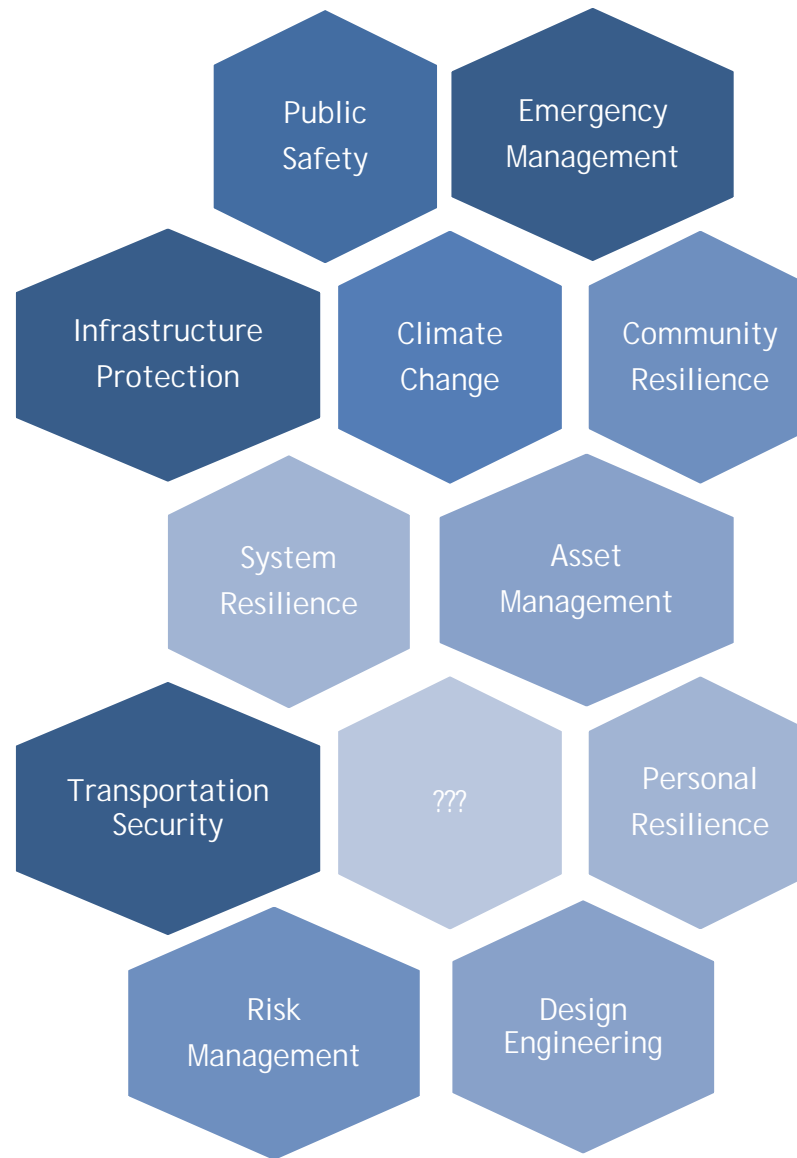


TRB Resilience: Key Products & Projects

June 2017



The Transportation Resilience Honeycomb.

Source: Understanding Transportation Resilience: A 2016-2018 Roadmap, Fletcher and Ekern (August 2016)

Security-, Emergency Management-, and Infrastructure Protection-related Projects In Development (June 2017)

1. Emergency Communication Models for Persons with Disabilities and Non-English Speakers
2. Airport Public Health Preparedness and Response: Legal Rights, Powers, and Duties
3. Essential Communications
4. Train-the-Trainer Regional Workshops for *Incident Command System for Field Level Transportation Supervisors and Personnel*
5. Update of *A Pre-Event Recovery Planning Guide for Transportation*
6. Voice and Data Interoperability for Transportation
7. Support for State DOT Transportation Systems Resilience and All-Hazards Programs
8. Impacts of Connected/Automated Vehicles on State and Local Transportation Agencies
9. Deploying Transportation Security Practices in State DOTs
10. Emergency Management in State Transportation Agencies
11. Deploying Resilience Practices in State DOTs
12. State DOT Contributions to the Study, Investigation, and Interdiction of Human Trafficking

Presentation Outline

- Definition and context for resilience
- Overview of National Academies/TRB work in resilience
- Key products for all hazards, all modes
- **Ways to get involved**
- Introduction to TRB & hot topics
- Catalog of completed work and work in progress

Promoting innovation and progress in transportation

TRB.org

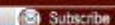
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The National Academies of
SCIENCE, ENGINEERING & MEDICINE



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National Academies

Security Products

Specialty Subject Papers

Disaster Recovery Experts

Security and Emergencies Research at TRB

The mission of the Transportation Research Board is to provide leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. This page highlights recently released TRB reports, meeting announcements, requests for proposals, and other announcements related to security and emergencies. In addition, it includes links to selected security and emergencies-related activities taking place at the federal and state levels, and within the academic and international transportation communities. Finally, this page also highlights and provides links to TRB programs and activities, which are the source of most of TRB's security and emergencies-related research products.

What's New



Call for Nominations: Sharon D. Banks Award for Humanitarian Leadership in Transportation

May 3, 2017
The Transportation Research Board is seeking nominations for the Sharon D. Banks Award for Humanitarian Leadership in Transportation. This TRB award, which recognizes excellence in people-oriented initiatives throughout transportation, was inaugurated in 2002 and is presented biennially. The next presentation of the award will be made during the Chairman's Luncheon on January 10, 2018, during t...



TRB's Twitter Account Name Changes This Month to @NASIMTRB

May 1, 2017
If you follow TRB's twitter account, TRB will be changing its handle from @TRBofNA to @NASIMTRB. TRB is part of the National Academies of Sciences, Engineering, and Medicine. Followers of @TRBofNA will automatically be following @NASIMTRB by the end of May 2017, and won't miss a message. For questions, contact Steve Androsch at SAndrosch@nas.edu.

Hearing on Infrastructure Damage and Recovery After Disasters

April 26, 2017
On April 27, 2017, the U.S. House of Representatives' Committee on Transportation and Infrastructure Subcommittee on Economic Development, Public Buildings, and Emergency Management held a hearing to examine how to protect infrastructure against future disaster damage, lower overall disaster costs, and identify challenges facing the U.S. Federal Emergency Management Agency (FEMA) in responding...

Visit the Redesigned TRB Homepage

April 10, 2017
TRB has redesigned its homepage at www.trb.org. The new homepage design is mobile responsive. Meeting and report announcements that are linked in the weekly TRB E-Newsletter have also been made responsive to mobile devices. Visit the homepage and provide your feedback and questions to MyTRB@nas.edu.

New Member of the TRB Executive Committee Announced: Dr. James M. Tien, University of Miami

April 10, 2017
Dr. James M. Tien, Distinguished Professor and Dean Emeritus, College of Engineering at the University of Miami, has been newly appointed to serve on the TRB Executive Committee. Dr. Tien was elected into the National Academy of Engineering in 2001. Prior to his work with the University of Miami, Dr. Tien served as the Yamada Corporation Professor at Rensselaer Polytechnic Institute (RPI), where...



2018 TRB Annual Meeting: Create Your MyTRB Profile Now

April 10, 2017
Create or update your MyTRB profile now if you will be a credited author of a paper submitted for presentation at the 2018 TRB Annual Meeting or for inclusion in the Transportation Research Record, Journal of the Transportation Research Board. Having up-to-date profile information in the MyTRB system will ensure that you'll have a smooth paper-submission process, if you are the designated con...



Guidebook for Preparing Public Notification Programs at Airports

April 7, 2017
TRB's Airport Cooperative Research Program (ACRP) Research Report 170, Guidebook for Preparing Public Notification Programs at Airports offers standards and practices to help airport industry practitioners develop and implement effective programs for delivering both routine notifications as well as incident and emergency-related notices. The guidance provides readers with the ability to...



Improving Stakeholder Engagement in Aircraft Accident Response Planning

April 1, 2017
TRB's Airport Cooperative Research Program (ACRP) Web-Only Document 31: Improving Stakeholder Engagement in Aircraft Accident Response Planning provides guidance to assist airport personnel who seek to engage with accident response stakeholders beyond the boundaries of the airport and outside of those typically engaged for mutual aid agreements in support of the airport. A customizable Aircraft...



Guidelines for Emergency Ventilation Smoke Control in Roadway Tunnels

March 28, 2017
TRB's National Cooperative Highway Research Program (NCHRP) Research Report 630: Guidelines for Emergency Ventilation Smoke Control in Roadway Tunnels presents guidelines for ventilation in roadway tunnels to facilitate human evacuation and emergency responder safety. These guidelines consider...

TRB Security and Emergencies-Related Programs and Activities

National Cooperative Highway Research Program (NCHRP)

NCHRP conducts research in problem areas that affect highway planning, design, construction, operation, and maintenance nationwide.

Synthesis of Information Related to Highway Problems

TRB's Synthesis of Information Related to Highway Problems searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute a National Cooperative Highway Research Program (NCHRP) report series, Synthesis of Highway Practice.

Highway Innovations Deserving Exploratory Analysis (IDEA) Program

TRB's Highway Innovations Deserving Exploratory Analysis (IDEA) Program is designed to provide an opportunity to investigate new and unproven concepts or to evaluate novel applications of technologies that have been tried, tested or used for highway systems practice.

Transit Cooperative Research Program (TCRP)

TCRP is an applied, contract research program that develops near-term, practical solutions to problems facing transit agencies.

Synthesis of Information Related to Transit Problems

TRB's Synthesis of Information Related to Transit Problems searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute a Transit Cooperative Research Program (TCRP) report series, Synthesis of Transit Practice.

Airport Cooperative Research Program (ACRP)

ACRP carries out applied research on problems that are shared by airport operating agencies.

Synthesis of Information Related to Airport Problems

TRB's Synthesis of Information Related to Airport Problems searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute an Airport Cooperative Research Program (ACRP) report series, Synthesis of Airport Practice.

National Cooperative Freight Research Program (NCFRP)

NCFRP conducts research and disseminates timely findings that will inform investment and operations decisions affecting the performance of the freight transportation system.

Commercial Truck and Bus Safety Synthesis Program

TRB's Commercial Truck and Bus Safety Synthesis Program searches out and synthesizes useful knowledge from all available sources and prepares concise, documented reports on specific topics. Reports from this endeavor constitute a Commercial Truck and Bus Safety Synthesis Program (CTBSSP) report series, Synthesis of Commercial Truck and Bus Safety Practice.

Hazardous Materials Cooperative Research Program (HMCRP)

HMCRP conducts research intended to advance current knowledge and practice relating to hazardous materials transportation.

Marine Board

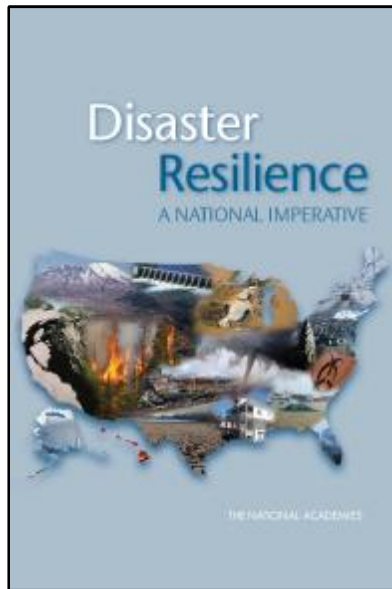
In response to requests from sponsoring agencies or on its own initiative, the Marine Board serves the national interest by providing evaluations and advice concerning the ability of the nation's marine and maritime industries to operate safely and efficiently and in an environmentally responsible manner. The Marine Board identifies research needs and provides a forum for exchange of information relating to new technologies, laws and regulations, economics, the environment, and other issues affecting the marine transportation system, port operations, coastal engineering, and marine governance.

Cooperative Research Programs

TRB's Cooperative Research Programs Division manages several cooperative research programs that frequently produces reports that have relevance to issues outside of the program's core focus areas.

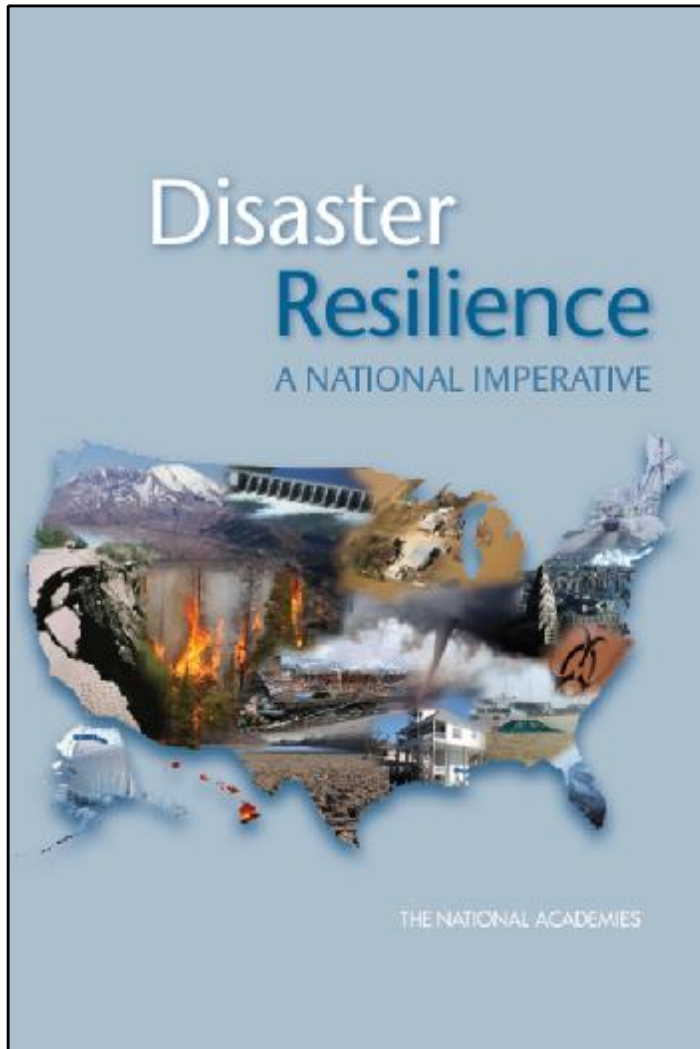
Technical Activities Standing Committees

TRB's Technical Activities Standing Committees are responsible for providing technical expertise in all modes and functions. Its work is closely coordinated with other organizations...



The ability to **prepare** and **plan for**,
absorb, **recover** from, or more
successfully **adapt** to actual or potential
adverse events.

Disaster Resilience: A National Imperative

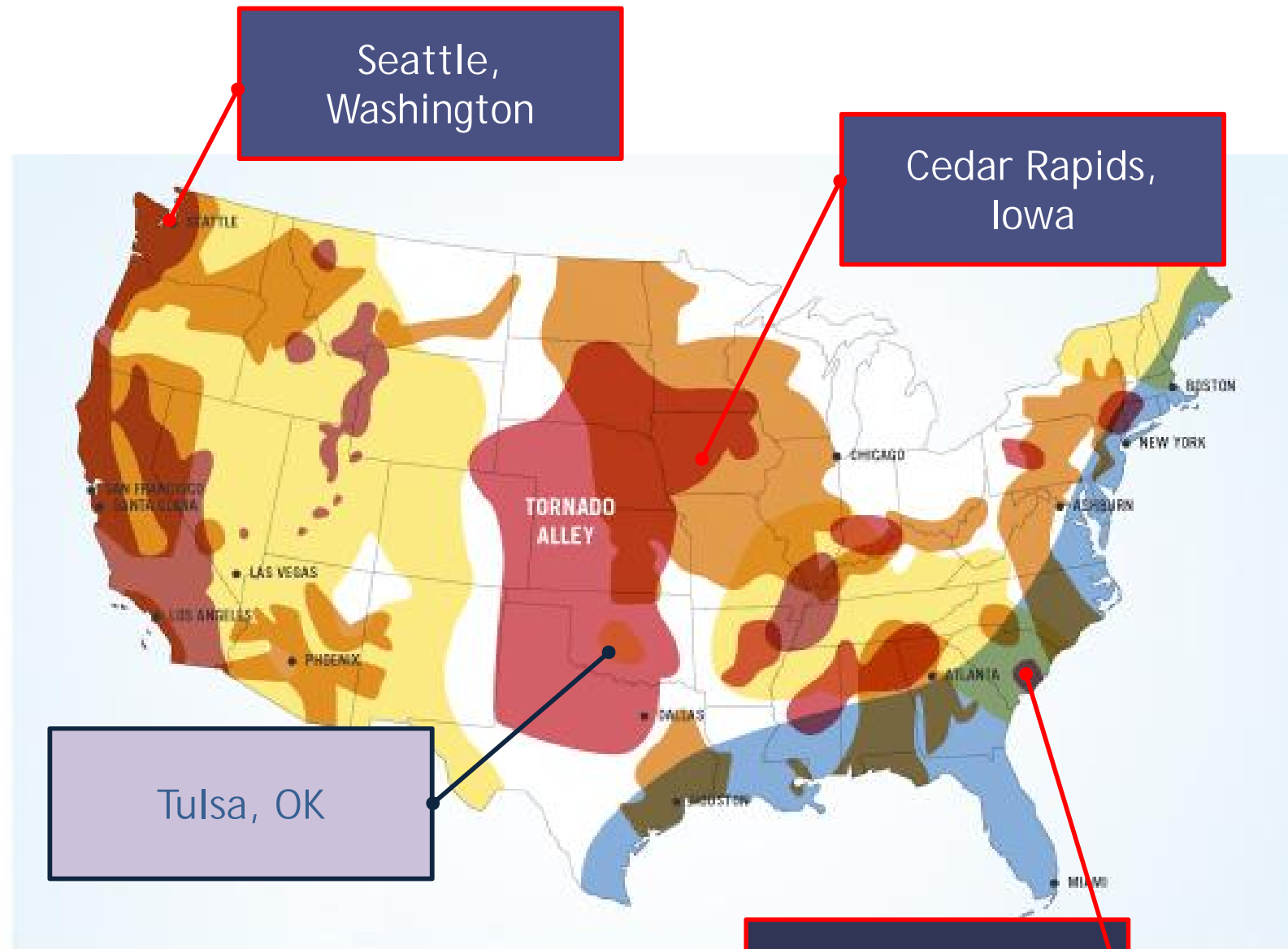
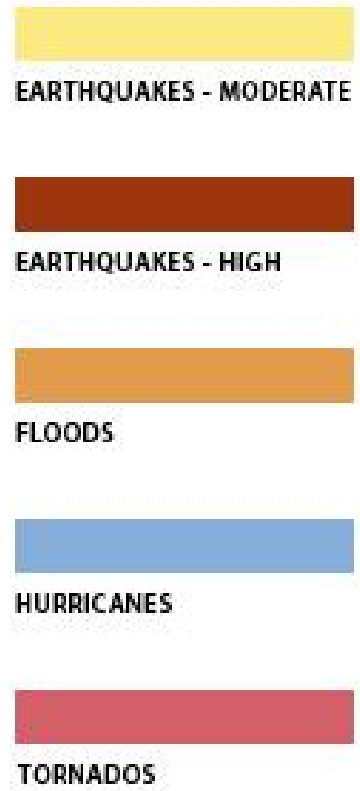


Four major recommendations

- **Manage and communicate** risk
- **Measure resilience** in communities
- Build community partnerships and **coalitions**
- **Share information and data** to build resilient communities

Four workstreams

1. Community Pilot Program
2. Workshops, Expert Meetings, and Activities
3. Measures and Metrics of Resilience
4. Economic Supply Chain Resilience



The Hazards and Disaster Management System

Pre-Impact Interventions

Mitigation Practices
 Emergency Preparedness Practices
 Recovery Preparedness Practices

Post-Impact Responses

Emergency Activities
 (planned and improvised)
 Recovery Activities
 (planned and improvised)

Hazard Vulnerability

Hazard Exposure
 Physical Vulnerability
 Social Vulnerability

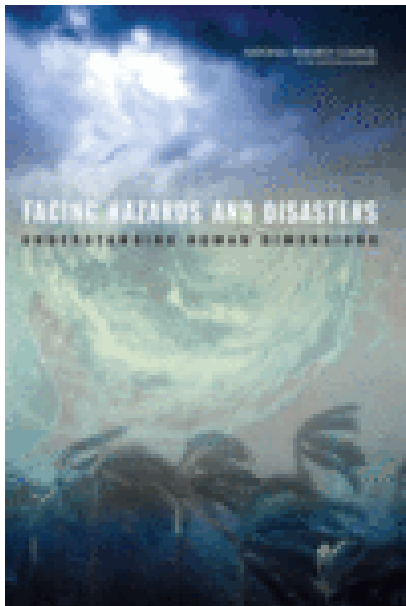


Disaster Impacts

Physical
 Social

Disaster Event Characteristics

Frequency	Magnitude of Impact
Predictability	Scope of Impact (spatial and social)
Controllability	Duration of Impact
Length of Forewarning	



CHRONOLOGICAL TIME



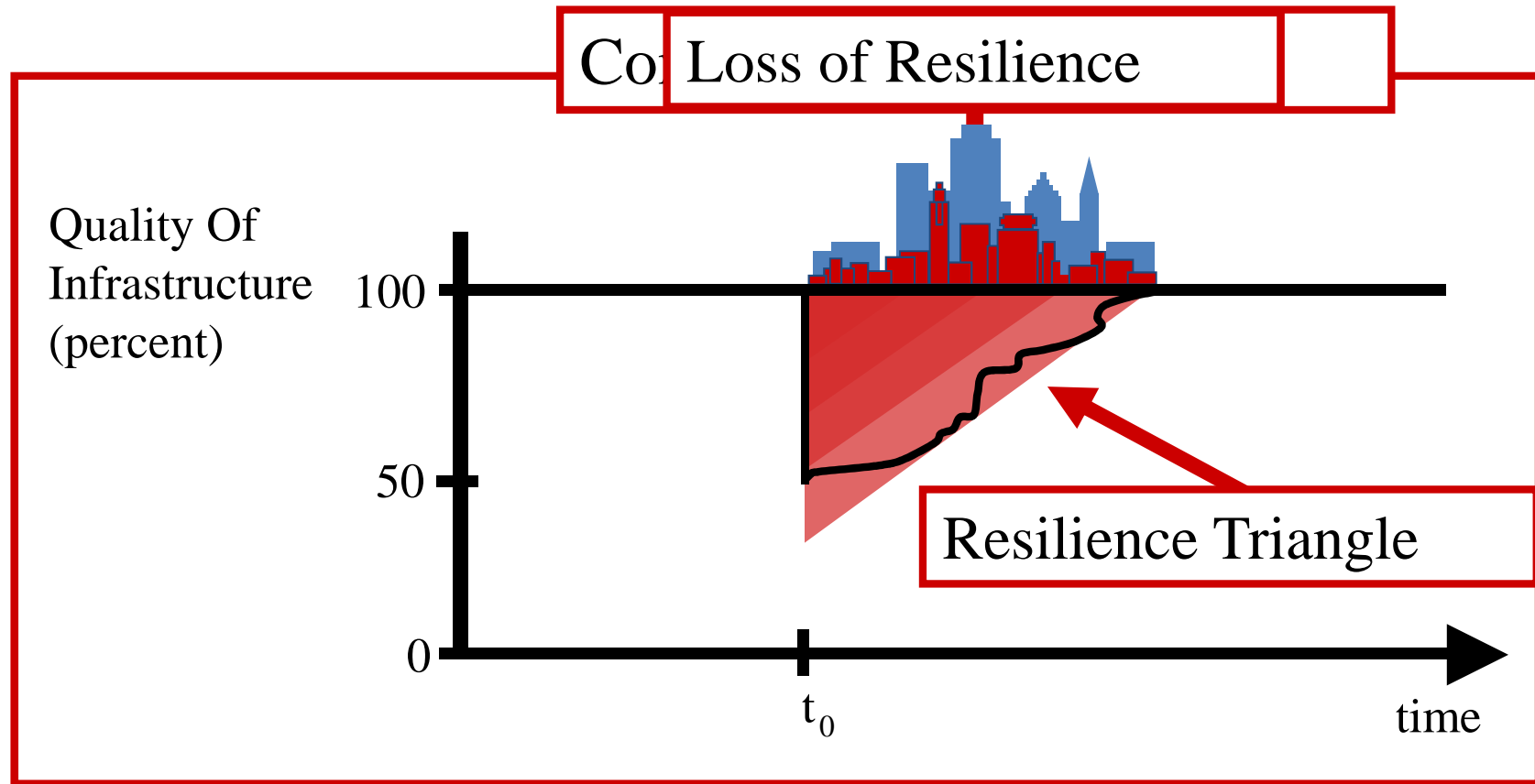
Source: Facing Hazards and Disasters (NAS, 2006), adapted from Kreps (1985), Cutter (1996), Lindell and Prater (2003)

Organization of federal disaster, civil defense, and defense mobilization functions, 1950-2006

Function	1950	1951	1952	1953	====	====>	1957	1958	1959	1960	1961	====	====	====>	1972	1973	====	====>	1978	1979	====	====	====>	2002	2003	2004	2005
Disaster Relief	Housing and Home Finance Administration (independent)		Federal Civil Defense Administration		Office of Civil Defense Mobilization (EOP)		Office of Emergency Planning (1968: Renamed Office of Emergency Preparedness)		Federal Disaster Assistance Administration (FDAA), in HUD		Federal Emergency Management Administration (FEMA) (Independent)		DHS (FEMA becomes part)														
Civil Defense	Federal Civil Defense Administration (Independent)								Office of Preparedness, later Federal Civil Preparedness Agency (GSA)				DHS														
Defense Mobilization	Office of Defense Mobilization (Executive Office of the President [EOP])								DoD (Defense Civil Preparedness Agency)				DoD (Defense Civil Preparedness Agency)		DOD												

Source: Facing Hazards and Disasters (National Academy of Sciences, 2006)

Multidisciplinary Center for Earthquake Engineering Research (MCEER) General Framework for Quantification of Resilience: Extent of Disruption and Recovery Time



Source: Bruneau & Tierney, Resilience: Defining and Measuring What Matters (MCEER 2006)
<http://mceer.buffalo.edu/>

Further elaboration: MCEER resilience domains

Technical: Physical Systems—Location-Based & Distributed Critical Facilities

Organizational: Attributes, Dynamics of Organizations & Institutions

Social: Attributes, Dynamics of Communities and Populations

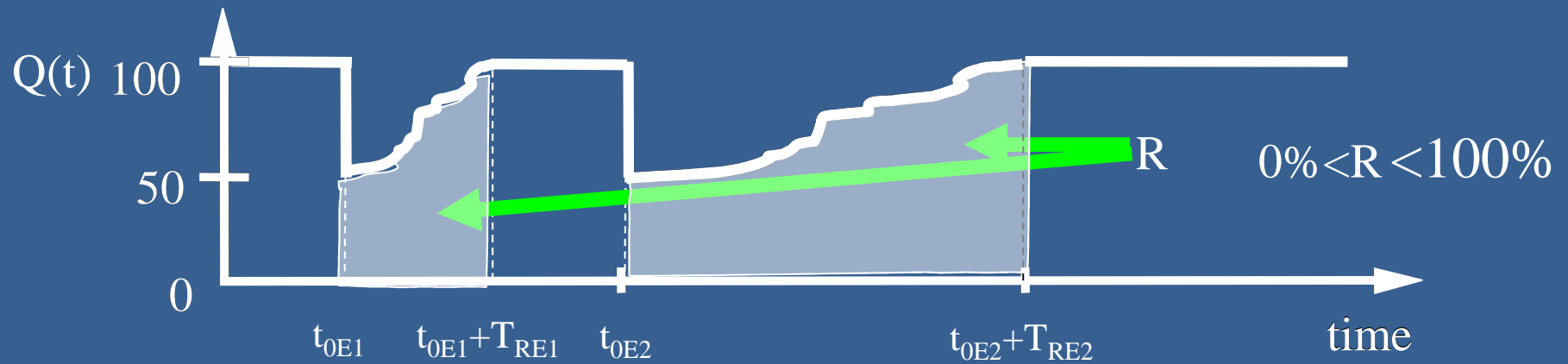
Economic: Attributes, Dynamics of Local and Regional Economies & Their Constituent Units (e.g. Businesses)

Source: Bruneau & Tierney, Resilience: Defining and Measuring What Matters (MCEER 2006)
<http://mceer.buffalo.edu/>

Resilience property space & examples

Dimension/ Domain	Technical	Organizational	Social	Economic
Robustness	Newer Structures, Built to Code	Extensiveness of Emergency Operations Planning	Social Vulnerability/ Resilience Indicators	Extent of Economic Diversification
Redundancy	Capacity for Technical Substitutions, "Work-Arounds"	Alternate Sites for Managing Disaster Operations	Availability of Housing Options for Disaster Victims	Ability to Substitute, Conserve Needed Inputs
Resourcefulness	Availability of Materials for Restoration, Repair	Capacity to Improvise, Innovate, Expand	Capacity to Address Human Needs	Capacity to Improvise, Innovate
Rapidity	System Downtime, Restoration Time	Time Between Impact & Early Recovery	Time to Restore Life-line Services	Time to Regain Capacity, Lost Revenue

Resilience quantification



$$\bar{R} = \frac{1}{N_I} \sum_{I=1}^{N_I} \left\{ \frac{1}{N_E} \cdot \sum_{E=1}^{N_E} \frac{1}{T_{RE}} \cdot \int_{t_{OE}}^{t_{OE}+T_{RE}} \left\{ 1 - L(I, T_{RE}) \left[H(t_{OE}) - H(t_{OE} + T_{RE}) \right] \cdot \alpha_R \cdot f_{Rec}(t, t_{OE}, T_{RE}) \right\} \cdot dt \cdot p_E(0, T_{LC}) \right\} \cdot P(I)$$

Where:

N_E Number extreme events expected during the lifespan (or control period) T_{LC} of the system

N_I Number of different extreme events intensities expected during the lifespan (or control period) expected during the T_{LC} of the system

T_{RE} Recovery time from event E

t_{OE} Time of occurrence of event E

$f_{rec}(t, t_{OE}, T_{RE})$ Recovery function

$H(t_{OE})$ is a step function (=0 for $t < t_{OE}$; =1 otherwise)

α_R Recovery factor =1 for full recovery

$L_I(I, T_{RE})$ Normalized loss function

$P(I)$ Probability that an event of given intensities happens in a given time interval T_{LC}

$p_E(0, T_{LC})$ probability that an event happens E times in a given time interval T_{LC}

Source: Bruneau & Tierney, Resilience: Defining and Measuring What Matters (MCEER 2006)

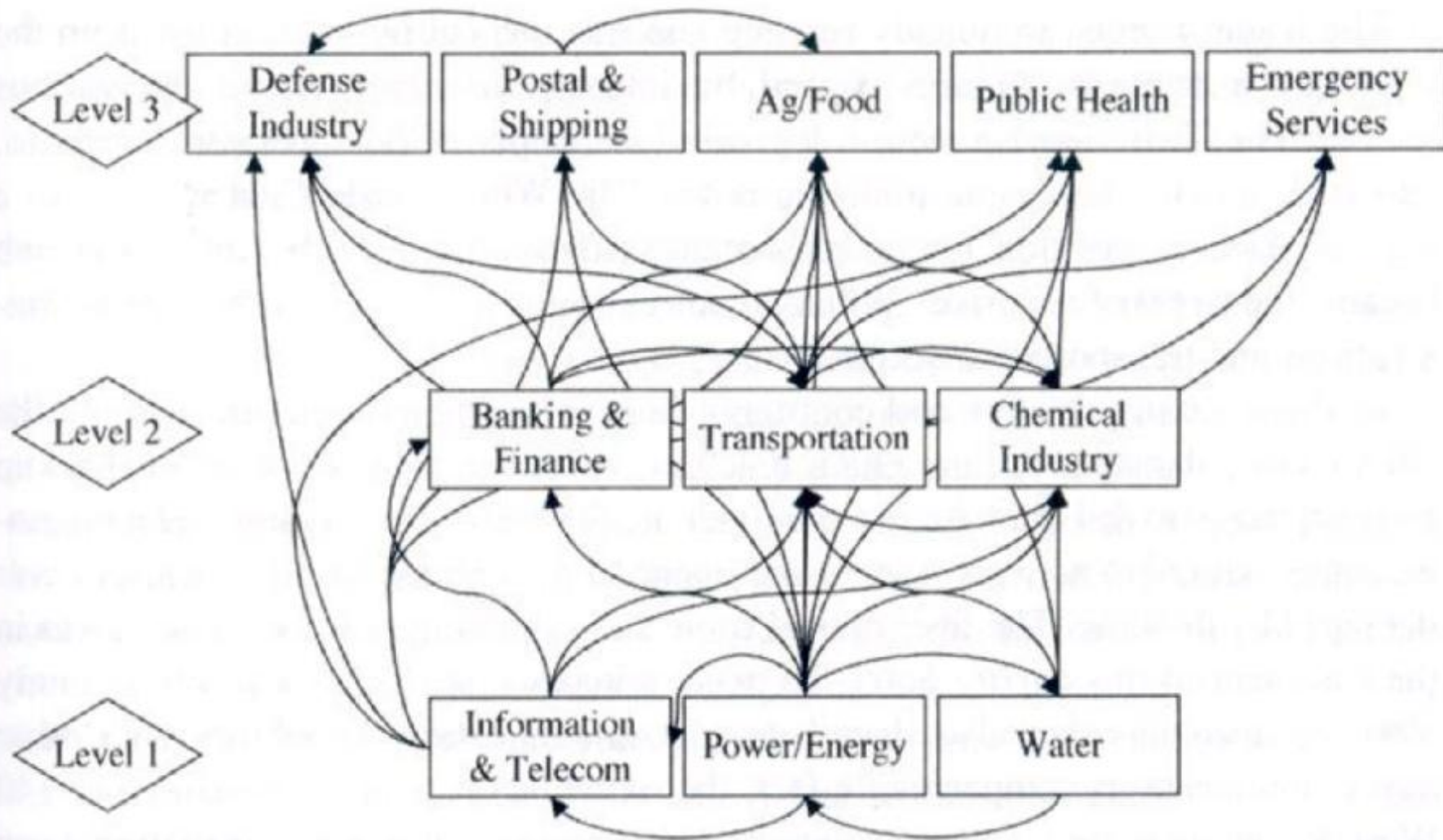
Three key themes for resilience

- **Measure**—Figure out way/s to measure resilience
- **Communicate**—New ways to talk about risk and resilience in ways that people can understand and take action
- **Connect**—Long-term change and impact with short-term decision making

Transportation context

- Multiple modes; multiple industries
- People and freight
- Massive network – central to economy
- International in scope
- Decentralized
- Public-private mix
- *No one in charge*

The transportation sector is central to enabling operability in all other sectors

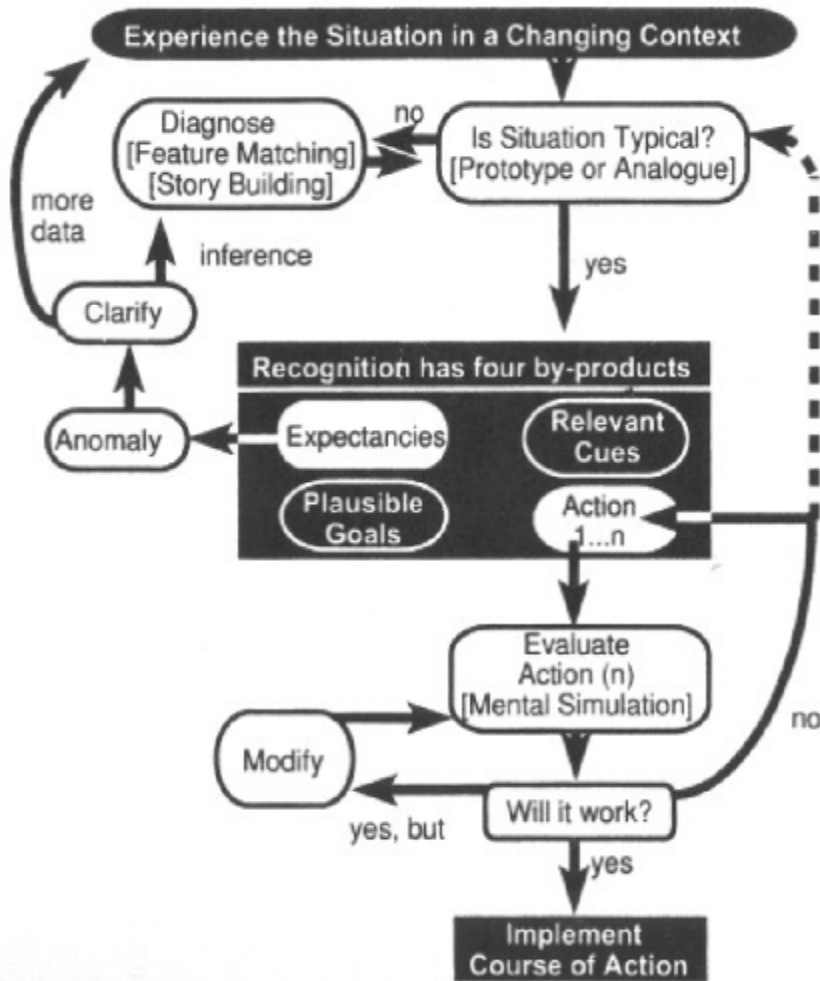


Levels and dependencies among the 11 critical infrastructure sectors.

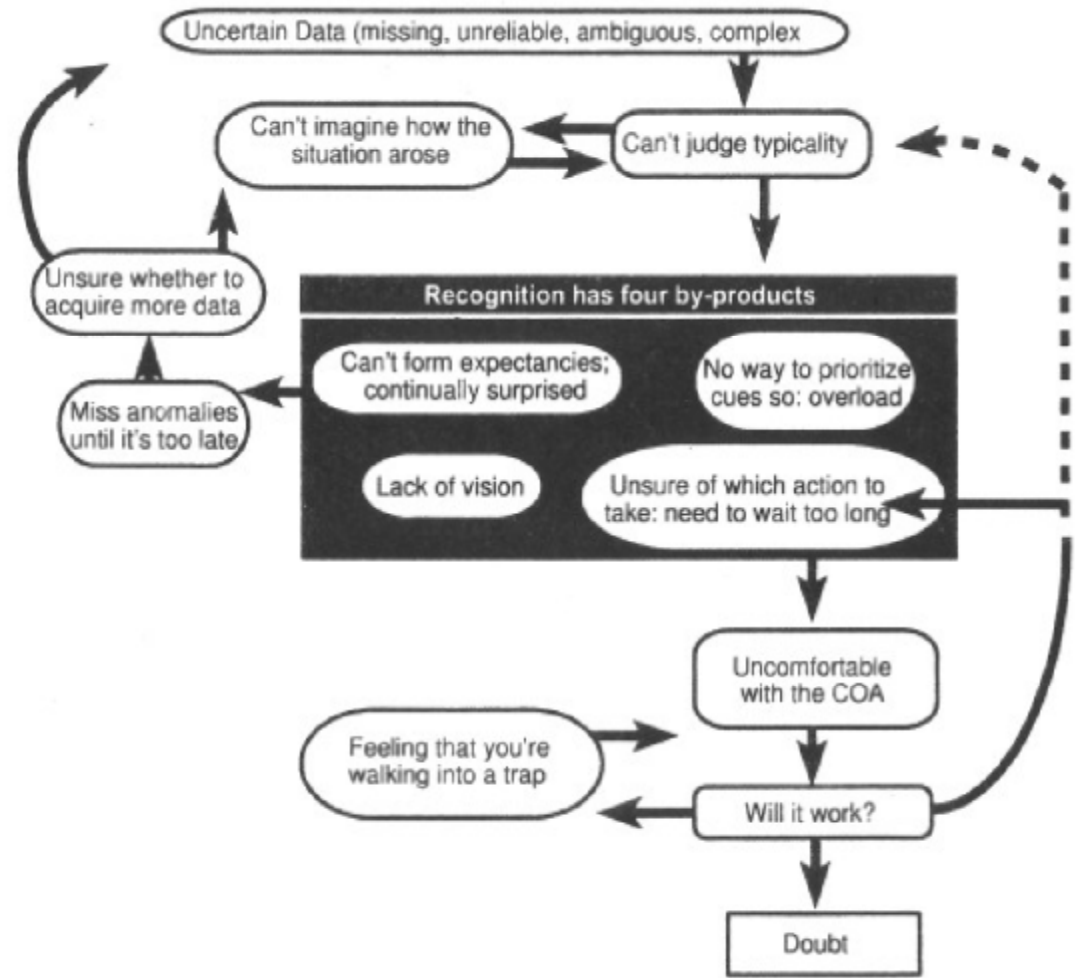
Source: Transportation System Sector-Specific Plan Research and Development Working Group Year in Review Progress Report and Next Steps (2008), adapted from Critical Infrastructure Protection in Homeland Security: Defending a Networked Nation by Ted G. Lewis, Wiley (2006).

