario for cities prone to flooding, successfully identifying the need to relocate the bus fleet in advance of the flood, could avoid the cost of losing the fleet, the value of which is known by the transit agencies. This could provide a means of estimating the potential return on investment in training. Many transit agencies are self-insured and may compile loss data for transit risk management. For example, there may be cost data associated with transit down time (e.g., for each day transit is offline, it costs the community $x). Each participating city may have access to loss data specific to past emergency events.

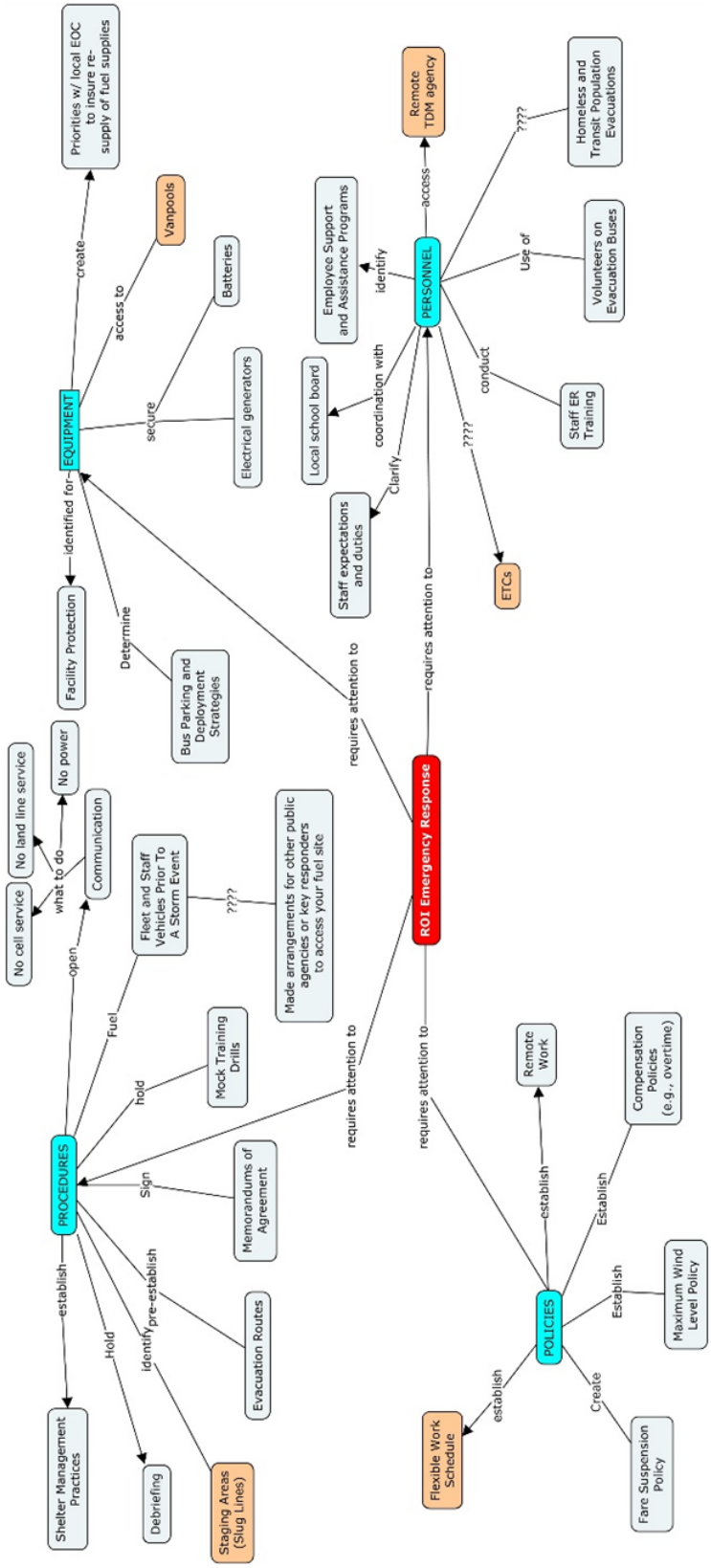

Figure 3 - Emergency Response Considerations for Transit and TDM Agencies

RESULTS ONE YEAR LATER

In May 2019, Portland State University (PSU) researchers contacted the organizations that represented six regions nationally, which participated in the two-day transportation emergency recovery training workshops prepared by the research team. The purpose of the one-year follow-up was to assess progress by the regions in developing their own local transportation recovery plans. The PSU researchers collected information via a Google form that asked the following questions.