Research explains how uncertainty leads to doubt

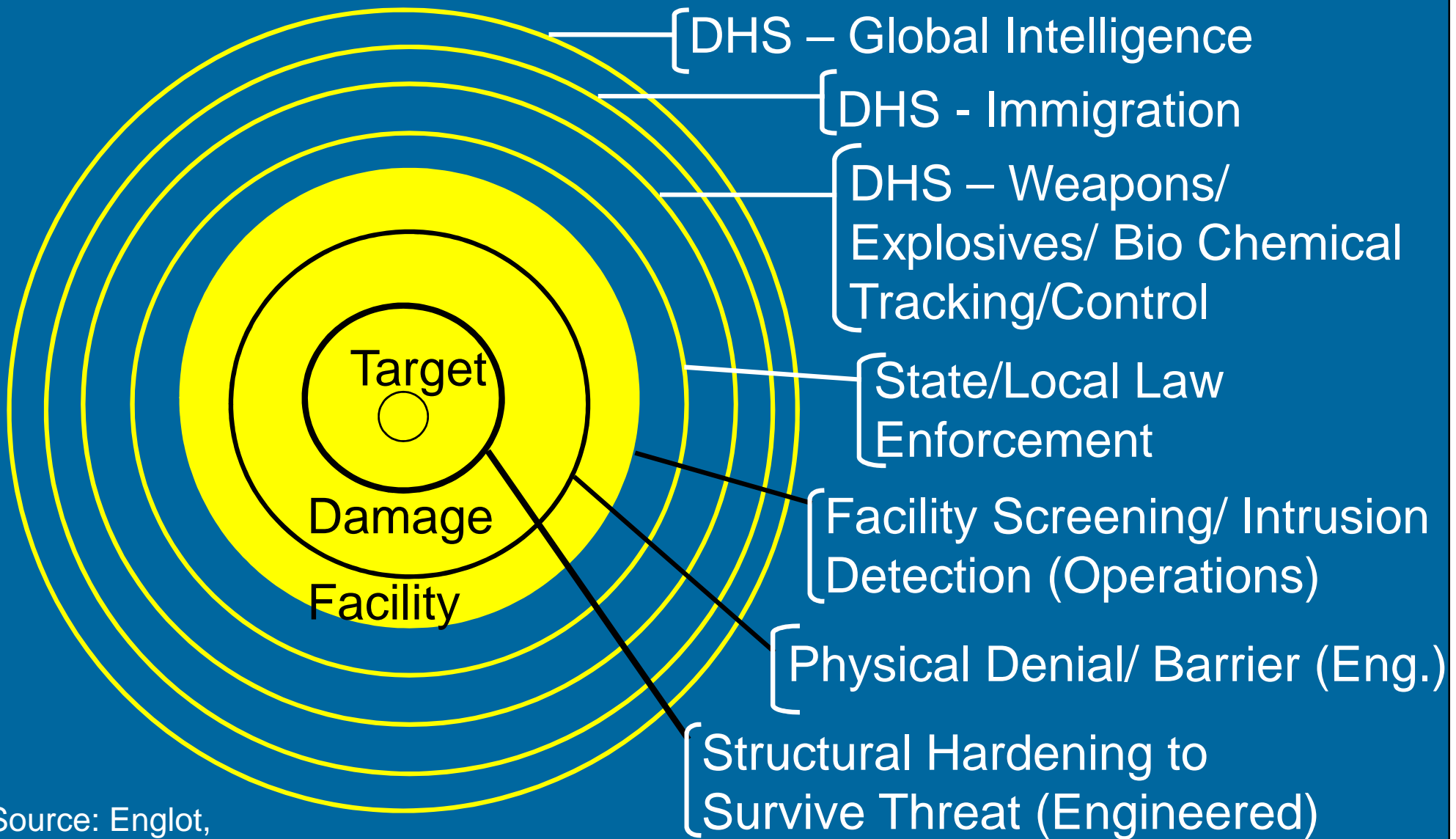
(a) Integrated Recognition-Primed Decision model



(b) Uncertainty as a barrier to action



An Infrastructure Owner's View of a Layered, Integrated Security System



Developing a Strategy to Counter Terrorism Requires a Roadmap; Each Component of the Roadmap Requires Research

Threat Analysis

Political, Economic,
Cultural Sources

Strategy, Tactics,
Capabilities

**Why do they hate us?
What makes them hate
us more?**

**How can we best reduce
the supply of terrorists?**

Homeland Security

Offensive/Foreign

Defensive/Domestic

Direct Action

- Military Strategy and Programs
- Intelligence Strategy and Programs
- Police and Justice

- Preventive Measures
- Response Measures
- Threat and Risk Analysis

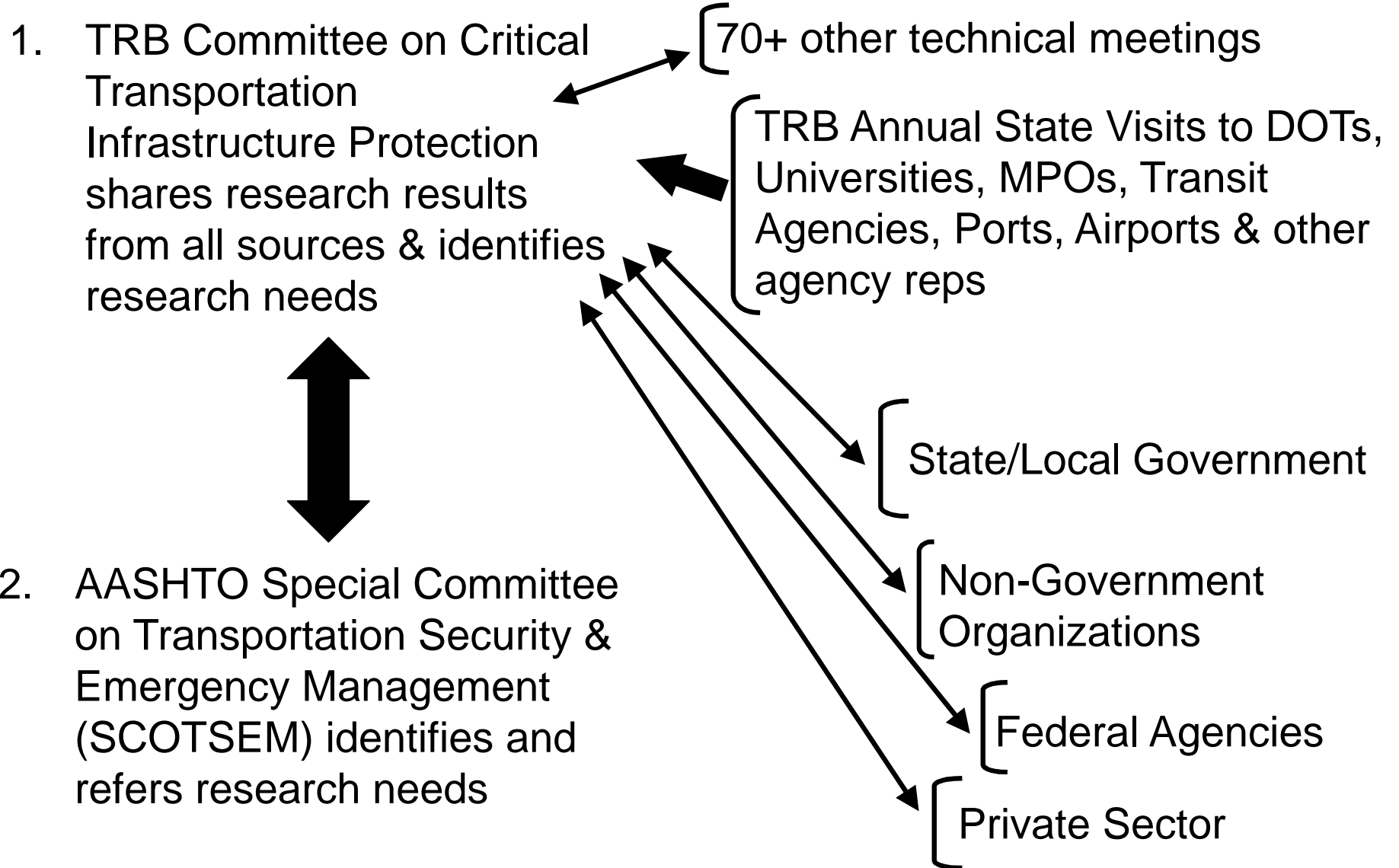
Support Denial

- International Development
- Political Actions
- Counter- and Non-Proliferation

**How can
we best
allocate
scarce HS
dollars?
Does
security
deter?**

Source: Riley, (2004), Reducing the Risks and Consequences of Terrorism, CREATE Conference

Identification of R&D Gaps & Needs



NCHRP Research Results Digest 333 / TCRP Research Results Digest 90

Natural Hazards Informer Number 4

A Guide to Planning Resources on Transportation and Hazards (2009)

Chapter 1: Introduction to the Disaster Cycle

Chapter 2: Overview

Chapter 3: The Economy and Hazards

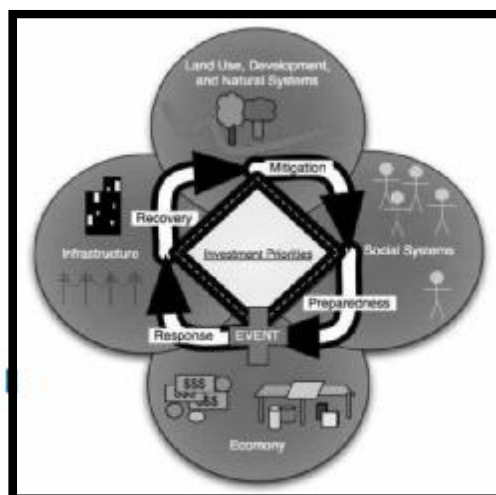
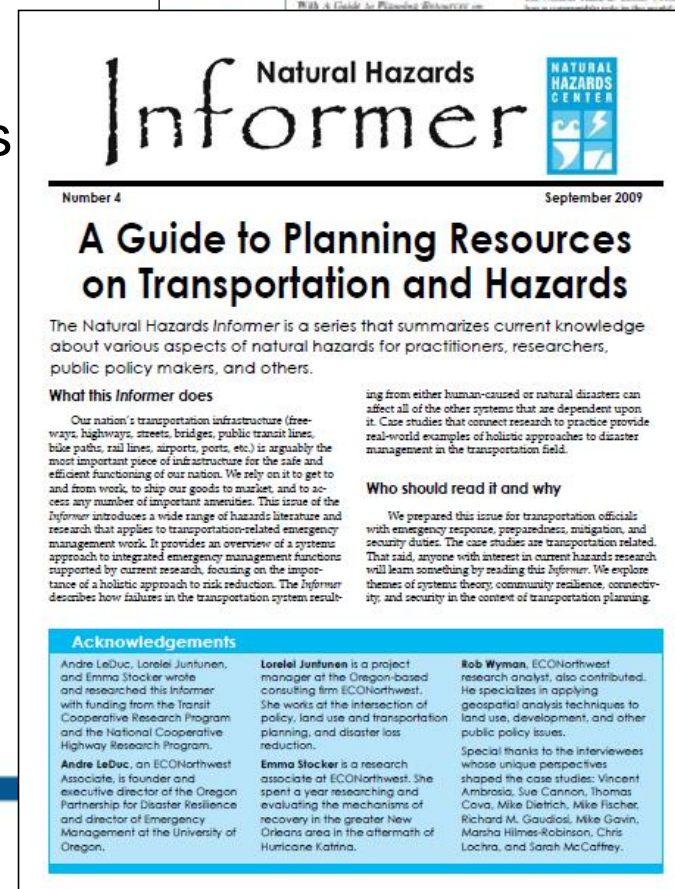
Chapter 4: People and Hazards

Chapter 5: Infrastructure: Lifelines During Disasters

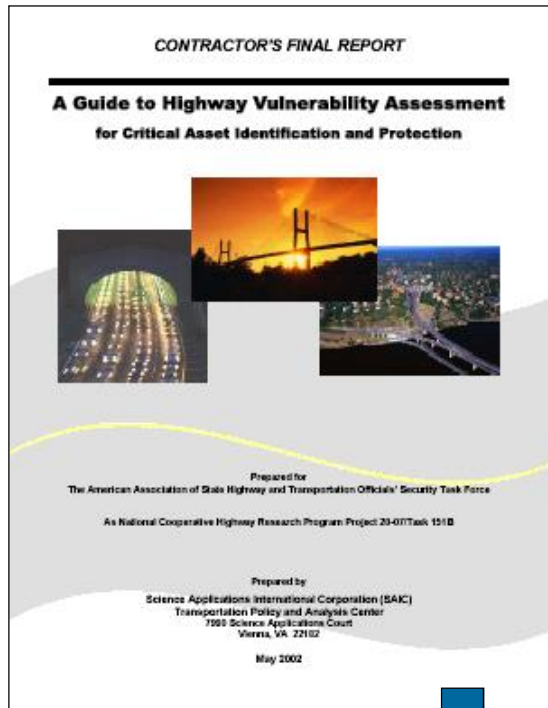
Chapter 6: Land Use, Development,
and Natural Systems

Chapter 7: From Theory to Practice: Case Studies

Chapter 8: Conclusion



Continuous Development of Risk Management and Emergency Response Planning Guidance

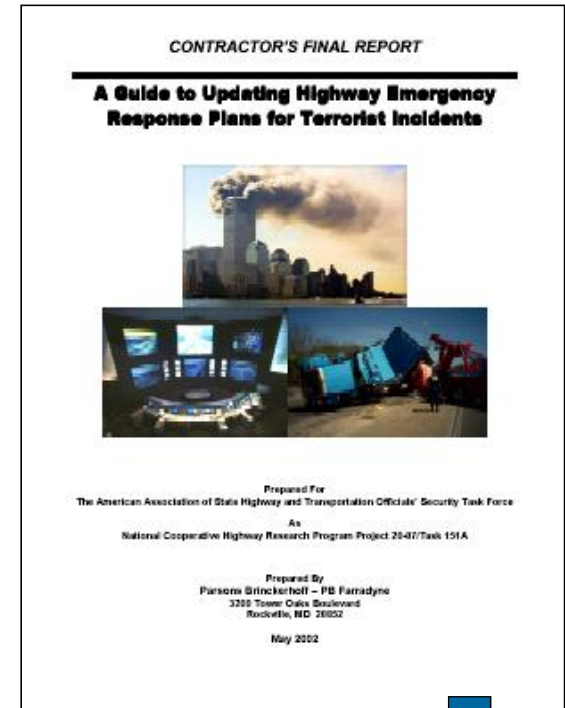


2002: Guides to Vulnerability Assessment & Emergency Response Planning

2002-2003: workshops

2004-2005: publications that anticipated NIMS, NRP/NRF, and NIPP.

2012: publications adopted by AASHTO



Published 2009:



NCHRP Report 525, Vol. 14

Security 101: A Physical Security Primer for Transportation Agencies

Published 2010:



NCHRP Report 525, Vol. 16

A Guide to Emergency Response Planning at State Transportation Agencies

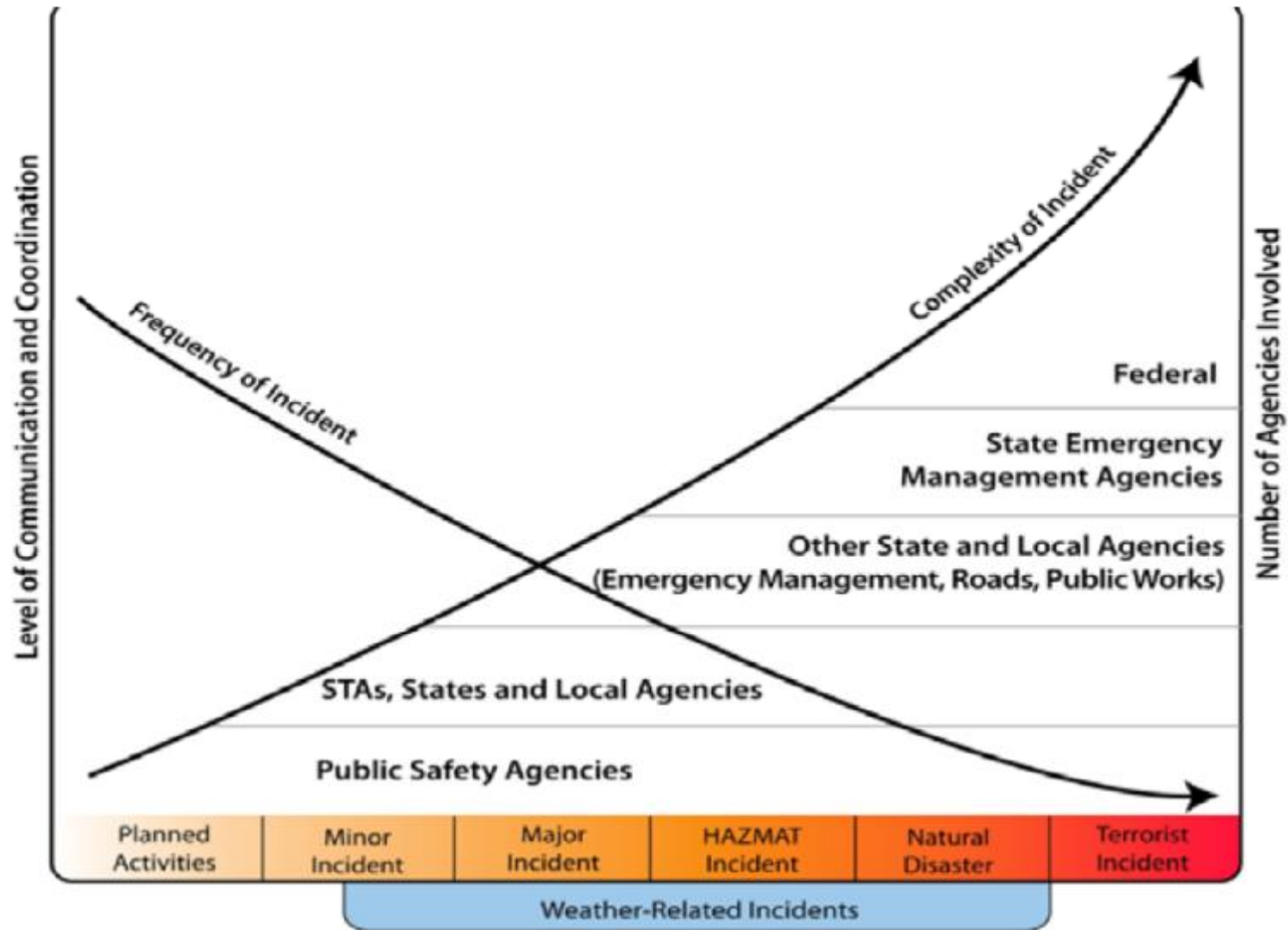
Resilience has many faces,



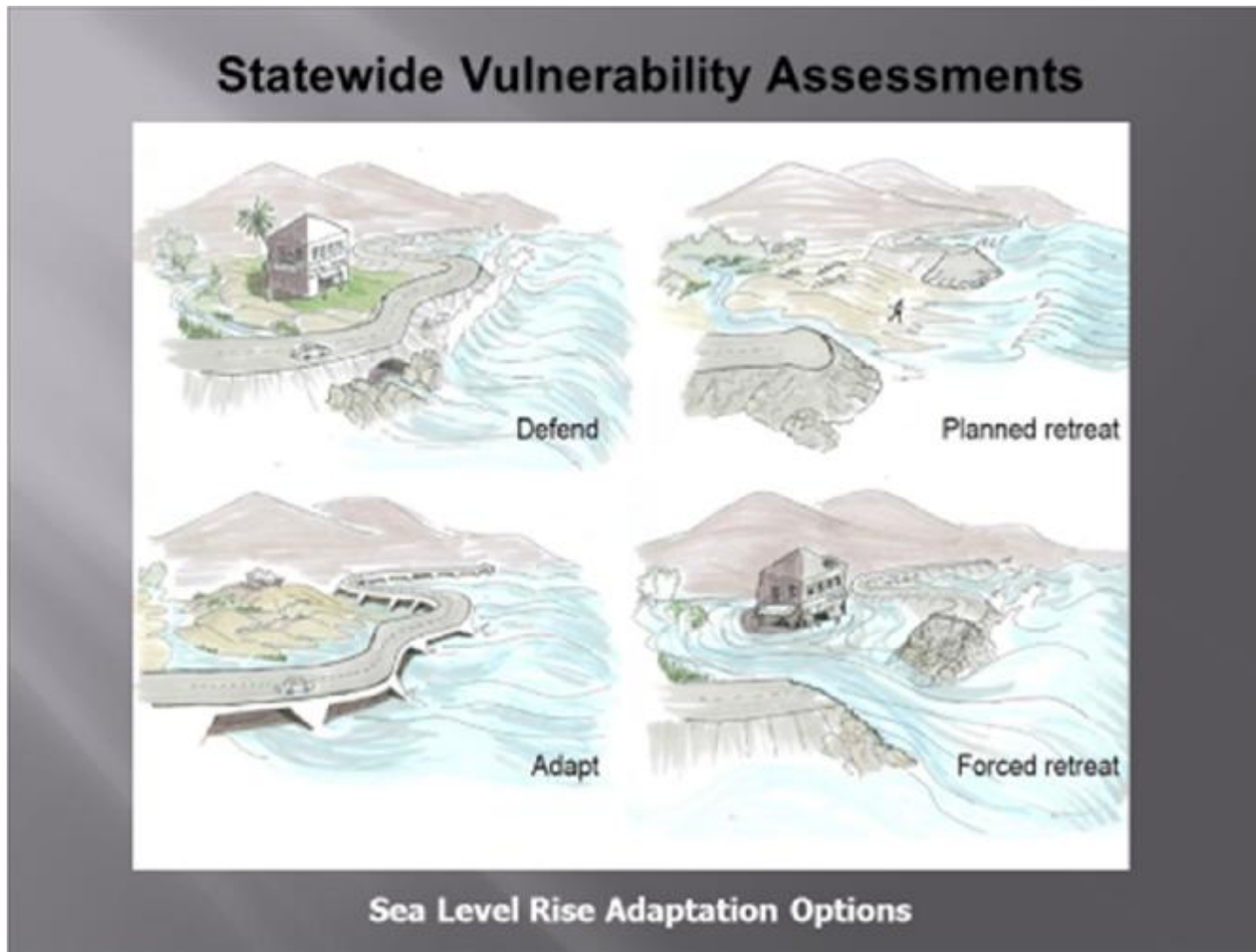
. . . many dimensions,

Dimension	Emergencies	Engineering	Climate, Community and Societal Change
Mission	Respond, Recover	Resist, Adapt	Defend, Adapt, Relocate
Duration	Hours - Months	Years - Decades	Decades or longer
Potential Disruptions	Extreme weather events Natural disasters Terrorist incidents	New load/durability requirements	Climate change impacts Sea level rise Mass migrations
Impact	Local - Regional	Local	Superregional - Global
Governance	Varies but Public Safety Agencies (PSA) generally provide Incident Command	Varies but State DOTs generally provide Project Management	All levels of government
Transportation Agency Role	Support evacuation and emergency access activities	Engineering and construction services	Funding Planning Policies and Standards

... many scales,

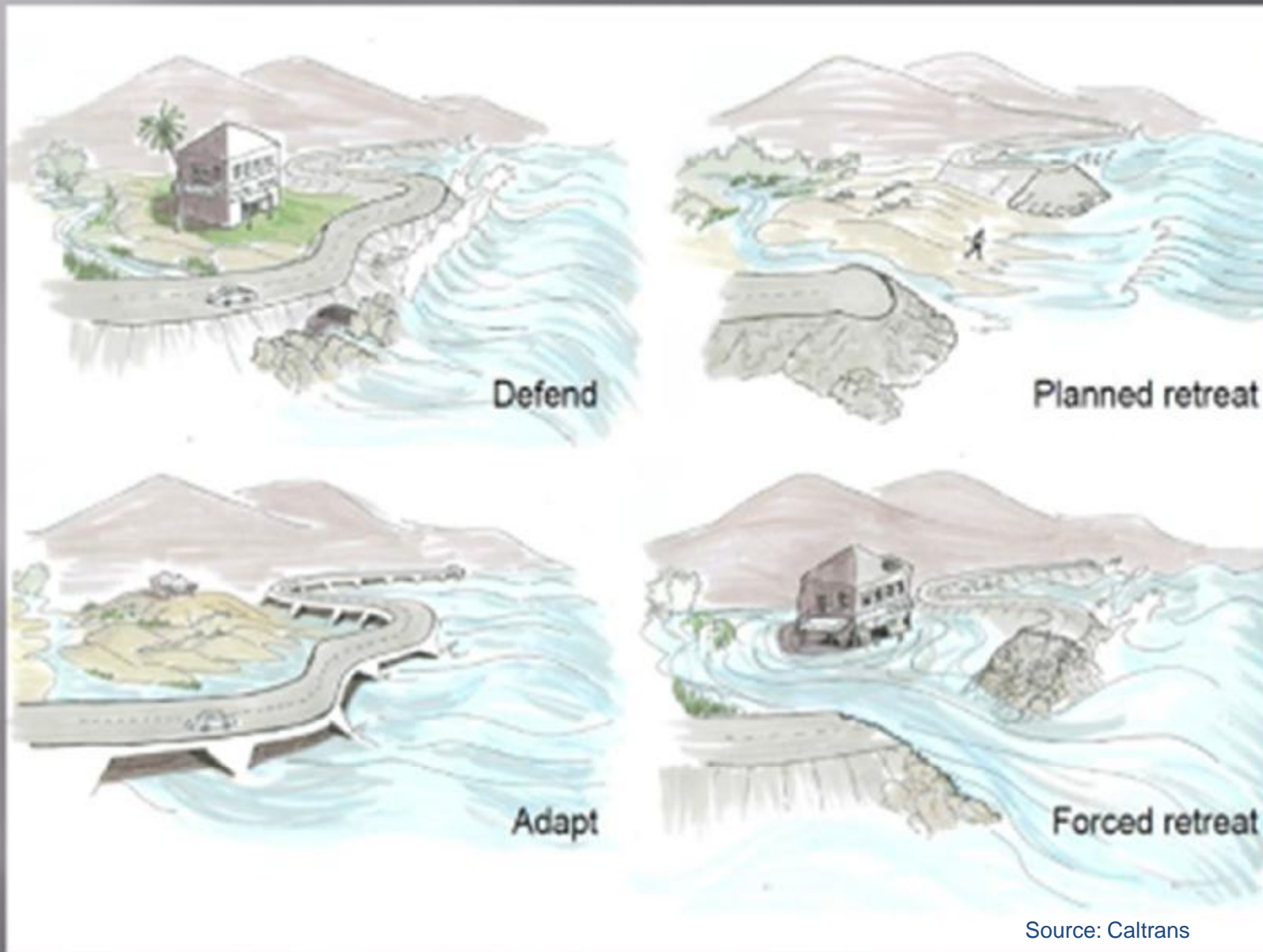


... and many choices



Source: Caltrans

Statewide Vulnerability Assessments



Sea Level Rise Adaptation Options

AASHTO SCOTSEM resilience resources

*Understanding Transportation Resilience:
A 2016-2018 Roadmap (2017)*

*Managing Catastrophic Transportation Emergencies:
A Guide for Transportation Executives (2015)*

*Fundamental Capabilities of Effective All Hazards
Infrastructure Protection Resilience, and Emergency
Management for State Dots (2015)*

*Security 101: A Physical Primer for Transportation
Agencies (2009) (Update in progress)*

*A Guide to Emergency Response Planning at State
Transportation Agencies (2010) (Update in Progress)*

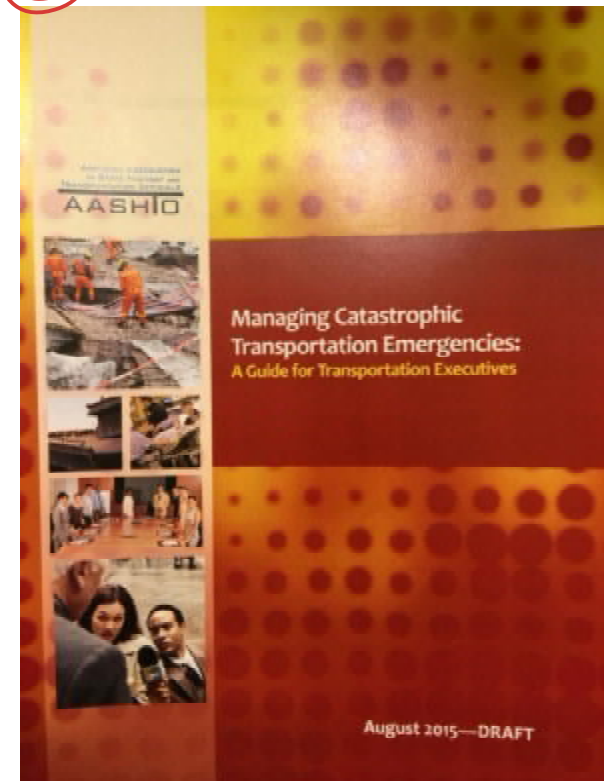


Adopted by AASHTO

NCHRP Project 20-59(36)

Managing Catastrophic Transportation Emergencies: A Guide for Transportation Executives (2015)

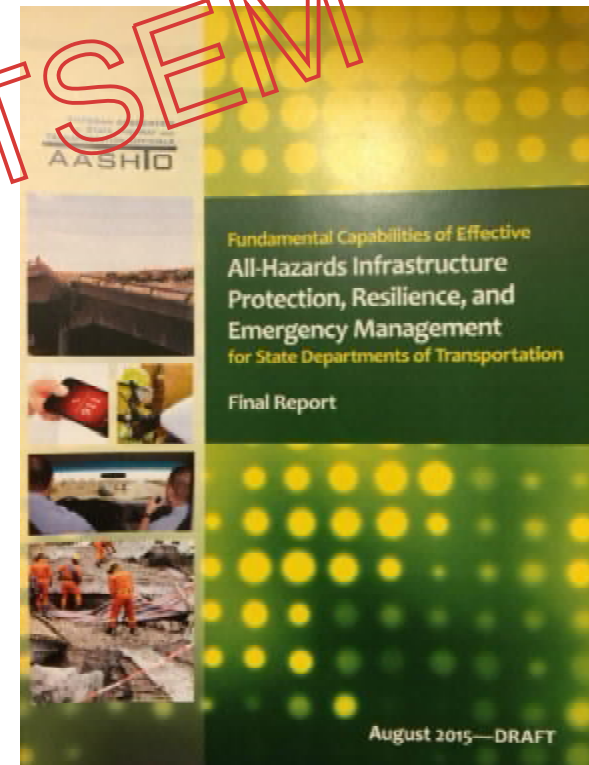
Adopted by SCOTSEM



NCHRP Project 20-59(14B)

***Fundamental Capabilities of Effective All-Hazards
Infrastructure Protection, Resilience, and Emergency
Management for State Departments of Transportation
(2015)***

Adopted by SCOTSEM



All hazards planning fundamentals

- **Prevention:** Capabilities necessary to avoid, prevent, or stop a threatened or actual act of terrorism.
- **Protection:** Capabilities necessary to secure against acts of terrorism and manmade or natural disasters.
- **Mitigation:** Capabilities necessary to reduce loss of life and property by lessening the impact of disasters.
- **Response:** Capabilities necessary to save lives, protect property and the environment, and meet basic human needs after an incident has occurred.
- **Recovery:** Capabilities necessary to assist communities affected by an incident to recover effectively.

Source: AASHTO. Fundamentals of Effective All Hazards Security and Resilience for State DOTs, 2015.

Transportation agency resilience: fundamental capabilities

Prevention	Protection	Mitigation	Response	Recovery
Planning				
Public Information and Warning				
Operational Coordination				
Intelligence & Information Sharing Screening, Search, & Detection	Access Control Physical Protective Measures Risk Management Supply Chain Integrity & Security	Long-Term Vulnerability Reduction Risk & Disaster Resilience Assessment Threat & Hazard Identification	Critical Transportation Communications Operational Communications Situational Assessment	Infrastructure Systems
Cybersecurity				
Training and Exercises				

Source: AASHTO. Fundamentals of Effective All Hazards Security and Resilience for State DOTs, 2015

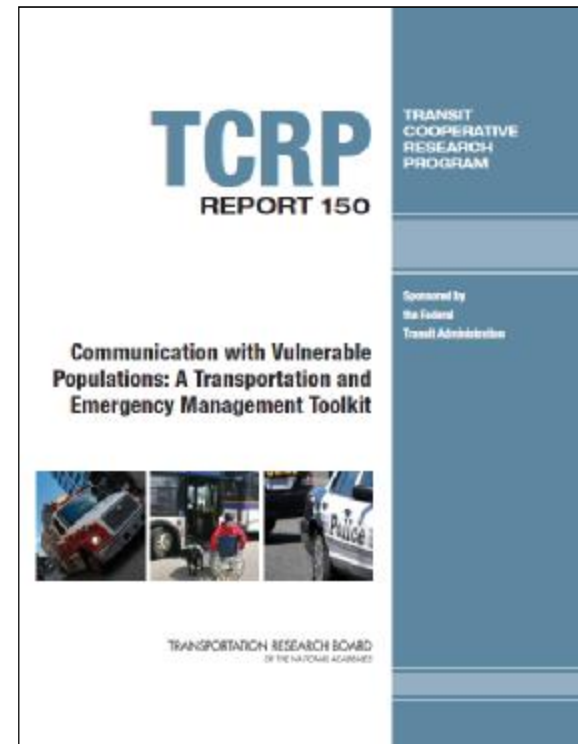
Transportation agency resilience: CRP resources for fundamental capabilities

Prevention	Protection	Mitigation	Response	Recovery
Planning: Guide to Emergency Response Planning at State Transportation Agencies				
Public Information and Warning: Communication with Vulnerable Populations FloodCast				
Operational Coordination: A Guide to Regional Transportation Planning for Disasters, Emergencies, and Extreme Events				
Intelligence & Information Sharing Screening, Search, & Detection	Access Control Physical Protective Measures Risk Management Supply Chain Integrity & Security	Long-Term Vulnerability Reduction Risk & Disaster Resilience Assessment Threat & Hazard Identification	Critical Transportation Operational Communications Situational Assessment	Infrastructure Systems
Cybersecurity: Effective Practices for the Protection of Transportation Infrastructure from Cyber Incidents Security 101, Second Edition				
Training and Exercises: Guidelines for Transportation Emergency Training Exercises ICS Training for Field Level Transportation Supervisors and Staff Transportation Emergency Response Application				

TCRP Report 150

Communication with Vulnerable Populations: A Transportation and Emergency Management Toolkit (2011)

Objective
to develop a toolkit of
communications strategies,
policies, and practices for
transportation agencies and
emergency management
agencies that focuses on
communicating with
vulnerable populations prior
to, during, and after all-hazards
emergencies.



Graphic: Cover for TCRP Report 150, Communication with Vulnerable Populations:
A Transportation and Emergency Management Toolkit

NCHRP 20-59(53) FloodCast: a strategic framework and a prototype tool for enhanced flood event decision built on National Flood Interoperability Experiment (NFIE) System

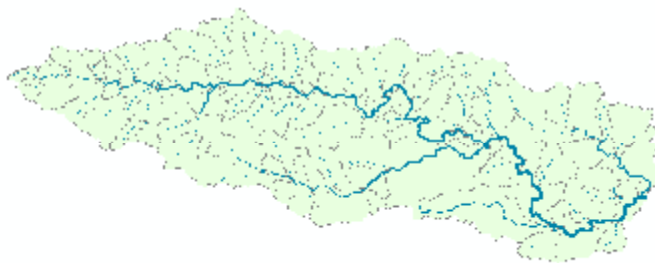
Blanco River at Wimberley

Current: 6600 basins and 3600 forecast points

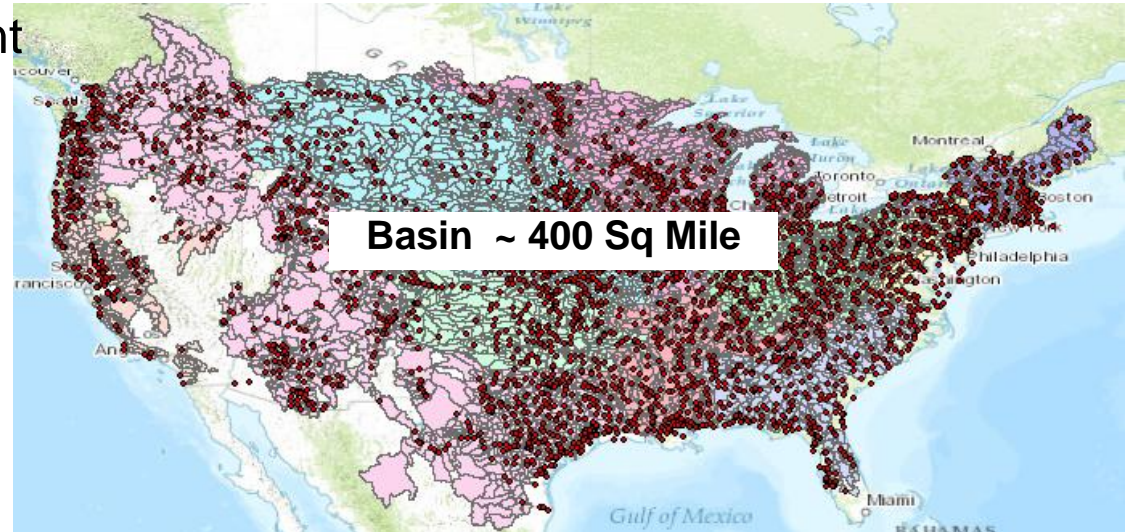
Two basins and one forecast point



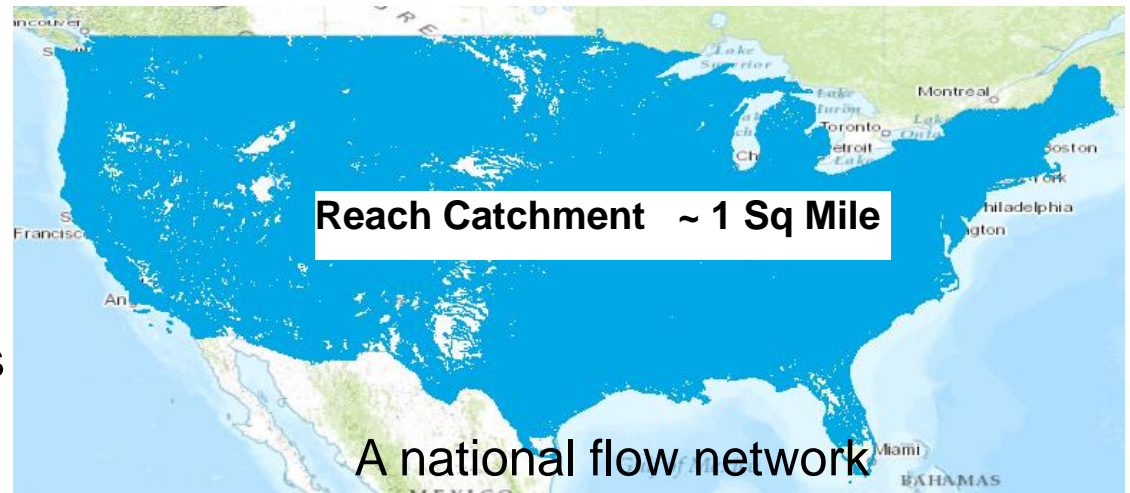
becomes ↓



130 Catchments and Flowlines uniquely labelled



NFIE: 2.7 million stream reaches and catchments



A national flow network

Adapting to Change in Urban Flooding

Rokstrom
Natural
Systems

Snowden &
Boone
Leader's
Framework for
Decision-
making

Milly et al
Stationarity is
Dead

Types of
Resilience

Resist

Complicated

Stationarity

**Engineered
resilience
(Probabilities
of failure)**

Adapt

**Complex (test-
bed for
innovation)**

**Stationarity is
Dead**

**Socio-
Ecological
Resilience
-capacity to
adapt
-attributes of
resilience**

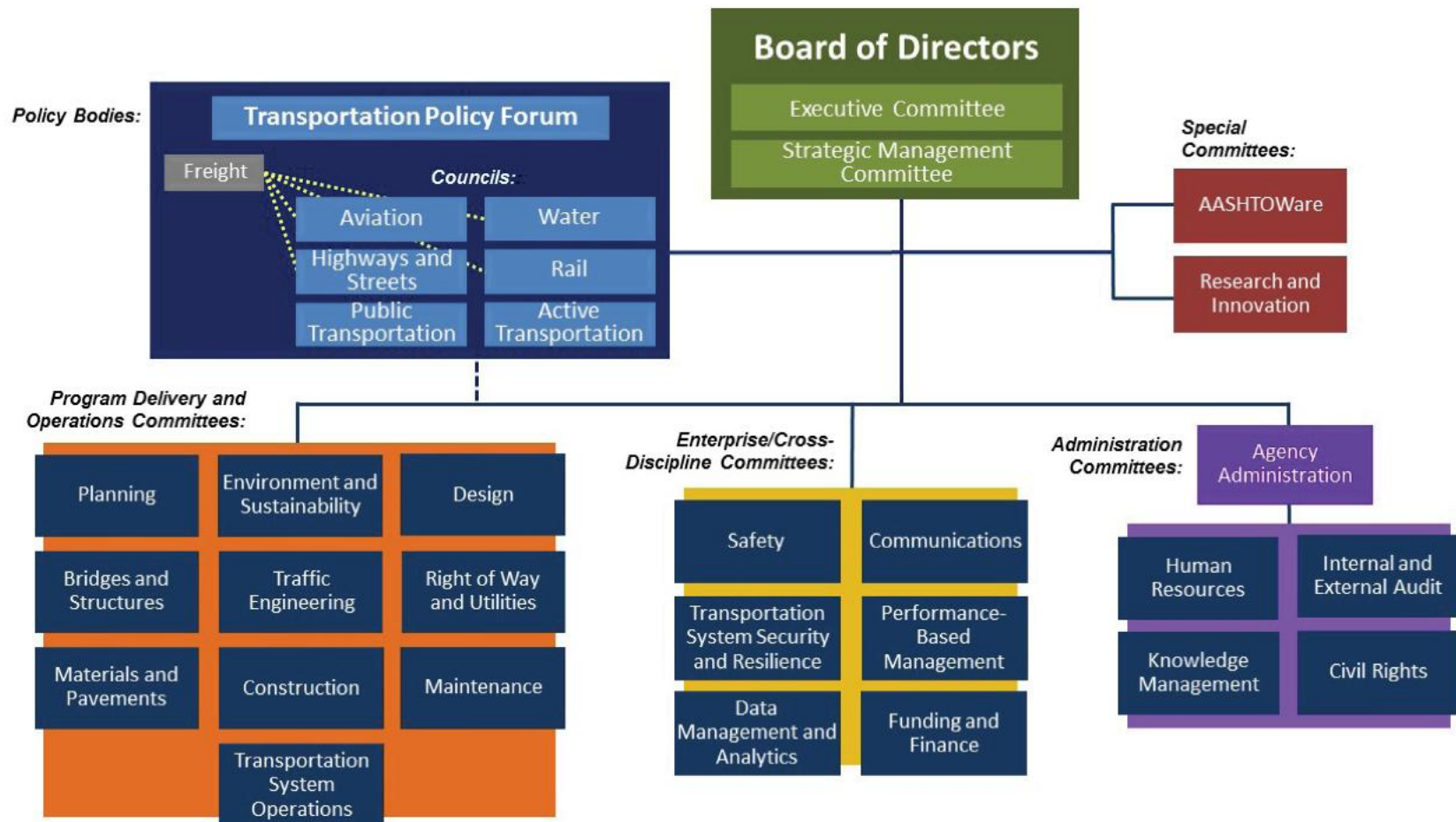
Transform

**Chaos
(openness to
innovation)**

Source: Steve Moddemeyer, "New Ideas around the Old Problem of Urban Flooding," ResilientAmerica Roundtable, February 17, 2017

Approved AASHTO Committee Structure

November 2016



Moving forward

“Disaster resilience is everyone’s business and is a shared responsibility among citizens, the private sector, and government. Community leaders and government officials face decisions every day that may pit short-term interests against longer-term goals. Increasing resilience to disasters will require decisions and actions that are informed and forward-looking.

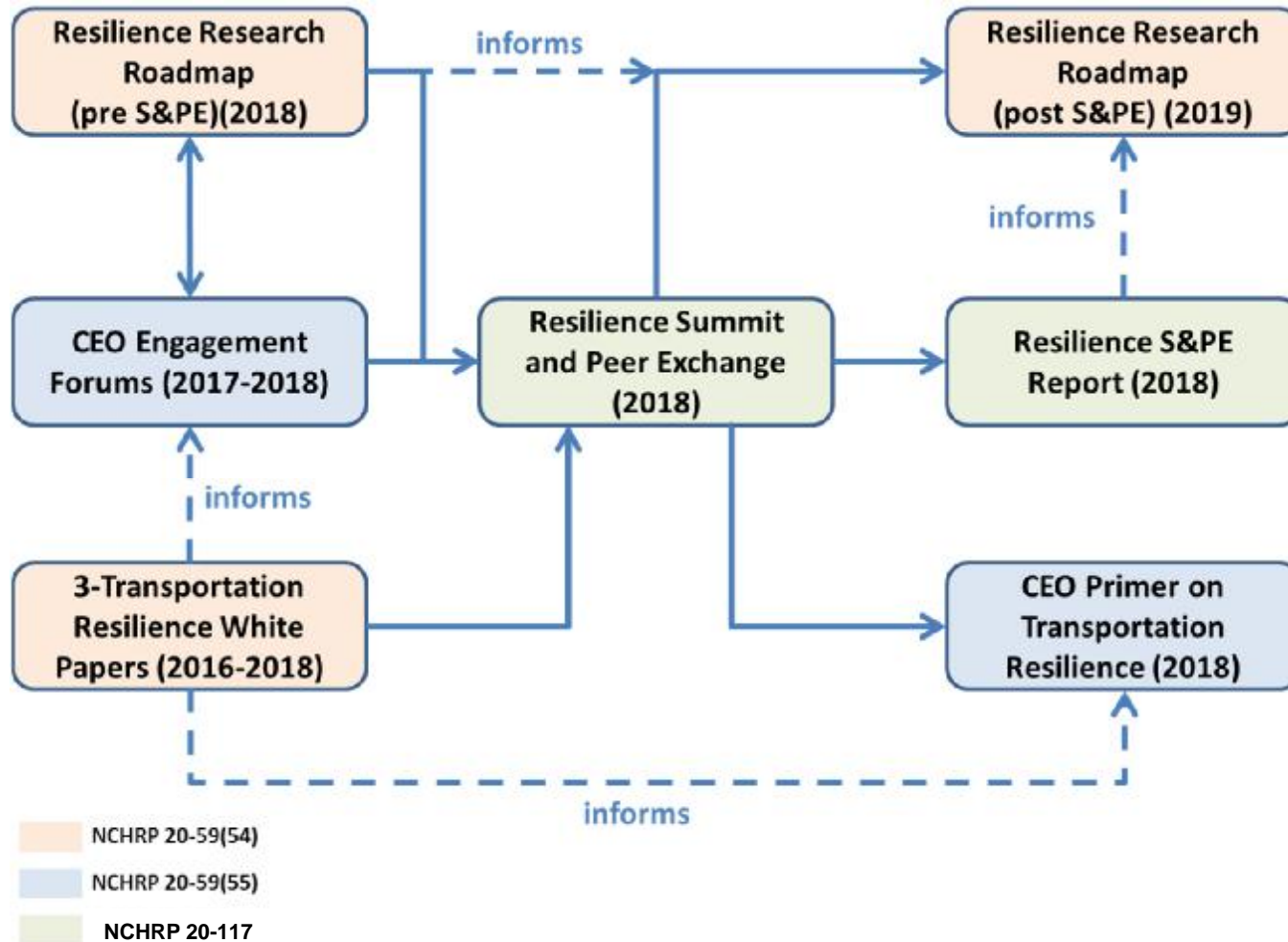
“Although disasters will continue to occur, actions that move the nation from a reactive to a proactive approach will reduce many of the societal and economic burdens and impacts that disasters cause. Building the nation’s resilience is a long-term process, one that will be socially and politically challenging, but the reward for our efforts will be a safer, healthier, more secure, and more prosperous nation.”

The National Academies, 2012

Ways to get involved

- SCOTSEM & RSTS (Soon to be TSS&R)
- TRB Committee on Critical Infrastructure Protection (ABR10)
- NCHRP Resilience Research Road Map Needs Solicitation
- 2018 Transportation Resilience Summit and Peer Exchange

AASHTO 2016-2019 resilience research program



NCHRP Project Panel 20-59

Surface Transportation Security & Resilience Research

- NCHRP 20-59(117) Deploying Transportation Resilience Practices in State DOTs (2017-2019)
- Resilience Research Roadmap (Pre and Post Summit versions) (2017-2019)
- Transportation Resilience White Papers (2017)
 - Understanding Transportation Resilience:
An Environmental Perspective
 - Understanding Transportation Resilience:
An Economic Perspective
 - Understanding Transportation Resilience:
A Cyber Perspective
- CEO Primer on Transportation Resilience (2017-2019)
- CEO Engagement Forums (2017-2018)

NCHRP Project 20-117

Deploying Transportation Resilience Practices in State DOTs (2019)

The objective of this research is to develop a set of implementation support tools and services to assist transportation organizations in deploying resilience-based innovations and effective practices based on the implementation recommendations contained in completed resiliency research.

The scope of these services shall encompass those activities involving (1) organizational/institutional implementation (e.g., governance, business process/data, performance measures, work plans); (2) employee learning (grounded in modern adult learning theory and centered on facilitating learning in the workplace); and (3) stakeholder outreach and engagement. A significant component of the this project will be to organize **a national summit and peer exchange on transportation resiliency to be held in 2018 and co-sponsored by TRB, AASHTO (SCOTSEM, Standing Committee on the Environment, and Resilient and Sustainable Transportation Systems), FHWA, Federal Emergency Management Agency, Department of Homeland Security, and other interested parties.**

TRB

Who We Are and What We Do

Promoting innovation and progress in transportation

TRB.org

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The National Academies of SCIENCES ENGINEERING MEDICINE **TRB** TRANSPORTATION RESEARCH BOARD

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- Annual Meeting**
TRB's Annual Meeting attracts 13,000+ attendees from around the world and is...
- Events**
Participate in the 70+ meetings and 100+ webinars TRB hosts each year.
- Support**
As a non-profit organization, TRB accepts gifts towards specific programmatic...

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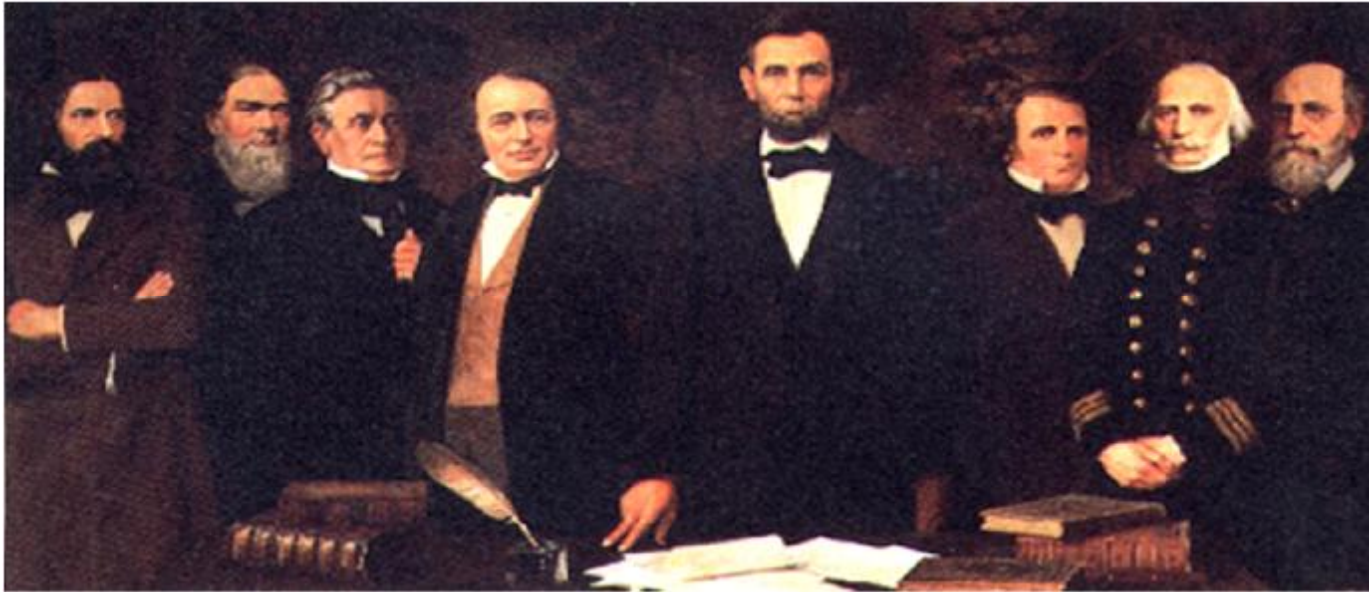
[Connect](#) [Convene](#) [Research](#) [Advise](#)

TRB's work relies on volunteers, and seeks to involve transportation professionals at every stage of their career. Get involved by receiving updates, volunteering, or responding to proposals:

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- [Follow us on Social Media](#)
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- [Respond to Requests for Proposals](#)

Publications

-  **NCRRP**
Web-Only Document 4
-  **Legal Research Digest 49**
-  **NCHRP Research Report 688 For Publication 2011—Subject to Revision**
An Expanded Functional Classification
- 



1863

- National Academy of Sciences

1964

- National Academy of Engineering

1970

- National Academy of Medicine

Making the Nation Safer: The Role of Science and Technology in Countering Terrorism

NRC Policy Study released June 25, 2002



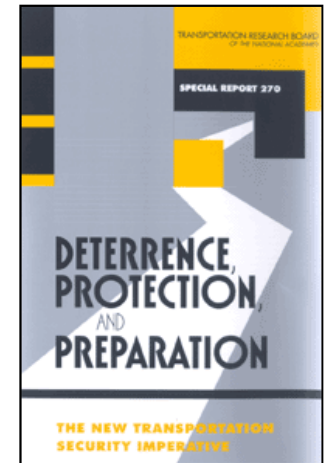
- Predict: Intelligence and surveillance of targets and means
- Prevent: Disrupt networks, contain threats
- Protect: Harden targets, immunize populations
- Interdict: Frustrate attacks, manage crisis
- Response & Recovery: Mitigate damage, expedite cleanup
- Attribute: Identify attacker to facilitate response

Source: Downey, TRB Annual Meeting 2003

Making the Nation Safer

General Strategies and Research Needs

- § Biological Research, prepare, distribute response to pathogens
- § Chemical/Explosives Sensors & filters
- § Info Technology Network security/ER communications
- § Energy SCADA controls/adaptive grid/vulnerabilities
- § Cities/Infrastructure Emergency responder support
- § Transportation Layered system security
- § People Trusted spokespersons
- § Complex Systems Data fusion/data mining/red-teaming
- § Cross-Cutting Technology Sensors/robots/SCADAs/systems analysis
- § Deployment Homeland Security Institute, Partnerships among feds/states/locals/universities
- § Nuclear Control weapons & materials at source



Source: Downey, TRB Annual Meeting 2003

Review of DHS' s Approach to Risk Analysis (2010)

This Congressionally-mandated study by the National Academies reviewed how the Department of Homeland Security (DHS) is building its capabilities in risk analysis to inform decision-making. More specifically, the study addressed the following tasks:

- a) Evaluate the quality of the current DHS approach to estimating risk and applying those estimates in its many management, planning, and resource-allocation (including grant-making) activities, through review of a committee-selected sample of models and methods;
- b) Assess the capability of DHS risk analysis methods to appropriately represent and analyze risks from across the Department' s spectrum of activities and responsibilities, including both terrorist threats and natural disasters;
- c) Assess the capability of DHS risk analysis methods to support DHS decision-making;
- d) Review the feasibility of creating integrated risk analyses covering the entire DHS program areas, including both terrorist threats and natural disasters, and make recommendations for best practices, including outreach and communications;
- e) Recommend how DHS can improve its risk analyses and how those analyses can be validated and provide improved decision support.

National Academies of Sciences, Engineering, and Medicine Transportation Policy Studies: Resilience

- ***Special Report 294: The Role of Transit in Emergency Evacuation (2008)***
- ***Special Report 290: The Potential Impacts of Climate Change on U.S. Transportation (2008)***

Foresight NCHRP Report 750 Series: Informing Transportation's Future



VOLUME 1: FREIGHT

Economic Changes Driving Future Freight Transportation

Explore and plan for the future of freight with a scenario planning toolkit.



VOLUME 2: CLIMATE CHANGE

Climate Change and the Highway System: Impacts and Adaptation Approaches

How to prepare for extreme weather events.



VOLUME 3: TECHNOLOGY

Expediting Future Technologies for Enhancing Transportation System Performance

Select the right technology investments at the right time.

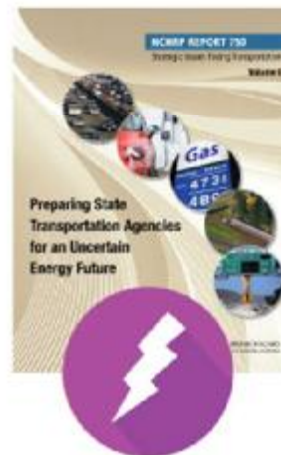
WEBINAR: A recorded webinar on Vol. 3 is available [here](#)



VOLUME 4: SUSTAINABILITY

Sustainability as an Organizing Principle for Transportation Agencies

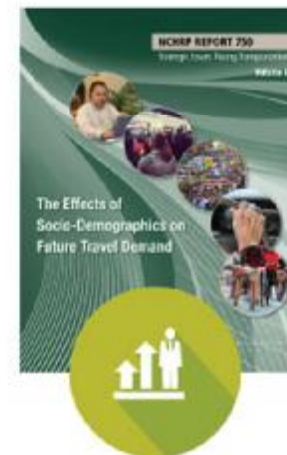
Organize transportation agencies to support a sustainable society.



VOLUME 5: ENERGY

Preparing State Transportation Agencies for an Uncertain Energy Future

Identify and assess strategic responses to a variety of future energy scenarios.



VOLUME 6: SOCIO- DEMOGRAPHICS

The Effects of Socio-Demographics on Future Travel Demand

Envision and model the transportation impacts of shifting demographics.

NCFRP Report 30

Making U.S. Ports Resilient as Part of Extended Intermodal Supply Chains (2014)

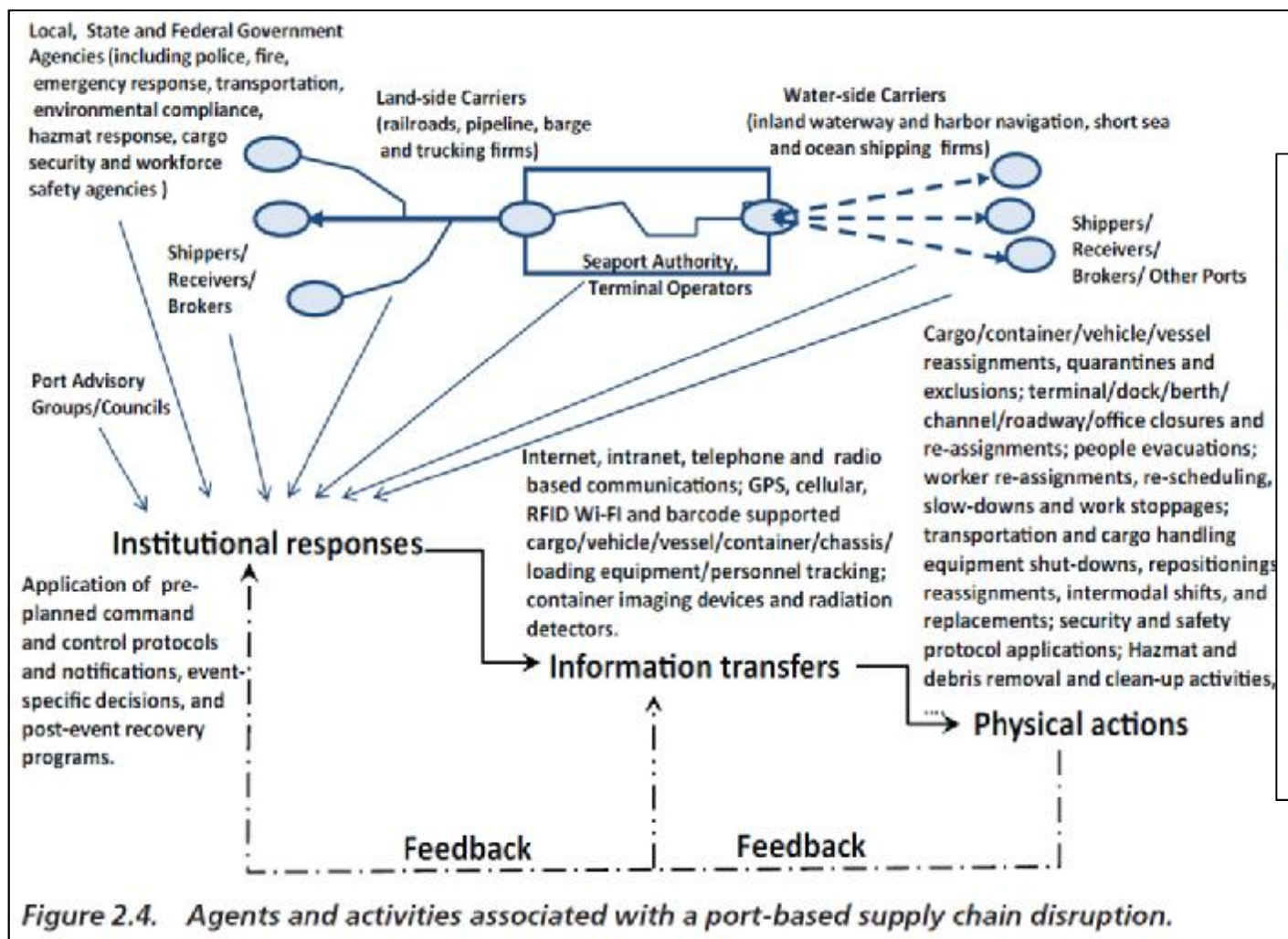
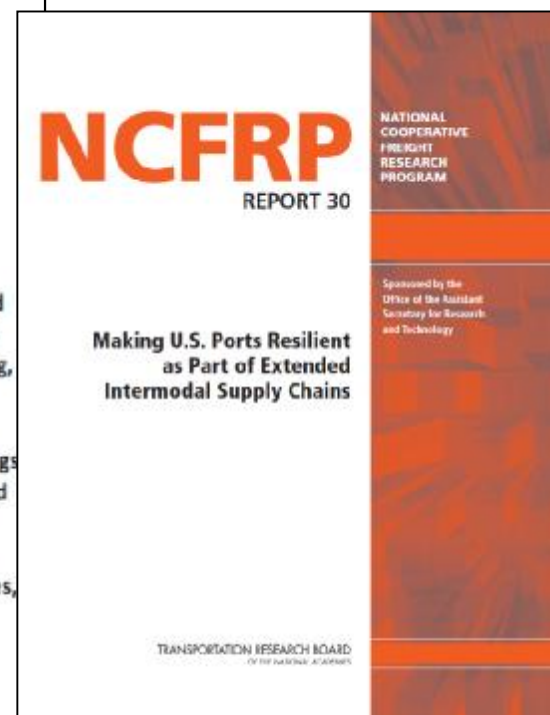


Figure 2.4. Agents and activities associated with a port-based supply chain disruption.



TCRP Project A-41 (2017)

Improving the Resiliency of Transit Systems Threatened by Natural Disasters

The objectives of this research are to develop (1) a **handbook** with an associated suite of digital presentation materials to address planning principles, guidelines (including metrics), strategies, tools, and techniques to enable public transit systems to become more resilient to natural disasters and climatic events; and (2) a **draft recommended practice** for public transit resilience to natural disasters and climatic events suitable as input to the APTA Standards Program. The handbook and its associated suite of digital presentation materials should be appropriately designed for use by public transit agency executive staff to plan, budget, and institutionalize effective practices to improve resilience, addressing (a) capital project planning and asset management (including financial planning and risk assessment for natural disasters and climatic events), (b) operations and maintenance, and (c) administration. They should provide sufficient detail to allow users to adapt them to their individual entities.

NCHRP Project 20-101 (2017)

Guidelines to Incorporate the Costs and Benefits of Adaptation Measures in Preparation for Extreme Weather Events and Climate Change

The objectives of this research are to develop (a) a stand-alone document providing **guidance** for practitioners on methods and tools, including illustrative case studies where applicable, to: (i) efficiently mine, manage, and document existing data sources; (ii) acquire and use data from new and innovative sources; and (iii) apply, and communicate the results from, a flexible and scalable framework for analyzing the costs and benefits of adaptation measures in preparation for extreme weather events and climate change conducted by various transportation organizations; (b) a **final report** that documents the entire research effort and includes the research team's recommendation of research needs and priorities for additional related research; and (c) an updated PowerPoint **presentation** describing the research and results suitable (upon revision) for posting on the TRB website.

ACRP Project 2-74 (2018)

Integrating Climate Resiliency into Airport Management Systems

The objective of this research is to develop a **handbook** incorporating climate adaptation into airport asset, risk, and emergency management systems.

Airports need a streamlined method to address climate vulnerability and planning as a part of risk and asset management and a way to align emergency planning with major climate related events. A quantification of risk factors, including airport and regional economic impact, can help inform asset management plans, emergency plans, and capital plans. Research is needed to help airports understand how climate risks add uncertainty to maintenance and capital budgets, and how this exposure can be mitigated and addressed through changes to airport asset management and capital planning.

NCHRP Project 15-61 (2018)

Applying and Adapting Climate Change Models to Hydraulic Design Procedures

The objectives of this research are to: (1) identify the needed levels of precision, accuracy, and confidence for climate models to be compatible with that of the data used in current hydrologic/hydraulic analysis and design techniques, identify downscaling strategies to move climate models closer towards these levels of precision, accuracy, and confidence, and develop science-based strategies and methodologies to advance engineering in extending climate predictions when the limits of downscaling of climate models are reached; (2) identify and quantify resiliency in existing hydraulic design practices due to current safety factors and conservative assumptions/techniques; and (3) identify cost-effective adaptation solutions that extend existing infrastructure to continue to function to the end of its service life despite not having been designed for climate change. An outcome of this research will be a **guidance** document with a list of available and achievable hydraulic resiliency in design for retrofits.

Criteria for Selecting TRB “Hot Topics”

- Identified in TRB *Critical Issues in Transportation*
- Timely
- Sustainable
- Diverse
- Key to helping to achieve multiple TRB strategic objectives

TRB Hot Topic: Transformational Technologies

*Transformational, or “disruptive” technologies, are those that can be expected **to completely displace the status quo**, forever changing the way we live and work.*

- General examples: internet, personal computer, email, smartphone, GPS, big data
- Transportation: Connected/automated vehicles, shared vehicles, advanced versions of on-demand shared ride and micro-transit services, NextGen, cog in “internet-of-things”

TRB Hot Topic: Resilience

Resilience is the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.

- Natural disasters: blizzards, tornadoes, floods, hurricanes, wildfires, heat waves, earthquakes, and other natural hazards
- Human-induced disasters: acts of terrorism, financial crises, social unrest, cyber attacks

TRB Hot Topic: Transportation and Public Health

*All aspects of public health that affect,
or are affected by, transportation*

- Public health impacts on transportation: public health laws and policies, medical advances, aging population
- Transportation impacts on health: crash fatalities and injuries, access to health care, emergency response, active transportation, transportation-induced pollution, accessibility for people with transportation disabilities

TRB Annual Meeting 1920s



TRB Today

- Manage Research
- Delivering Policy Analysis & Advice
- Information Exchange: Meetings, Publications, Website, Dissemination, Outreach



TRB Sponsors

- American Public Transportation Association
- Association of American Railroads
- State Departments of Transportation (All)
- South Coast Air Quality Management District
- U.S. Army Corps of Engineers
- U.S. Air Force Civil Engineering Center
- U.S. Coast Guard
- U.S. DOT: OST, FHWA, FTA, FRA, FMCSA, FAA

Research Management Cooperative Research Programs

- Highway
- Transit
- Airport
- Freight
- Hazardous Materials
- Rail

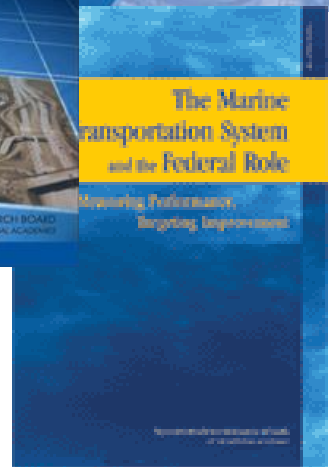
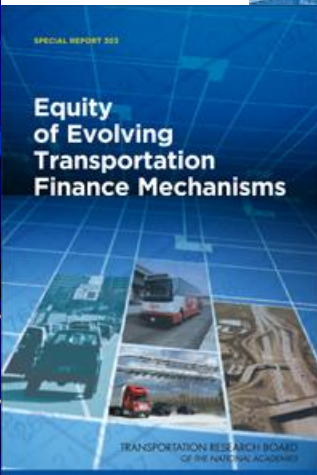
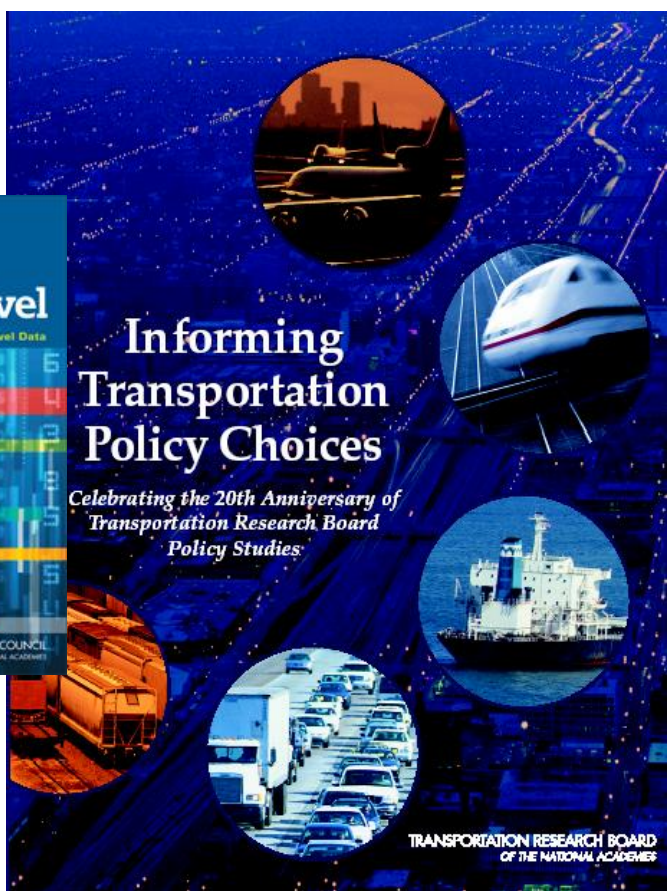
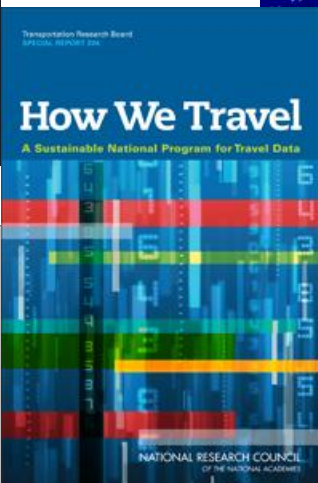
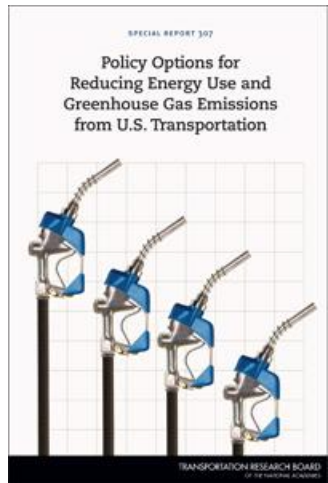
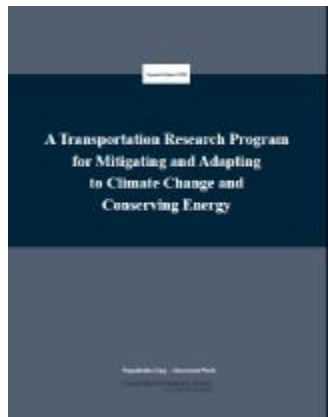


Characteristics of Cooperative Research Programs

- Sponsors own programs
- Practitioners select projects
- Emphasis on solving problems; short-term results
- Panels oversee each project
- Consultants, universities conduct research
- 200+ reports each year



Policy Analysis and Advice



TRB Convening Events and Standing Committees



TRB “Professional Society” Functions

- 200 Standing Technical Committees – about 4,000+ people
- Constitute communities of interest
- Identify research needs
- Sponsor sessions, conferences, and meetings – 50+ events in addition to Annual Meeting
- Review and publish papers and reports
- Share information

TRB Annual Meeting Today



TRB Annual Meeting Events

- 750 workshops & sessions
- 5,000 technical papers and presentations
- 500 TRB committee meetings
- 150+ other meetings by affiliated groups



TRB NEWS

[2017 TRB Annual Meeting: Papers Due August 1, 2016](#)

TRB is accepting papers for consideration as part of the program for the [96th TRB Annual Meeting](#), January 8–12, 2017, in Washington, D.C., and for publication in the *Transportation Research Record: Journal of the Transportation Research Board (TRR)*. All papers—whether for presentation at the 2016 TRB Annual Meeting or publication in the TRR—must...

[International Conference on Demand Responsive Transportation: Early Bird Registration Expires July 29](#)

TRB is sponsoring the International Conference on Demand Responsive Transportation on September 26–28, 2016 in Breckenridge, Colorado. Register by July 29, 2016 to qualify for Early Bird Registration rates. The conference will provide an opportunity for paratransit professionals from around world to discuss ideas and trends in the areas of...

[15th International Conference on Managed Lanes - PowerPoint Presentations Available](#)

TRB is sponsoring the 15th International Conference on Managed Lanes from May 4–6, 2016 in Miami, Florida. The workshop will explore planning, design, and operations of managed lanes as well as emerging research needs related to integrating managed lanes into the transportation system. [PowerPoint presentations](#) are now available.

[TRB Webinar: Controlling Corrosion of Infrastructure Systems](#)

TRB will conduct a webinar on Thursday, August 4, 2016 from 2:00PM to 3:30PM ET that discusses corrosion control. Corrosion poses a risk to public safety and the environment; the annual direct cost of corrosion in the United States is estimated to be more than 3 percent of national GDP. This webinar will help engineers bridge the gap between...

[TRB Webinar: The Evolving Surface Transportation Operations and Maintenance Workforce: Challenges and Opportunities](#)

TRB will conduct a webinar on Thursday, August 18, 2016 from 1:00PM to 2:30PM ET that focuses on the rapid changes in the surface transportation maintenance and operations workforce. Factors such as increasing retirement rates, downsizing staff, recruiting and retaining qualified employees, shifting responsibilities, and expanding the use of...

[TRB Webinar: Moisture and Compaction Measurement during Unbound Aggregate](#)

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96th Annual Meeting

January 8–12, 2017 • Washington, D.C.

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TRB Research Databases



What is TRID?

Available for Free at trid.trb.org

The Transportation Research International Documentation (TRID) Database is the **world's largest, most comprehensive bibliographic resource** on published and ongoing transportation research. TRID contains more than 1.1 million records with 200,000+ links to free and fee-based full text.

Produced and maintained by TRB

What is in TRID (trid.trb.org)?

- Federal and state department of transportation reports
- Ongoing, recently completed, or soon-to-start transportation research projects
- TRB publications back to 1920
- University Transportation Centers reports
- Commercial and academic journal literature
- Monographs

TRID also includes international research: the ITRD Database (Europe), the ATRI Database (Australia and New Zealand), and select records from the J-STAGE Database (Japan).

Benefits of Using TRID

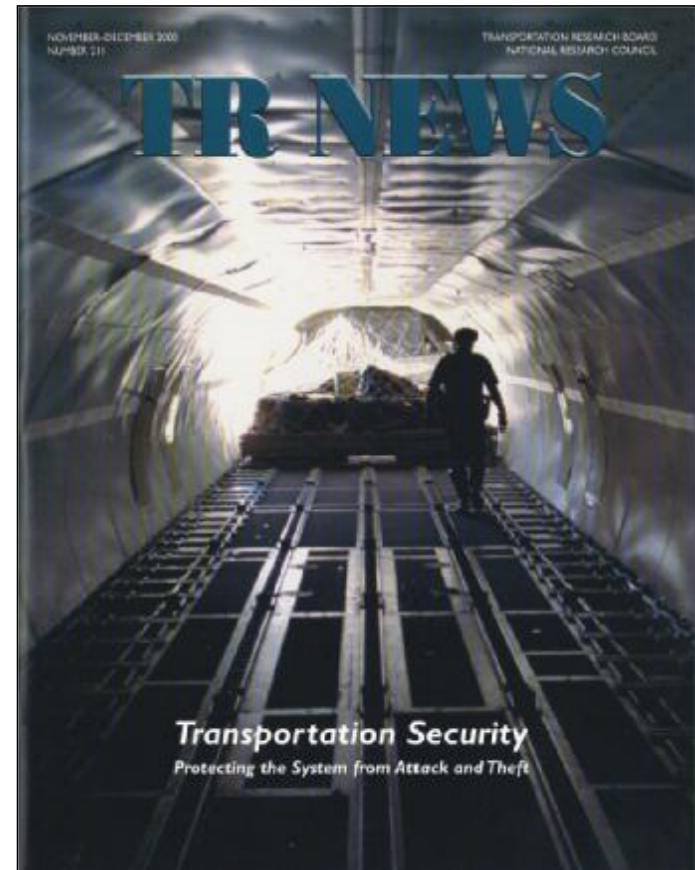
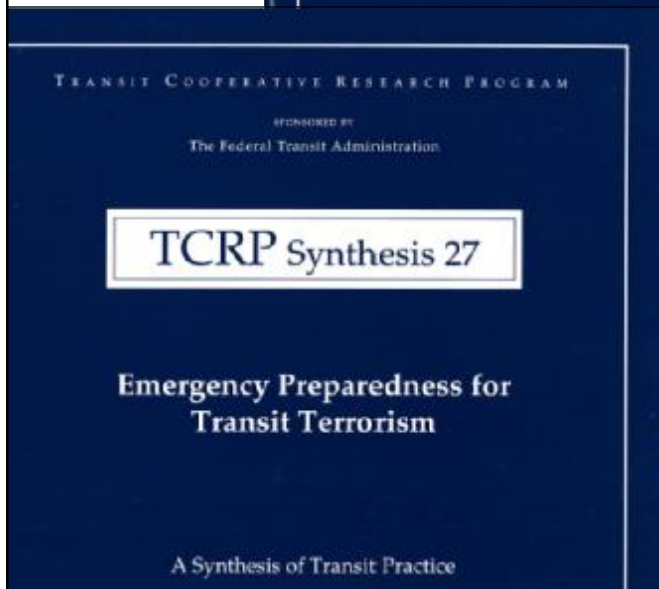
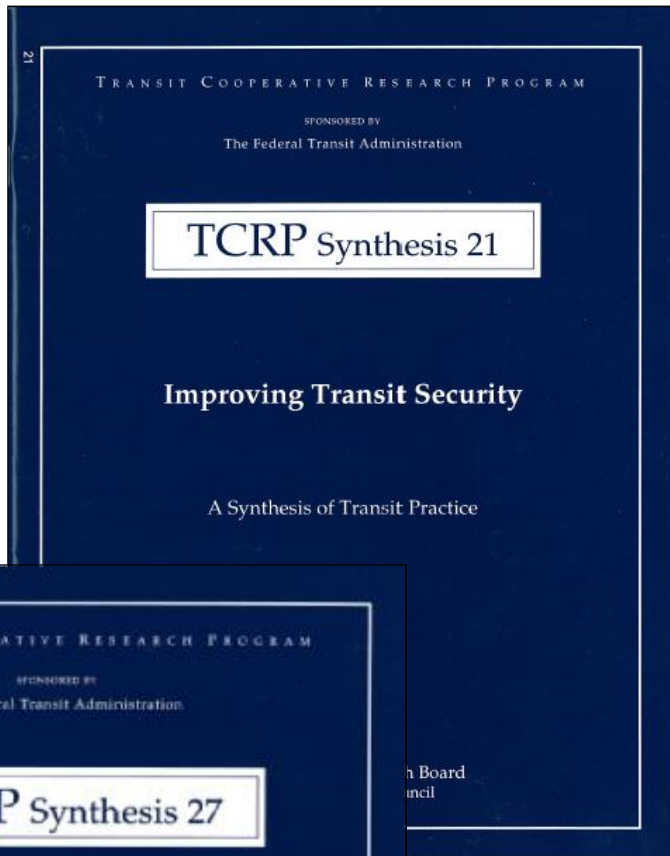
- Locate solutions to problems
- Avoid duplication of work and save resources
- Encourage and facilitate cooperation and partnership
- Identify practitioners and experts in specific research areas

Please contact the TRB Library (TRBLibrary@nas.edu) with questions about using TRID.

Cooperative Research Programs

TRB Publications in 1997 & 2000 - Security and Terrorism

- Improving Transit Security (1997)
- Emergency Preparedness for Transit Terrorism (1997)



November-December 2000, TR News 211
Transportation Security: Protecting the System from Attack and Theft



TRANSPORTATION RESEARCH BOARD

2002 APTA/FTA Transit Security Workshops

APTA/FTA Transit Security Workshops

January 2002 – May 2002

1. New York City
2. San Francisco, California
3. Atlanta, Georgia
4. Chicago, Illinois

CONTRACTOR'S REPORT ON THE 2002 APTA/FTA SECURITY WORKSHOPS

NEW YORK CITY
SAN FRANCISCO
ATLANTA
CHICAGO

Requested by:

American Public Transportation Association

Executive Committee Security Task Force

Prepared by:

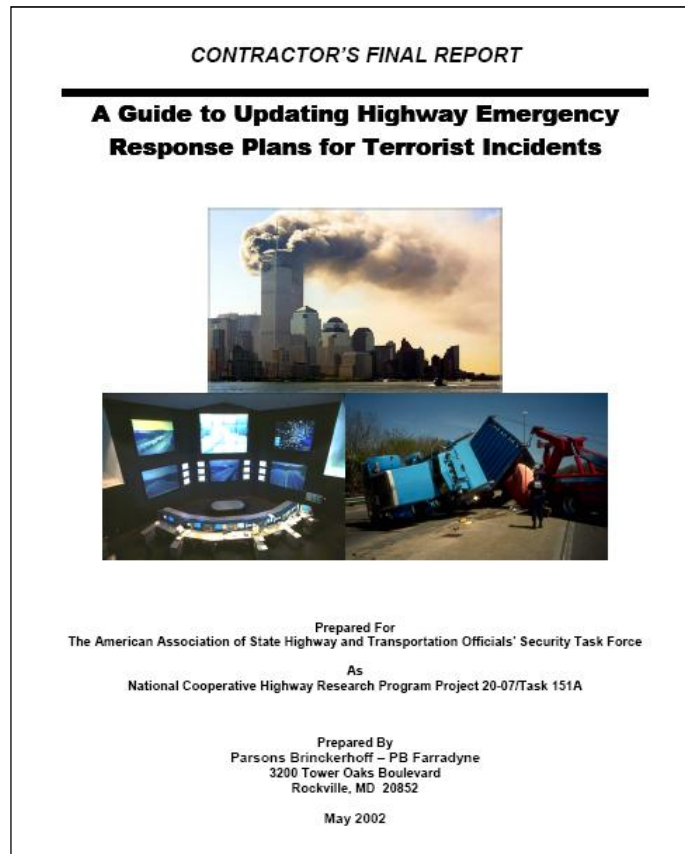
Nicholas J. Bahr
Booz | Allen | Hamilton
8283 Greensboro Drive
McLean, Virginia 22102-3838

DECEMBER 11, 2002

The information contained in this report was prepared as part of TCRP Project J-10, Task J-10 (1),
Transit Cooperative Research Program, Transportation Research Board

APTA International Transit Security Workshop September 2002 –
Leads to Transit Security Exchange Plans

A Guide to Updating Highway Emergency Response Plans for Terrorist Incidents available May 2002



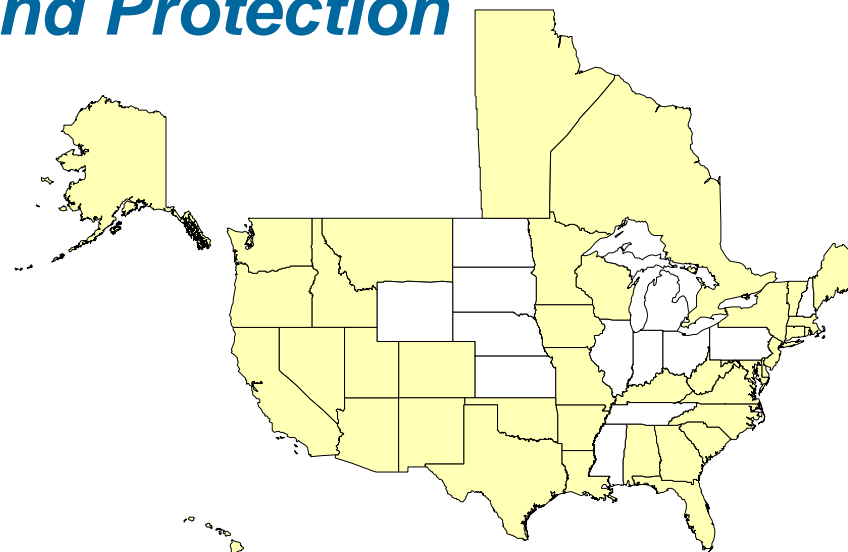
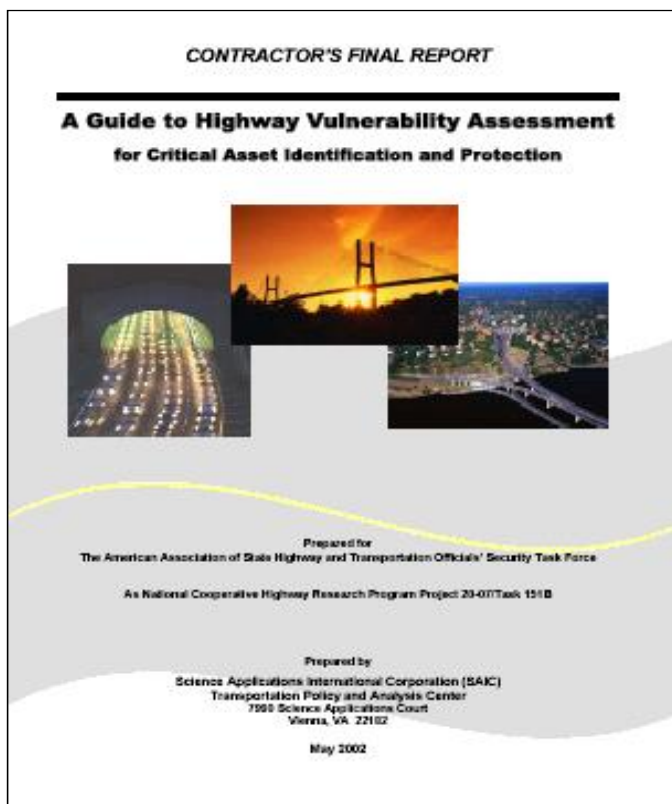
Emergency Transportation
Operations Preparedness
& Response Workshops
For Statewide Applications

June – November 2003

1. New Mexico
2. Minnesota
3. Washington
4. Idaho

<http://security.transportation.org/sites/security/docs/guide-ResponsePlans.pdf>

A Guide to Highway Vulnerability Assessment for Critical Asset Identification and Protection



Bridge/Tunnel/Highway Infrastructure Vulnerability Workshop Attendees February-March 2003

1. Sacramento, California
2. Albany, New York
3. Austin, Texas

http://security.transportation.org/sites/security/docs/guide-VA_FinalReport.pdf
http://security.transportation.org/sites/security/docs/guide-VA_Appendices.pdf

DOT-FTA-MA-26-5019-03-01
DOT-VNTSC-FTA-03-01



The Public Transportation System Security and Emergency Preparedness Planning Guide

U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National Transportation Systems Center
Cambridge, Massachusetts 02142-1093

January 2003
Final Report



FEDERAL TRANSIT ADMINISTRATION

The Public Transportation System Security and Emergency Preparedness Planning Guide (2003)

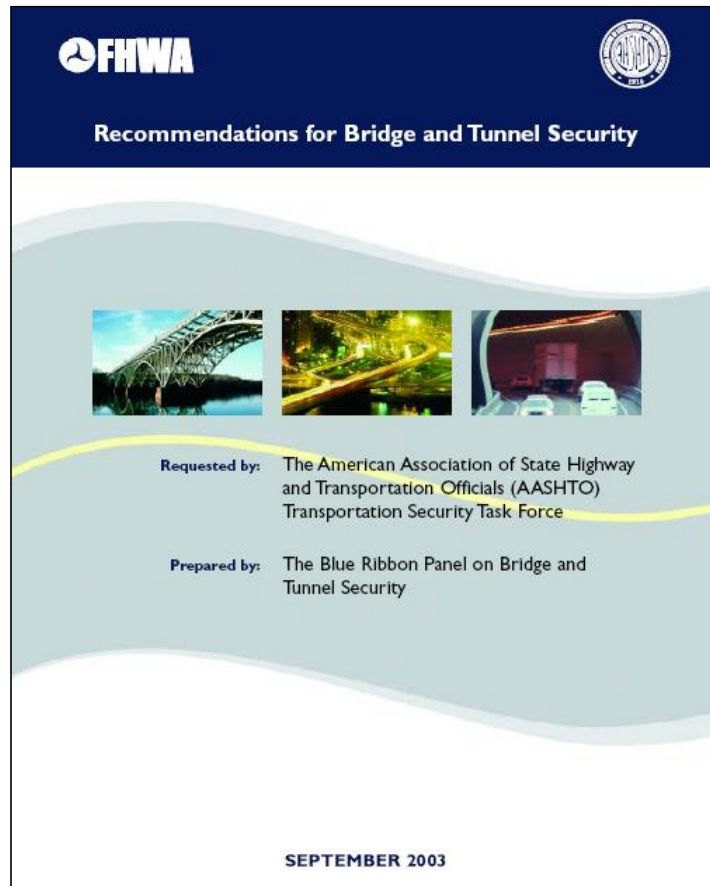
Table 1: Program of Commitments

COMMIT to a program that enables the public transportation system to:

- ⇒ **PREVENT** incidents within its control and responsibility, effectively protect critical assets;
- ⇒ **RESPOND** decisively to events that cannot be prevented, mitigate loss, and protect employees, passengers, and emergency responders;
- ⇒ **SUPPORT** response to events that impact local communities, integrating equipment and capabilities seamlessly into the total effort; and
- ⇒ **RECOVER** from major events, taking full advantage of available resources and programs.