Update on emergency transportation recovery plan activities

It has been a year since we conducted an emergency transportation recovery plan training in your region. Please briefly update us on any activities your organization or others have done related to the training and moving towards developing a local transportation recovery plan. For example, additional meetings, trainings, building partnerships, projects and activities. Thank you! This information will be extremely useful to the Federal Transit Administration and FEMA in supporting additional trainings.

1. What activities have happened since the training last spring to move your region towards transportation recovery planning for extreme events and hazards?
2. What are any future activities that are planned?
3. Are there any barriers or issues you have had to move forward with a plan?

Portland-Vancouver Metropolitan Region

Survey responses were received by the Portland-Vancouver metropolitan region agencies that participated in the first workshop, in addition to responses from Broward MPO, Sarasota/Manatee MPO, Strafford MPO, the Coastal Region MPO and the El Paso MPO. The Sarasota/Manatee MPO held its 2045 TRANSFORUM in April 2019, during which resiliency was addressed. In addition, results from the Portland metropolitan region were prepared. The results documented in these surveys and information shared by workshop participants, constitute the Final Project Deliverable from the PSU research team. This information is summarized below. This evaluation seeks to find evidence of consideration of TDM/ITS and social media in all-hazards transportation emergency recovery planning.

Results from Portland are provided below.

Since the training, the City of Portland draft transportation recovery plan was completed. One of the major findings in the development of the plan was the regional Emergency Transportation Routes (ETR) had not been updated for over 10 years and that some key connections were not designated.

From this finding, the Regional Disaster Preparedness Organization (RDPO) and Metro are coordinating efforts with transportation, emergency management and public works departments of each county and the City of Portland, ODOT and Washington Department of Transportation (WSDOT), as well as the Metro Council, the Joint Policy Advisory Committee on Transportation (JPACT), Southwest Regional Transportation Council (RTC), TriMet, SMART, C-TRAN (Vancouver transit agency) and DOGAMI (Oregon Department of Geology and Mineral Industries). The regional ETRs project will update the existing regional ETRs for the five-county Portland-Vancouver metropolitan region. The project will also make recommendations on elements to be included in an updated memorandum of understanding (MOU), mutual aid or other written agreements needed to implement ETRs, and provide information to support future planning work related to regional transportation recovery, resiliency and emergency management.

The regional project will update existing designated regional routes using the latest DOGAMI seismic data, ODOT Lifeline analysis and subsequent county-level bridges and ETR analysis. This will also ensure the updated ETRs are responsive to local and state knowledge and priorities in the rapidly growing and changing region. Planning and updates to infrastructure within the region since 2006 will also inform the ETR update; particularly the now seismically-resilient Sellwood and Tilikum Crossing bridges owned by Multnomah County and TriMet within the City of Portland, and recommendations identified in the 2018 Earthquake Ready Burnside Project Feasibility Report.

Another key project that has kicked off in the last year is the Regional Recovery Framework, which is led by the five-county, multi-state RDPO. The framework will guide rebuilding, redevelopment, and recovery efforts in the weeks, months, and years after the disaster. The goal is to seize the opportunity to creatively re-design the region to be even stronger and more resilient for the future. The efforts of the transportation recovery plan are being incorporated in the framework.

The main focus of the City and the Region will be on the activities stated above. The City is having each of the Bureaus develop internal resiliency plans, which will have sections focusing on disaster recovery. One of the unique aspects of this planning effort is that the City is looking to focus additional efforts on the development of local bicycle ETRs. Following a major emergency, the easiest way for the general public to travel may be on foot or via bicycle. Many roads may be impassable, and ETRs may be reserved for the movement of disaster responders. Fuel may also be reserved for the exclusive use of vehicles leading the response and recovery effort. Moreover, walking or cycling may be the only option for residents without access to a personal vehicle. In order to keep ETRs clear for emergency response, alternative routes for other traffic may need to be established.

The major barrier for the city and region is securing resources to work on the plan. Often this work is not funded within normal activities and staff do not have the time or resources to fully devote towards working on these activities. Though there are regional efforts going on through RDPO, moving the project forward can be slow.

Broward MPO, Florida

Below are the results provided by the Broward MPO.

1. What activities have happened since the training last spring to move your region towards transportation recovery planning for extreme events and hazards?