<http://www.transit-safety.volpe.dot.gov/Publications/security/PlanningGuide.pdf>

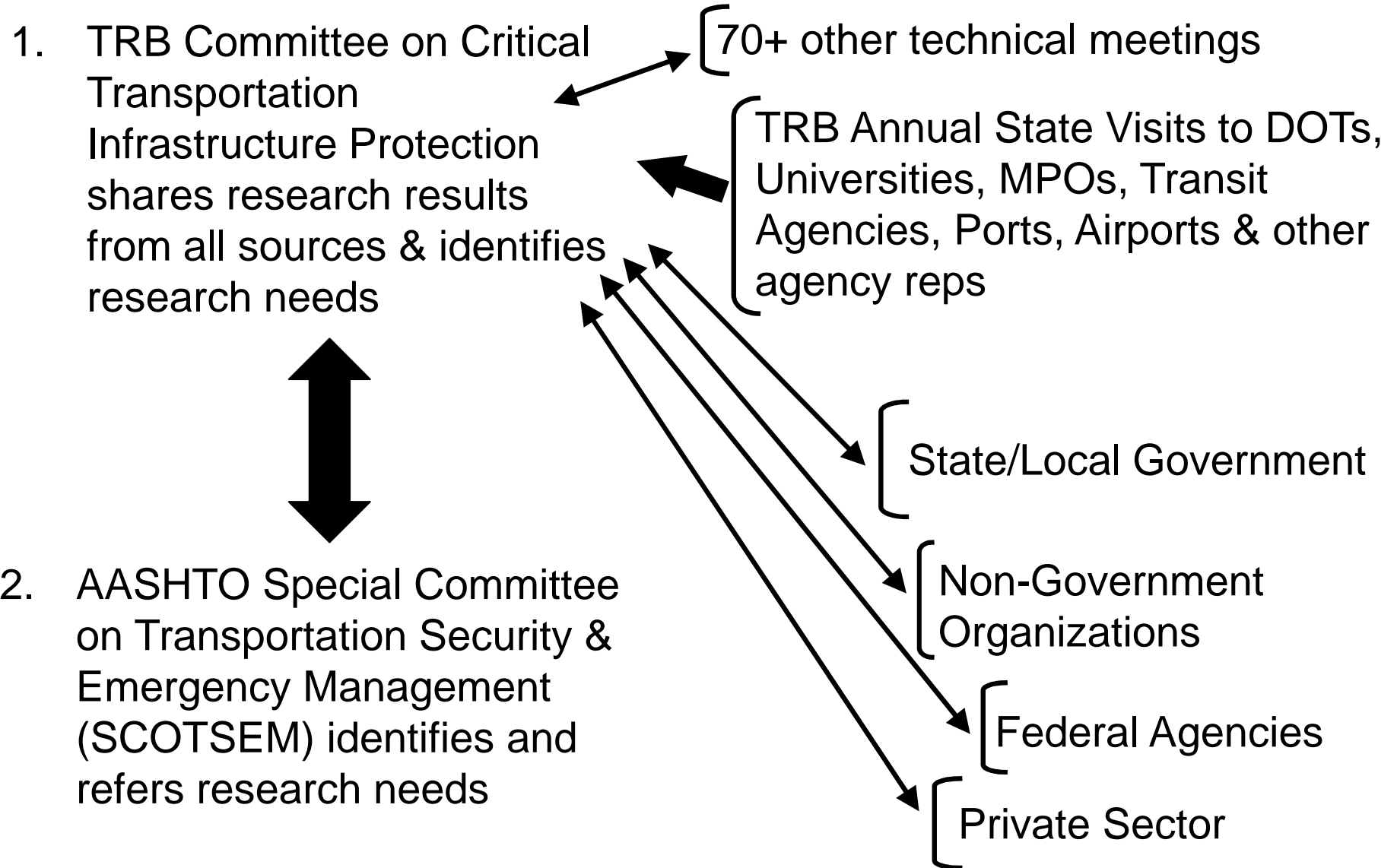
Recommendations for Bridge and Tunnel Security (2003)



“Blue Ribbon Panel on Bridge and Tunnel Security” report presented institutional, fiscal, and technical recommendations

<http://www.fhwa.dot.gov/bridge/security/brpcover.htm>
http://trb.org/news/blurb_detail.asp?id=1872

Identification of R&D Gaps & Needs



TCRP Report 86 Series Guides on Transit Security

- 1 Communication of Threats
- 2 K9 Units
- 3 Robotic Devices
- 4 Intrusion Detection
- 5 Customer Communications and Training
- 6 Portable Explosive Detection Devices
- 7 Security Awareness for Employees**
- 8 Continuity of Operations Planning**
- 9 Emergency Drills and Exercises**
- 10 Hazard and Security Plan Workshop
- 11 Security Measures for Ferry Systems
- 12 Tunnel Security Countermeasures**
- 13 Passenger Security Inspections

NCHRP Report 525 Series

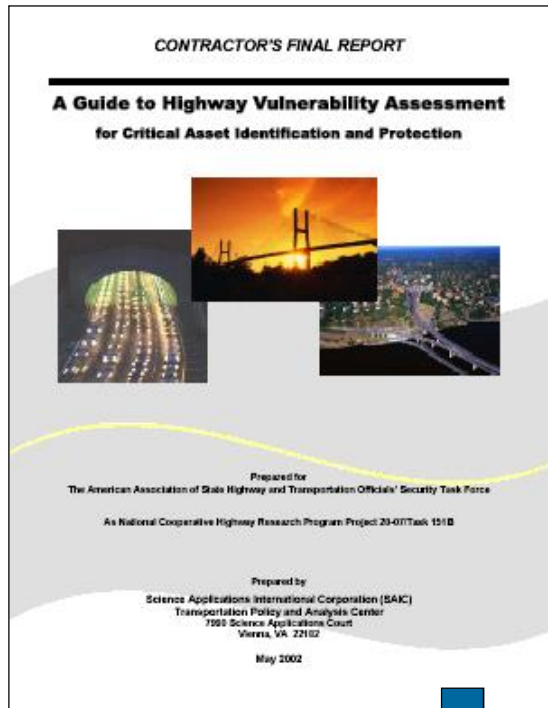
Guides on Surface Transportation Security

- 1 Responding to Threats
- 2 Information Sharing and Analysis
- 3 Incorporating Security into Planning
- 4 Terrorism-Related Risk Management
- 5 Managing Sensitive Information
- 6 Emergency Operations
- 7 Security Awareness for Employees
- 8 Continuity of Operations Planning
- 9 Emergency Drills and Exercises
- 10 Public Health Disasters
- 11 Disruption Impact Estimation
- 12 Tunnel Security Countermeasures
- 13 Traffic Control for Agricultural Emergencies
- 14 Physical Security Primer**
- 15 Costing Asset Protection**
- 16 Emergency Response Planning**



Risk-Informed Decision Support

Continuous Development of Risk Management and Emergency Response Planning Guidance

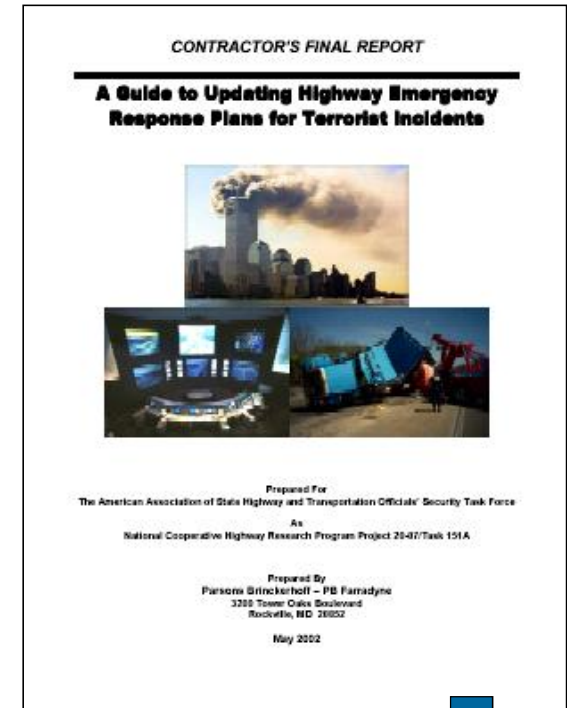


2002: Guides to Vulnerability Assessment & Emergency Response Planning

2002-2003: workshops

2004-2005: publications that anticipated NIMS, NRP/NRF, and NIPP.

2012: publications adopted by AASHTO



Published 2009:



NCHRP Report 525, Vol. 14

Security 101: A Physical Security Primer for Transportation Agencies

Published 2010:

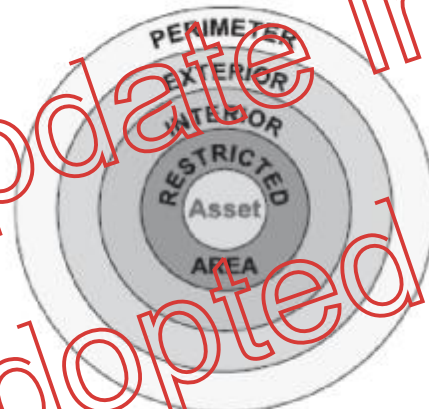
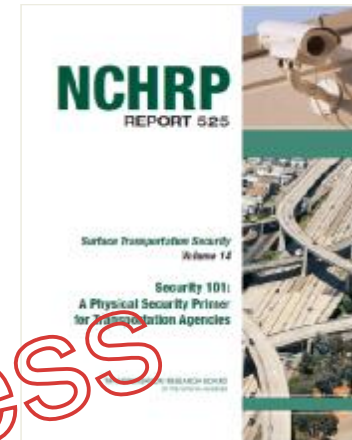


NCHRP Report 525, Vol. 16

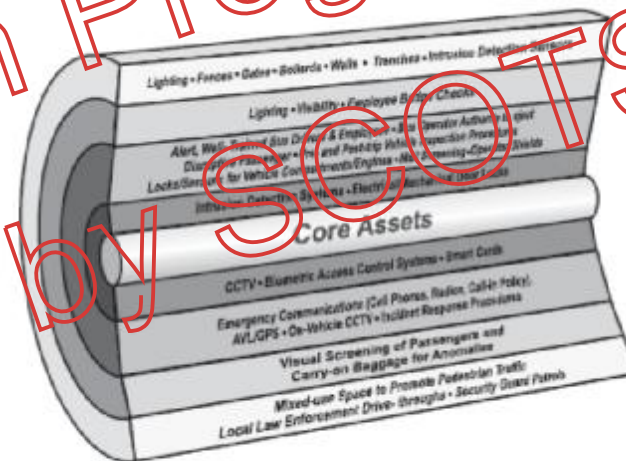
A Guide to Emergency Response Planning at State Transportation Agencies

Security 101: A Physical Security Primer for Transportation Agencies (2009)

- Chapter 1: Risk Management and Risk Assessment
- Chapter 2: Plans and Strategies
- Chapter 3: Physical Security Measures
- Chapter 4: Security Personnel and Training
- Chapter 5: Infrastructure Protection
- Chapter 6: Homeland Security



Source: FTA Security Design Considerations, 2004
Figure 3-2. Layers of security.



Update in Progress
Adopted by SCOTSEM

NCHRP Web-Only Document 221/ TCRP Web-Only Document 67
***Effective Practices for the
Protection of Transportation Infrastructure
from Cyber Incidents (December 2015)***

Objective: develop (1) a primer and (2) a briefing for transportation system owners and operators explaining the nature of cyber events and their operational and safety impacts. These products contain a list of effective practices that can be used to protect transportation systems from cyber events and to mitigate damage should an attack or breach occur.

NCHRP Report 525, Volume 16
***A Guide to Emergency Response Planning
at State Transportation Agencies (2010)***

Guide

- Summary
- Overview for state transportation agencies (authorities, etc.)
- High-level requirements based on national policies and guidelines
- High-level self-assessment with pointers

Section 6: Resource Guide

- Organizational/staffing/position guidance
- Decision-making sequences
- Detailed self-assessment and resource lists



Costing Asset Protection: An All Hazards Guide for Transportation Agencies (CAPTA, 2009)

Application Context

- Top-down, program level – to support resource allocation
- Consequence-driven – based on user-selected thresholds (“possibilistic”)
- Iterative – use to compare/refine assumptions

Model Attributes

- Objective – when possible use data rather than “best judgment”
- Transparent – avoid “weighting and rating”
- Consistent – uses simple, available data and criteria, standard data base, default values
- Replicable – identify basis of all judgments

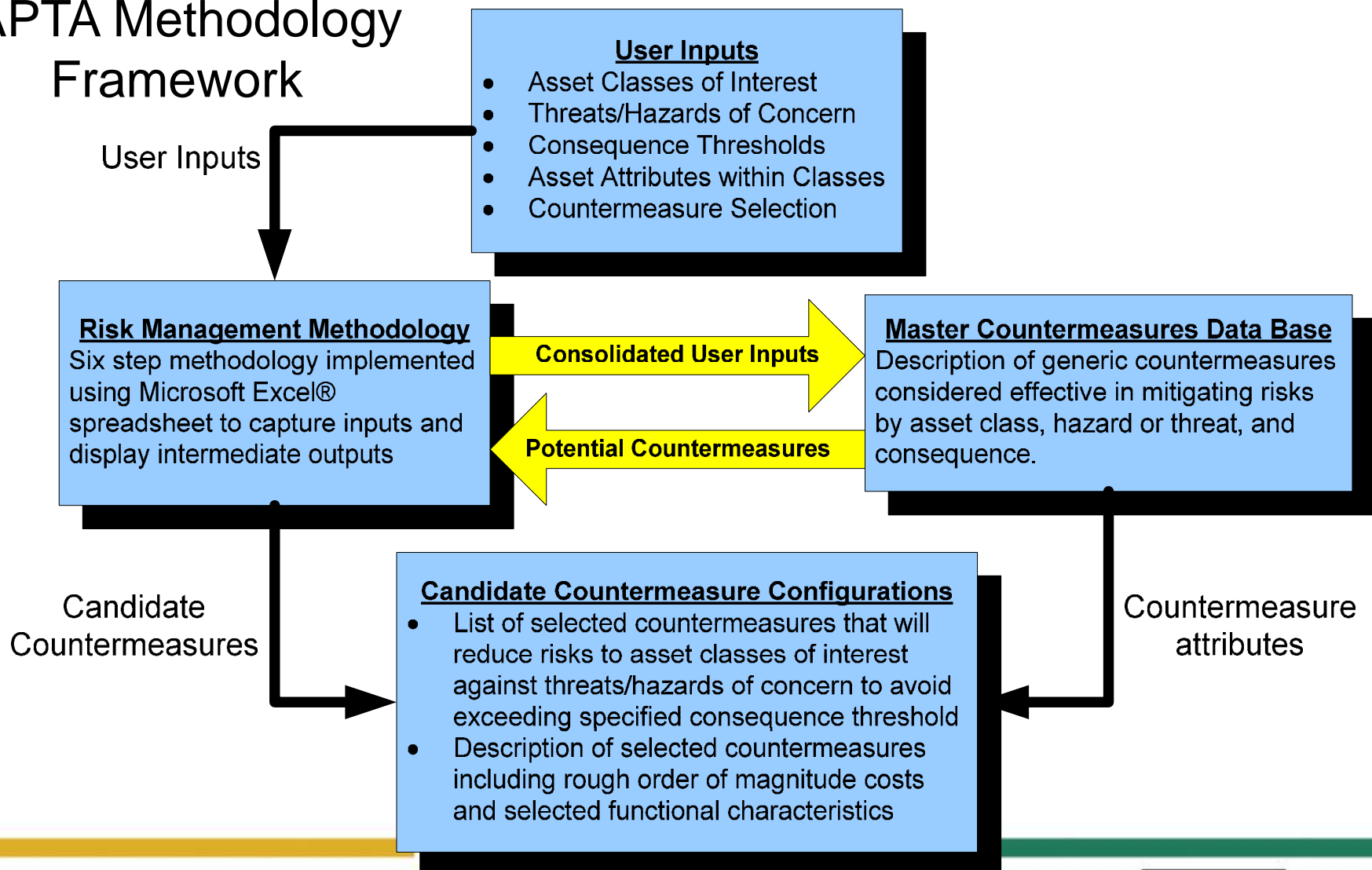
User Features

- Convenient – uses available resources (people and software) and imbedded data model
- Scalable – support a range of user contexts, mode, hazards,
- Expandable – to accommodate new threats/hazards, asset types, and countermeasures

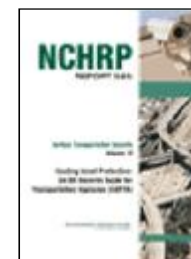
Update in Progress

Costing Asset Protection: An All Hazards Guide for Transportation Agencies (CAPTA, 2009)

CAPTA Methodology Framework



Costing Asset Protection: An All Hazards Guide for Transportation Agencies (CAPTA, 2009)



Basic CAPTA	Steps in Methodology	Expanded CAPTA
1	Identify Relevant Risks and Asset Classes	1
	Verify High Consequence Threats and Hazards	1a
2	Establish Consequence Thresholds	2
3	Describe Infrastructure Assets	3
4	Identify Critical Assets Across Modes	4
	Review Countermeasure Unit Costs	5a
	Identify and Describe Additional Countermeasures	5b
	Set Countermeasure Filters based on User Preference	5c
5	Select Candidate Countermeasures	5
6	Summary Report	6

Costing Asset Protection: An All Hazards Guide for Transportation Agencies (CAPTA, 2009)

- ① — ② — ③ — ④ — ⑤ — ⑥ Basic CAPTool
- ① — ①a — ② — ③ — ④ — ⑤a — ⑤b — ⑥ — ⑤ — ⑥ Expanded CAPTool

Select Candidate Countermeasures Instructions

The following is a list of countermeasure opportunities for each critical asset -- orange indicates medium effectiveness and red indicates high effectiveness.

To analyze an asset more closely, click on the name of the asset in row 15, and then click "Analyze Asset." A new sheet will pop up that details the effectiveness of the countermeasure against every relevant threat and hazard. The sheet will also tell you how many units of countermeasures you have selected so far for the asset, and the estimated cost.

To add units of countermeasures, enter the desired number of units into any cell. Alternatively, the "Analyze Asset" sheet also has a field for adding units of countermeasures.

When you are satisfied with your CM allocation, click "Continue."

Analyze Asset

Filter Countermeasures

Clear All Countermeasure Quantities

Next

Color Key

Medium Effectiveness	High Effectiveness
----------------------	--------------------

		Road Bridges	Road Tunnels	Transit/Rail Station																
		Covered Bridge	State Line Bridge	Veteran's Bridge	Downtown Tunnel	Uptown Tunnel	Midtown Tunnel	North Station	South Station	Bay Station	Downtown Station	Market Street Station	Park Street Station	Government Center Station	State Street Station	City Center Station	Suburban Station	Airport Station	All other aboveground	All other belowground
		Quantity of Named Asset			→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Physical Security Countermeasures	Lighting																			
	Barrier Systems																			
	Fences																			
	CCTV																			
	Intrusion Detection Devices																			
Access Control Countermeasures	Physical Inspection of Asset																			
	ID Cards																			
	Biometrics																			
	Background Checks																			
	Metal Detectors																			
Asset Design/Engineering	Restricted Access																			
	Random Inspections																			
	Visible Limited Access																			
	Locks																			
	Explosion-Resistant Structures																			
Operational Countermeasures	Visible Security																			
	Seismic Mitigation																			
	Fire Detection & Suppression																			
	Encasement, Wrapping, Jacketing																			
	Patrols																			
WX/Seismic Information																				
Intelligence Networking																				
HAZMAT Mitigation																				
Security Awareness Training																				
Emergency Response Training																				
Emergency Evacuation Planning																				
Planned Redundancy (e.g., detours)																				
Public Information and Dissemination																				

Description of this step & instructions

Step indicators

Reset Buttons

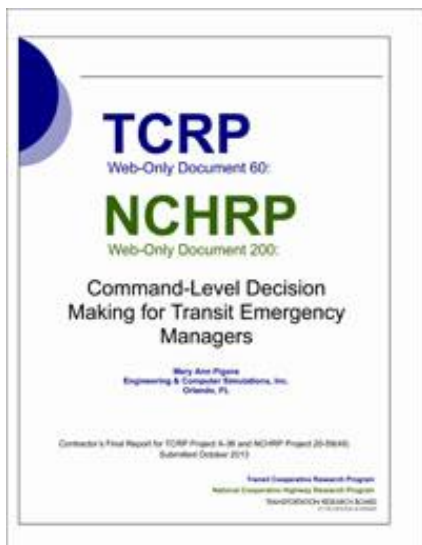
User Options

Color code key

TCRP Web-Only Document 60 / NCHRP Web-Only Document 200

Command-Level Decision Making For Transit Emergency Managers (2014)

Objective: develop a scenario-based training system compliant with federal standards (e.g., the National Incident Management System and the Homeland Security Exercise Evaluation Program) and relevant transit industry standards and regulations. It is anticipated that the training system will be delivered through an automated, functional exercise simulation system capable of providing on-demand emergency response training and exercises.



TCRP Project A-36 / NCHRP Project 20-59(49) / ACRP Project 4-04 Command-Level Decision Making For Transportation (2017)

Initiate the Incident Briefing Form (ICS Form 201)

Relay information from damage report

Schedule a Planning Meeting

Action

Assess

Our office has been told unofficially that some Guardsmen were at a meeting in the Federal building when the bomb went off. We may have some casualties of our own. Do we need to take any action on this?

Check all of the boxes that apply.

- This is a CCR.
- Get the names of the people at the meeting and arrange a press release announcing the fatalities.
- No, it's probably just a rumor. We should wait until things settle down.
- Yes, get with personnel to see if we can confirm and find out who was at the meeting.

Reply Goodbye

Consequences

	Created By	Sensitivity
Hotwash	TRB	For Official Use Only
ICS Form 202	TRB	For Official Use Only
ICS Form 203	TRB	For Official Use Only
ICS Form 204	TRB	For Official Use Only
ICS Form 206	TRB	For Official Use Only
ICS Form 205A	TRB	For Official Use Only
ICS Form 206	TRB	For Official Use Only
ICS Form 207	TRB	For Official Use Only

NCHRP Web-Only Document 215

Incident Command System (ICS) Training for Field Level Transportation Supervisors and Staff (December 2015)

NIMS/ICS: Perform Reliably & Effectively

- Goal of NIMS/ICS: Reliable and effective response to an event, emphasizing safety of DOT staff
- Achieved through
 - Safety
 - Check-in, check out, demobilization
 - Personnel accountability
 - Food, shelter, family contacts
 - Reimbursement
 - The job you save may be your own
 - MAP-21 changes, debris removal reimbursement



Check-In, Check-Out, and Demobilization at ICP



NCHRP Report 525, Vol. 2

Information Sharing and Analysis Centers: Overview and Supporting Software Features (2004)

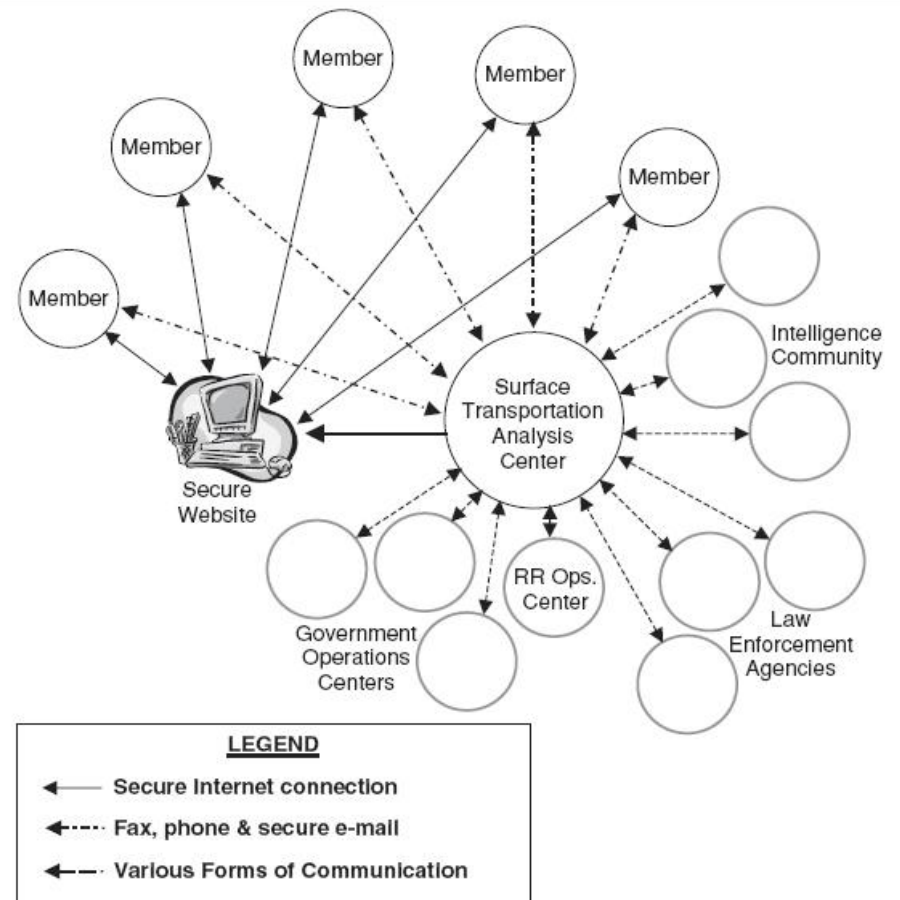
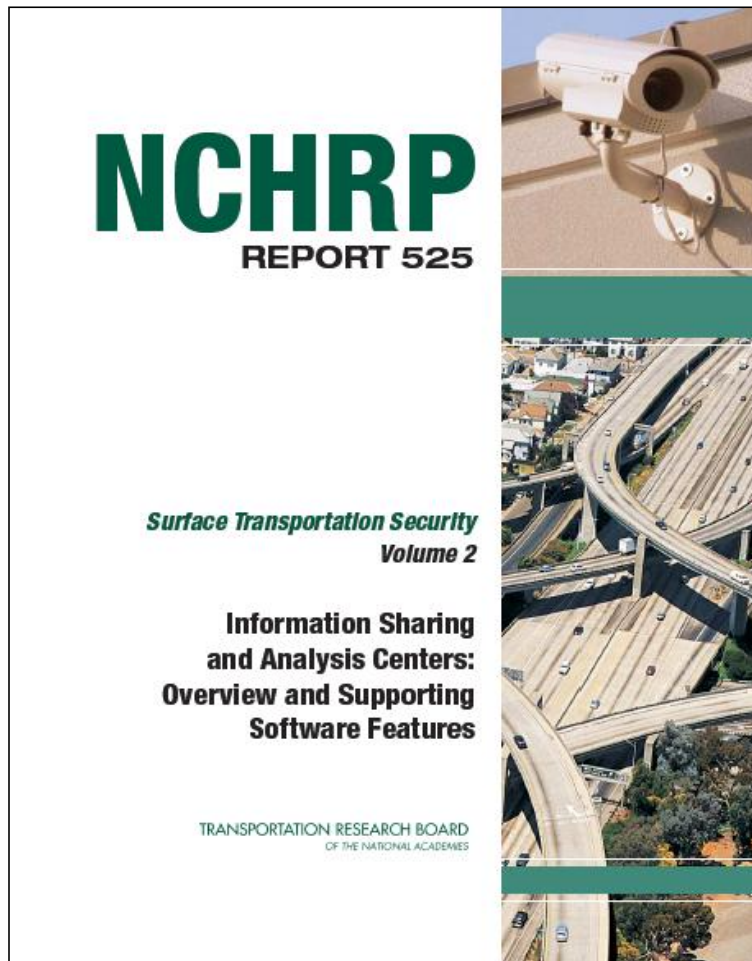
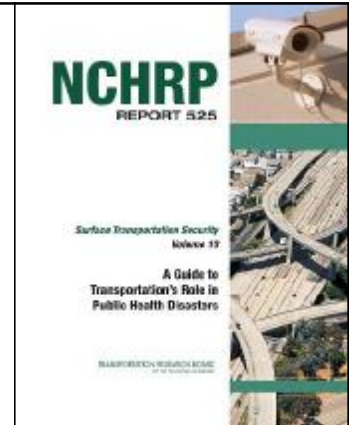


FIGURE 6: TYPICAL ST-ISAC INFORMATION PATHWAYS

NCHRP Report 525, Vol. 10 *A Guide to Transportation's Role in Public Health Disasters (2006)*

- Transportation response options to an extreme event with chemical, biological, or radiological agents
- Focuses on the effect and role of transportation
- Applicable to all civilian sites (not just transportation sites)



TERET (Tracking Emergency Response Effects on Transportation) – Spreadsheet Layout

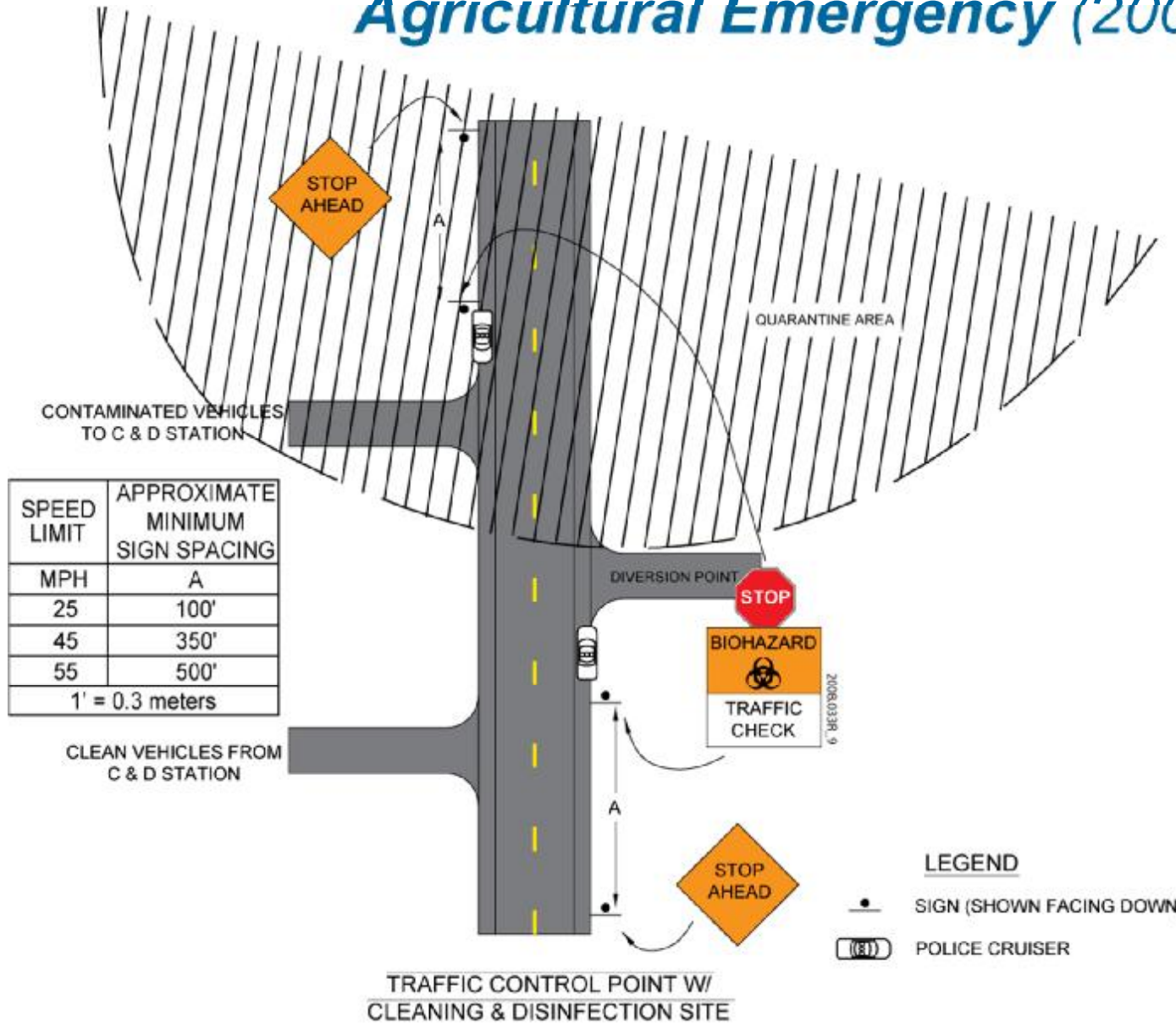
Sheet 1: Introduction
Provides summary instructions

Sheet 3: Mass Care
Assess needs during shelter-in-place, temporary shelters, or quarantine shelter.

Sheet 2: Basic Services
Assess criticalities that may develop from ER changes in traffic patterns.

NCHRP Report 525, Vol. 13

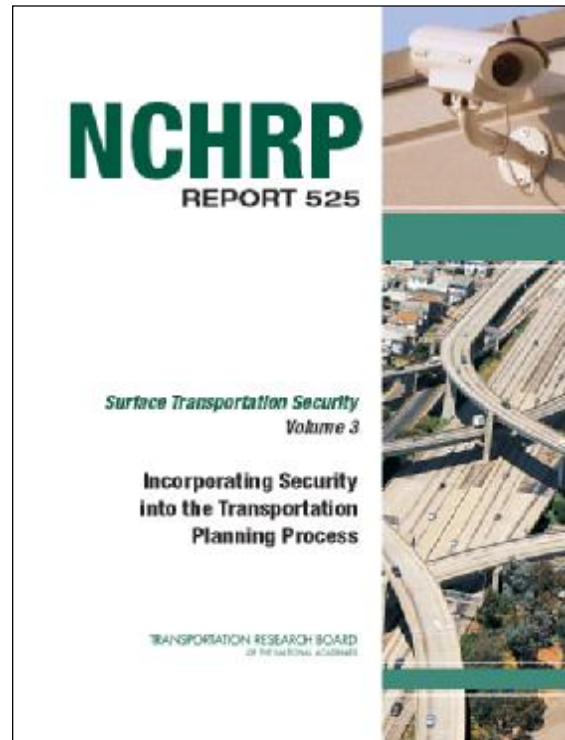
A Guide to Traffic Control of Rural Roads in an Agricultural Emergency (2008)



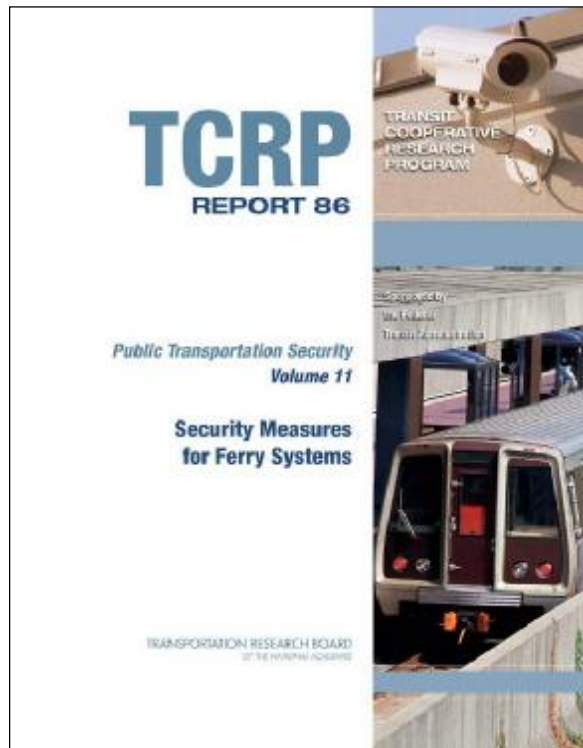
- LEGEND**
- SIGN (SHOWN FACING DOWN)
 - (81) POLICE CRUISER



NCHRP Report 525, Vol. 3
***Incorporating Security Into the Transportation
Planning Process (2005)***



TCRP Report 86, Vol. 11
Security Measures for Ferry Systems (2006)



ACRP Report 5

Quarantine Facilities for Arriving Air Travelers: Identification of Planning Needs and Costs (2008)

Table 1. Total stand-by costs.

<p>1. Cost of Space in a Separate Facility if Used for Quarantine</p> <p>Needed: 20 square feet per person x 200 people = 4,000 square feet</p> <p>7 additional rooms for: recreation/leisure (3), office area, food assembly and serving, medical, and storage. Each room 500 square feet x 7 = 3,500 square feet. Total space: 7,500 square feet</p> <p>Approximately \$2.00 per square foot/month x 7,500 = \$15,000 per month</p>	<p>Value of the space: \$15,000 per month</p>
<p>2. Privacy Partitions and Space Dividers</p> <p>Partitions needed for sleeping areas—approximately 320 partitions (based on 10 individually divided spaces and 50 other divided spaces occupied by couples or small families). 7 other divided spaces for recreation/leisure (3), office area, food assembly and serving, medical, and storage—approximately 22 (2-3 dividers per space depending if it is on location next to walls or at end of aisles)</p> <p>342 dividers x \$200 each = \$68,400*</p>	
<p>3. Storage</p> <p>Lockers—6 tiered metal lockers (size 1 cu ft.) with 3 for each row (18 individual lockers) x 12 @ \$325 each = \$3,900</p>	
<p>4. Cleaning supplies</p> <p>Commercial mopping combo @ \$26.00 x 5 = \$130*</p> <p>Mops @ \$11 each x 5 = \$55*</p> <p>Trash cans: 1 44-gallon cans per 20 people plus 1 for each of 7 “other use” spaces and 3 extra = 20 cans x \$45 per can = \$900*</p> <p>Cleaning liquids, approximately 25 gallons x \$7.00 per gallon = \$175</p> <p>Trash can liners @ \$1.50 per liner x 20 cans x 14 days = \$420</p>	



APPENDIX A. CDC DISEASE QUARANTINES						
Disease / Bacterium	Symptoms in Early Stage (prodrome stage)	Symptoms for Full Blown Illness (definitive stage)	Period (average and range for 95% of cases)	Method(s) of Contagion	Method for Diagnosis in Early Stage	Method for Diagnosis during Incubation
Diphtheria 1-4	Malaise, sore throat, loss of appetite, moderate fever, and hoarse cough.	Adenovirus, gray membrane forms over the mucous membranes of the mouth and in pharynx.	2-3 days (range 1-20 days)	Direct person-to-person transmission by oral route (respiratory and physical contact). Contaminated objects are important in transmission.	Detection of the fibrin and protein toxin produced by the bacteria that cause the disease (i.e. diphtheria) in the discharge used for making a diagnosis of diphtheria. Also, using the levels of toxin antigens (pyrrolidines) and cytotoxins may aid diagnosis.	None established by CDC.
Influenza TH 5-10	Prolonged recurrent fever, anorexia, cough, weakness, fatigue, and weight loss.	Coughing blood from the lungs. Chronic Obstructive Pulmonary Disease, abnormal crackling and crackling of the respiratory passages caused by mucus blockage, fluid in the lungs.	Average incubation period 21 weeks; 95% of cases will develop within 11-28 weeks.	Airborne route. Extended period of close contact.	Axial chest radiograph. Respiratory specimen smear or culture, positive. Tuberculin Skin Test (TST) or Quantiferon-TB Test positive. Symptom based confirmation of chronic cough (≥2 weeks), weight loss, and fatigue.	Quantiferon-TB Test.
Cholera 11-14	≥20% of Cholera patients will show any symptoms before full onset of disease.	Diarrhea, painless, watery diarrhea. Vomiting also occurs in most patients.	Short incubation period, from less than one day to five days.	Ingesting contaminated water or food; person-to-person transmission is rare.	Diagnosis is confirmed by identification of the organism in a stool specimen.	None established by CDC.
Smallpox 15-21	High fever, back pain, headaches, vomiting, malaise, and prostration.	Macropapular rash that progresses to papules, then vesicles, and then pustules and scab lesions.	Incubation period averages about 11 to 17 days (in case range from 7 to 17 days).	Spread by inhalation of air droplets or aerosols. Direct contact (within 6.7 feet) and fairly prolonged (approximately 2 hours) face-to-face contact is required for spread unless from one patient to another.	Characteristic rash and symptoms (fever, abdominal pain, etc.). Electron microscopic (EM) visualization. RT-PCR. Confirmation.	Close contact of case, virus found in throat during incubation.
Scarlet fever 19-24	Fever, aching muscles, diarrhea, neck pain, stiffness, headache, sore eyes and sensitivity to light. Penicillin, vomiting, sore throat, diarrhea, and generalized abdominal pain. Low contagion.	Fast heart rate, enlarged lymph nodes, and a rash caused by bleeding into the skin. Bleeding in the mouth and throat, the upper bowel, and the joints. Inflammation of liver and kidney and pulmonary failure.	Incub 2-21 days. Length of incubation may depend on the mode of acquisition (5-7 months). Group IV's incub time, 1 to 7 days, with a maximum of 10 days; related blood or disease is usually 5 to 8 days, with a documented maximum of 13 days.	Direct contact with blood or other infected tissues from throat or tick bite. Human to human contact.	After 4 days of illness, antibodies can be detected (IgM or IgG). Prior to that, virus must be isolated from blood or tissue specimens and grown in test cells. Viral DNA may also be detected in the blood.	Virus can be isolated from blood or tissue specimens in the first five days of illness, and grows in cell cultures. Likelihood to find virus in throat swabs, nasal swabs, stool, lymph, and sputum/saliva.
Plague 25-31	Fever, chills, headache, malaise, aching muscles, nausea, and prostration. Bubonic plague: painful, swollen lymph nodes. Pneumonic plague: cough, breathing difficulties.	Bubonic: Swelling the size of the flea bite. Pneumonic plague: bloody sputum.	Bubonic: 2-6 days. Pneumonic: 2-4 days with range of 1-8 days.	flea bite. Direct contact with infectious animals or other materials or inhalation of infective respiratory droplets. Ingestion.	The median grain called a "bubo" (1) Ag immunosorption ELISA. Culture typed by specific bacteriology.	None established by CDC. Bacteria likely found by throat swab or in lymph.

NCHRP Report 740 (2013)
***A Transportation Guide for All-Hazards
Emergency Evacuation***

Objective
to develop an all-hazards
emergency evacuation
guide for transportation
and emergency
management agencies
that integrates the broad
community of resources
that are necessary to
plan, train, exercise, and
execute evacuations.