- Among the primary areas of emphasis were to increase coordination with partners and provide training to increase knowledge of the issues with All-Hazards Transportation Recovery.
- Increased coordination with Homeland Security Transportation and Critical Infrastructure Committee
- Coordinated with Broward County to pursue options for Emergency Management training/workshops
- MPO registered an account with the Florida Disaster Organization's Florida State Emergency Response Team (SERT TRAC) to review and/or post Region 7 training classes and consortiums. In other words, MPO can now host or participate in SERT TRAC trainings including, those related to All-Hazards Emergency Transportation Recovery Plans.
- Hosted training with the Grant Professionals Association focused on preparation for FEMA disaster funding
- Established formal communication between Broward MPO Public Involvement staff and Homeland Security Public Involvement staff to coordinate emergency management messages in the region
- Incorporated information from All-Hazards recovery training into the Broward MPO's Metropolitan Transportation Plan development
- Continued to add to the Broward MPO's All-Hazards contact list

2. What are any future activities that are planned?

- Engage Broward County to plan an emergency management training/workshop at the Broward MPO for member governments and partners in Winter 2019
- As part of the Broward MPO's Vision 2100 planning document, the MPO will include a resiliency section focused on long-term recovery and adaptation to future climate change events and related hazards.
- Working through an upcoming workshop on Integrated Corridor Management. This is an opportunity to build partnerships and establish commitments among participants for incident/disaster response and long-term recovery planning
- Invite representative from Homeland Security Transportation and Critical Infrastructure Committee to present to the MPO Board and educate members on disaster response and recovery coordination
- Utilize existing relationships and partnerships to introduce local recovery planning

3. Are there any barriers or issues you have had to move forward with a plan?

- Bringing it all together – challenge to do something at a regional level
- Need clarity about how to collect and maintain a database of partner emergency response and recovery plans

Hillsborough MPO and Sarasota/Manatee MPO, Florida

Below is the survey response from the Sarasota/Manatee MPO.

1. What activities have happened since the training last spring to move your region towards transportation recovery planning for extreme events and hazards?

The MPO published its first Security Assessment Report in 2018 where it highlighted the coordination and results from the All-Hazards Recovery Plan workshop. This report also summarized reviews of the counties' Comprehensive Emergency Management Plans, Post Disaster Redevelopment Plans, Local Mitigation Strategies, and Transportation Disadvantaged Service Plans with emergency preparedness components to find common themes and best practices. The Security Assessment Report provides an overview of how the MPO is adding security and emergency management components to all planning aspects instead of creating a standalone plan.

The MPO uses a set of scoring criteria to prioritize projects for funding through the Transportation Improvement Program (TIP). These criteria include items described below that are relevant to prioritization in terms of hazard mitigation planning and rebuilding during long-term recovery:

Safety:

- Evacuation Route – 3 points if project is located on a designated evacuation route in Zones A–B, 1 point in Zones C–E

Infrastructure Condition:

- Resiliency (Flood Hazard Area) – 1 point if project improves resiliency in special flood hazard area
- Resiliency (Storm Surge Zone) – 3 points if project improves resiliency in Storm Surge Zone Category T or 1; 2 points in Category 2; 1 point in Category 3.

Note that the maximum number of points for each of the six overall criteria categories is 15, for a total maximum of 90 points per project.

As part of our Congestion Management Process (CMP) update, we have analyzed how Advanced Traffic Management System (ATMS) can be helpful in facilitating response to hazards, such as using information collected via cameras to evaluate disaster response after the fact. Comparing the location of ATMS infrastructure to the location of evacuation routes provides a means of prioritizing ATMS projects; projects that correspond to evacuation routes can be prioritized over those that are not. Many of the region's evacuation routes have or are planned to be equipped with ATMS technology.

The MPO hosted a workshop on April 22, 2019 as part of our 2045 Long Range Transportation Plan (LRTP) update, where themes like, safety, security, resilience, environment, congestion, technology, livability, and equity were discussed. Guest keynote speaker, Sean Sullivan, presented on FHWA Resilience & Durability to Extreme Weather Pilot Program and how it relates to Long Range Transportation Planning as well as how to adapt during these events.

Below is a continuation of the survey response from the Sarasota/Manatee MPO.

2. *What are any future activities that are planned?*

The MPO is in the process of updating the Long Range Transportation Plan (LRTP). Federal regulations require MPOs to develop LRTPs through a performance-driven, outcome-based approach to planning. The metropolitan transportation planning process shall be continuous, cooperative, and comprehensive; and provide for consideration and implementation of projects, strategies, and services that will address the following factors: [23 C.F.R. 450.306(a) and (b)]:

- Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency;
- Increase the safety of the transportation system for motorized and non-motorized users;
- Increase the security of the transportation system for motorized and non-motorized users;
- Increase the accessibility and mobility of people and freight;
- Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns;
- Enhance the integration and connectivity of the transportation system across and between modes for people and freight;
- Promote efficient system management and operations;
- Emphasize the preservation of the existing transportation system;
- Improve the resiliency and reliability of the transportation system, and reduce or mitigate storm water impacts of surface transportation; and
- Enhance travel and tourism.

The MPO has new and updated plans that will feed into the LRTP and will address these federally mandated requirements.

3. *Are there any barriers or issues you have had to move forward with a plan?*

The MPO will be incorporating all-hazards planning and everything learned during the workshop into every planning process. Due to limited resources and funding, the MPO has not determined whether there will be a full All-Hazards Recovery Plan. For this reason, there will be more all-hazards planning components in our plans, performance measures-based planning and processes.

The Sarasota/Manatee MPO shared information about its TRANSFORUM conference, which was held as part of preparations for their 2045 Long Range Transportation Plan update. The planning forum recognized the federal LRTP requirements to emphasize preservation of the existing transportation system and improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation. The MPO system objectives are to preserve the existing transportation system, maintain infrastructure in good repair, and improve system security during

emergencies. Project prioritizations to meet these objectives include improving traffic flow on an evacuation route, addressing aging or deteriorating infrastructure on roads and/or bridges (as rated by FDOT) and addressing flooding or stormwater issues in flood hazard areas or storm surge zones. While TDM is not listed as a strategy with regard to emergency planning, it is listed under mobility/congestion/reliability-related objectives. A presentation on Smart Cities recognizes its role in emergency management.

A representative from the Tampa Bay Regional Planning Council that specializes in resiliency planning was one of the keynote speakers. The presentation described a process of addressing resiliency with three inputs. These were anticipated 2045 NOAA sea level rise estimations, storm surge, and increased precipitation, as applied to the 2040 adopted transportation network and socio-economic data. A regional econometric analysis was recognized as a tool to develop adaptation and mitigation strategies, using 11 criticality factors. Assumptions for modeling purposes included sea level rise with a Category 3 storm and nine inches of rain in one day. An Adaptation Toolbox identified raising the road profile, enhancing the road surface or subbase, enhancing drainage and protecting median shoulders. Other Adaptation Toolbox strategies included hardened shoulders, wave attenuation, living shorelines, and seawalls/revetments. The presentation did not explicitly discuss transportation recovery, social media or the use of TDM or ITS. A listing of community partners was provided, which represented program outreach. The Commuter Assistance Program was not included. This was a presentation prepared by the Tampa Bay Regional Planning Council, whose service area includes Manatee County but not Sarasota County.

Strafford Regional Planning Commission with the New Hampshire and Southern Maine Planning and Development Commission, Maine

The Strafford MPO, NH Director responded to the survey with comments below.

We honestly haven't had any major events focused on transportation recovery since our workshop for SE Maine and New Hampshire. Strafford MPO is working on a Metro Plan update that will incorporate some specific recovery issues and lessons learned from our workshop. One follow-up activity I believe would be valuable in our region is coordination among our municipalities and agencies to ensure emergency planning is coordinated across municipal boundaries. This is something we could facilitate as an MPO.

We're a small MPO so data access and analysis tools are a bit of a barrier for us. A while back I worked with our data/analysis folks on a scheme to integrate our multiple data sources in a regional vulnerability planning toolkit, but we ran into significant data access and continuity issues. The idea was to pull together stuff like culvert, pavement, and bridge conditions, evac routes, flood/ sea level rise hazard zones, etc. and develop a tool that could help municipalities prioritize vulnerable infrastructure and inversely show us where disaster impacts were likely to occur. On the positive side, we've just about finished revitalizing our regional travel demand model and I've been chatting with our modeling team about adapting it for recovery scenario planning. I proposed that we purposely "break" parts of the network in the model to simulate disaster scenarios and see how that would impact travel during response and recovery. I think this could be a useful communication and engagement tool for future planning with our municipalities and neighbor MPOs.