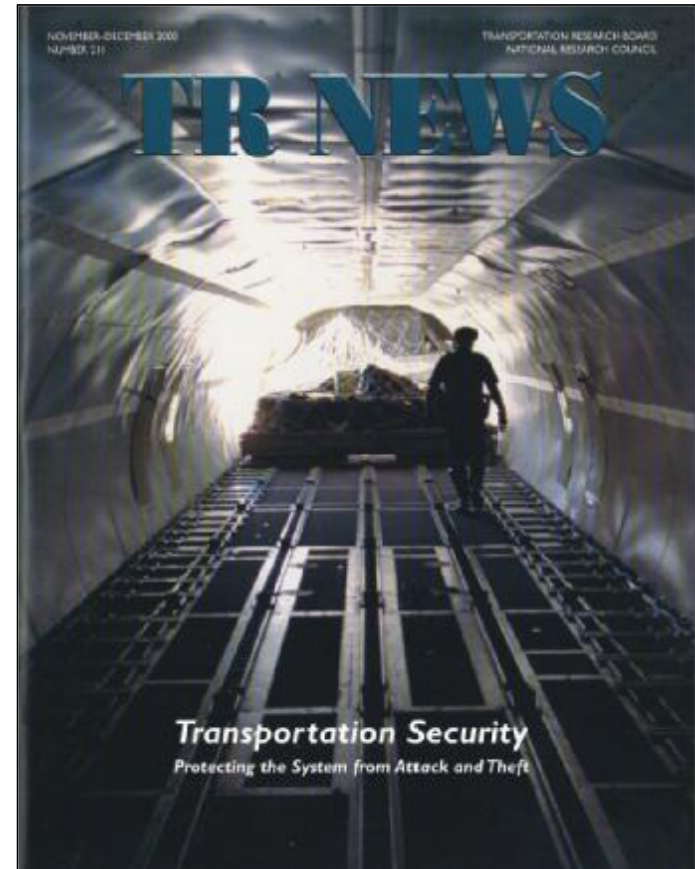
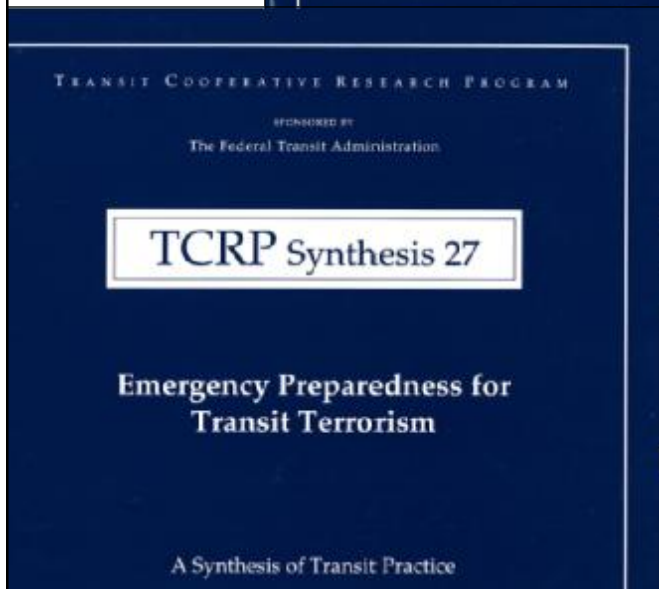
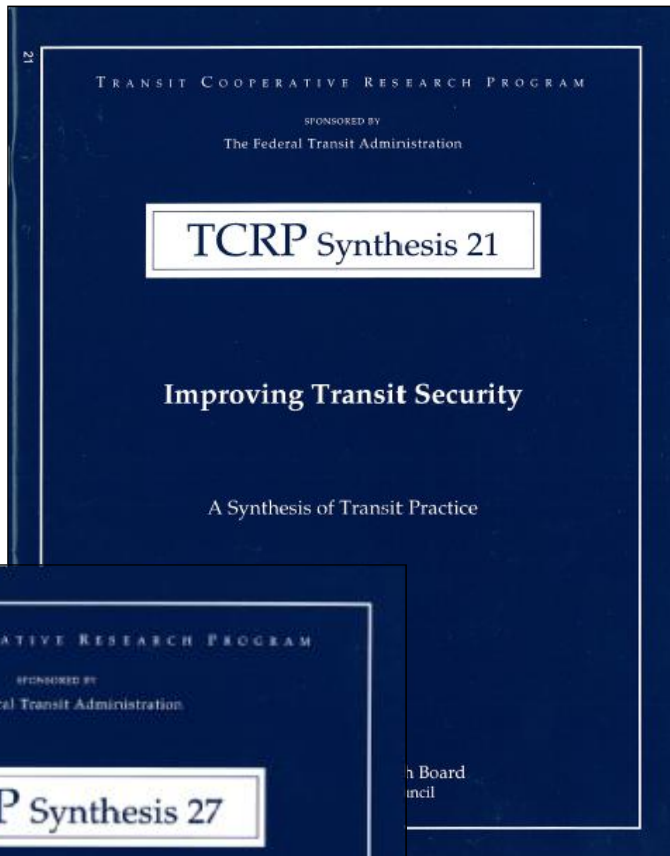


The Past Is Prologue

1. Prior to September 11, 2001

TRB Publications in 1997 & 2000 - Security and Terrorism

- Improving Transit Security (1997)
- Emergency Preparedness for Transit Terrorism (1997)



November-December 2000, TR News 211
Transportation Security: Protecting the System from Attack and Theft



TRANSPORTATION RESEARCH BOARD

2. Stage I

Immediate Aftermath of September 11, 2001:

Information Sharing

2002 APTA/FTA Transit Security Workshops

APTA/FTA Transit Security Workshops

January 2002 – May 2002

1. New York City
2. San Francisco, California
3. Atlanta, Georgia
4. Chicago, Illinois

CONTRACTOR'S REPORT ON THE
2002 APTA/FTA SECURITY WORKSHOPS

NEW YORK CITY
SAN FRANCISCO
ATLANTA
CHICAGO

Requested by:

American Public Transportation Association

Executive Committee Security Task Force

Prepared by:

Nicholas J. Bahr
Booz | Allen | Hamilton
8283 Greensboro Drive
McLean, Virginia 22102-3838

DECEMBER 11, 2002

The information contained in this report was prepared as part of TCRP Project J-10, Task J-10 (1),
Transit Cooperative Research Program, Transportation Research Board

APTA International Transit Security Workshop September 2002 –
Leads to Transit Security Exchange Plans

TCRP Report 86, Vol. 1

Communication of Threats: A Guide (2002)

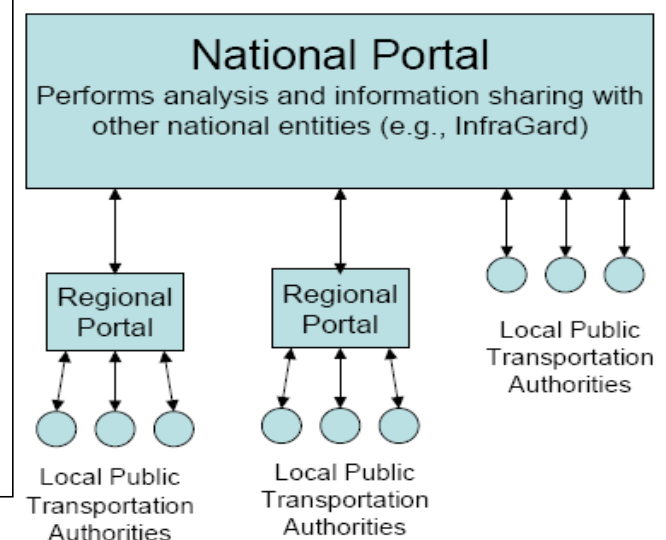
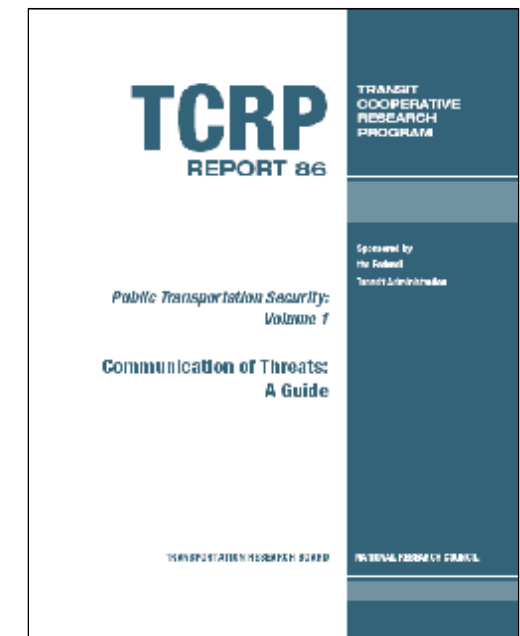
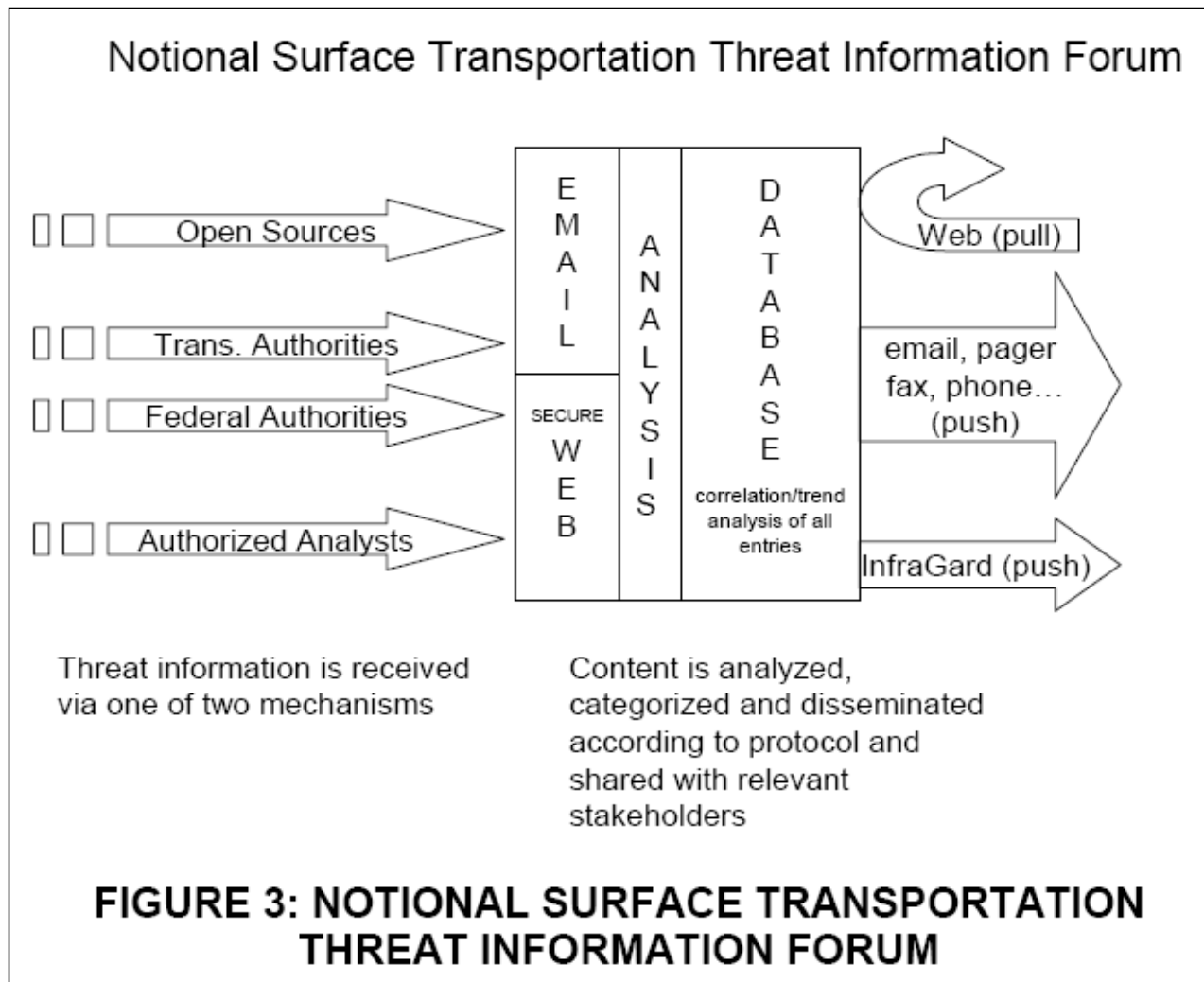


FIGURE 4: DISTRIBUTED IMPLEMENTATION MODEL

NCHRP Report 525, Vol. 2

Information Sharing and Analysis Centers: Overview and Supporting Software Features (2004)

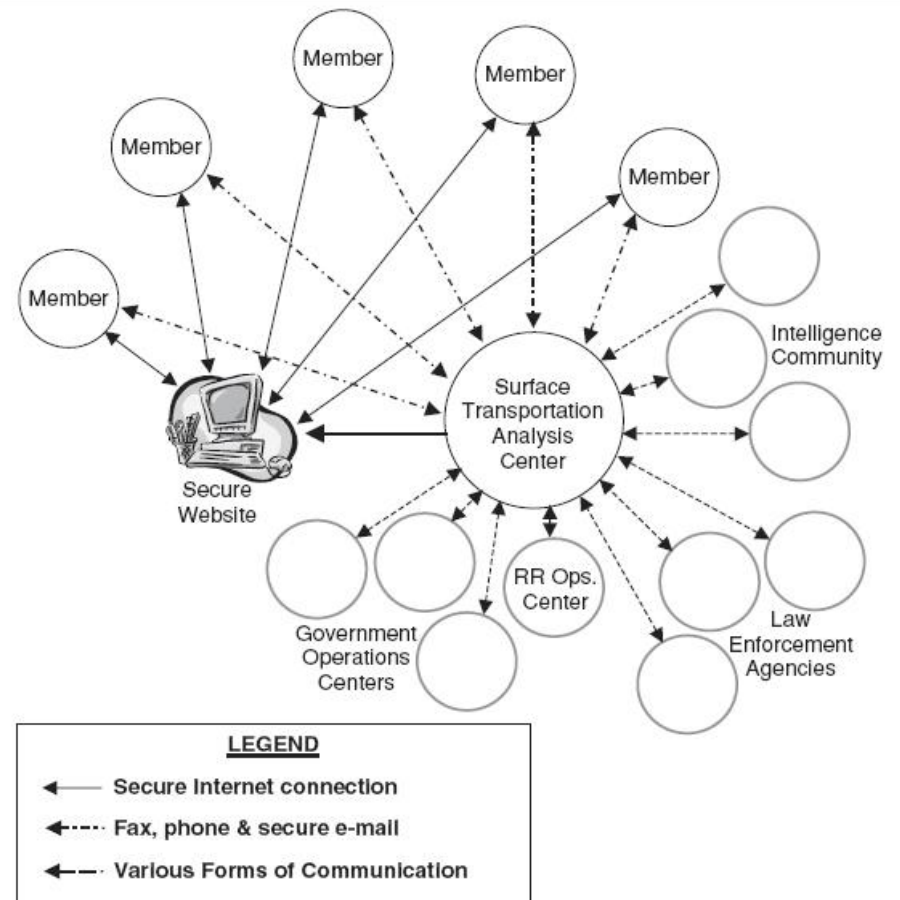
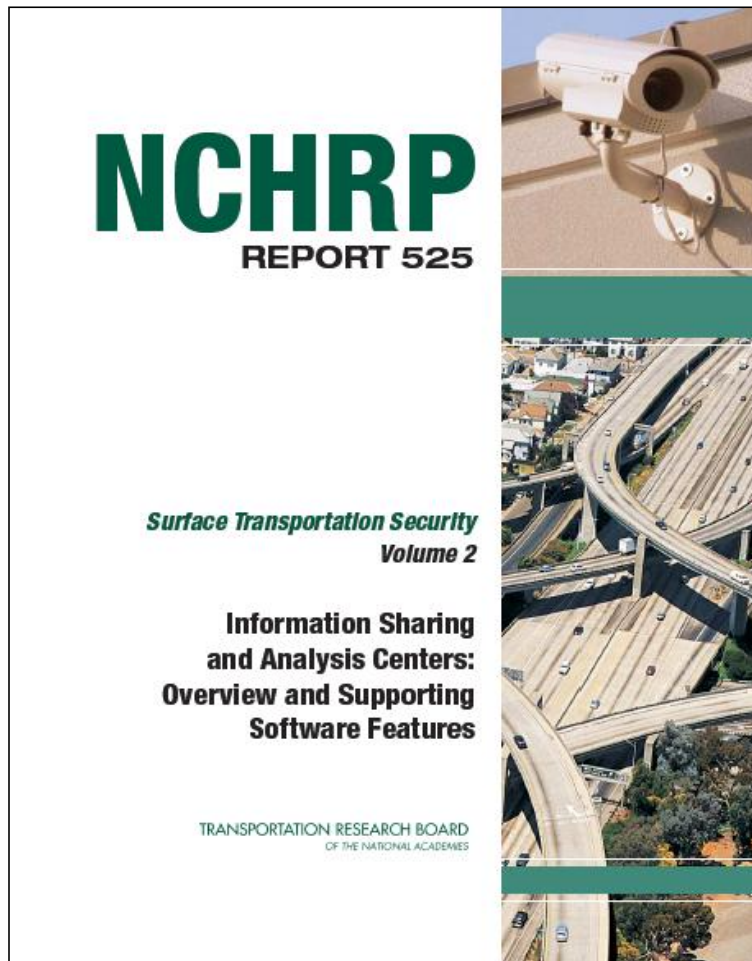


FIGURE 6: TYPICAL ST-ISAC INFORMATION PATHWAYS

Security White Paper (2006)

Identifying and Evaluating Implementation Options for a Highway Asset ISAC

Project No. 20-59(7A)

IDENTIFYING AND EVALUATING IMPLEMENTATION OPTIONS
FOR A HIGHWAY ASSET ISAC

FINAL REPORT

Prepared for
National Cooperative Highway Research Program
Transportation Research Board
National Research Council

Vicki Glenn
CACI Premier Technology, Inc.
Chantilly, Virginia
NCHRP Project 20-59(7A)

February 2006

The information contained in this report was prepared as part of NCHRP Project 20-59,
National Cooperative Highway Research Program, Transportation Research Board.

3. Stage I

Technology Assessments

Security White Paper (May 2002)

Public Transportation System Technology Clearinghouse

Task-Order #J-10(2)B

**SECURITY WHITE PAPER ON PUBLIC TRANSPORTATION
SYSTEM TECHNOLOGY CLEARINGHOUSE**

**Performed under: Contract NAS#112 --
Task-Order Support for Surface Transportation
Security Research**

Submitted to:

**Mr. S. A. Parker, Project Manager
Transit Cooperative Research Program
Transportation Research Board
National Research Council
2001 Wisconsin Avenue, NW
Washington, DC 20007**

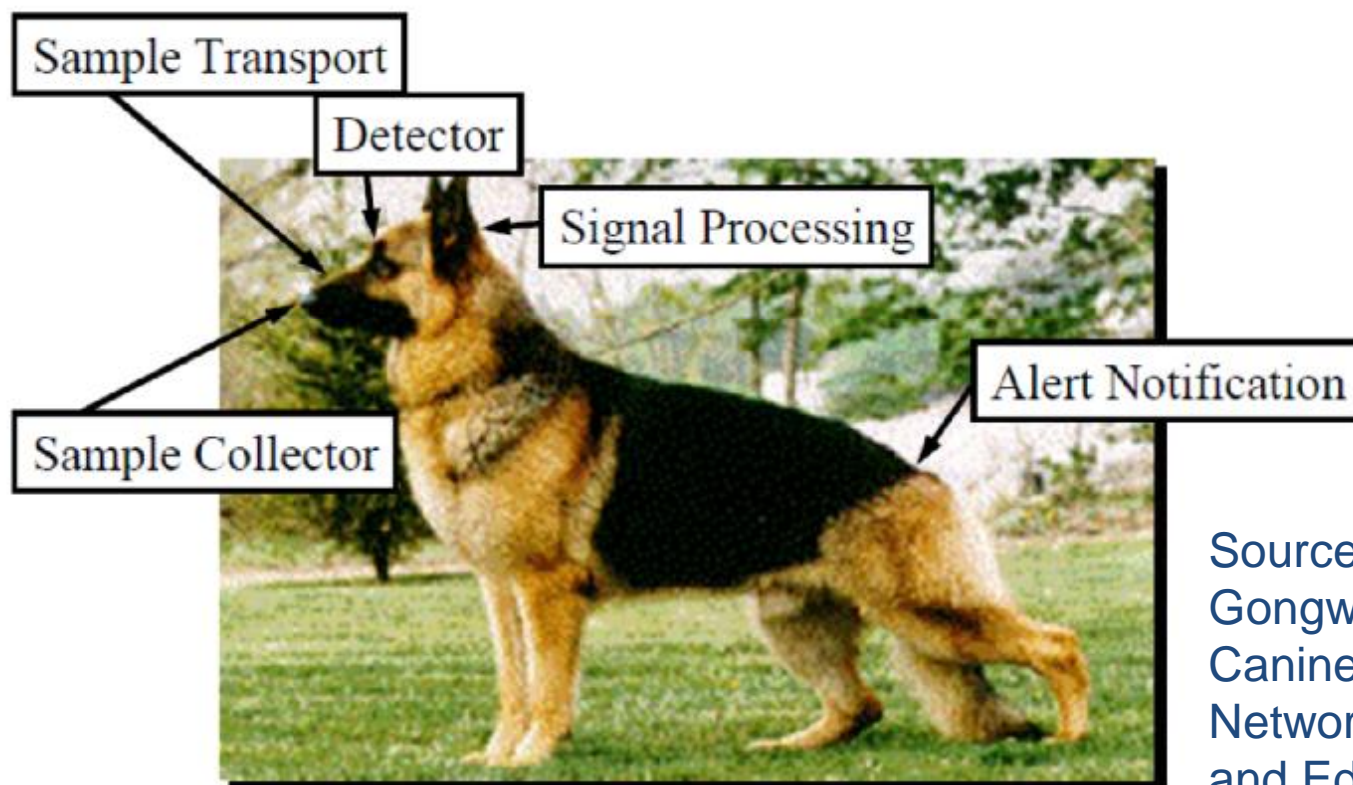
Submitted by:

**Roger Jenkins (P.I.)
Science Applications International Corporation
1710 SAIC Drive
McLean, VA 22102
(703) 676 - 8128**

Date: May 10, 2002

K9 Units in Public Transportation: A Guide for Decision Makers (2002)

Anatomy of a Detection System



Source of graphic: DHS.
Gongwer - Explosives Detection
Canine Research - University
Network Summit on Research
and Education, March 16, 2007,
Washington DC

TCRP Report 86, Vol. 2

K9 Units in Public Transportation: A Guide for Decision Makers (2002)

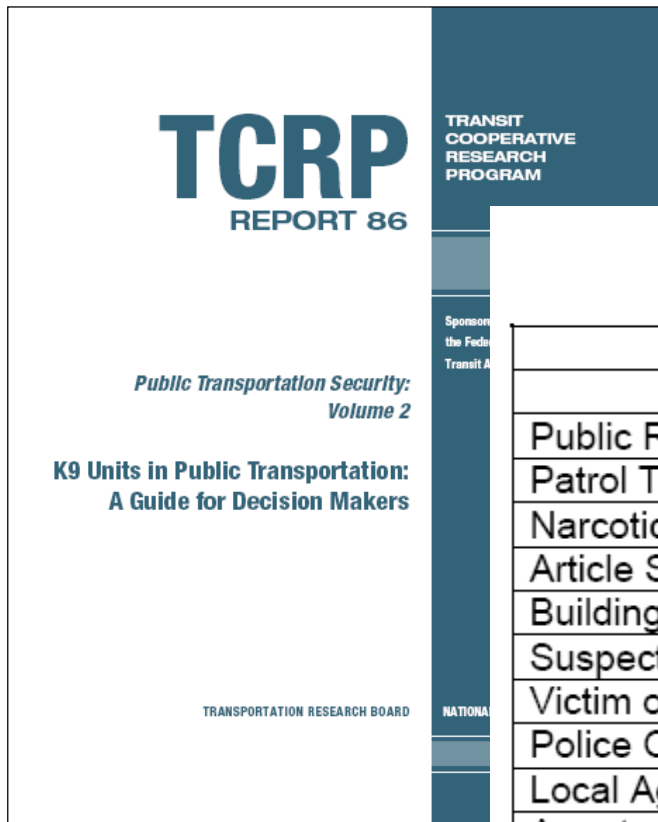
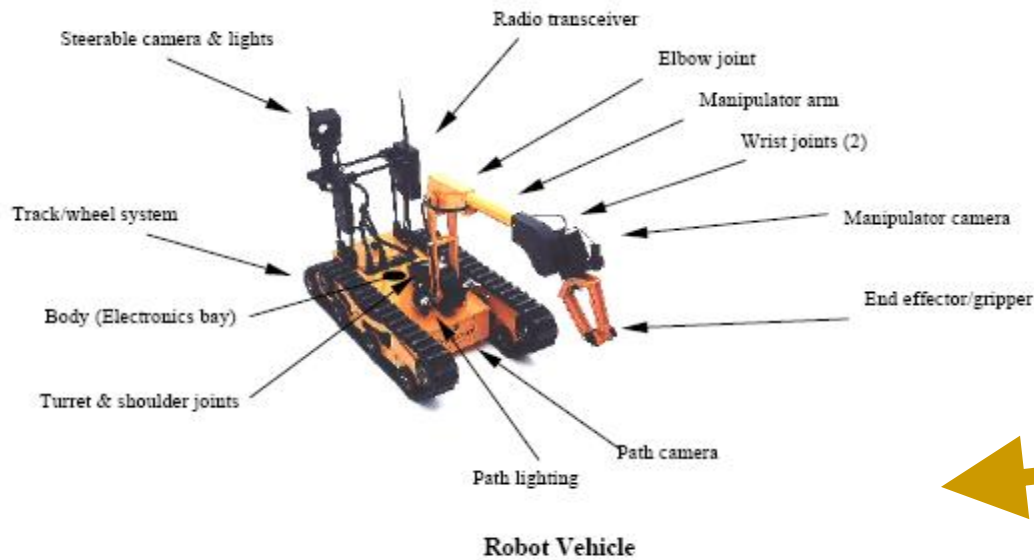


TABLE 22: ACTIVITY OF DUAL PURPOSE K9 TEAM

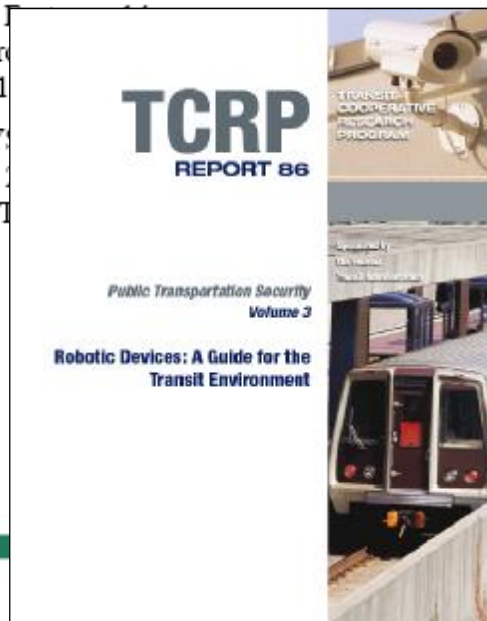
Activity	Number per Year
Public Relations and Other Demonstrations	10-20
Patrol Tours or Routes (two-hour shifts)	500-700
Narcotics Searches	25-50
Article Search	25
Building Search	100
Suspect Tracking	50
Victim or Lost Person Tracking	1
Police Officer Assist Calls	50
Local Agency Assist Calls	25
Arrests Made or Supported	12-50
Trials and Competitions	2

TCRP Report 86, Vol. 3

Robotic Devices for the Transit Environment (2003)



- 1 INTRODUCTION
- 2 OVERVIEW
- 2 ENVIRONMENTS
 - Structures, 2
 - Vehicles, 4
 - Vehicle Access/Egress, 4
 - Vehicle Pathways, Overheads, and Transitions, 6
 - Vehicle Special Obstacles, 7
 - Roadways and Terrain, 9
 - Weather Conditions, 10
 - Optical Navigation Environments, 10
 - Radio Environments, 10
 - Hazardous Environments, 10
 - Other Requirements, 11
 - Requirements Specification, 12
- 13 AVAILABLE ROBOTIC SYSTEMS
 - Introduction to Robotic Systems, 13
 - Robot Vehicle I
 - Operator Contr
 - Available Systems, 1
- 20 SELECTION ANALYSIS
 - Selection Rationale, 1
 - Operator Demands, T
- 22 GLOSSARY
- 23 BIBLIOGRAPHY

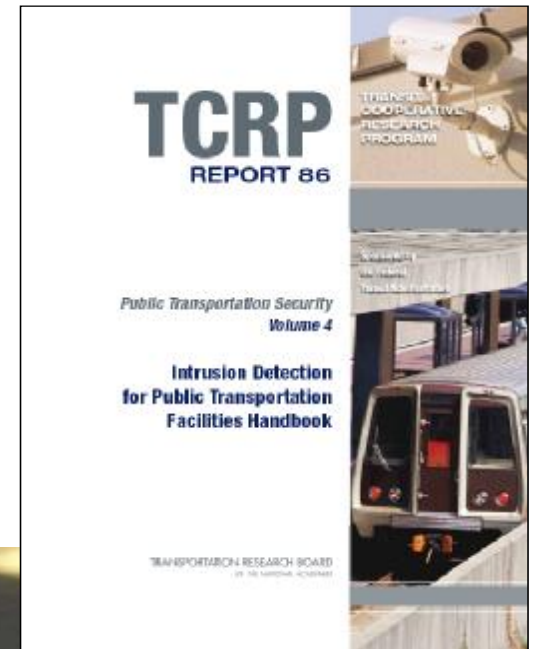


TCRP Report 86, Vol. 4

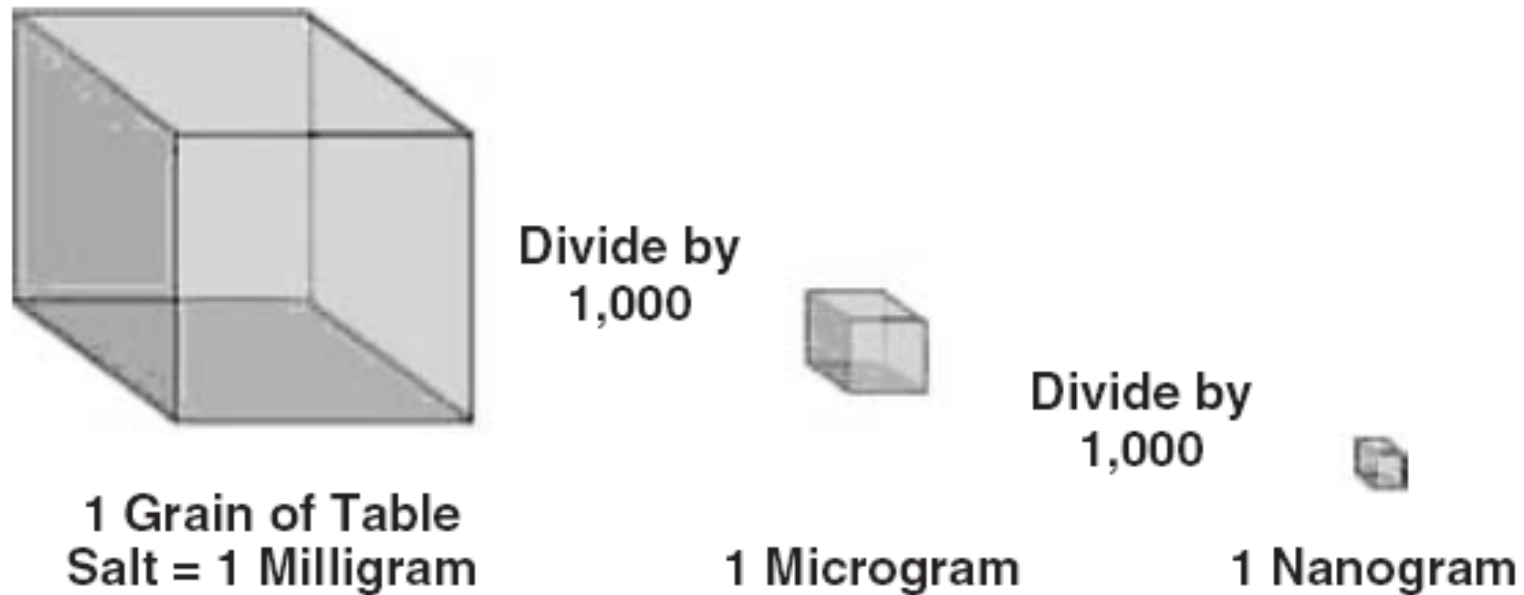
Intrusion Detection for Public Transportation Facilities Handbook (2003)

Checklist:

- Does the lighting system meet the transit agency's established security requirement?
- Does the lighting system comply with the local building and safety codes?
- Have lighting effects on neighboring buildings or private homes been considered?
- Are sufficient portable lighting devices available?
- Is there a need for specialized spotlighting or infrared (IR) lighting?
- If required, is there adequate backup electrical power to support the lighting system?
- Is the lighting system clear of any obstructions within 6-feet (minimum) to 20-feet (ideal)?
- Is the lighting system properly secured to prevent removal, displacement, modification or theft?
- If required, are there adequate signs or language(s)?
- Are procedures in place for routine inspection of hardware?
- Have the system operators/maintainers provided input to the selection of this system?
- Are there adequate spare parts to support the system?
- Is Point-of-Contact information readily available to the system?



Applicability of Portable Explosive Detection Devices in Transit Environments (2004)



Sensitivity of the tested device: 10 nanograms (not to scale)

4. Stage I

Decontamination

Security White Paper (August 2002)

Public Transportation System Nuclear, Biological, and Chemical Decontamination Procedures

Task-Order #J-10(2)A

**SECURITY WHITE PAPER ON PUBLIC TRANSPORTATION SYSTEM NUCLEAR,
BIOLOGICAL, AND CHEMICAL DECONTAMINATION PROCEDURES**

Final

**Performed under: Contract NAS#112 --
Task-Order Support for Surface Transportation
Security Research**

Submitted to:

**Mr. S. A. Parker, Project Manager
Transit Cooperative Research Program
Transportation Research Board
National Research Council
2001 Wisconsin Avenue, NW
Washington, DC 20007**

Submitted by:

**Roger Jenkins (P.I.)
Science Applications International Corporation
1710 SAIC Drive
McLean, VA 22102
(703) 676 - 8128**

Date: August 23, 2002

Innovations Deserving Exploratory Analysis (IDEA)

Nine Transit IDEA projects address security.



January 6, 2006, presentation on Transit IDEA Project 45, Chemical and Biological Decontamination System for Rail Transit Facilities (completed January 2007).

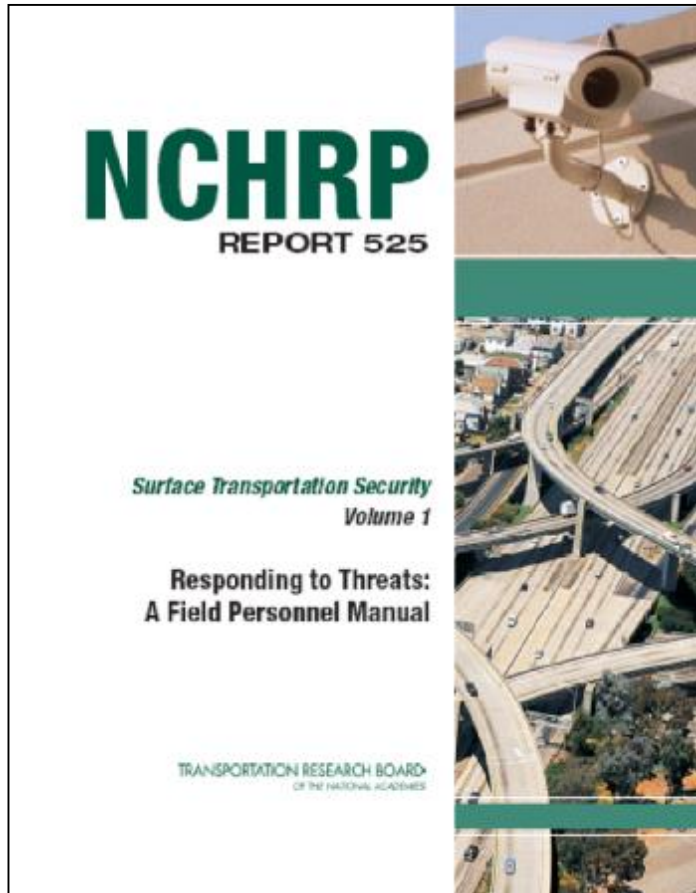
5. Stage I

Training

NCHRP Report 525, Vol. 1

Responding to Threats: A Field Personnel Manual

(2004)



- 1** Introduction, 1
- 2** How Terrorists/Criminals Select a Target or a Victim, 2
- 3** Potential Targets, 3
- 4** What the Terrorist/Criminal Needs to Know, 4
- 5** Where to Look, 5
- 6** What to Look For, 7
- 7** How and What to Report, 10
- 8** When to Intervene, 12
- 9** Potential Actions to Further Improve Security, 13
- 10** Sample Report, 15
- 11** Contact List, 16
- 12** A Few Key Reminders, 17

Provides a draft template that contains basic security awareness training in a workbook format that can be redesigned as a pamphlet, glove-box brochure, or other user-specific document.

NCHRP Report 525, Vol. 7

System Security Awareness for Transportation Employees (2005)

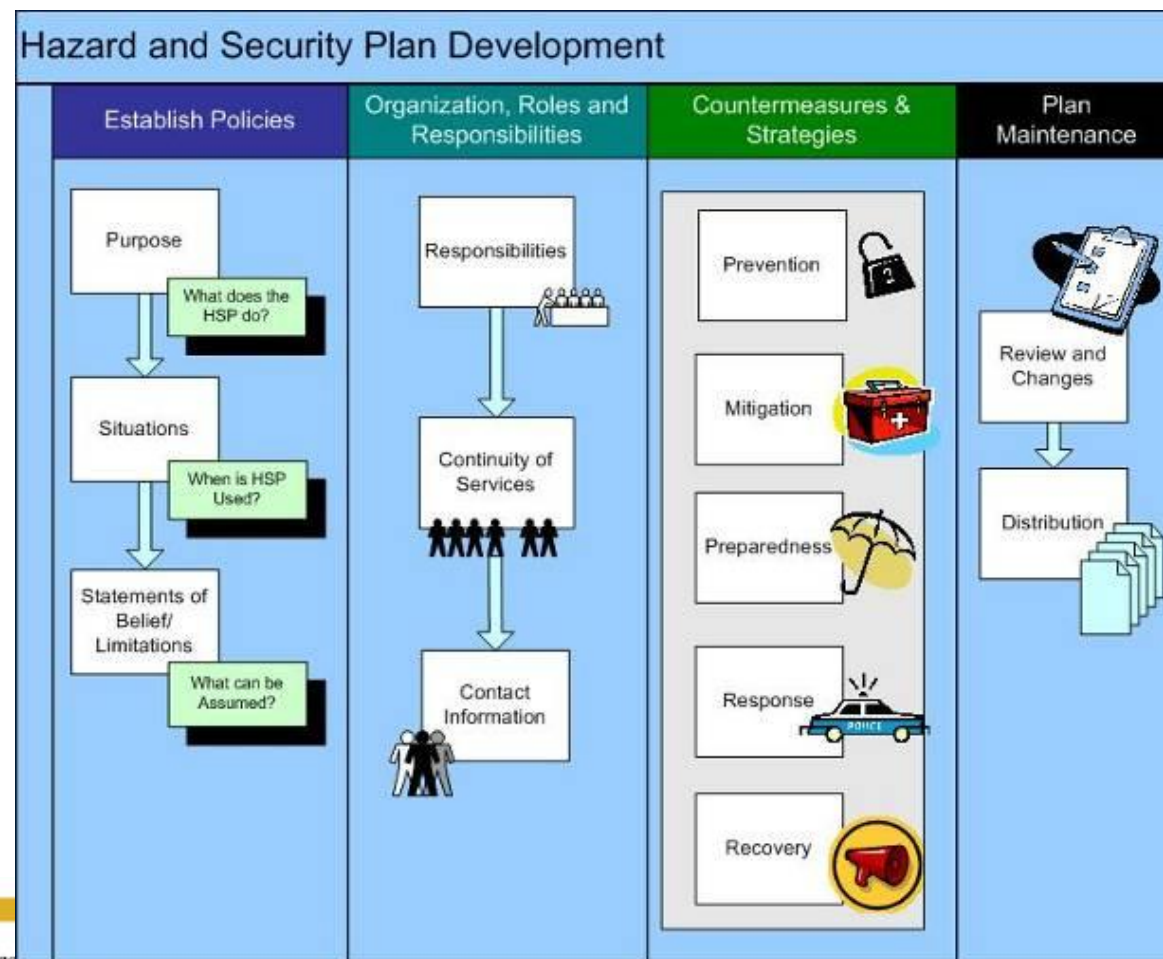


An interactive CD-ROM training course; also provided as train-the-trainer and by direct delivery through the National Transit Institute

TCRP Report 86, Vol. 10

Hazard and Security Plan Workshop: Instructor Guide (2006)

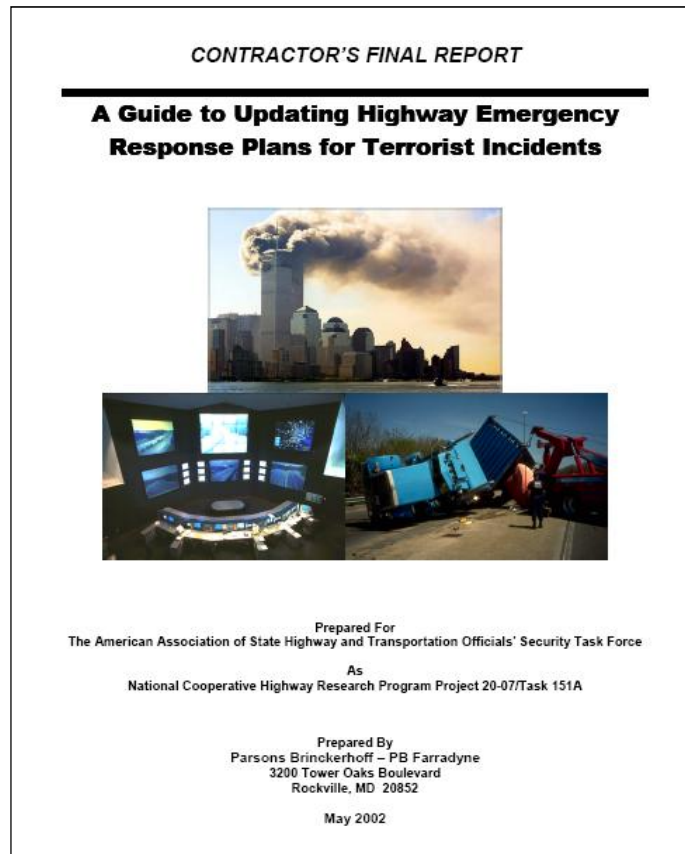
Hazard and Security Planning Tools for Rural, Small Urban,
and Community-Based Public Transportation Operations



6. Stage I

Immediate Guidance on Risk Management and Emergency Response

A Guide to Updating Highway Emergency Response Plans for Terrorist Incidents available May 2002



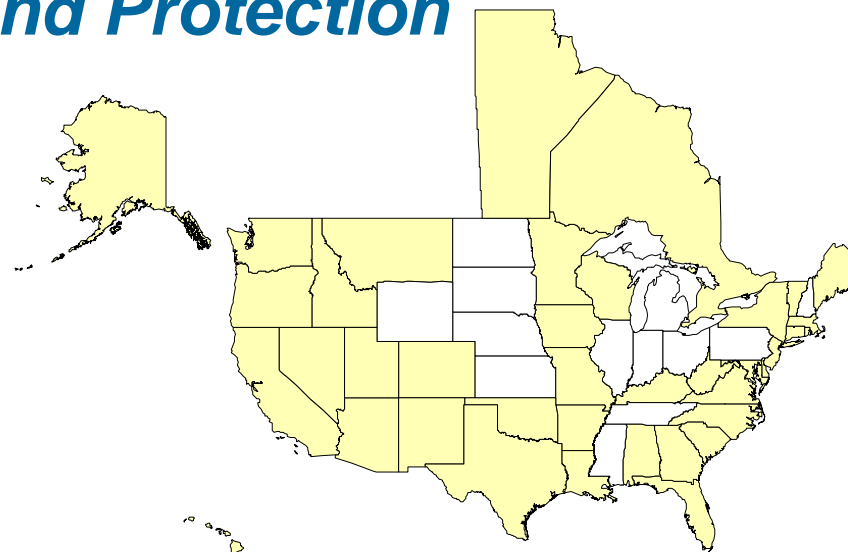
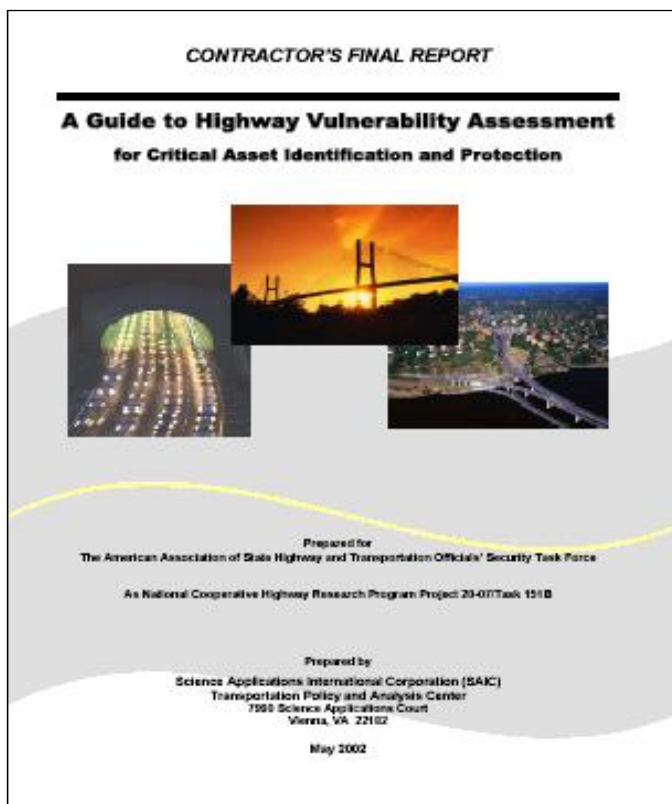
Emergency Transportation
Operations Preparedness
& Response Workshops
For Statewide Applications

June – November 2003

1. New Mexico
2. Minnesota
3. Washington
4. Idaho

<http://security.transportation.org/sites/security/docs/guide-ResponsePlans.pdf>

A Guide to Highway Vulnerability Assessment for Critical Asset Identification and Protection



Bridge/Tunnel/Highway Infrastructure Vulnerability Workshop Attendees February-March 2003

1. Sacramento, California
2. Albany, New York
3. Austin, Texas

http://security.transportation.org/sites/security/docs/guide-VA_FinalReport.pdf
http://security.transportation.org/sites/security/docs/guide-VA_Appendices.pdf

NCHRP Report 525, Vol. 4

A Self-Study Course on Terrorism-Related Risk Management of Highway Infrastructure (2005)

Vulnerability Issues		Countermeasures	C/E
Perception	<ul style="list-style-type: none"> • Demonstrated defense 	<ul style="list-style-type: none"> • Deter Discourage attacks by visibility of countermeasures 	
Ease of Access	<ul style="list-style-type: none"> • Adjacent land-use • Road approach • Vessel approach 	<ul style="list-style-type: none"> • Deny Increase standoff distance from bridge substructure and tunnel entrances 	
Clear zone	<ul style="list-style-type: none"> • Adjacent vegetation • Adjacent buildings 	<ul style="list-style-type: none"> • Dynamic Threat-adjustable operational measures (inspections) 	
Exposure	<ul style="list-style-type: none"> • Lighting level • Visibility 	<ul style="list-style-type: none"> • Detect Monitor access to bridge substructure and tunnel portals to minimize time on targets 	
Time on target	<ul style="list-style-type: none"> • Detection • Response 		
Structure	<ul style="list-style-type: none"> • Scale • Specific features 	<ul style="list-style-type: none"> • Defend Harden key structural elements 	

Security White Paper (May 2003)

Security Measure Prioritization Tools: A Guide for Transportation Decision Makers

J-10A(4)

SECURITY MEASURE PRIORITIZATION TOOLS: A
GUIDE FOR TRANSPORTATION DECISION MAKERS

FINAL REPORT



Prepared for
Transit Cooperative Research Program
Transportation Research Board

JOHN N. BALOG, PRINCIPAL INVESTIGATOR
MCCORMICK, TAYLOR & ASSOCIATES, INC.

ANNABELLE BOYD
BOYD, CATON & GRANT TRANSPORTATION GROUP, INC.

JAMIE BETH STRONGIN
MCCORMICK, TAYLOR & ASSOCIATES, INC.