Coastal Region MPO, Savannah, Georgia

The Coastal Region MPO director responded to the survey with the following observations.

> We haven't really haven't had the chance to make much progress due to organizational changes that have been going on for the past year. We were wrapping up a second year under interim agency management when we held our training here. Since that time, under new management, we have been dealing with shrinking budgets and staffing, and numerous existential distractions.
>
> Interest in the training in Savannah initially seemed high, but our actual attendance was very low. I suspect it may be due in part to having fairly mature disaster management functions already in place with quite a bit of practical experience. The biggest interest that I picked up on from the emergency management agencies was funding partnerships.
>
> Staying out of the weeds, suffice to say that the MPO staff will be consumed with completing required planning documents for the rest of the year. There may be opportunities going into 2020 and beyond, particularly if we can partner on grant funding opportunities with our emergency management agencies.

El Paso MPO, Texas

Below is the response from the El Paso MPO.

> I don't believe there has been anything else done related to the training and moving towards developing a local transportation recovery plan. We coordinated the training (workshop) back in March 2018.

Lake Charles MPO, Louisiana

There was no response from the Lake Charles, LA region.

DISCUSSION

The concept for the Smart, Shared, and Social All-Hazards Recovery Plan workshops was ambitious. It recognized many weaknesses in the current framework of emergency planning and recovery, necessitating the need for developing and holding these workshops in regions that are vulnerable to a variety of hazards. Additionally, the project put a spotlight on potential new strategies that could be applied to recovery, which have not been well considered before the workshops. Provided below is a discussion of lessons learned through the conduct of these workshops, from the perspective of the third-party independent evaluators. Also offered are potential next steps forward.

Lessons Learned

Emergency management activities and preparations are customarily highly focused upon hazards that have already been experienced by a region and which will almost certainly happen again. For example, seasonal weather patterns in the southeast spawn storms, strong enough to be named. The Midwest experiences frequent tornadoes. Hazards planning resources appear to be universally limited among the regions who participated in the workshops. As a result, the predictably anticipated disasters (i.e., "Hurricane Season") take up all the available attention. It was observed that it is presently beyond the capabilities of most regions to think about an "All-Hazards" approach that invites planners to imagine and plan for other plausible and potential kinds of disasters. All-hazards is so wide ranging, the response and recovery from a megafire might be totally different from a pandemic.

Even for predictable disasters, there appears in some cases, to be a certain casual bravado among the public that they have weathered similar events in the past, they know what to expect, and they already know what to do and what warnings to disregard. Doing anything differently or proactively might be believed to be overkill. Communications with the public requires instilling a healthy respect for a degree of uncertainty prior to an anticipated disaster event, and a sense that the unexpected may result in a different set of circumstances for which preparations were not made. More work needs to be done to make such communications with the public more effective.

Communications and coordinative relationships among emergency response and recovery stakeholders is disadvantaged by the fact that it relies on regular interaction. Without it, initially established lines of communication break down quickly due to staff turnover, and community and elected leadership turnover. Some sort of structured commitment is needed to purposefully reconnect or reassemble on a regular basis. Regular interaction takes time and resources.

Emergency management efforts also are focused on saving lives, during and immediately after a disaster. The limited resources are put toward getting people out of harm's way during an imminent threat, then responding to the disaster immediately afterward for the purpose of

saving lives. During the workshops, it appeared difficult to maintain the discussion on the topic of recovery, instead of disaster response. Beyond disaster response, regions do not allocate limited funding for planning recovery efforts and as a result, planning for the recovery phase has received far less attention. A discussion about transportation recovery was completely new to most workshop participants.

The workshop presented very new concepts. The tools of workshop focus are unconventional: TDM, public transit, ITS and other emerging technologies, and social media. It will take time and repeated exposure to these concepts before efforts are made by regional leaders to integrate them into disaster response procedures as well as taking the next step to develop a recovery plan using these strategies. In addition to developing a better understanding of the potential to use these other strategies, these other strategies are best implemented by an entirely different group of professionals, such as commuter assistance programs. Emergency management staff and commuter assistance program staff have likely never collaborated on anything prior to the workshops. Emergency responders are not used to working with commuter assistance professionals or social media professionals. These new kinds of working relationships, such as simply understanding each other's vocabulary and acronyms will take time to develop.

While these workshops focused upon transportation, the discussions during the workshop uncovered circumstances where transportation recovery may conflict in some way with other recovery goals. For example, disaster recovery may require the prioritization, rationing, and a communication about this rationing, of the use of scarce motor vehicle fuel. Such fuel may be needed by hospitals. Lines of communication across sectors need to be established. Saving lives in the midst of an unfolding disaster requires military discipline, protocols and strict lines of communication and decision making. During the recovery phase, at the point at which no lives are in immediate danger, a certain nimble flexibility is required of those in charge, to know when to diverge from the playbook of established procedures, and let go of some control, as circumstances necessitate it. For example, creative and practical problem solving and quick responsiveness may be most successful in the hands of those closest to the aftermath, such as local agencies, churches, private businesses, neighborhood associations, and nonprofits who have experience organizing volunteers.

Next Steps

The All-Hazards workshops were a strong start for regions to begin the important task of planning response and recovery for a wide range of disasters, using all the tools available.

Due to limited regional and local resources, outside motivation will be needed to keep the momentum going. Motivation and momentum could be aided by ongoing federal and state financial assistance in the form of pilot projects, grants, competitions and other forms of financial aid made available to regions and local governments. It is recommended that grant programs be developed for regions to apply for recovery planning funding, and incentives, offered on multiple scales. For example, such grants and incentives could be offered to

municipalities. Other grants and incentive programs could be offered to school districts. Still others could be offered to downtown special districts, employers, and residential subdivisions or neighborhood associations. These units all have some type of organizational structure already in place. Funding support should be attached to a demonstration of ongoing regular coordinative activities among disaster response and recovery stakeholders.

Further motivation could come from transportation recovery planning performance measures. Such performance measures could be developed through an informed discussion process. For example, issuing periodic table top exercises for participating regions could help identify action options, and share what works well. Each exercise should provide enough detail about a disaster to enable participating regions to consider what would be needed to plan transportation recovery. Each region's plan will differ due to unique vulnerabilities and resources. The results of these table top exercises could be regional summaries that describe solutions and identify further challenges and issues, which could be shared among the regions. This would generate new ideas and insights for their transportation recovery plans.

The aftermaths of real disasters should be evaluated to determine what actions and strategies worked well and what did not. What problems and issues could have been addressed using TDM, ITS and other emerging technologies, and social media? This knowledge base could be used to develop transportation recovery performance measures. Such performance measures could be applied by regions and local governments as a yard stick and a guide to develop transportation recovery plans.

After each actual disaster, regional and local emergency management agencies typically conduct debriefings to explore what happened, what was done well, and what could have been done better. The results of debriefings are used to "tweak" official disaster response procedures. Debriefings are valuable because the details of what happened are factual and specific, making it less difficult to consider applying alternative practical responses in the future. For example, how could TDM, ITS and other emerging technologies, and social media have been used during transportation recovery?

Unconventional partners should proactively request an invitation to participate in these debriefings. These unconventional partners include commuter assistance programs, large employers, utilities, and others. It is incumbent upon unconventional partners to assertively seek an active role in transportation recovery.

APPENDIX 1

Evaluation Instruments: Pre-Training Questionnaire, Post-Training Questionnaire, Self-Assessment and Assessment of Instructor Effectiveness

MY SELF GENERATED UNIQUE CODE: _____

PRE TRAINING QUESTIONNAIRE

A member of your board/council has asked to meet with you regarding All-Hazards Recovery Planning. She has asked that you explain to her what it is and why it is important to your agency. Please answer the following questions as to your ability to explain to her each of the following aspects.

TO WHAT EXTENT DO YOU AGREE WITH THE FOLLOWING STATEMENTS? Please rate yourself on a scale of 1-4 with 1 being "Not at all" in agreement and 4 being in agreement to a "Very great extent".

1. I can describe the differences between Hazard Mitigation Planning, Emergency Response Planning and All Hazards Recovery Planning.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

2. I can identify three different types of hazards that could impact my region.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

3. I can identify at least five agencies in my region that should be included in the development of an All-Hazards Transportation Recovery Plan.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

4. I can identify three methods of communication that should be integrated into a recovery plan.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

5. I understand the roles and responsibilities of the key agencies in recovery planning in my region.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

6. I can list six strategies that should be considered in a transportation recovery plan including transit, TDM, ITS and ways to use social media in recovery.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

7. I can explain what a vulnerability assessment is and why it is an important part of a recovery plan.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

8. I can describe at least two tools that can be used to help prioritize investments after a disaster.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

9. I can list the most important components of an All-Hazards Transportation Recovery Plan.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

MY SELF GENERATED UNIQUE CODE: _____

POST TRAINING QUESTIONNAIRE

A member of your board/council has asked to meet with you regarding All-Hazards Recovery Planning. After you return from this training, she has asked that you explain to her what it is and why it is important to your agency. Please answer the following questions as to your ability to explain to her each of the following aspects.