DOT-FTA-MA-26-5019-03-01
DOT-VNTSC-FTA-03-01



The Public Transportation System Security and Emergency Preparedness Planning Guide

U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National Transportation Systems Center
Cambridge, Massachusetts 02142-1093

January 2003
Final Report



FEDERAL TRANSIT ADMINISTRATION

The Public Transportation System Security and Emergency Preparedness Planning Guide (2003)

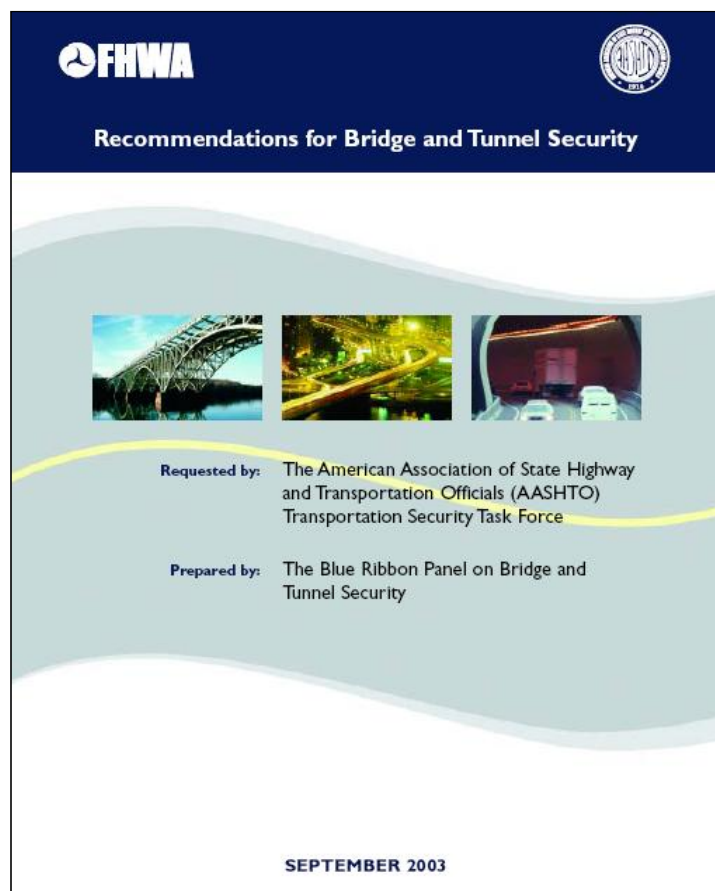
Table 1: Program of Commitments

COMMIT to a program that enables the public transportation system to:

- ⇒ **PREVENT** incidents within its control and responsibility, effectively protect critical assets;
- ⇒ **RESPOND** decisively to events that cannot be prevented, mitigate loss, and protect employees, passengers, and emergency responders;
- ⇒ **SUPPORT** response to events that impact local communities, integrating equipment and capabilities seamlessly into the total effort; and
- ⇒ **RECOVER** from major events, taking full advantage of available resources and programs.

<http://www.transit-safety.volpe.dot.gov/Publications/security/PlanningGuide.pdf>

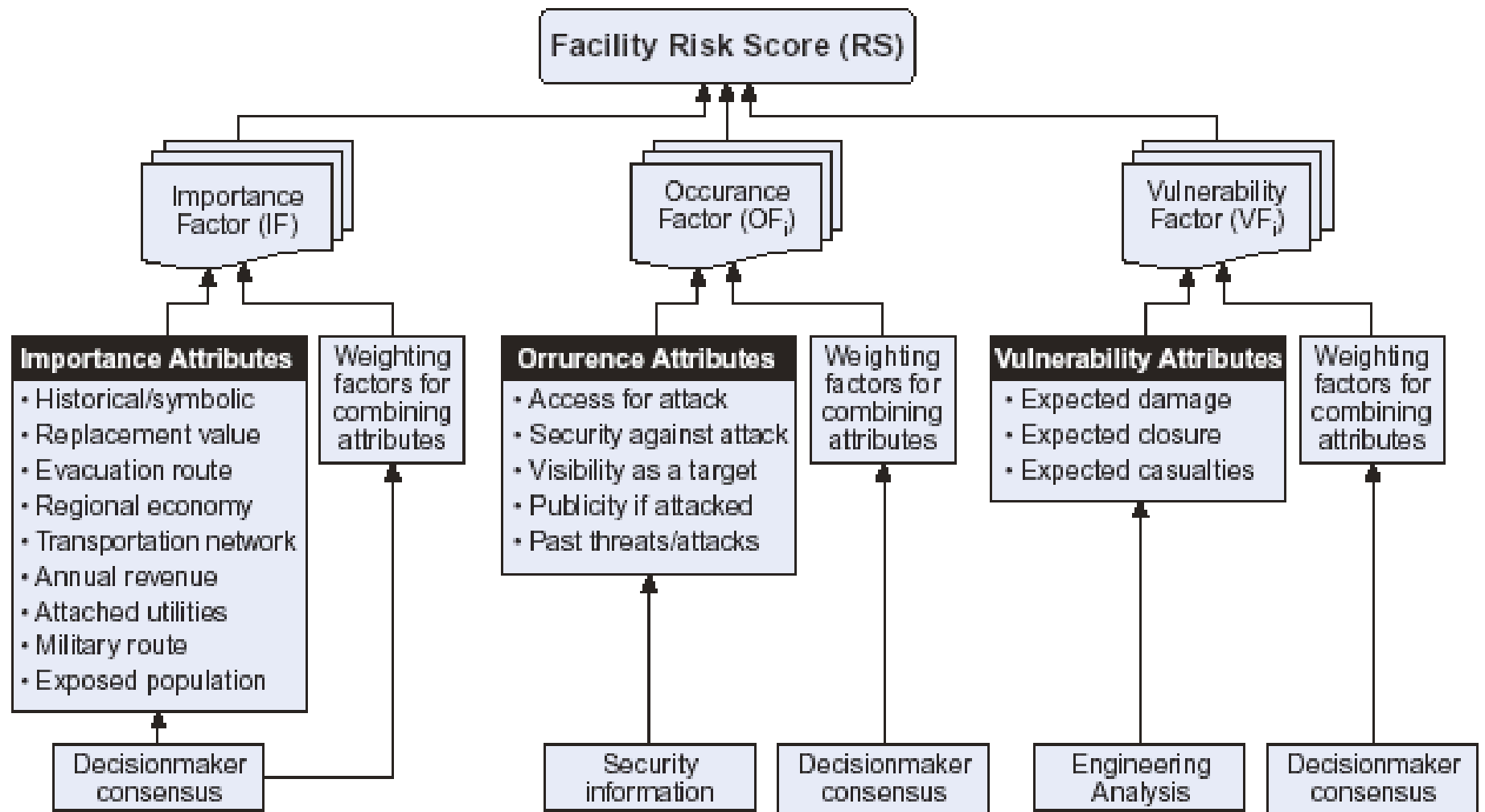
Recommendations for Bridge and Tunnel Security (2003)



“Blue Ribbon Panel on Bridge and Tunnel Security” report presented institutional, fiscal, and technical recommendations

<http://www.fhwa.dot.gov/bridge/security/brpcover.htm>
http://trb.org/news/blurb_detail.asp?id=1872

Components in Risk Assessment for a Facility



7. Stage II

Development of Organizational Capacity to Support Security and Emergency Management Activities

NCHRP Report 525, Vol. 3

Incorporating Security Into the Transportation Planning Process (2005)

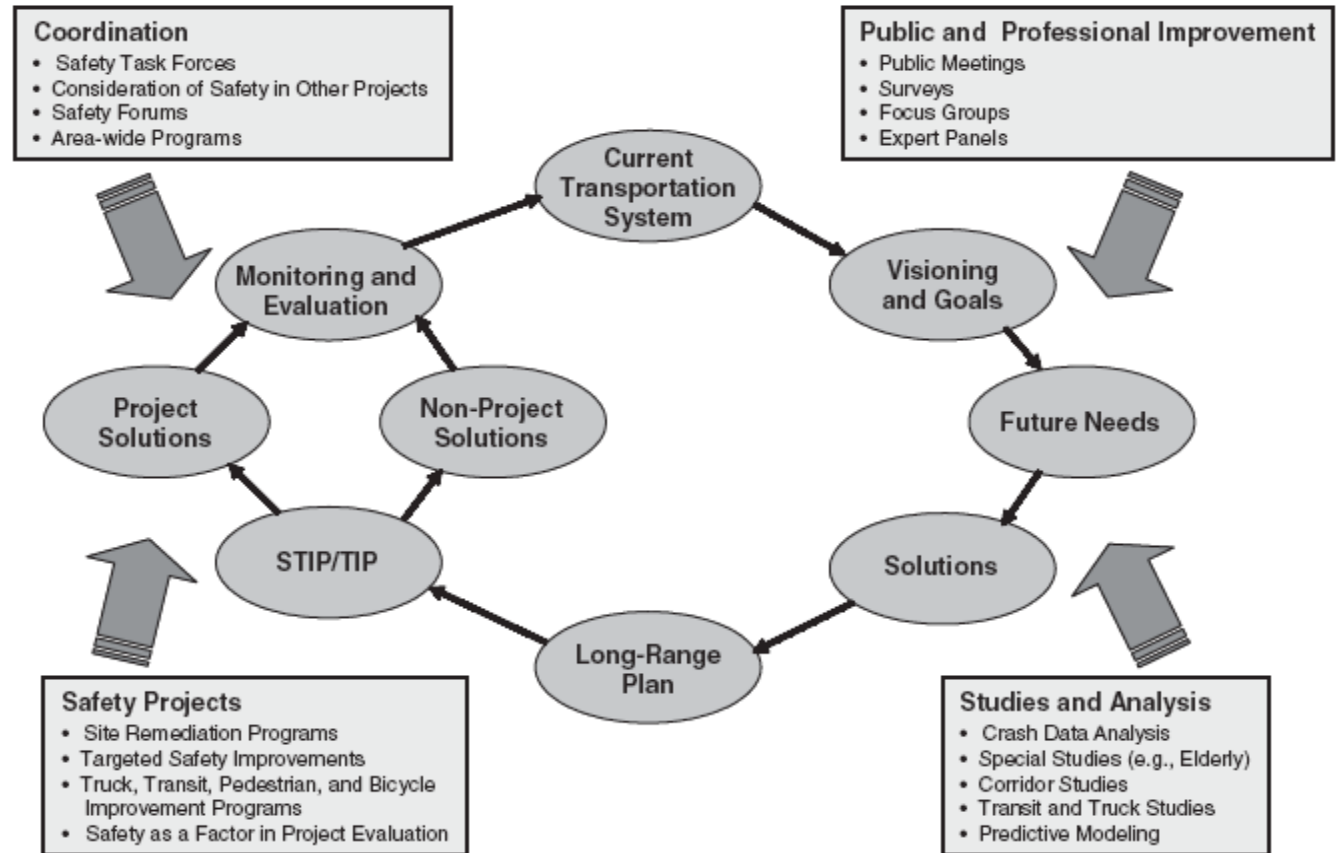
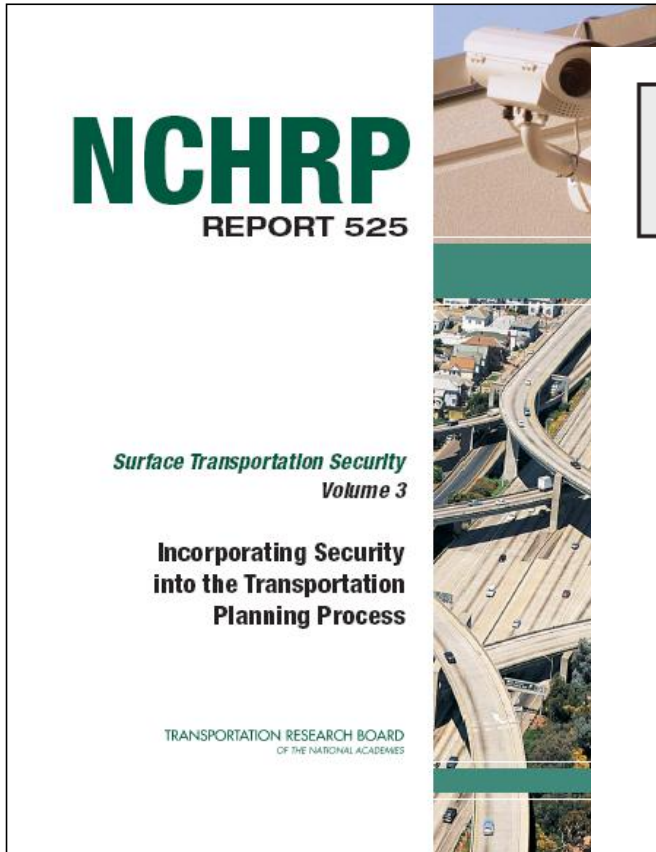


Figure 3. Overview of the transportation planning process in the context of safety (adapted from FHWA, *Citizen's Guide to Transportation Decisionmaking*, FHWA EP-01-013, 2001).

Peer Exchange Series: State & Metropolitan Transportation Planning Issues

Disaster Response in Transportation Planning (2007)

PEER EXCHANGE SERIES ON STATE AND METROPOLITAN TRANSPORTATION PLANNING ISSUES

MEETING 3:
DISASTER RESPONSE IN TRANSPORTATION PLANNING

Requested by:

American Association of State Highway and Transportation Officials (AASHTO)
Standing Committee on Planning

Prepared by:

Jocelyn Hoffman
Patricia G. Hendren, Ph.D.
Cambridge Systematics, Inc.
Bethesda, Maryland

With:

Russell Henk, Texas Transportation Institute (TTI)

September 2007

The information contained in this report was prepared as part of NCHRP Project 00-56, Task 09 (09), National Cooperative Highway Research Program, Transportation Research Board.

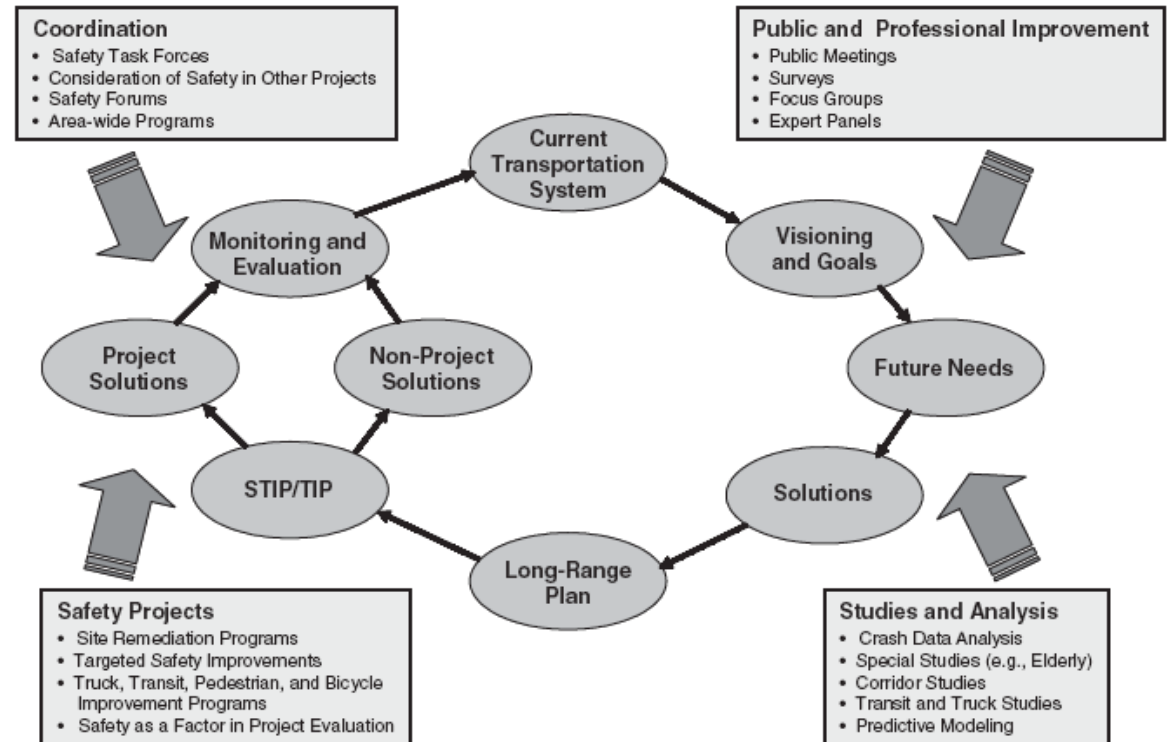
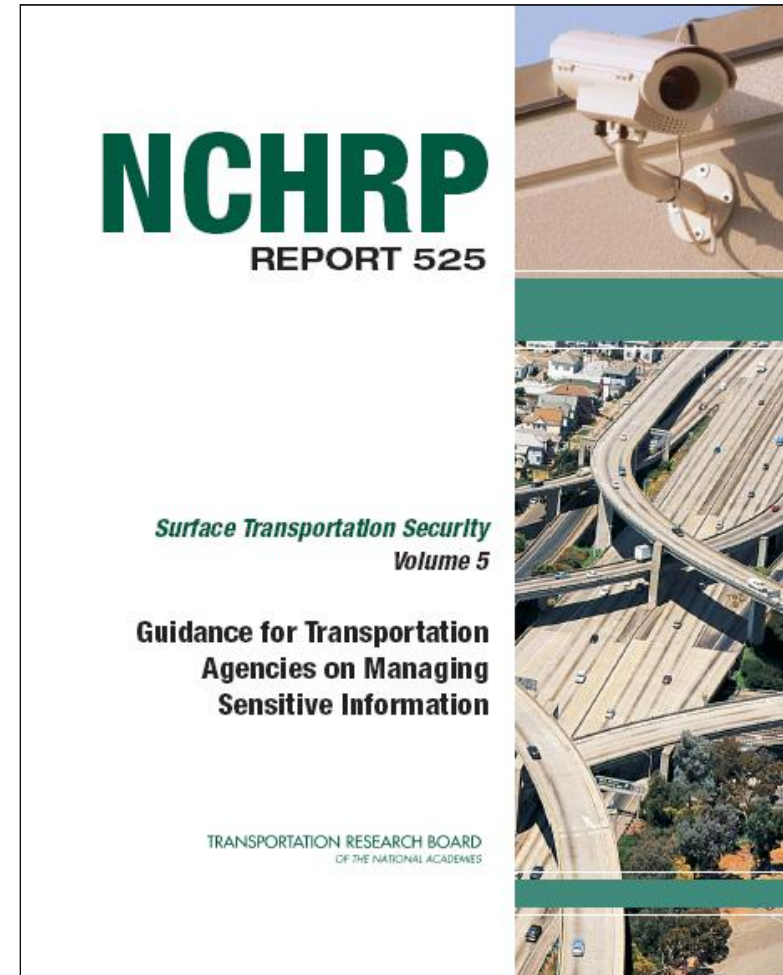


Figure 3. Overview of the transportation planning process in the context of safety (adapted from FHWA, *Citizen's Guide to Transportation Decisionmaking*, FHWA EP-01-013, 2001).

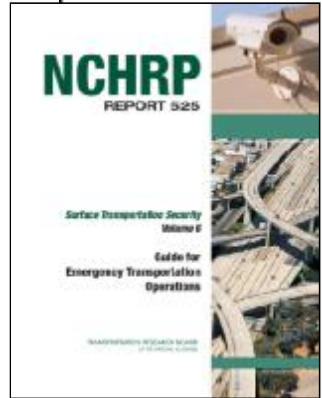
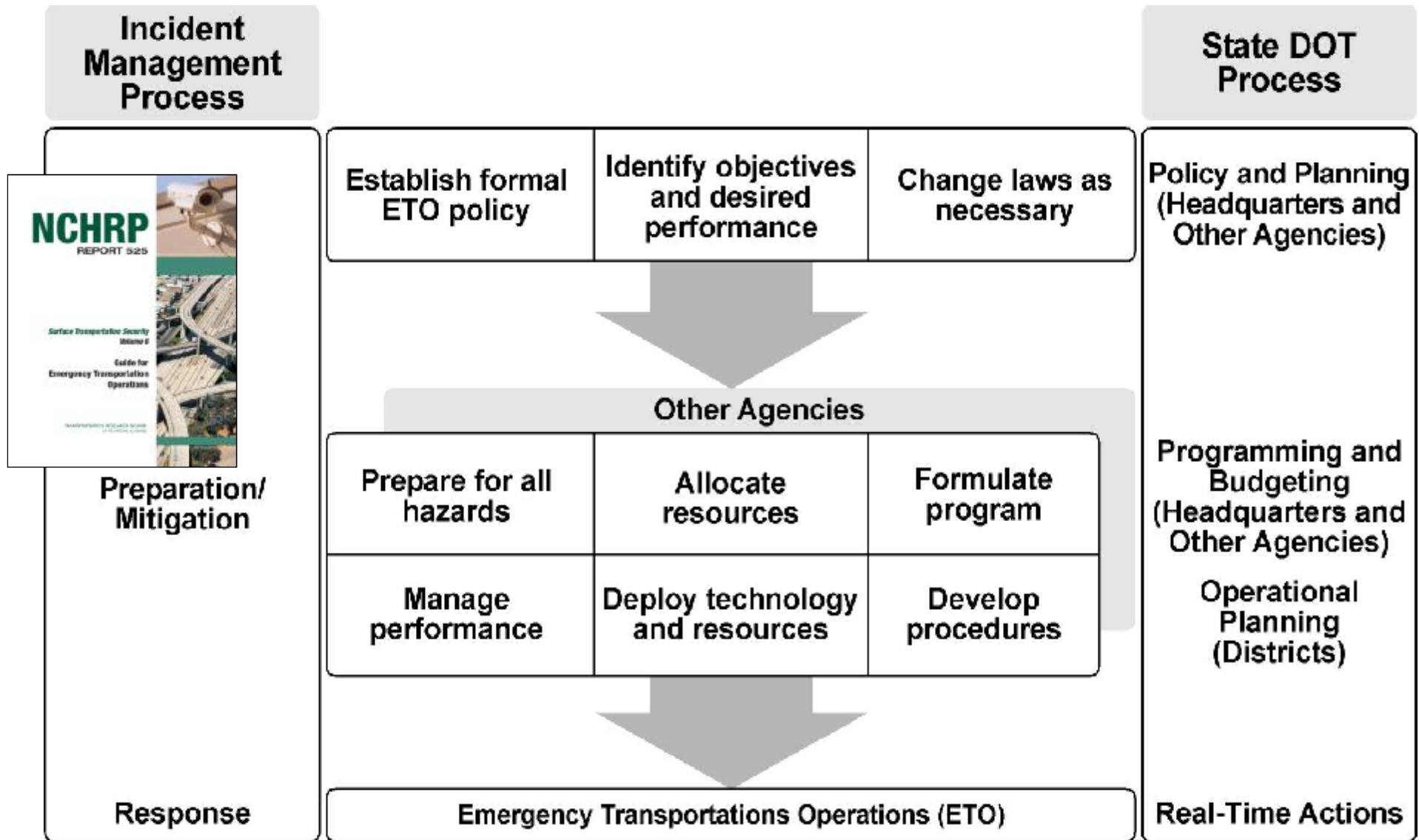
NCHRP Report 525, Vol. 5
***Guidance for Transportation Agencies
on Managing Sensitive Information (2005)***

- 1** Establishing a Sensitive Information Management Policy, 1
 - 2** Identifying Sensitive Information, 3
 - 3** Controlling Access to Sensitive Information, 5
 - 4** Keys for Success, 10
- Appendix A Florida DOT's Exempt Documents and Security System Plan Request Form, A-1
- Appendix B Texas DOT's Confidential Safety Information Memorandum, B-1
- Appendix C Examples of State Legislation to Exempt Selected Sensitive Transportation-Related Information from State "FOIA" Laws, C-1



NCHRP Report 525, Vol. 6

Guide for Emergency Transportation Operations (2005)

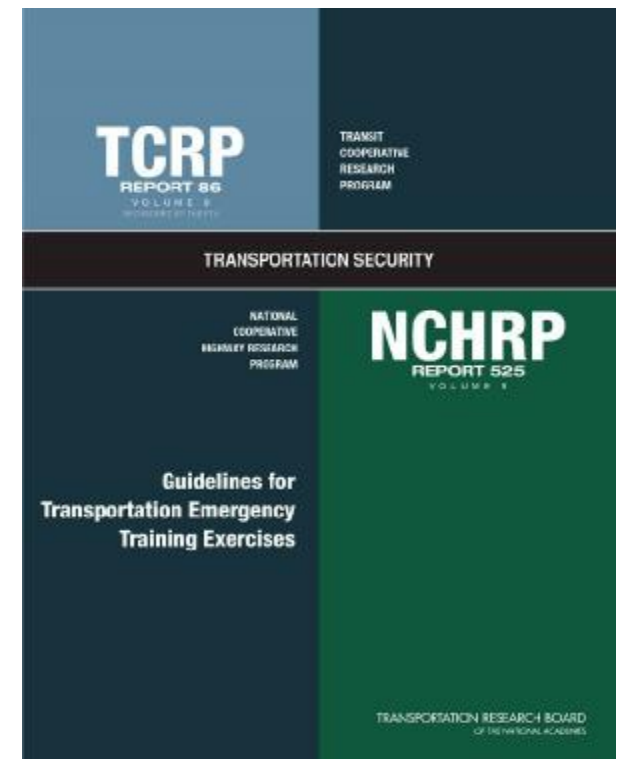


TCRP Report 86, Vol. 9 / NCHRP Report 525, Vol. 9 (2006)

Guidelines for Transportation Emergency Training Exercises

TABLE 1 EMERGENCY EVENTS AFFECTING TRANSPORTATION AGENCIES

Naturally Occurring	Human-Caused	
	Intentional	Unintentional
<ul style="list-style-type: none"> ▶ Droughts ▶ Dust/Wind Storms ▶ Earthquakes ▶ Electrical Storms ▶ Floods ▶ High Winds ▶ Hurricanes ▶ Ice Storms ▶ Landslides ▶ Naturally Occurring Epidemics ▶ Snowstorms and Blizzards ▶ Tornadoes ▶ Tropical Storms ▶ Tsunamis ▶ Typhoons ▶ Wildfires 	<ul style="list-style-type: none"> ▶ Bomb Threats and Other Threats of Violence ▶ Disruption of Supply Sources ▶ Fire/Arson ▶ Fraud/Embezzlement ▶ Labor Disputes/Strikes ▶ Misuse of Resources ▶ Riot/Civil Disorder ▶ Sabotage: External and Internal Actors ▶ Security Breaches ▶ Terrorist Assaults Using Chemical, Biological, Radiological, or Nuclear Agents ▶ Terrorist Assaults Using Explosives, Firearms, or Conventional Weapons ▶ Theft ▶ Vandalism ▶ War ▶ Workplace Violence 	<ul style="list-style-type: none"> ▶ Accidental Contamination or Hazardous Materials Spills ▶ Accidental Damage to or Destruction of Physical Plant and Assets ▶ Accidents That Affect the Transportation System ▶ Gas Outages ▶ Human Errors ▶ HVAC System Failures or Malfunctions ▶ Inappropriate Training on Emergency Procedures ▶ Power Outages ▶ Software/Hardware Failures or Malfunctions ▶ Unavailability of Key Personnel ▶ Uninterruptible Power Supply (UPS) Failure or Malfunction ▶ Voice and Data Telecommunications Failures or Malfunctions ▶ Water Outages



NCHRP Report 525, Vol. 9 / TCRP Report 86, Vol. 9 (2006)

Guidelines for Transportation Emergency Training Exercises

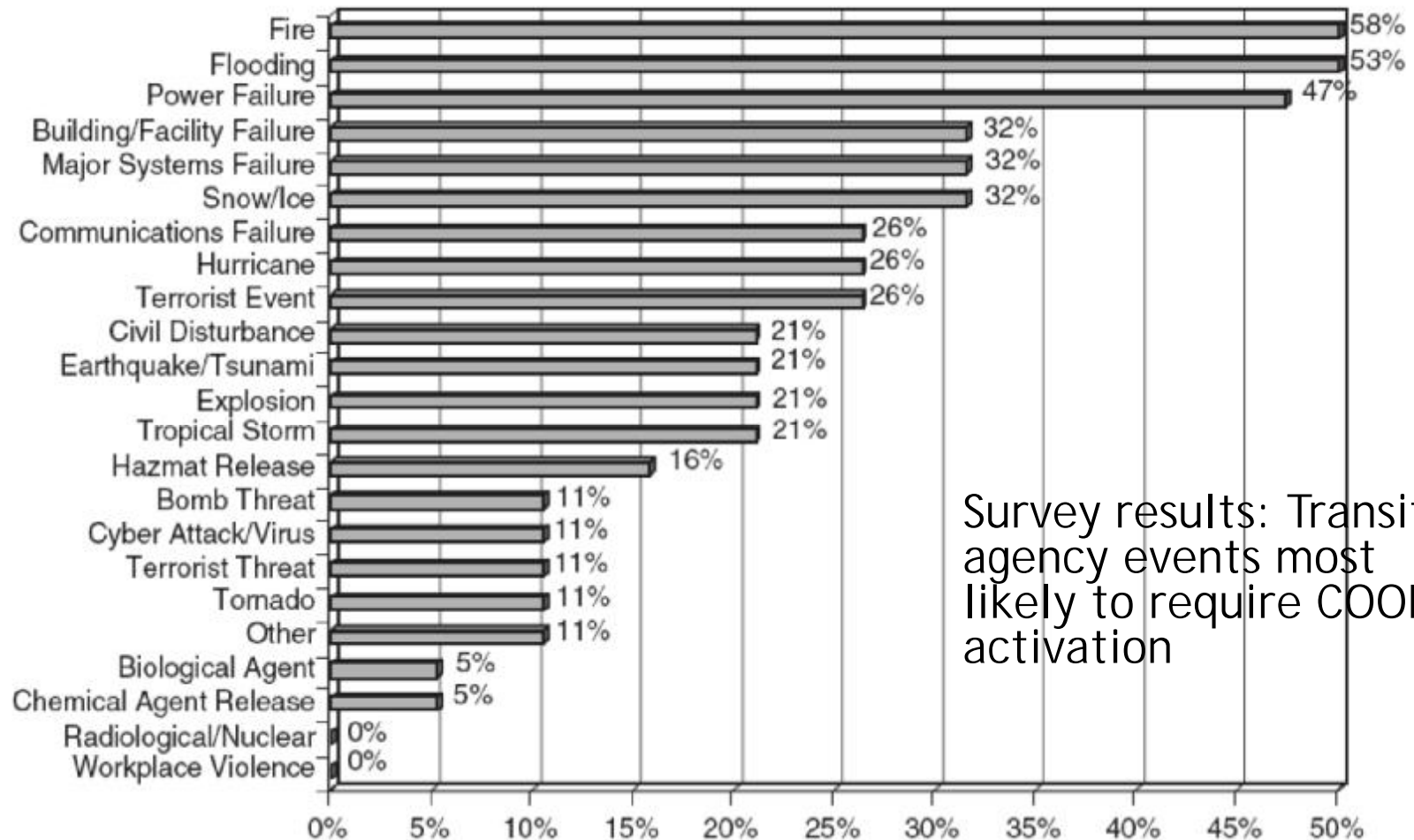
- Guidelines, resource CD-ROM and templates for developing a Progressive Exercise Program, compliant with DHS and ODP requirements
- Exercise program must address NIMS requirements and Transit Emergency Response Plan and procedures.
- Moves users through the steps necessary to develop and implement a three-year program.
- Practical emphasis on affordable exercises, cost sharing, and grant opportunities.

Building Block Approach



NCHRP Report 525, Vol. 8 / TCRP Report 86, Vol. 8

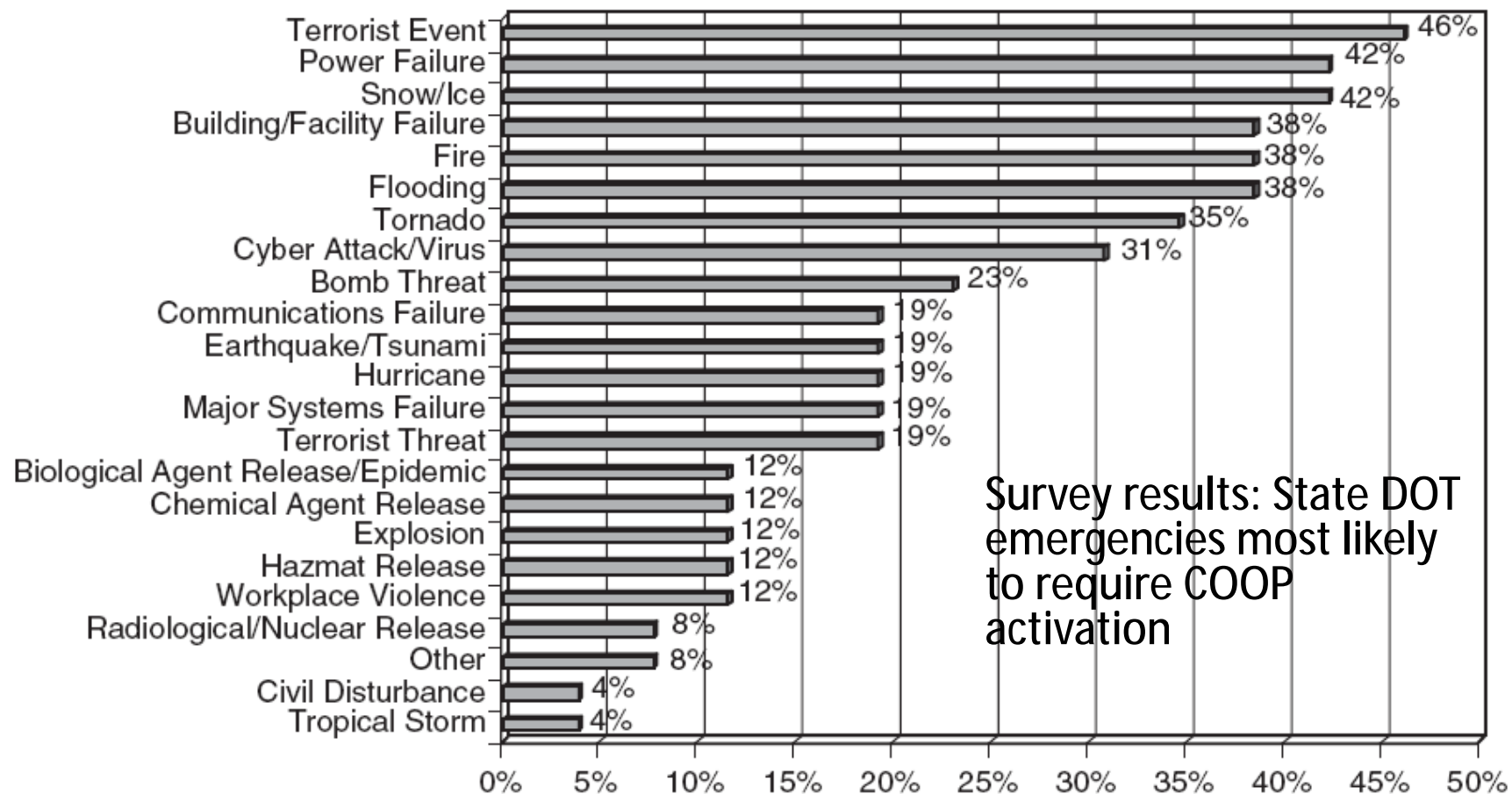
Continuity of Operations (COOP) Planning Guidelines for Transportation Agencies (2005)



Survey results: Transit agency events most likely to require COOP activation

NCHRP Report 525, Vol. 8 / TCRP Report 86, Vol. 8

Continuity of Operations (COOP) Planning Guidelines for Transportation Agencies (2005)



NCHRP Legal Research Digest 49

Emergency Contracting: Flexibilities in Contracting Procedures during an Emergency (2007)

- I. Introduction—When Is Emergency Contracting Applicable?
- II. The Concept of Flexibility for Contracting in Emergency Situations and How It Can Be Misused
- III. Basic Conditions for Waiving Contract Requirements in Emergency Situations
- IV. Range of Contracting Options
- V. Specific Authority to Waive Certain Contracting Requirements



VI. Federal Statutes Applicable to State Emergency Procurements (Title 23)

VII. Limitations Imposed by FEMA for Reimbursement to the States in an Emergency

VIII. Impact of Limitations Imposed by FEMA for Reimbursement

to the States for Emergency Procurements

IX. General Guidance That Has Been Issued on Federal Emergency Contracting

X. Summary and Conclusion

8. Stage II

Specialized Guidance

TCRP Report 86, Vol. 5

Security-Related Customer Communications and Training for Public Transportation Providers (2004)

1. Being Prepared: Security Training and Communication (video)
2. Overview (PowerPoint presentation)
3. Guide to Security-Related Customer Communications and Training for Public Transportation Providers (final report for Volume 5 of TCRP Report 86, in pdf)
4. Templates of Communication Devices Presented in the Final Report for Volume 5 of TCRP Report 86 (MS-Word)

CD-ROM contains all 4 items

Response

All-hazards approach

- **Natural disasters (e.g., hurricanes, tornadoes, floods, storms)**
- **Human accidents (e.g., hazardous materials spills, fires)**
- **Terrorism**

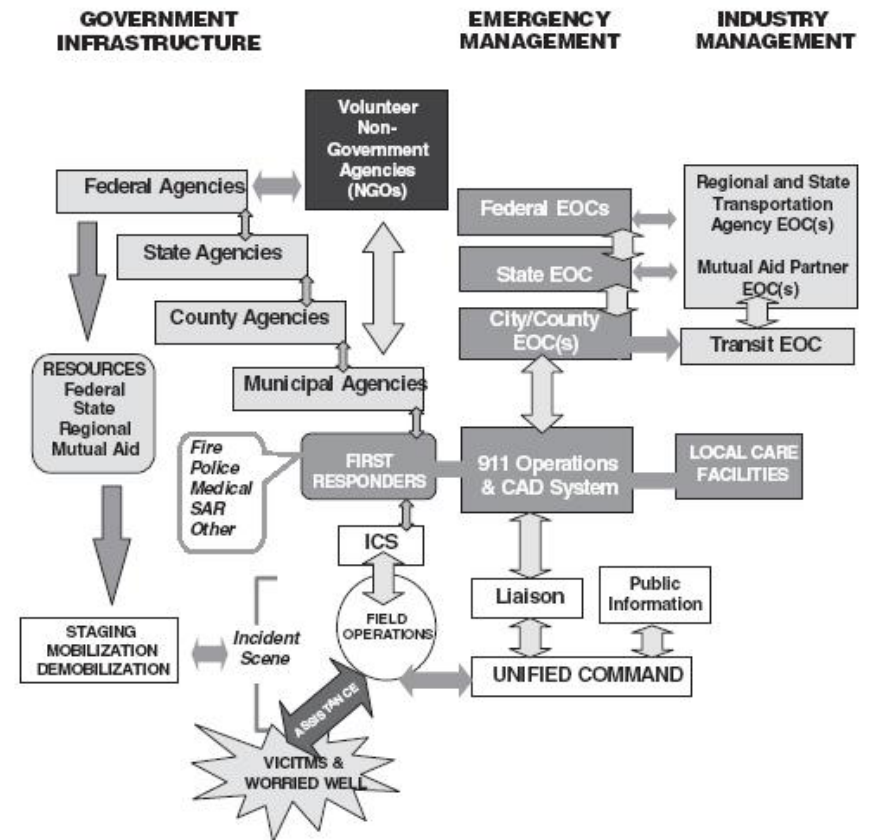
Communication protocols must be applicable to all emergency events



TCRP Report 86, Vol. 7

Public Transportation Emergency Mobilization and Emergency Operations Guide (2005)

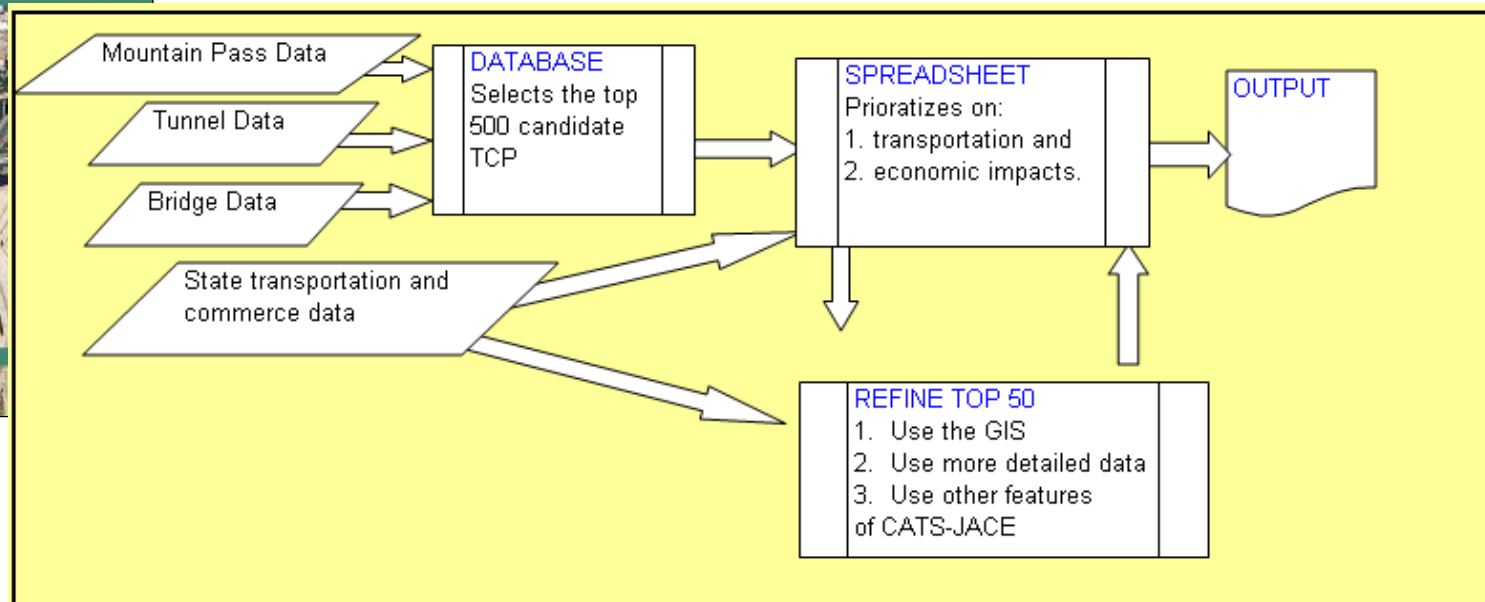
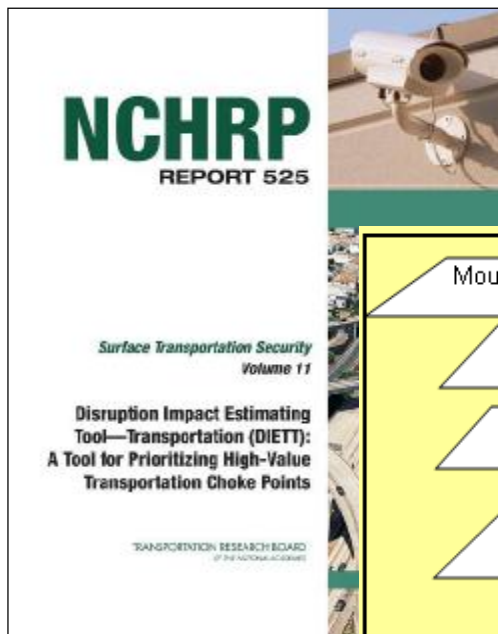
- Overview of NIMS/NRP requirements.
- Updated discussion regarding new threats to transportation agencies:
 - Chronology of worldwide incidents.
 - Capabilities and intentions of specified terrorist groups.
- Guidance for updating Transit Emergency Response Plans.
- Recommendations for establishing a Transit Incident Management Organization.
- Specialized research and recommendations for mobilizing transit personnel resources to address a range of emergencies, including no-notice evacuations and terrorist events.
 - Over all incident management phases: awareness, prevention, preparedness, response and recovery.
 - Checklist for response to events indicating WMD agent release



NCHRP Report 525, Vol. 11

Disruption Impact Estimating Tool—Transportation (DIETT): A Tool for Prioritizing High-Value Transportation Choke Points (2006)

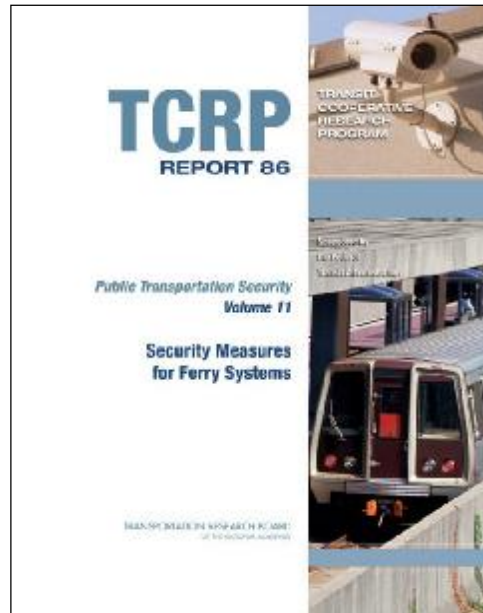
- Highways, rail, and waterway choke points
- Key variable: Impact on commercial shipments
- Prioritize on net national economic impacts
- Excludes replacement costs & collateral damage



TCRP Report 86, Vol. 11

Security Measures for Ferry Systems (2006)

Table 1. Categorization of GSMs.



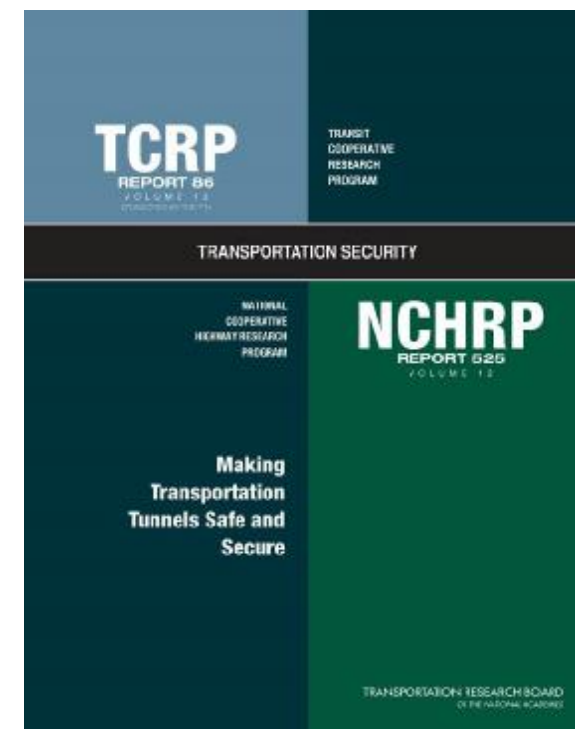
GSM Categories and Sub-Categories	(General Security Measures) # of GSMs
Fencing/Barriers	
Retractable vehicle barriers/gates	5
Fixed vehicle deterrent with pedestrian access	4
Fixed, both vehicle and pedestrian deterrent	5
Access Control	
Credentials	13
Locks	3
System Control	3
Intruder Sensors	
Perimeter (doors & windows, walls & fences, and buried)	13
Volume sensors – motion detectors	9
Monitoring	
Lighting	3
CCTV/video	7
Procedural/Low Cost	5
Waterside Security	
Surface	4
Underwater	5
Screening	
Passengers and Cargo	7
Trace Detection	14
Human Observation	
All Areas	3
Waterside	2

TCRP Report 86, Vol. 12 / NCHRP Report 525, Vol. 12

Making Transportation Tunnels Safe and Secure (2006)

Table 72. How countermeasures deter, detect, and respond to hazards and threats.

Deterrence	Detection	Response
<ul style="list-style-type: none"> • Operational Tactics <ul style="list-style-type: none"> – Roving patrols – Bomb-sniffing dogs – Background checks of employees and contractors – Background checks of facility vendors – Access control – Credentialing and identification card system – Guards at entry points – Intelligence – Hazardous material restriction – Inspections • Technology <ul style="list-style-type: none"> – CCTV – Intrusion detectors – System integration • Engineering <ul style="list-style-type: none"> – Blast design – Elimination of hidden corners, alcoves, and shelves – Open, unimpeded lines of sight – Lighting – Locked facility doors 	<ul style="list-style-type: none"> • Operational Tactics <ul style="list-style-type: none"> – Intelligence – Security awareness training of operating and maintenance personnel – Roving patrols – Guards at entry points – Bombing-sniffing dogs – Identification card system – Inspections • Technology <ul style="list-style-type: none"> – Intrusion detectors – Identification card readers – Chemical/biological/radiological detectors – Seismic/stress detectors – Mobile monitoring – Explosive detectors – System integration • Engineering <ul style="list-style-type: none"> – Fire detection 	<ul style="list-style-type: none"> • Operational Tactics <ul style="list-style-type: none"> – Command and control (multi-tenant) – Evacuation protocol – Information sharing – Tunnel ventilation – Portable fire extinguishers • Technology <ul style="list-style-type: none"> – CCTV system – Communication – Chemical/biological/radiological monitoring – Explosive detectors – Interface with traffic monitoring – System integration • Engineering <ul style="list-style-type: none"> – Fire protection – Lighting – Ventilation



NCHRP Project 20-7 Task 230

Safety & Security in Roadway Tunnels (2008)

SAFETY & SECURITY IN ROADWAY TUNNELS

FINAL REPORT

Requested by:
American Association of State Highway
and Transportation Officials (AASHTO)
Standing Committee on Highways

Prepared by:
Kathleen Almand
Fire Protection Research Foundation
Quincy, Massachusetts

March 2008

The information contained in this report was prepared as part of NCHRP Project 20-7, Task 230,
National Cooperative Highway Research Program, Transportation Research Board.



NCHRP Synthesis 415

Design Fires in Road Tunnels (2011)

NCHRP

SYNTHESIS 415

NATIONAL
COOPERATIVE
HIGHWAY
RESEARCH
PROGRAM

Design Fires in Road Tunnels



A Synthesis of Highway Practice

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

TABLE 38
MAIN DESIGN FIRE VARIABLES

Time Dependent Design Fire Variables	Values Range	Design fire variables are a function of:
Fire Size—Maximum FHRR	(1.5 MW–300 MW)	<div style="font-size: 3em; margin: 0;">}</div> <ul style="list-style-type: none"> Type of vehicle (cars, buses, HGVs, tankers; alternative fuel) Type of cargo including bulk transport of fuel Fire detection system and delay in activation of FLS systems Ventilation profile Fire suppression system Tunnel geometry <ul style="list-style-type: none"> - tunnel width, height, cross section, length - volume (available oxygen) - shape of tunnel, grade - location of exits Tunnel drainage system
Fire Growth Rate (slow, medium, fast, ultra fast)	0.002–0.178 kW/s ² as high as 0.331 kW/s ² measured at one test	
Fire Decay Rate	0.042–0.06 (min ⁻¹)	
Perimeter of Fire	Car—truck perimeter	
Maximum Gas Temperature at Ceiling	110°C–1350°C (212°F–2462°F) (higher with FCV)	
Fire Duration	10 min–2 days	
Smoke and Toxic Species Production Rate	20–300 m ³ /sec	
Radiation	From 0.25 to 0.4 of total heat flux up to 5,125 W/m ² (1,625 Btu/hr/ft ²)	
Flame Length		

NCHRP Report 645

Blast-Resistant Highway Bridges: Design and Detailing Guidelines (2010)

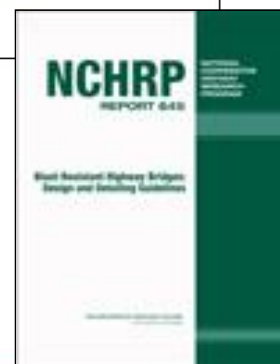


NCHRP 12-72

Final Report

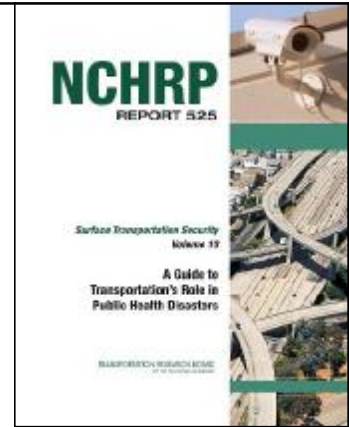
Countermeasure	Function/Effectiveness				Costs per year		
	Deterrence	Detect	Defend	Reduce Impact	Capital	Operating	Maintenance
Countermeasure 1	M	L	L		\$	\$	\$
Countermeasure 2	M	H			\$	\$	\$
Countermeasure 3				H	\$	\$	\$
Countermeasure 4	L		H		\$	\$	\$
L = Low Effectiveness M = Medium Effectiveness H = High Effectiveness	Source: Modified from SAIC "A Guide to Highway Vulnerability Assessment for Critical Asset Identification and Protection."						

Figure 17. Countermeasure summary sheet (Winget and Williamson, 2003)



NCHRP Report 525, Vol. 10 *A Guide to Transportation's Role in Public Health Disasters (2006)*

- Transportation response options to an extreme event with chemical, biological, or radiological agents
- Focuses on the effect and role of transportation
- Applicable to all civilian sites (not just transportation sites)



TERET (Tracking Emergency Response Effects on Transportation) – Spreadsheet Layout

Sheet 1: Introduction
Provides summary instructions

Sheet 3: Mass Care
Assess needs during shelter-in-place, temporary shelters, or quarantine shelter.

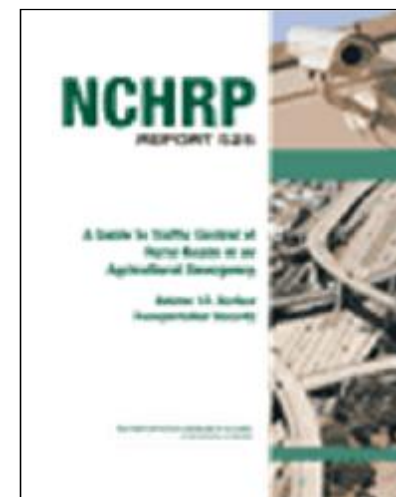
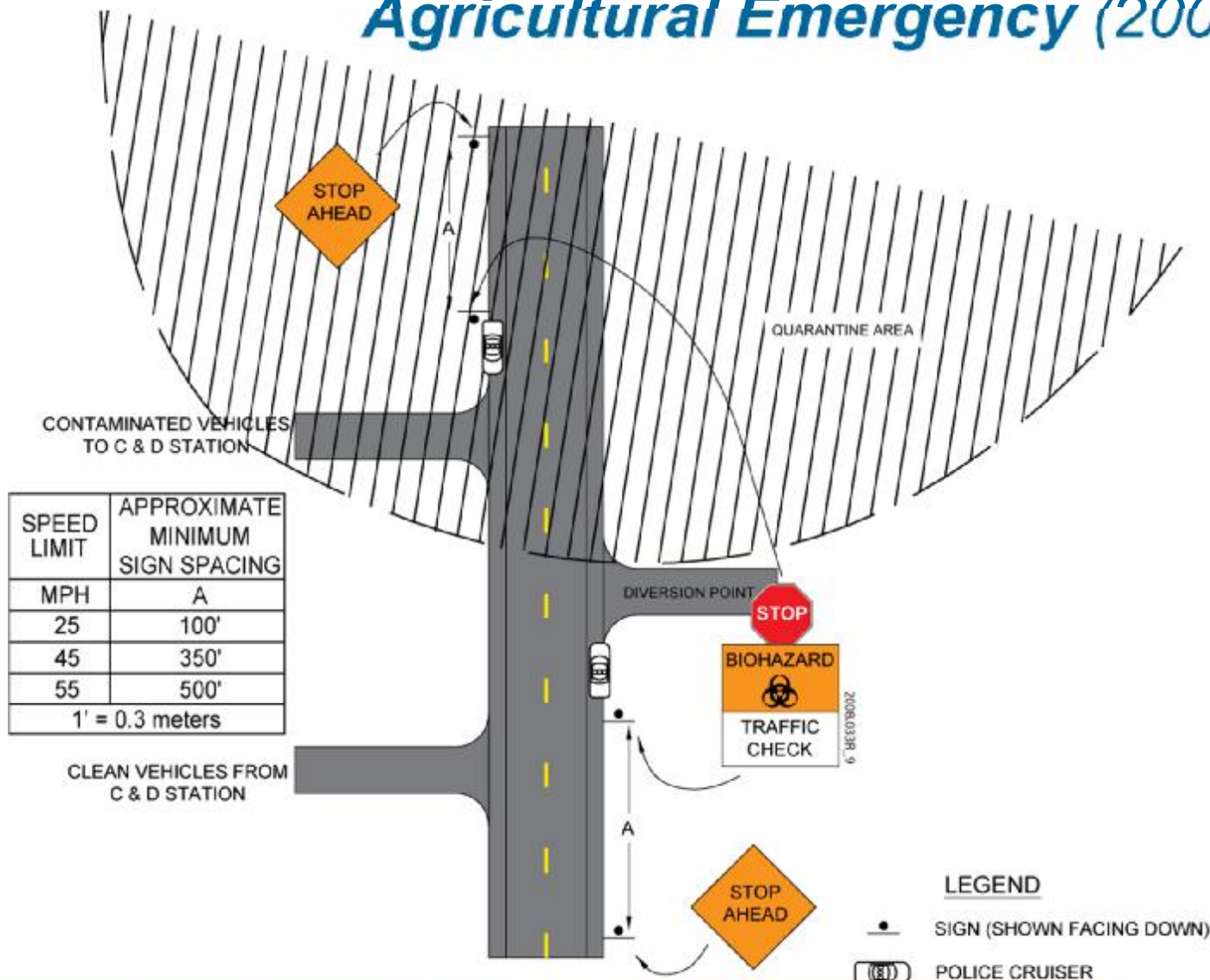
Sheet 2: Basic Services
Assess criticalities that may develop from ER changes in traffic patterns.

Essential Services	Modes						Hours to Criticality		
	Bike	Boat	Mass	Marine	Air	Pipeline	High	Medium	Low
CRITICAL SUPPLIES (For normal operations)									
Water									
Food									
Medical (Non-animal-related)									
Vehicle and Generator Fuel									
Electricity									
Heating Fuel									

Mass Care Needs	Hours until Need		Physical Destruction (hurricane, explosion, etc)	Radio-logical	Chemical	
	Initial	Current			Persistent	Not Persistent
Decon, triage, pre-hospital treatment						
Mass Public Transport						
Standard Decontamination Supplies						
Reduced Power or Water Conditions						
Shelter-in-Place -- delivery until evacuation or safe levels						
Temporary Shelter -- Shelter deliveries until other housing or safe levels						
Quarantine Shelter Until not contagious						

NCHRP Report 525, Vol. 13

A Guide to Traffic Control of Rural Roads in an Agricultural Emergency (2008)



TRAFFIC CONTROL POINT W/
CLEANING & DISINFECTION SITE

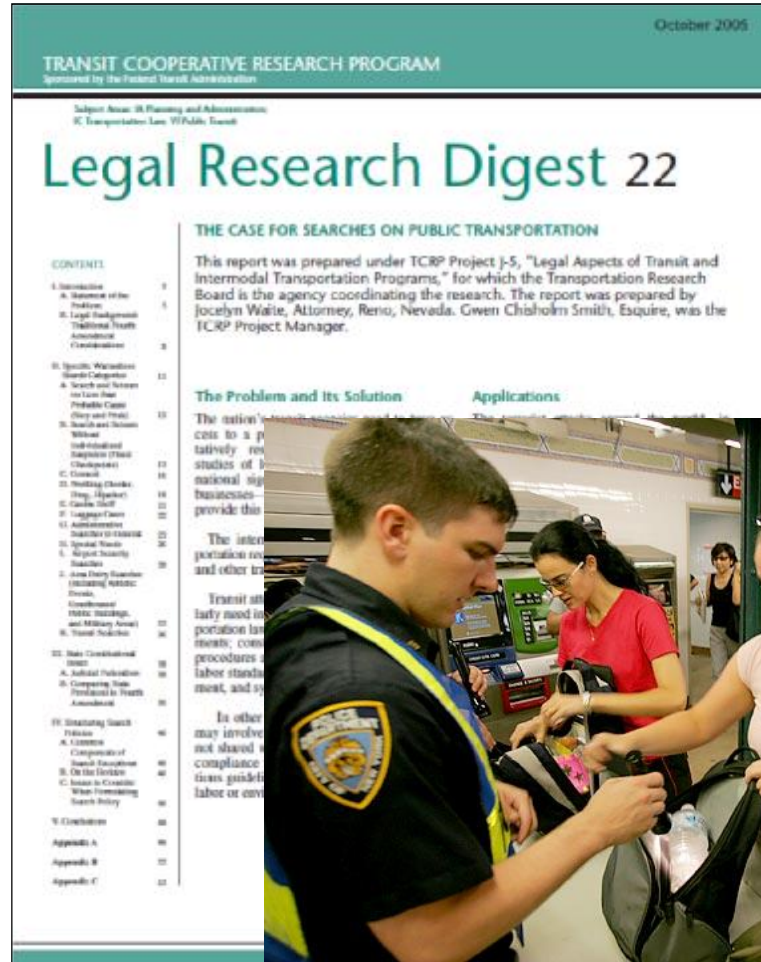
TCRP Legal Research Digest 22

The Case for Searches on Public Transportation (2005)

1. Traditional Fourth Amendment Considerations
2. Specific Warrantless Search Categories
3. State Constitutional Issues
4. Structuring Search Policies

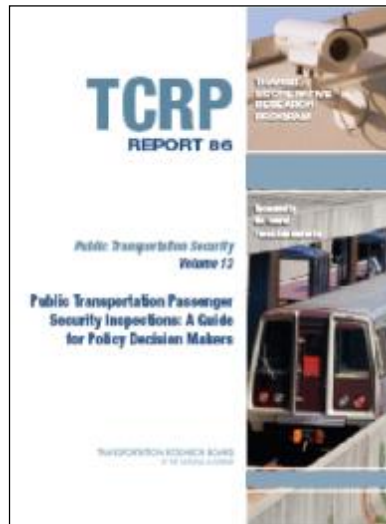


Photos source: Ernest R. Frazier Sr., Esq. Countermeasures Assessment & Security Experts, LLC
GAO Panel on Explosives Detection Technologies That Could Help Protect Passenger Rail, 11-12 August 2009



TCRP Report 86, Vol. 13

Public Transportation Passenger Security Inspections: A Guide for Policy Decision Makers (2007)



Includes measures for:

1. Mitigation of intrusion
2. Mitigation of privacy concerns
3. Mitigation of claims with respect to unreasonable detention, etc.
4. Mitigation of health risks

Table 7. Mitigation measures.

	Mitigation of intrusion	Mitigation of privacy concerns	Mitigation of claims with respect to unreasonable detention, etc.	Mitigation of health risks
Behavioral assessments	Use, to extent feasible, of objective indicators; reasonable limitations on officer's discretion; extreme caution in using radiometric characteristics.	Same as for intrusion.	Same as for intrusion.	N/A
Radiation detection papers	Not a primary risk.	Not a primary risk.	Require positive results be treated as cause for suspicion, not evidence of guilt, and process accordingly in conducting secondary screening.	Not a primary risk.
Trace detector integrated into ticket machine	Provide notice that ticket machine contains a scanner to allow passenger's option of avoiding even minimally intrusive inspection.	Not a primary risk.	Require positive results be treated as cause for suspicion, not evidence of guilt, and process accordingly in conducting secondary screening.	Scrutinously maintain radiation components.
Non-integrated (desktop) scanner	Minimally intrusive for Fourth Amendment purposes.	Not a primary risk.	Require positive results be treated as cause for suspicion, not evidence of guilt, and process accordingly in conducting secondary screening.	Scrutinously maintain radiation components.
Explosives detection canine	Not a primary risk.	Not a primary risk.	Require positive results be treated as cause for suspicion, not evidence of guilt, and process accordingly in conducting secondary screening.	N/A
Visual/physical bag search	Protocols and inspection policies and procedures must be documented and followed. Inspections are based on compelling government need.	Directing officers not to read any material in passenger bags will minimize privacy claims as well as intrusiveness.	Not a primary risk.	N/A
Handheld trace detector	No additional measures.	Not a primary risk.	Require positive results be treated as cause for suspicion, not evidence of guilt, and process accordingly in conducting secondary screening.	Scrutinously maintain radiation components.
Handheld magnetometers	Use as secondary PSI method should mitigate intrusiveness of physical approach to passenger, as there would be some grounds for suspicion.	Not a primary risk.	Not a primary risk.	Not a primary risk.
Backscatter X-ray	Conceal sensitive body areas or reduce image details. Also ensure that images are not displayed to anyone but the inspectors. Destroying images once they are reviewed for security purposes should also mitigate risk.	Conceal sensitive body areas or reduce image details. Also ensure that images are not displayed to anyone but the inspectors. Destroying images once they are reviewed for security purposes should also mitigate risk.	Require positive results be treated as cause for suspicion, not evidence of guilt, and process accordingly in conducting secondary screening.	Scrutinously maintain radiation components.
Millimeter wave imaging scanner	Not a primary risk.	Not a primary risk.	Require positive results be treated as cause for suspicion, not evidence of guilt, and process accordingly in conducting secondary screening.	Scrutinously maintain radiation components.
Puffer portal	Not a primary risk.	Not a primary risk.	Require positive results be treated as cause for suspicion, not evidence of guilt, and process accordingly in conducting secondary screening.	Scrutinously maintain radiation components.
Baggage X-ray	Not a primary risk.	Not a primary risk.	Not a primary risk.	Scrutinously maintain radiation components.
Z backscatter van	Avoid scanning vans with passengers.	Avoid scanning vans with passengers.	Require positive results be treated as cause for suspicion, not evidence of guilt, and process accordingly in conducting secondary screening.	Scrutinously maintain radiation components; avoid scanning vans with passengers.

ACRP Report 5

Quarantine Facilities for Arriving Air Travelers: Identification of Planning Needs and Costs (2008)

Table 1. Total stand-by costs.

<p>1. Cost of Space in a Separate Facility if Used for Quarantine</p> <p>Needed: 20 square feet per person x 200 people = 4,000 square feet</p> <p>7 additional rooms for: recreation/leisure (3), office area, food assembly and serving, medical, and storage. Each room 500 square feet x 7 = 3,500 square feet. Total space: 7,500 square feet</p> <p>Approximately \$2.00 per square foot/month x \$7,500 = \$15,000</p>	<p>Value of the space: \$15,000 per month</p>
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------

2. Privacy Partitions and Space Dividers

Partitions needed for sleeping areas—approximately 320 partitioned individually divided spaces and 50 other divided spaces occupied by small families). 7 other divided spaces for recreation/leisure (3), food assembly and serving, medical, and storage—approximately 22 (21) spaces depending if it is on location next to walls or at end of aisle

342 dividers x \$200 each = **\$68,400***

3. Storage

Lockers—6 tiered metal lockers (size 1 cu ft.) with 3 for each room (lockers) x 12 @ \$325 each = **\$3,900**

4. Cleaning supplies

Commercial mopping combo @ \$26.00 x 5 = **\$130***

Mops @ \$11 each x 5 = **\$55***

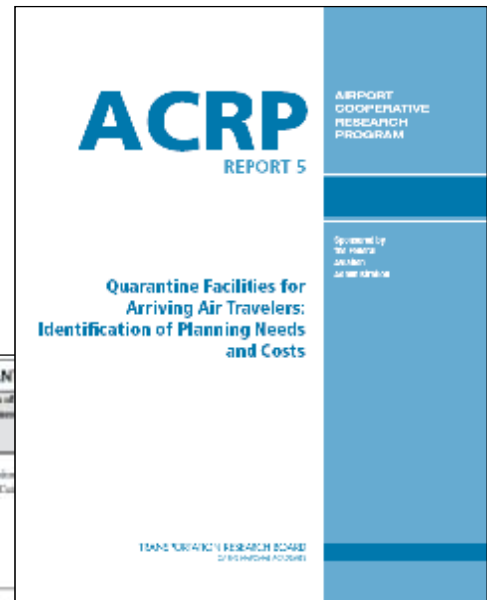
Trash cans: 1 44-gallon cans per 20 people plus 1 for each of 7 spaces and 3 extra = 20 cans x \$45 per can = **\$900***

Cleaning liquids, approximately 25 gallons x \$7.00 per gallon = **\$175***

Trash can liners @ \$1.50 per liner x 20 cans x 14 days = **\$420**

APPENDIX A. CDC DISEASE QUARAN

Disease / Reference	Symptoms in Early Stage (prodrome stage)	Symptoms for Full Blown Illness (definitive stage)	Incubation Period (average and range for 95% of cases)	Mechanism of Contagion	Diagnosis	Notes
Diphtheria 1-4	Malaise, sore throat, loss of appetite, moderate fever, and hoarse cough.	Adherent, gray membrane forms over the mucous membranes of the tonsils and/or pharynx.	2-5 days (range 1-10 days).	Direct person-to-person transmission respiratory and physical contact. Cof important in transmission.	Microscopic clinical findings (e.g., respiratory specimens smear or culture positive, Tuberculin Skin Test (TST) or Quantiferon-TB Test positive, Sputum smear combination of chronic cough (>2 weeks), weight loss, and fatigue.	Specimens to be sent to CDC.
Influenza 5-10	Prodromal recurrent fever; chronic cough, anorexia, fatigue, and weight loss.	Coughing blood from the lungs, Chronic Obstructive Pulmonary Disease, abnormal stridor and enlarging of the respiratory passages caused by mucous blockage, fluid in the lungs.	Average incubation period 21 weeks, 95% of cases will develop within 15-28 weeks.	Airborne route. Extended period of low contagiousness.	Microscopic clinical findings (e.g., respiratory specimens smear or culture positive, Tuberculin Skin Test (TST) or Quantiferon-TB Test positive, Sputum smear combination of chronic cough (>2 weeks), weight loss, and fatigue.	Specimens to be sent to CDC.
Cholera 11-14	<20% of Cholera patients will show any symptoms before full onset of disease.	Diarrhea, painless, watery diarrhea. Vomiting also occurs in most patients.	Short incubation period, from less than one day to five days.	Ingesting contaminated water or food; person-to-person transmission is rare.	Diagnosis is confirmed by identification of the organism in a stool specimen.	Notes established by CDC.
Smallpox 15-21	High fever, back pain, headache, sweating, malaise, and prostration.	Maculopapular rash that progresses to pustules, then scabs, and then pustules and nail lesions.	Incubation period averages about 12 to 14 days but can range from 7 to 17 days.	Spread by inhalation of air droplets or aerosols. Direct (within 6-7 feet) and fairly prolonged (approximately 3 hours) face-to-face contact is required to spread smallpox from one person to another.	Characteristic rash and symptoms (fever, abdominal pain, etc). Electron microscopic (EM) visualization. RT-PCR. Confirmation.	Close contact of case, when found, is done during incubation.
Haemorrhagic Fever Viruses 22-24	Fever, aching muscles, dizziness, back pain, stiffness, headache, headache, sore eyes and sensitivity to light, Nausea, vomiting, sore throat, diarrhea, and generalized abdominal pain. Liver enlargement.	Fast heart rate, enlarged lymph nodes, and a rash caused by bleeding into the skin. Bleeding in the mouth and throat, the upper bowel, and the gums. Hepatitis. Liver and kidney and pulmonary failure.	10-16 days. Length of incubation may depend on the virus of acquisition (Crimean-Congo RV); tick bite, 1 to 3 days, with a maximum of 5 days; infected blood or tissues is usually 5 to 6 days, with a documented maximum of 13 days.	Direct contact with blood or other infected tissues from livestock or tick bite. Human to human close contact.	After 5 days of illness, antibodies can be detected (IgG or IgM). Prior to that, virus must be isolated from blood or tissue specimens and grown in host cells. Viral DNA may also be detected in the blood.	Virus can be isolated from blood or tissue specimens in the first five days of illness, and grown in cell culture. Likely to find virus in blood smears, nasal smears, blood, lymph, and sputum/throat.
Plague 25-31	Fever, chills, headache, malaise, aching muscles, nausea, and prostration. Bubonic plague: painful, swollen lymph nodes. Pneumonic plague: cough, breathing difficulties.	Bubonic: draining of the site of the flea bite. Pneumonic plague: bloody sputum.	Bubonic: 2-6 days. Pneumonic: 2-4 days with range of 1-6 days.	Flea bites. Direct contact with infectious animals or other materials or inhalation of infectious respiratory droplets. Ingestion.	The swollen gland called a "bubo." If IgG immunoglobulin ELISA. Culture (by specific bacteriophage).	Notes established by CDC. Bacteria likely to be found in or on lymph.



ACRP Report 12

An Airport Guide for Emergency Planning for CBRNE Events (2009)



Special Considerations for CBRNE

(Chemical, Biological, Radiological, Nuclear, or Explosives)

- Command and control
- Responder communications
- Emergency public information
- Firefighting and special operations
- Law enforcement and special operations
- Emergency Medical Services (EMS)
- Quarantine
- Fatality management
- Logistics
- Continuity of Operations
- Family and customer assistance

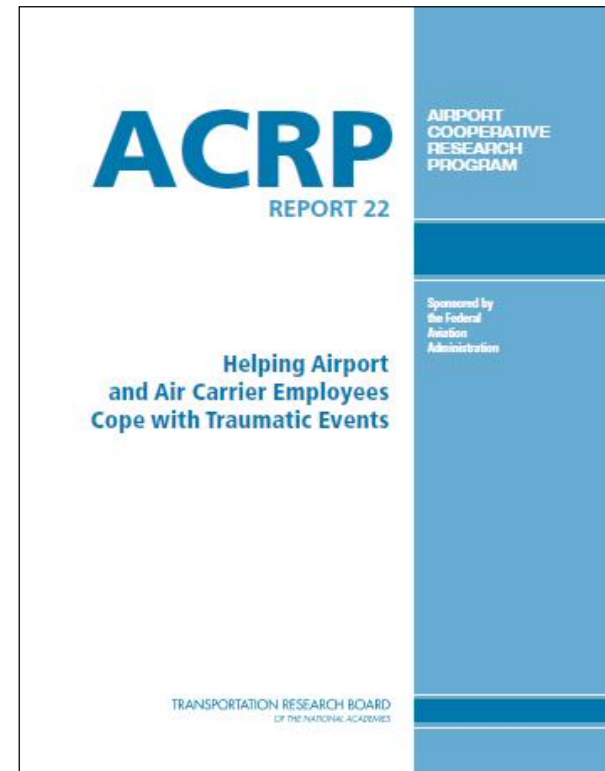
ACRP Report 22

Helping Airport and Air Carrier Employees Cope with Traumatic Events (2009)

Five Essential Intervention Principles



Source: Hobfoll, et. al. (2007).



9. Stage II

All Hazards, All Modes

Six Goals

Five Pillars

Transportation Sector Rationale for An All Hazards Approach to Natural Hazards and Security

Safety first: build on the successful experience of the systems approach, and extend the mission of existing safety personnel

Build on DOT expertise in response: urban areas work with law enforcement, fire, rescue, and towing and recovery on traffic incident management; statewide presence with emergency contracting, equipment (e.g., communications systems), personnel, and common response to weather emergencies; trained to observe and report

Build on transit expertise in security: in urban areas parallel size and location of high-value infrastructure; invested; bring expertise on policing and security; trained to observe and report

Make interdependence an asset: transportation depends on, and is depended on, by other critical infrastructures; roads and transit are publicly owned and managed, and house public involvement experts

Six Goals for Transportation Security

1. **Social:** Involve the public—make pre-operational surveillance riskier
2. **Budget & Policy:** Make risk-informed decisions the norm
3. **Technical:** focus on countermeasures & design (instead of vulnerabilities & threats) with dual benefits
4. **Operational:** quick, layered response with effective surge capability
5. **Psychological:**
 - a. for the public, peace of mind/acceptance of risk:
security \approx satisfaction
 - b. for the attack planner, transportation is a difficult target,
prepare more or attack something easier
6. **Intelligence:** Support police/military/intelligence by having trained transportation employees report suspicious activities and by making the bad guys stretch out their planning time

Six Goals for Transportation Security ***Desired Outcome***

Mainstreaming an integrated, high level, all-hazard, National Incident Management System (NIMS)-responsive, multimodal risk management process into major transportation agency programs and activities

Six Goals for Transportation Security

Desired Outcome

Five Pillars

- 1. A systems approach to emergency management functions focusing on a holistic approach to risk reduction:** A Guide to Planning Resources on Transportation and Hazards
- 2. Understanding security fundamentals:** Security 101: A Physical Security Primer for Transportation Agencies (Security 101)
- 3. Organizing to be a reliable partner in emergency management:** Guide for Emergency Transportation Operations (ETO)
- 4. Risk-informed decision support to buy down risk:** Costing Asset Protection: An All Hazards Guide for Transportation Agencies (CAPTA)
- 5. Integrated emergency response planning:** A Guide to Emergency Response Planning at State Transportation Agencies (2010 Guide)

The Hazards and Disaster Management System

Pre-Impact Interventions

Mitigation Practices
 Emergency Preparedness Practices
 Recovery Preparedness Practices

Post-Impact Responses

Emergency Activities
 (planned and improvised)
 Recovery Activities
 (planned and improvised)

Hazard Vulnerability

Hazard Exposure
 Physical Vulnerability
 Social Vulnerability

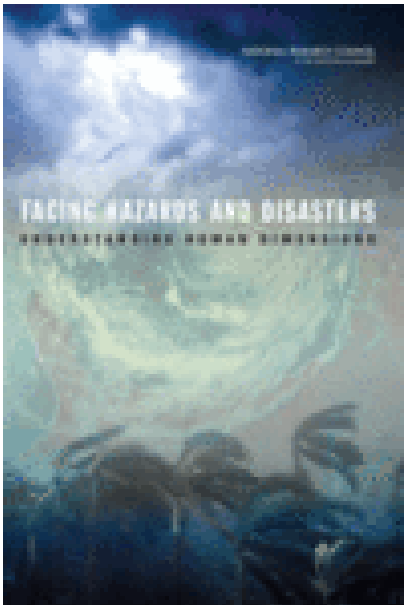


Disaster Impacts

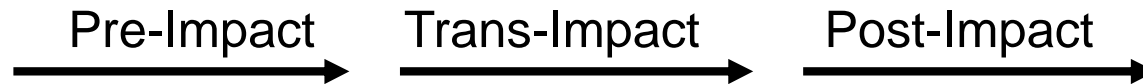
Physical
 Social

Disaster Event Characteristics

Frequency	Magnitude of Impact
Predictability	Scope of Impact (spatial and social)
Controllability	Duration of Impact
Length of Forewarning	



CHRONOLOGICAL TIME

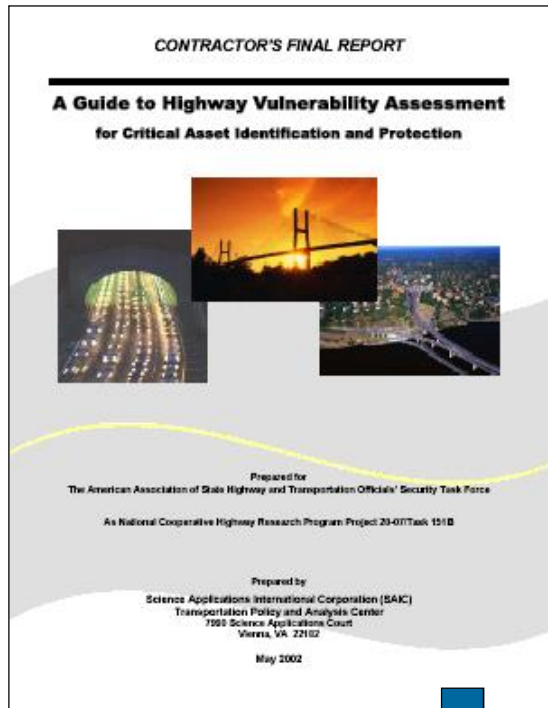


Source: Facing Hazards and Disasters (NAS, 2006), adapted from Kreps (1985), Cutter (1996), Lindell and Prater (2003)

10. Stage III

Risk-Informed Decision Support

Continuous Development of Risk Management and Emergency Response Planning Guidance

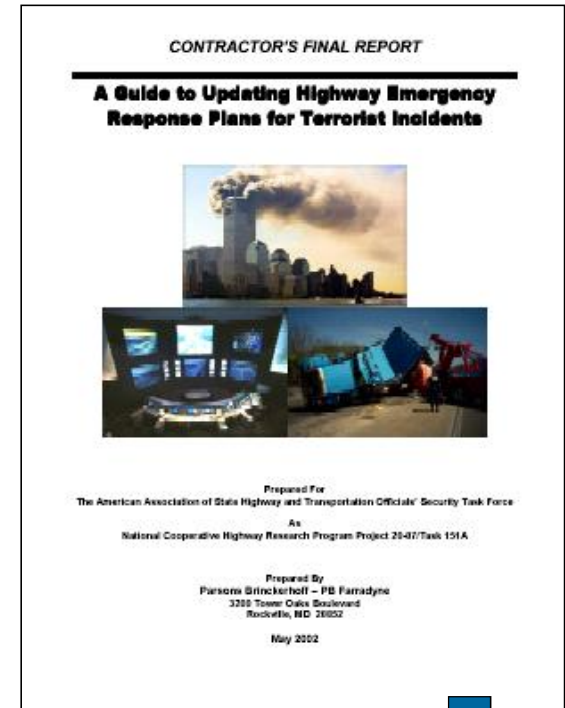


2002: Guides to Vulnerability Assessment & Emergency Response Planning

2002-2003: workshops

2004-2005: publications that anticipated NIMS, NRP/NRF, and NIPP.

2012: publications adopted by AASHTO



Published 2009:



NCHRP Report 525, Vol. 14

Security 101: A Physical Security Primer for Transportation Agencies

Published 2010:



NCHRP Report 525, Vol. 16

A Guide to Emergency Response Planning at State Transportation Agencies

Costing Asset Protection: An All Hazards Guide for Transportation Agencies (CAPTA, 2009)

Application Context

- Top-down, program level – to support resource allocation
- Consequence-driven – based on user-selected thresholds (“possibilistic”)
- Iterative – use to compare/refine assumptions

Model Attributes

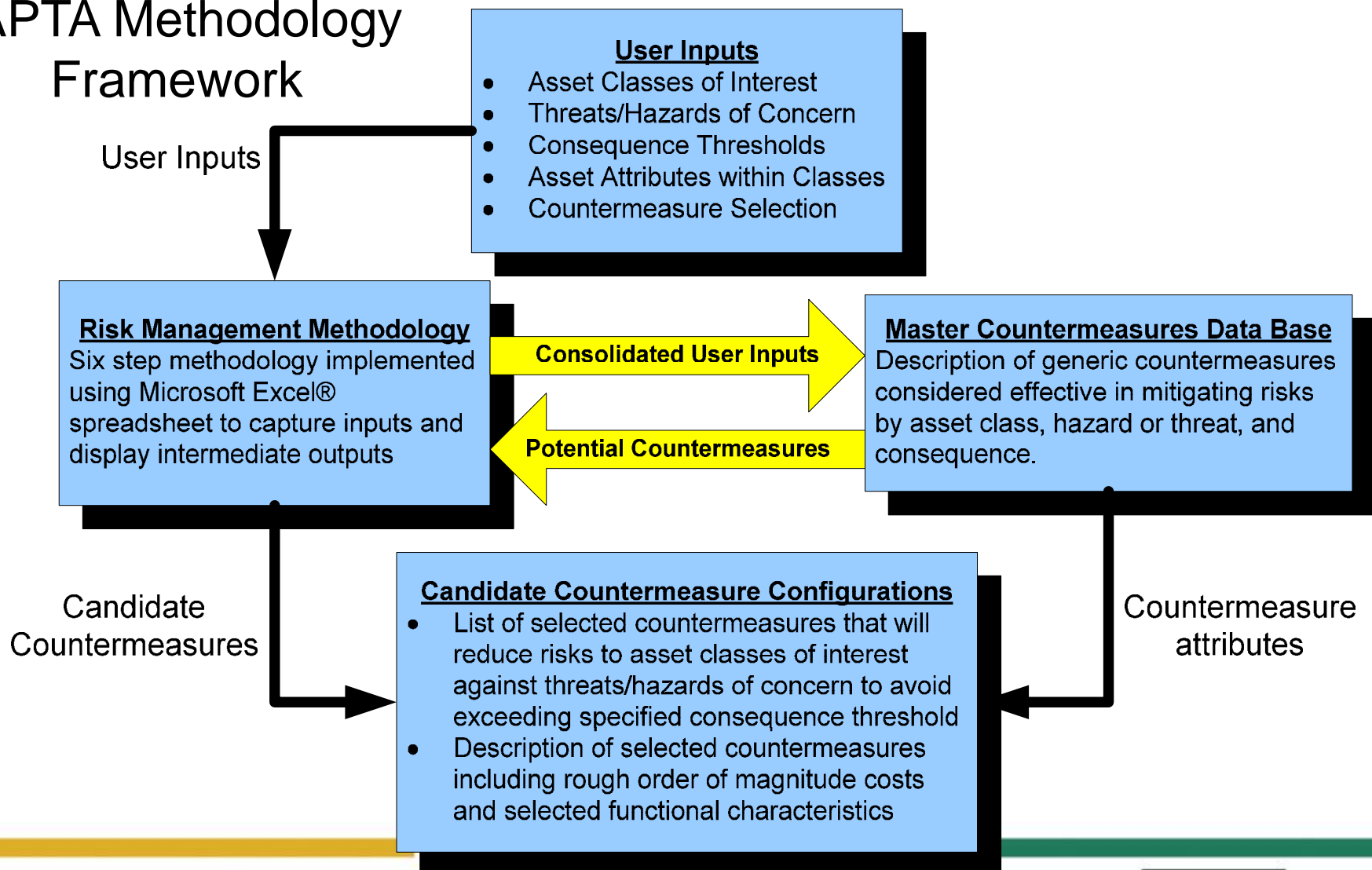
- Objective – when possible use data rather than “best judgment”
- Transparent – avoid “weighting and rating”
- Consistent – uses simple, available data and criteria, standard data base, default values
- Replicable – identify basis of all judgments

User Features

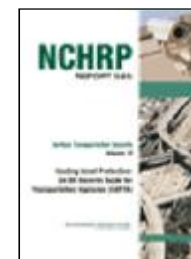
- Convenient – uses available resources (people and software) and imbedded data model
- Scalable – support a range of user contexts, mode, hazards,
- Expandable – to accommodate new threats/hazards, asset types, and countermeasures

Costing Asset Protection: An All Hazards Guide for Transportation Agencies (CAPTA, 2009)

CAPTA Methodology Framework



Costing Asset Protection: An All Hazards Guide for Transportation Agencies (CAPTA, 2009)



Basic CAPTA	Steps in Methodology	Expanded CAPTA
1	Identify Relevant Risks and Asset Classes	1
	Verify High Consequence Threats and Hazards	1a
2	Establish Consequence Thresholds	2
3	Describe Infrastructure Assets	3
4	Identify Critical Assets Across Modes	4
	Review Countermeasure Unit Costs	5a
	Identify and Describe Additional Countermeasures	5b
	Set Countermeasure Filters based on User Preference	5c
5	Select Candidate Countermeasures	5
6	Summary Report	6

Costing Asset Protection: An All Hazards Guide for Transportation Agencies (CAPTA, 2009)

- ① — ② — ③ — ④ — ⑤ — ⑥ Basic CAPTool
- ① — ①a — ② — ③ — ④ — ⑤a — ⑤b — ⑥ — ⑤ — ⑥ Expanded CAPTool

Select Candidate Countermeasures Instructions

The following is a list of countermeasure opportunities for each critical asset -- orange indicates medium effectiveness and red indicates high effectiveness.

To analyze an asset more closely, click on the name of the asset in row 15, and then click "Analyze Asset." A new sheet will pop up that details the effectiveness of the countermeasure against every relevant threat and hazard. The sheet will also tell you how many units of countermeasures you have selected so far for the asset, and the estimated cost.

To add units of countermeasures, enter the desired number of units into any cell. Alternatively, the "Analyze Asset" sheet also has a field for adding units of countermeasures.

When you are satisfied with your CM allocation, click "Continue."