TO WHAT EXTENT DO YOU AGREE WITH THE FOLLOWING STATEMENTS? Please rate yourself on a scale of 1-4 with 1 being "Not at all" in agreement and 4 being in agreement to a "Very great extent".

1. I can describe the differences between Hazard Mitigation Planning, Emergency Response Planning and All Hazards Recovery Planning.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

2. I can identify three different types of hazards that could impact my region.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

3. I can identify at least five agencies in my region that should be included in the development of an All-Hazards Transportation Recovery Plan.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

4. I can identify three methods of communication that should be integrated into a recovery plan.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

5. I understand the roles and responsibilities of the key agencies in recovery planning in my region.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

6. I can list six strategies that should be considered in a transportation recovery plan including transit, TDM, ITS and ways to use social media in recovery.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

7. I can explain what a vulnerability assessment is and why it is an important part of a recovery plan.

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8. I can describe at least two tools that can be used to help prioritize investments after a disaster.

☐ **1 – Not at all** ☐ **2 - A Small Extent** ☐ **3- To Some Extent** ☐ **4 – Very Great Extent**

9. I can list the most important components of an All-Hazards Transportation Recovery Plan.

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SELF-ASSESSMENT

1. How would you explain the differences between Hazard Mitigation Plans, Emergency Response Plans and All Hazards Transportation Recovery Plans?

2. List at least 4 factors that help ensure an effective recovery process.

   a.

   b.

   c.

   d.

3. Identify at least one benefit and one limitation of using social media in recovery.

4. Vulnerability assessments typically include cataloging _____ and _____ then assigning _____ and _____. (Fill in the blanks)

5. Describe example actions to take PRIOR to a major incident for each of transit, TDM, ITS and social media strategies. Explain why take that action before a major incident.

   a. Transit: _____
      Why take action:

   b. TDM: _____
      Why take action:

   c. ITS: _____
      Why take action:

   d. Social media: _____
      Why take action:

6. Ideally, decision support tools that help communities rank and prioritize transportation projects for funding priority AFTER a disaster should be _____, _____, _____ and _____. (Fill in the blanks)

7. Provide an example of a contracting consideration that should be addressed BEFORE a disaster occurs.

8. Because of participating in this training workshop, what aspects of recovery planning do you have a greater appreciation, if any?

SMART, SHARED and SOCIAL: ALL HAZARDS RECOVERY PLANNING - PILOT COURSE
PORTLAND, OREGON - December 5-6, 2017

Course Evaluation/Course Rating	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	N/A
Content was organized and consistent with course goals						
Learning activities aided in my comprehension of course content						
Class discussions enhanced my understanding of the course materials						
Presentation corresponded with handout						
Training materials can be used as a reference at my job						
Pace of instruction was appropriate						
This course increased knowledge of the subject matter						
I can identify other agencies and private/non-profit partners in recovery planning						
I understand the role my agency can play in Recovery after a disaster						
Development of an Emergency Recovery Plan is vital to our region						
The course prepared me to participate effectively in Recovery Plan development						

Instructor Evaluation	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	N/A
Instructors made appropriate transitions and summaries throughout the course						
Presented all materials in handout						
Kept the discussion relevant to the course topics						
Related the course materials to real-life examples						
Provided opportunities for participant to ask questions						
Encouraged participants to engage in class discussions						
Demonstrated subject matter expertise						
Made effective use of time						
Increase your interest in the course topics						

Did the course meet your expectations?	NO	YES

Explain your answer to the question here.

What did you like about the course?

What did you dislike or would change about the course?

Instructors were most effective at:

Instructors were least effective at:

GLOSSARY

DOT – Department of Transportation

ETR – emergency transportation route

ITS – intelligent transportation system

MPO – metropolitan planning organization

ODOT – Oregon Department of Transportation

PBEM – Portland Bureau of Emergency Management

PBOT – Portland Bureau of Transportation

RDPO – Regional Disaster Preparedness Organization

TDM – transportation demand management

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