Analyze Asset

Filter Countermeasures

Clear All Countermeasure Quantities

Next

Color Key

Medium Effectiveness	High Effectiveness
----------------------	--------------------

		Road Bridges	Road Tunnels	Transit/Rail Station																		
		Covered Bridge	State Line Bridge	Veteran's Bridge	Downtown Tunnel	Uptown Tunnel	Midtown Tunnel	North Station	South Station	Bay Station	Downtown Station	Market Street Station	Park Street Station	Government Center Station	State Street Station	City Center Station	Suburban Station	Airport Station	All other aboveground	All other belowground		
		Quantity of Named Asset			→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	20	13	
Physical Security Countermeasures	Lighting																					
	Barrier Systems																					
	Fences																					
	CCTV																					
Access Control Countermeasures	Intrusion Detection Devices																					
	Physical Inspection of Asset																					
	ID Cards																					
	Biometrics																					
Asset Design/Engineering	Background Checks																					
	Metal Detectors																					
	Restricted Access																					
	Random Searches																					
Operational Countermeasures	Visible Limited Access																					
	Visitor Management																					
	Locks																					
	Explosive Detection																					
Establish Visible Security																						
Seismic Detection																						
Fire Detection & Suppression																						
Encasement, Wrapping, Jacketing																						
Patrols																						
WX/Seismic Information																						
Intelligence Networking																						
HAZMAT Mitigation																						
Security Awareness Training																						
Emergency Response Training																						
Emergency Evacuation Planning																						
Planned Redundancy (e.g., detours)																						
Public Information and Dissemination																						

Description of this step & instructions

Step indicators

Reset Buttons

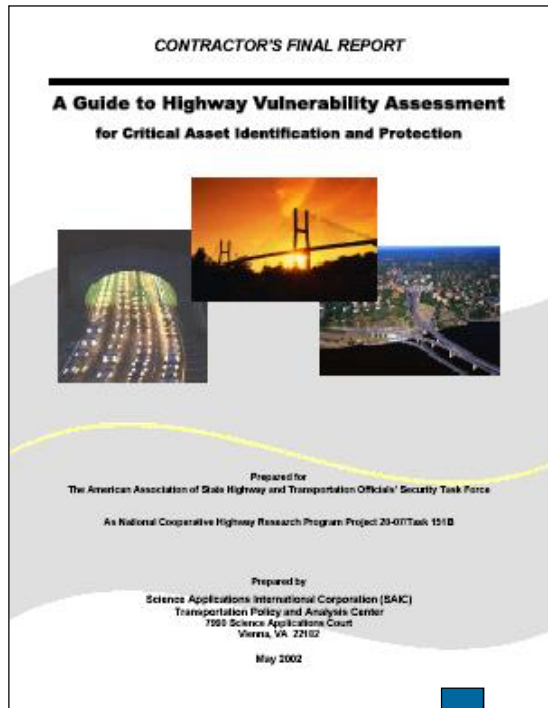
User Options

Color code key

11. Stage III

Comprehensive Emergency Response Planning

Continuous Development of Risk Management and Emergency Response Planning Guidance

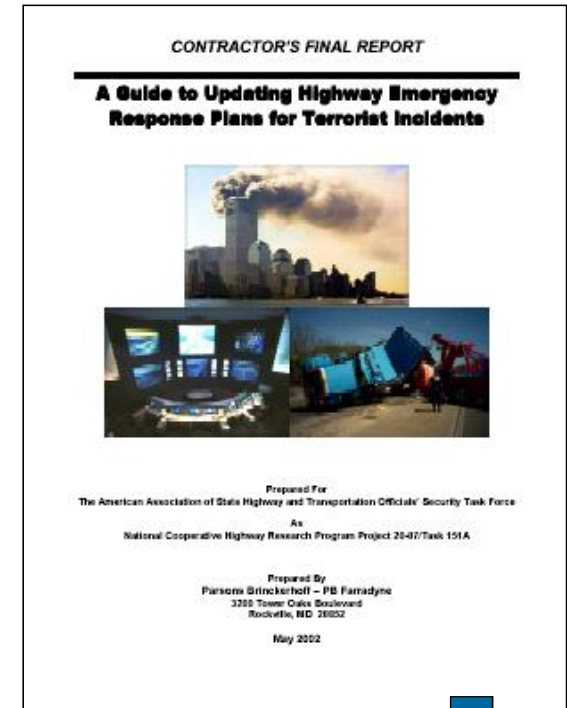


2002: Guides to Vulnerability Assessment & Emergency Response Planning

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2012: publications adopted by AASHTO



Published 2009:



NCHRP Report 525, Vol. 14

Security 101: A Physical Security Primer for Transportation Agencies

Published 2010:



NCHRP Report 525, Vol. 16

A Guide to Emergency Response Planning at State Transportation Agencies

NCHRP Report 525, Volume 16

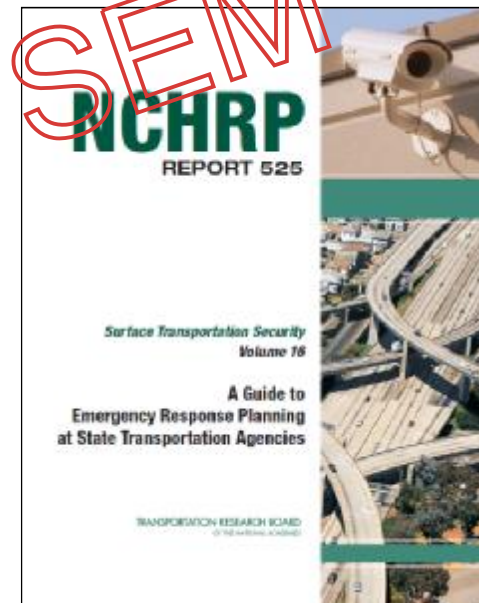
A Guide to Emergency Response Planning at State Transportation Agencies (2010)

Guide

- Summary
- Overview for state transportation agencies (authorities, etc.)
- High-level requirements based on national policies and guidelines
- High-level self-assessment with pointers

Section 6: Resource Guide

- Organizational/staffing/position guidance
- Decision-making sequences
- Detailed self-assessment and resource lists



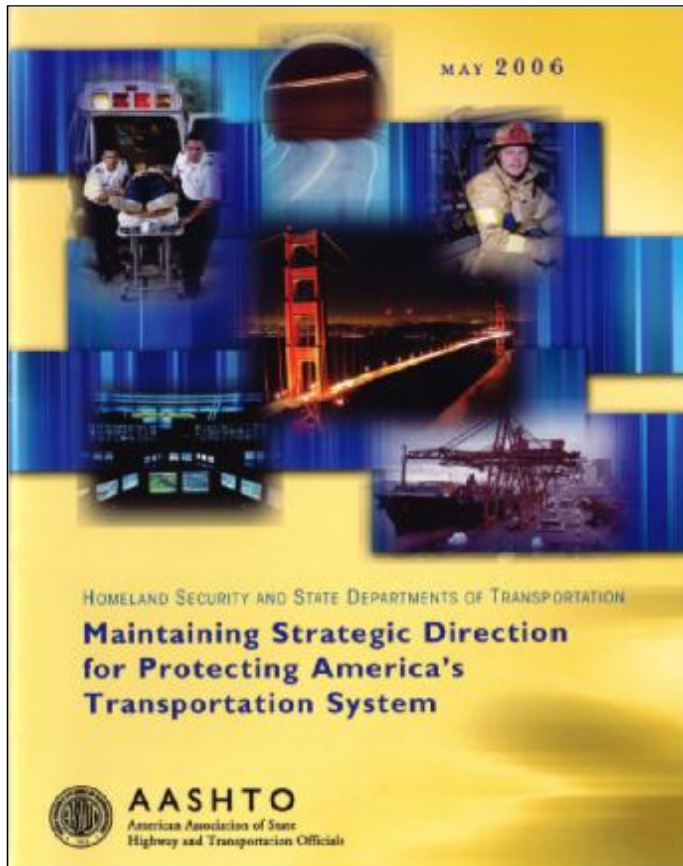
NCHRP Report 525, Volume 16

***A Guide to Emergency Response Planning at State
Transportation Agencies (2010)***

- Appendices (A-M)
 - Applicable parts of 2002 Report (A)
 - Details of material summarized in Sections 1-5 (B-G)
 - Links to model emergency operations plans (H)
 - Links to model policy/procedural memoranda/MOUs (I)
 - Links to model exercises/training plans (J)
 - Annotated bibliography (K)*
 - White Paper: Identification and Delineation of Incident Management and Large-Scale Emergency Response Functions (L)*
 - PowerPoint presentation (M)*
- **available at www.TRB.org/SecurityPubs*

12. Stage III

A Focus on Fundamentals



Homeland Security and State Departments of Transportation: Maintaining Strategic Direction for Protecting America's Transportation System

1. State DOTs—Guardians of Transportation Infrastructure and Mobility
2. Protection of Critical Transportation Assets
3. Emergency Management Support to First Responders
4. Critical Gaps and Needs

State DOTs - Guardians of Nation's Transportation Network

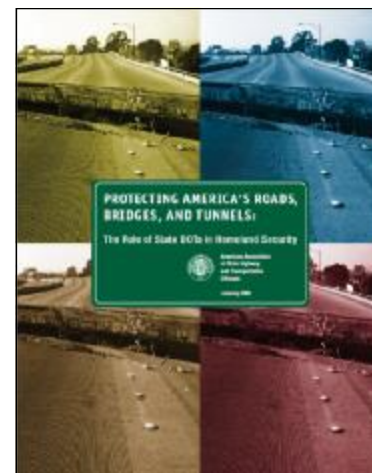
- DOTs own & operate 1.8 million lane miles & 273,200 bridges
- 5 billion daily vehicle miles (DVMT) traveled on DOTs' roads and bridges, or 65% of total DVMT
- \$92 billion/yr needed just to preserve system without extra security



Source: Protecting America's Roads, Bridges, & Tunnels: The Role of State DOTs in Homeland Security, AASHTO, 2006.

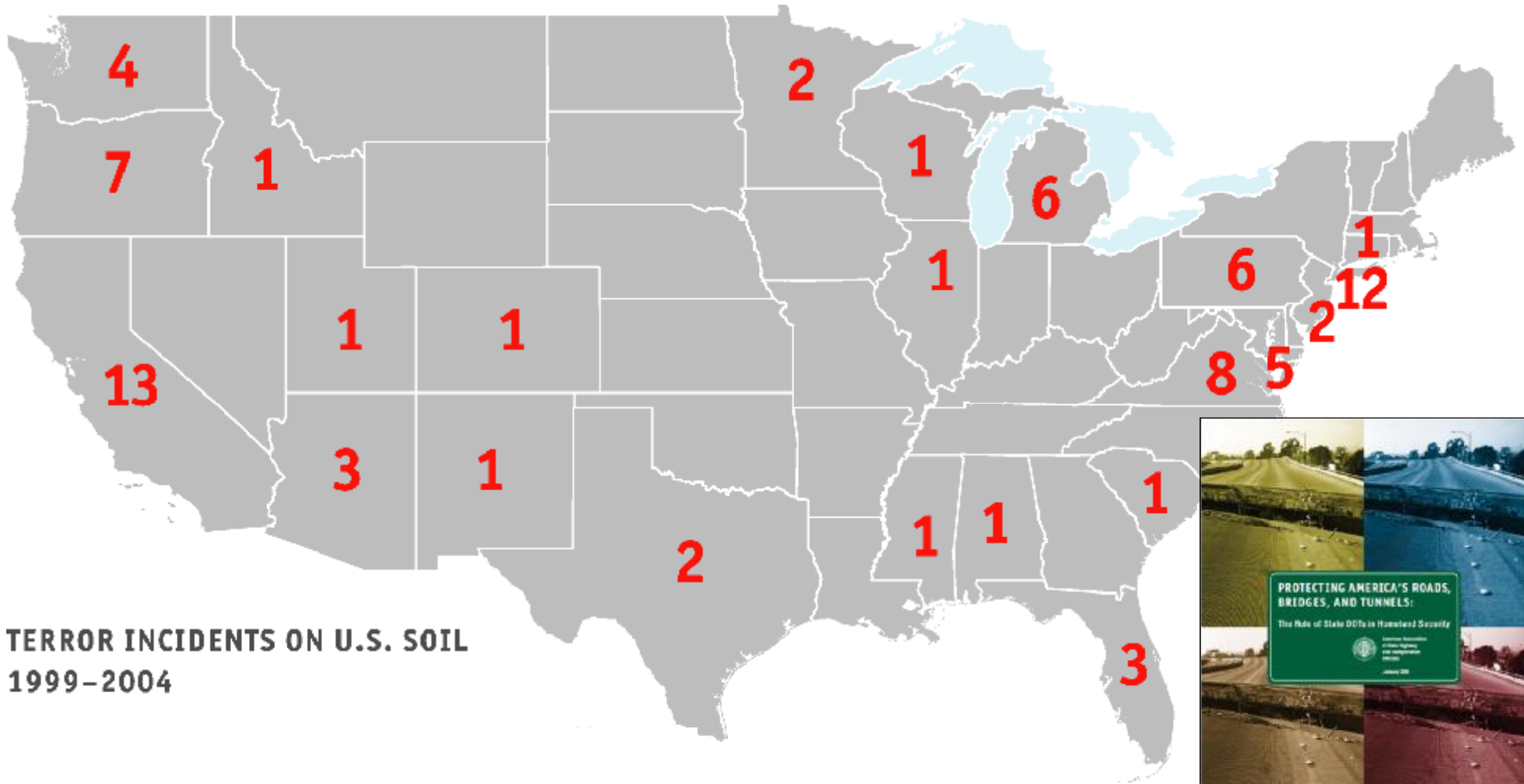
State DOTs' Major Responsibilities

- Highways
- Transit
- Freight and passenger rail
- Ports and ferries
- General and commercial aviation facilities
- Bike/pedestrian
- Motor carrier/motor vehicle services
- State patrol

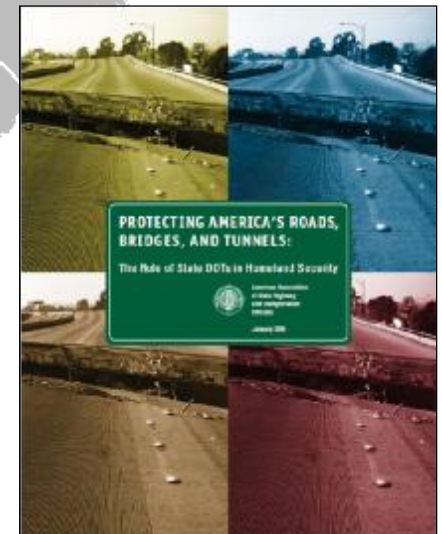


Source: Protecting America's Roads, Bridges, & Tunnels: The Role of State DOTs in Homeland Security, AASHTO, 2006.

U.S. Terror Incidents 1999-2004



TERROR INCIDENTS ON U.S. SOIL
1999-2004



Source: Memorial Institute for the Prevention of Terrorism, Terrorism Knowledge Database. Cited in Protecting America's Roads, Bridges, & Tunnels: The Role of State DOTs in Homeland Security, AASHTO, 2006.

All hazards planning fundamentals

- **Prevention:** Capabilities necessary to avoid, prevent, or stop a threatened or actual act of terrorism.
- **Protection:** Capabilities necessary to secure against acts of terrorism and manmade or natural disasters.
- **Mitigation:** Capabilities necessary to reduce loss of life and property by lessening the impact of disasters.
- **Response:** Capabilities necessary to save lives, protect property and the environment, and meet basic human needs after an incident has occurred.
- **Recovery:** Capabilities necessary to assist communities affected by an incident to recover effectively.

Source: AASHTO. Fundamentals of Effective All Hazards Security and Resilience for State DOTs, 2015.

Transportation agency resilience: fundamental capabilities

Prevention	Protection	Mitigation	Response	Recovery
Planning				
Public Information and Warning				
Operational Coordination				
Intelligence & Information Sharing Screening, Search, & Detection	Access Control Physical Protective Measures Risk Management Supply Chain Integrity & Security	Long-Term Vulnerability Reduction Risk & Disaster Resilience Assessment Threat & Hazard Identification	Critical Transportation Communications Operational Communications Situational Assessment	Infrastructure Systems
Cybersecurity				
Training and Exercises				

Source: AASHTO. Fundamentals of Effective All Hazards Security and Resilience for State DOTs, 2015

NCHRP Research Results Digest 333 / TCRP Research Results Digest 90

Natural Hazards Informer Number 4

A Guide to Planning Resources on Transportation and Hazards (2009)

Chapter 1: Introduction to the Disaster Cycle

Chapter 2: Overview

Chapter 3: The Economy and Hazards

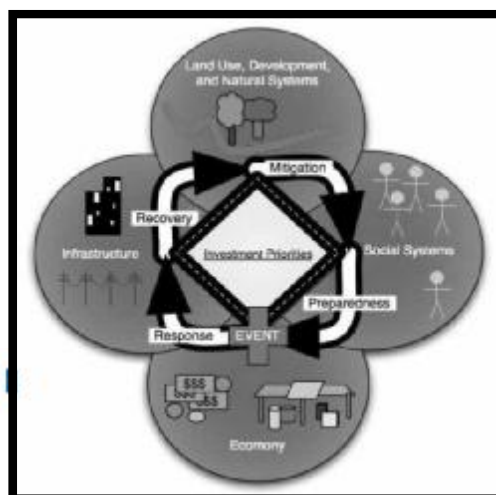
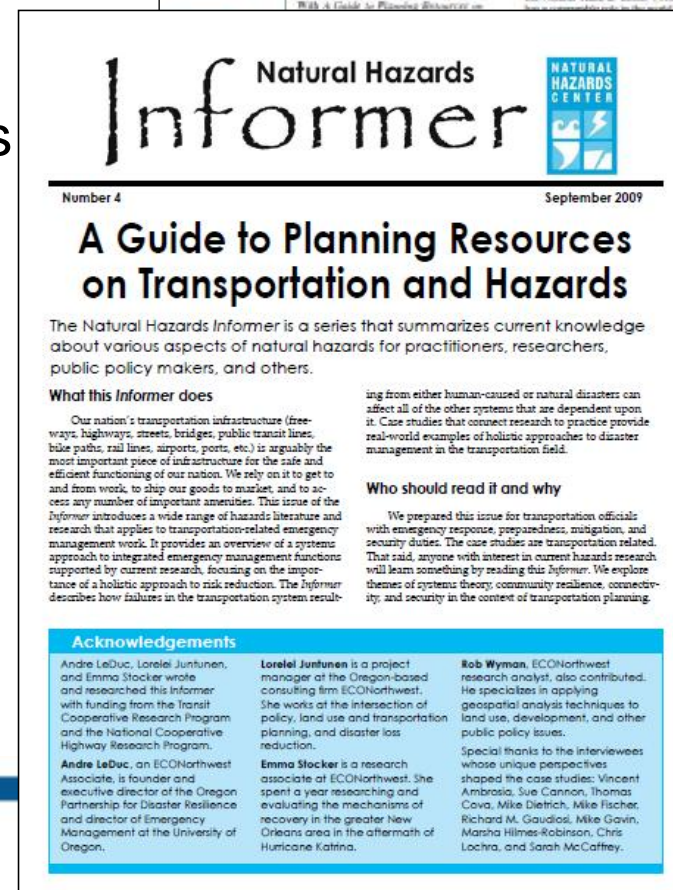
Chapter 4: People and Hazards

Chapter 5: Infrastructure: Lifelines During Disasters

Chapter 6: Land Use, Development,
and Natural Systems

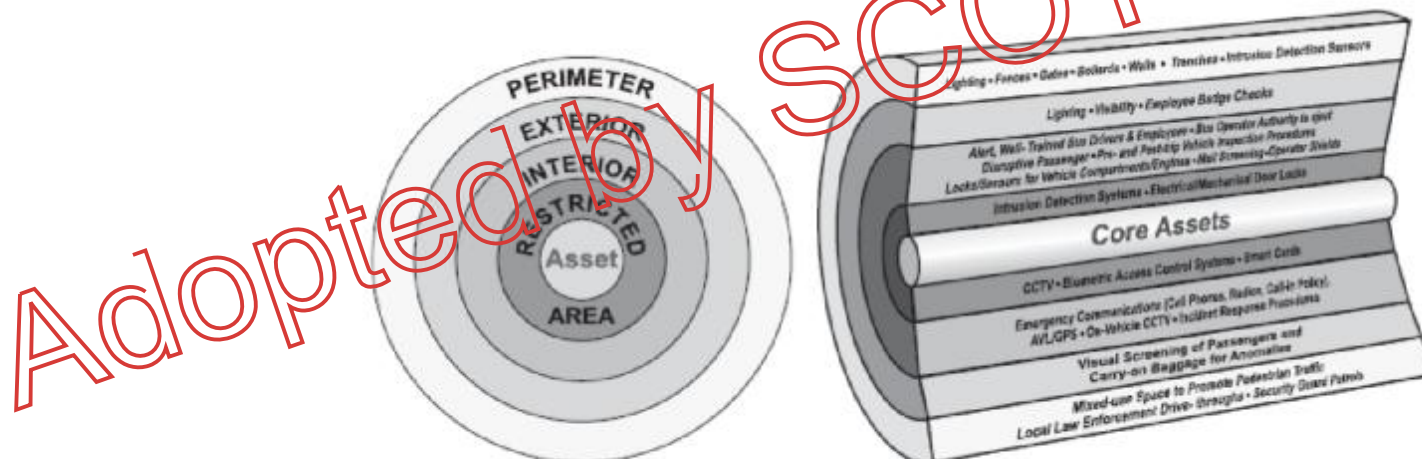
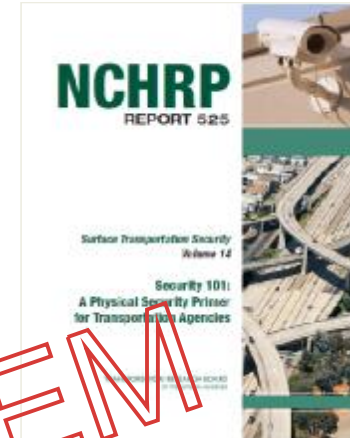
Chapter 7: From Theory to Practice: Case Studies

Chapter 8: Conclusion



Security 101: A Physical Security Primer for Transportation Agencies (2009)

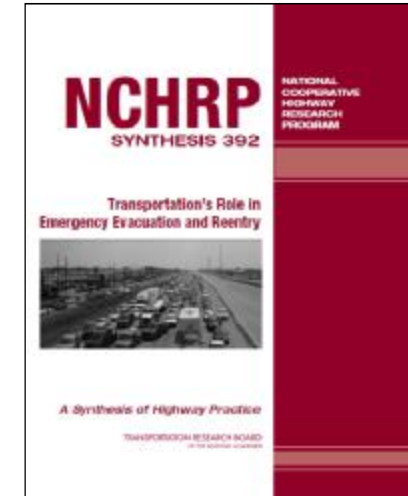
- Chapter 1: Risk Management and Risk Assessment
- Chapter 2: Plans and Strategies
- Chapter 3: Physical Security Measures
- Chapter 4: Security Personnel and Training
- Chapter 5: Infrastructure Protection
- Chapter 6: Homeland Security



Source: FTA Security Design Considerations, 2004
Figure 3-2. Layers of security.

NCHRP Synthesis 392

Transportation's Role in Emergency Evacuation and Reentry (2009)



Chapter 1: Introduction

Chapter 2: Background

Chapter 3: Evacuation Planning and Phasing

Chapter 4: Direction and Control on Highways

Chapter 5: Evacuee Travel Characteristics and Assisted Evacuation

Chapter 6: Communication, Data Exchange, and Public Information

Chapter 7: Reentry

Chapter 8: Current State of Practice

Chapter 9: Conclusions and Future Needs

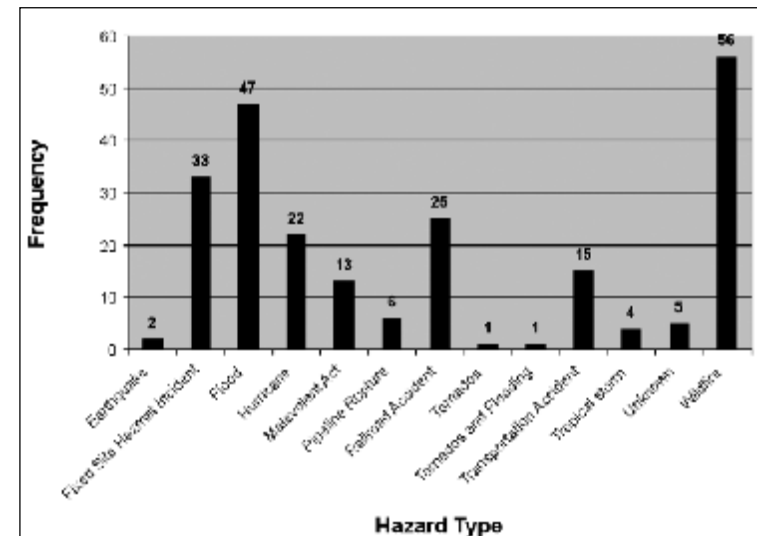


Figure 1: Evacuation frequency based on hazard type (1990-2003)
(Source: F. Walton, Sandia National Laboratory)

TCRP Synthesis 80

Transit Security Update (2009)

Chapter 1: Introduction

Chapter 2: Passenger Perception of Crime and Terrorism

Chapter 3: Security Measures

Chapter 4: Security Practices

Chapter 5: Conflict Mitigation Strategies

Chapter 6: Case Studies

Chapter 7: Conclusions

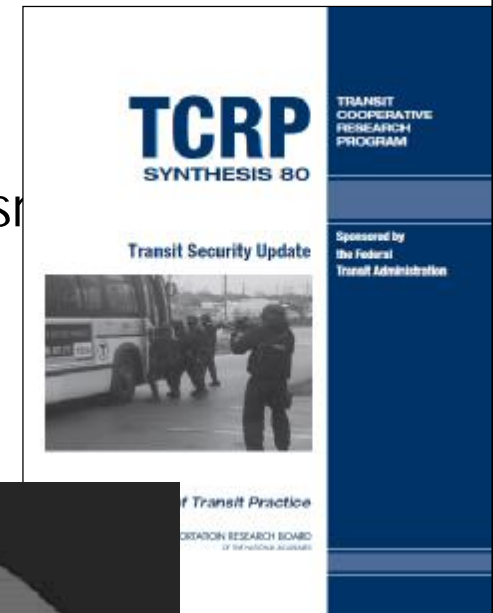


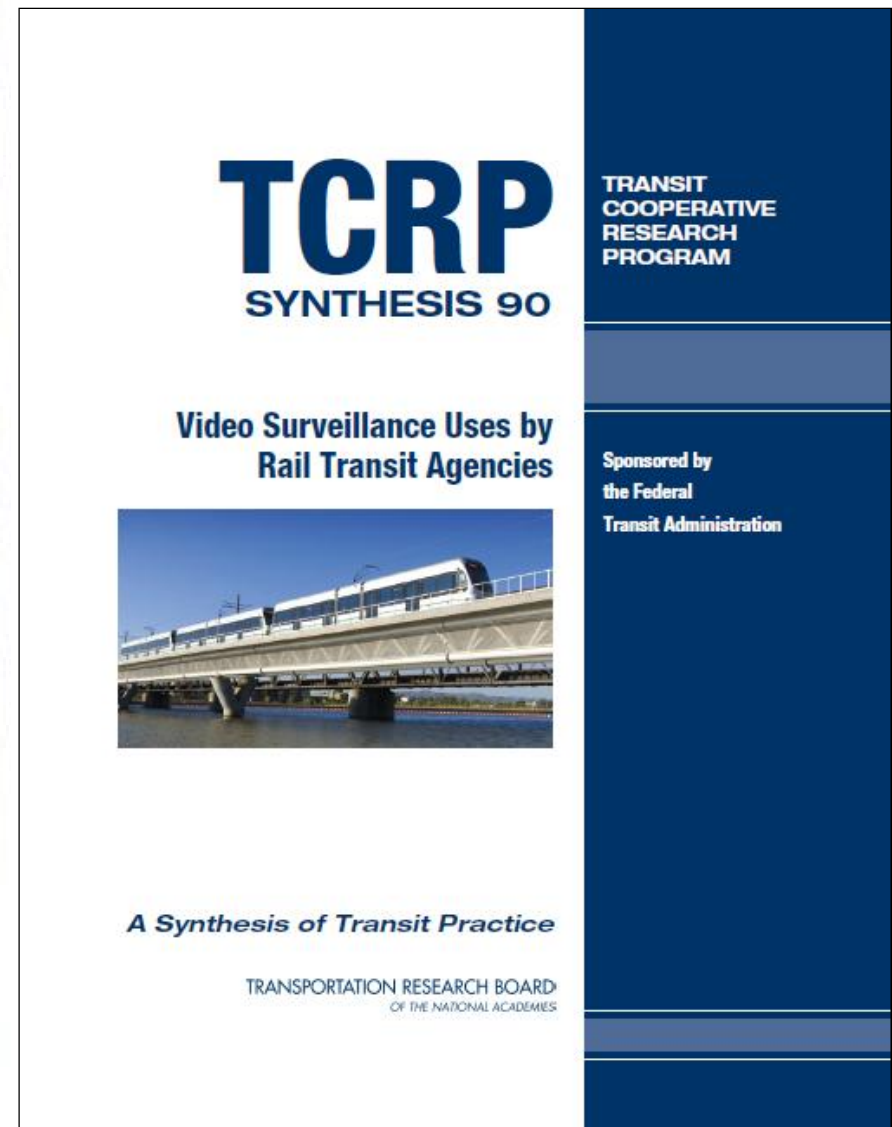
Figure 10 from Chapter 5: Physical Aggression Continuum
(Source: Crisis Prevention Institute's 2007 Webinar on
Workplace Violence Prevention)

TCRP Synthesis 90

Video Surveillance Uses by Rail Transit Agencies (2011)



FIGURE 4 The New York City Police Department posts signs on local streets indicating the presence of security cameras. This sign was across the street from a Manhattan subway station. *Photo courtesy of Dorothy M. Schulz.*



13. Stage IV In Progress / What's Next

Simulation, Communication, Evacuation,
Risk & Recovery:
Focus on Implementation

ACRP Project 4-04

Exercising Command-Level Decision Making For Critical Incidents at Airports (2011)

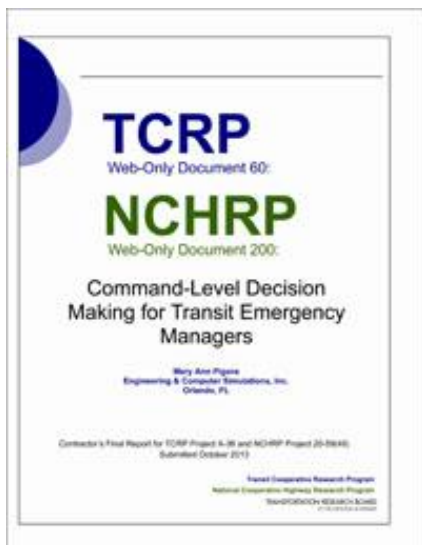
- Computer-based simulation
 - A means to exercise critical decision-making at the command level
 - Accessible through a web browser
- Broad collection of scenarios
- Standards compliant
 - National Incident Management System (NIMS)
 - 14 CFR Part 139.325, Airport Emergency Plan
- Based on the National Guard Bureau's Emergency Management Staff Trainer (EMST), a proven architecture



TCRP Web-Only Document 60 / NCHRP Web-Only Document 200

Command-Level Decision Making For Transit Emergency Managers (2014)

Objective: develop a scenario-based training system compliant with federal standards (e.g., the National Incident Management System and the Homeland Security Exercise Evaluation Program) and relevant transit industry standards and regulations. It is anticipated that the training system will be delivered through an automated, functional exercise simulation system capable of providing on-demand emergency response training and exercises.



TCRP Project A-36/ NCHRP Project 20-59(49) Command-Level Decision Making For Transportation (2017)

Operations Coordinator, Facilitator (San Diego, California)
Clock is running

Important Information | Website | Meeting Guides | Email

From: Priscilla Bailey (Logistics Co: Transport for H) Fri Mar 09 08:07 AM
 Subject: Transport for H

From: Sherborne Boggs (Department of Transportation, Department of Transportation)
 To: Marv Ann Piqora (Operations Coordinator, San Diego Transit EOC), Ben W
 Subject: Bridges to Undergo Safety Checks

I am sending out some DOT reps to do safety checks on the bridges that are

Action

Assess

Consequences

- Initiate the Incident Briefing Form (ICS Form 201)**
- Relay information from damage report**
- Schedule a Planning Meeting**

Our office has been told unofficially that some Guardsman were at a meeting in the Federal building when the bomb went off. We may have some casualties of our own. Do we need to take any action on this?

Check all of the boxes that apply.

- This is a COIR.
- Get the names of the people at the meeting and arrange a press release announcing the fatalities.
- No, it's probably just a rumor. We should wait until things settle down.
- Yes, get with personnel to see if we can confirm and find out who was at the meeting.

Reply Goodbye

Assess

Consequences

	Created By	Sensitivity
Hotwash	TRB	For Official Use Only
ICS Form 202	TRB	For Official Use Only
ICS Form 203	TRB	For Official Use Only
ICS Form 204	TRB	For Official Use Only
ICS Form 205	TRB	For Official Use Only
ICS Form 205A	TRB	For Official Use Only
ICS Form 206	TRB	For Official Use Only
ICS Form 207	TRB	For Official Use Only

NCHRP Research Results Digest 385

The Legal Definitions of “First Responder” (2013)

Objectives: (1) identify the legislation, regulations, and executive orders in which the term “first responder” is defined; (2) briefly summarize the legislation / regulation / order to understand their scope and purpose; (3) provide the definition existing in the source documents; and (4) highlight any commonalities or inconsistencies between the definitions.

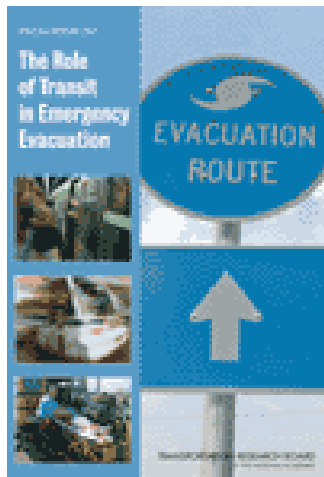
NCHRP Web-Only Document 221/ TCRP Web-Only Document 67
***Effective Practices for the
Protection of Transportation Infrastructure
from Cyber Incidents (December 2015)***

Objective: develop (1) a primer and (2) a briefing for transportation system owners and operators explaining the nature of cyber events and their operational and safety impacts. These products contain a list of effective practices that can be used to protect transportation systems from cyber events and to mitigate damage should an attack or breach occur.

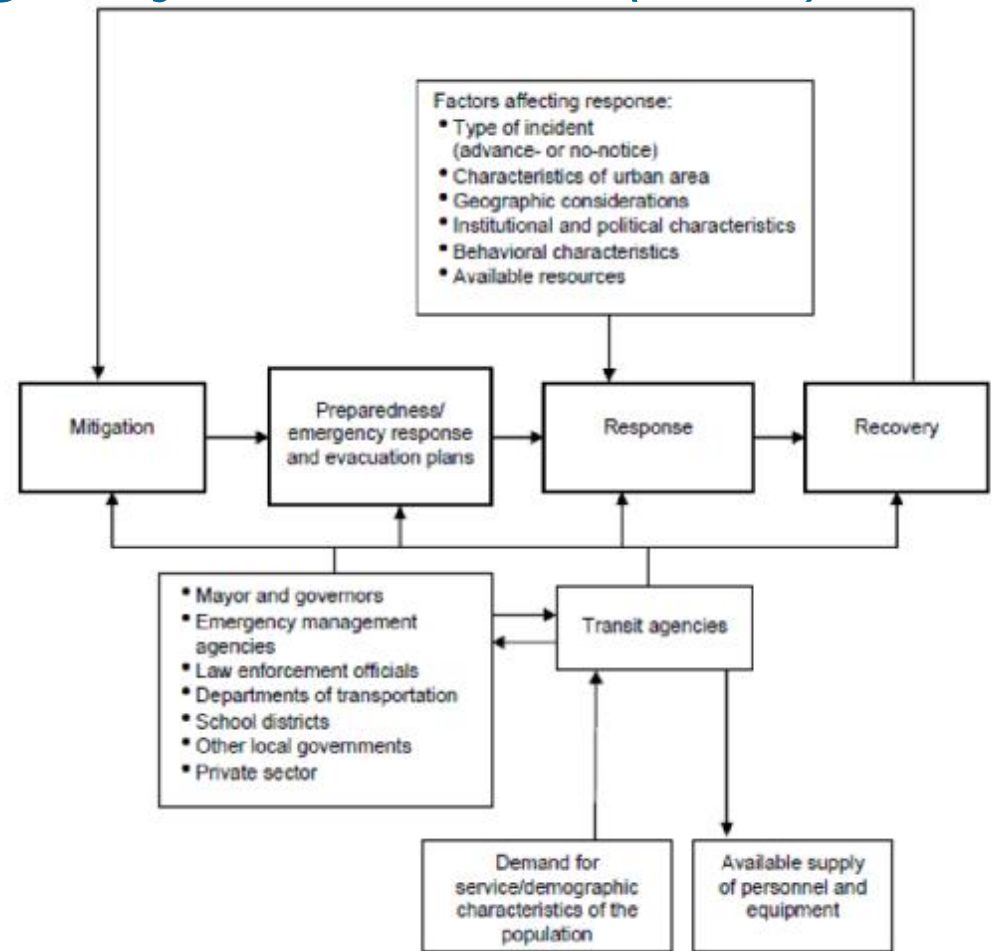
Study Charge:

Evaluate the potential role of transit systems serving the 38 largest urbanized areas (UAs) (> 1 million in population) to “accommodate the evacuation, egress, and ingress of people to or from critical locations in times of emergency.”

Source: SAFETEA-LU, Section 3046(a)(1)



TRB Special Report 294 *The Role of Transit in Emergency Evacuation (2008)*



Graphic: Factors affecting local emergency response capacity

http://www.trb.org/news/blurb_detail.asp?id=9264

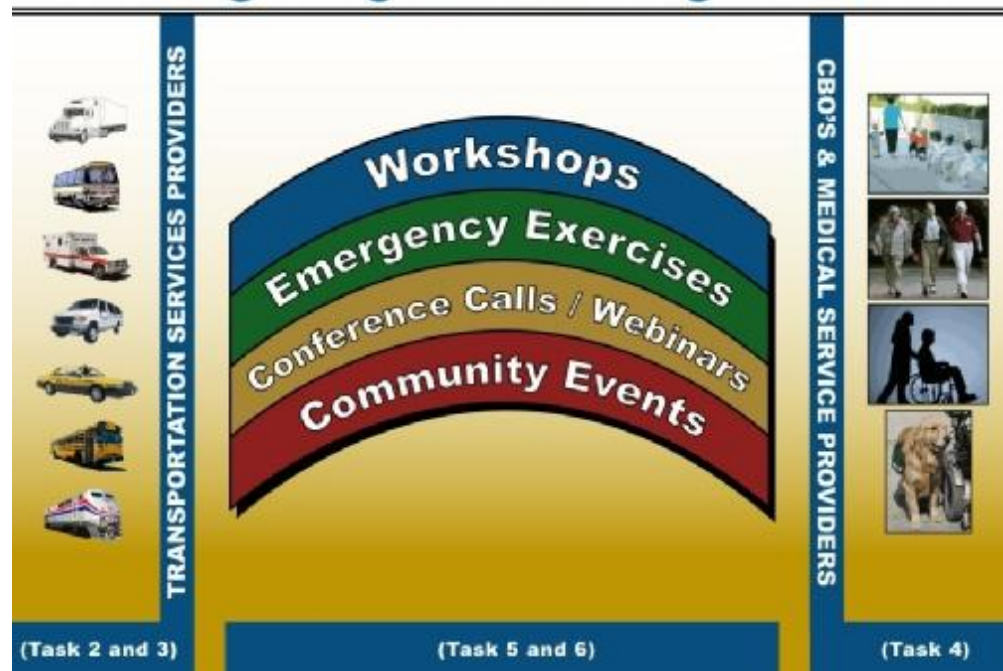
NCHRP Report 740 (2013)

A Transportation Guide for All-Hazards Emergency Evacuation

Objective

to develop an all-hazards emergency evacuation guide for transportation and emergency management agencies that integrates the broad community of resources that are necessary to plan, train, exercise, and execute evacuations.

Building Bridges / Matching Resources



Tasks

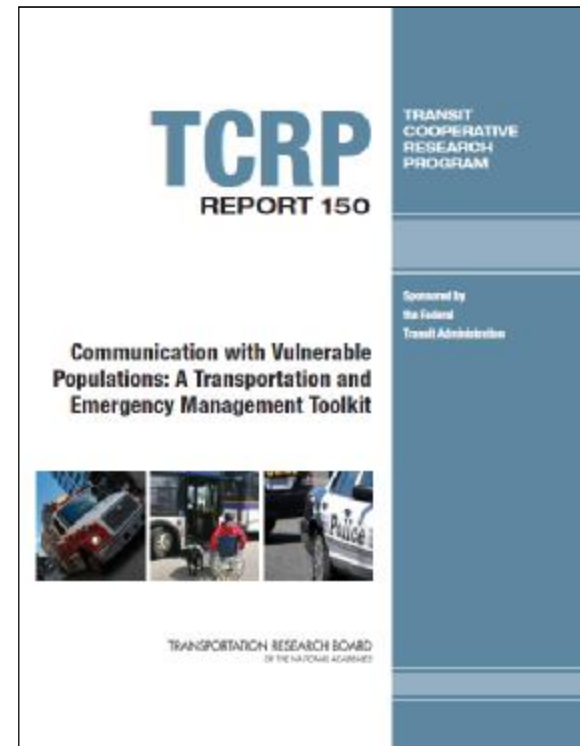
1. Literature Review
2. Roles of Modes and Other Entities in Evacuation
3. Mode Integration
4. Matching Resources to Needs
5. "Workshop in a Box"
6. Case Studies
7. Operations Plan Templates
8. Report & Draft Outline
9. Draft & Final Guide
10. Final Report

TCRP Report 150

Communication with Vulnerable Populations: A Transportation and Emergency Management Toolkit (2011)

Objective

to develop a toolkit of communications strategies, policies, and practices for transportation agencies and emergency management agencies that focuses on communicating with vulnerable populations prior to, during, and after all-hazards emergencies.



Graphic: Cover for TCRP Report 150, Communication with Vulnerable Populations: A Transportation and Emergency Management Toolkit

Paratransit Emergency Preparedness and Operations Handbook (2013)

Objective

to develop a Handbook that provides guidance to paratransit service providers, including public transportation agencies and other public and private paratransit service providers, about how to prepare for all types of emergencies, including

(a) events with notification such as floods, hurricanes, blizzards, and pandemics, as well as

(b) events with no notification, including those that may cause regional disruptions such as earthquakes, power blackouts, fires, and acts of terrorism.



Photo: participants at a Handbook validation workshop

Review of DHS's Approach to Risk Analysis (2010)

This Congressionally-mandated study by the National Academies reviewed how the Department of Homeland Security (DHS) is building its capabilities in risk analysis to inform decision-making. More specifically, the study addressed the following tasks:

- a) Evaluate the quality of the current DHS approach to estimating risk and applying those estimates in its many management, planning, and resource-allocation (including grant-making) activities, through review of a committee-selected sample of models and methods;
- b) Assess the capability of DHS risk analysis methods to appropriately represent and analyze risks from across the Department's spectrum of activities and responsibilities, including both terrorist threats and natural disasters;
- c) Assess the capability of DHS risk analysis methods to support DHS decision-making;
- d) Review the feasibility of creating integrated risk analyses covering the entire DHS program areas, including both terrorist threats and natural disasters, and make recommendations for best practices, including outreach and communications;
- e) Recommend how DHS can improve its risk analyses and how those analyses can be validated and provide improved decision support.

HMCRP Report 12

Hazardous Materials Transportation Risk Assessment: State of the Practice (2013)



TRB's Hazardous Materials Cooperative Research Program (HMCRP) Report 12: Hazardous Materials Transportation Risk Assessment: State of the Practice documents the current practice for hazardous materials transportation risk assessment by government agencies and the private sector.

A [PowerPoint presentation](#) that describes the entire project is available.

Project: [Project Information](#)

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E-Newsletter Type: [Recently Released TRB Publications](#)

TRB Publication Type: [HMCRP Reports](#)

HMCRP Report 9

A Compendium of Best Practices and Lessons Learned for Improving Local Community Recovery from Disastrous Hazardous Materials Transportation Incidents (2012)

Objective: Develop a compendium of best practices that can be used by local communities to plan for recovery from disastrous hazardous materials transportation incidents.

Recovery is defined as both short- and long-term efforts to re-build and revitalize affected communities.

Recovery planning must provide for a near-seamless transition from emergency response activities to recovery operations to de-briefing lessons learned, including, but not limited to, restoration of interrupted utility services, reestablishment of transportation routes, the provision of food and shelter to displaced persons, environmental restoration, business continuity, and economic rebuilding.

HMCRR Report 6

Feasibility of a Consolidated Security Credential for Persons Who Transport Hazardous Materials (2011)

Objective: to identify options for achieving the objective of a single, universally recognized credential that establishes (a) identity; (b) eligibility to access secure areas; and (c) eligibility to obtain or hold transportation-related licenses, credentials and other government certifications required of persons who transport hazardous materials by all modes in the U.S.

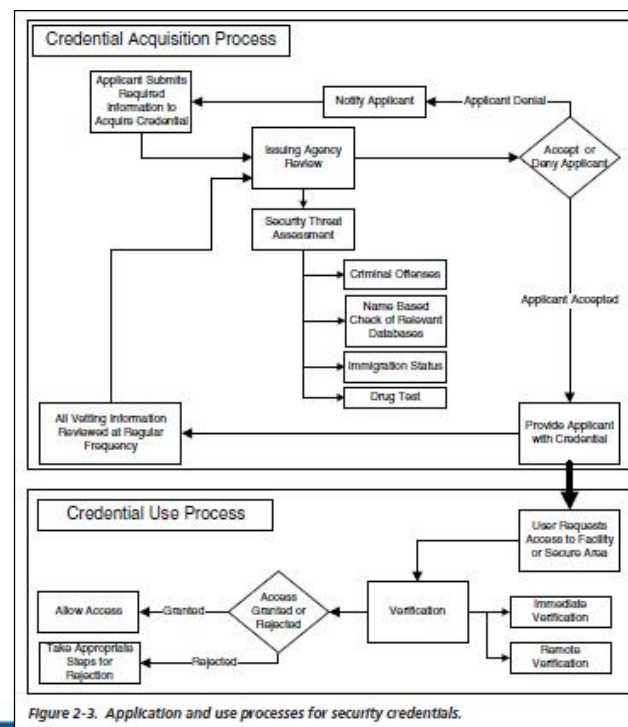


Figure 2-3. Application and use processes for security credentials.

Methodologies to Estimate the Economic Impacts of Disruptions to the Goods Movement System (2012)

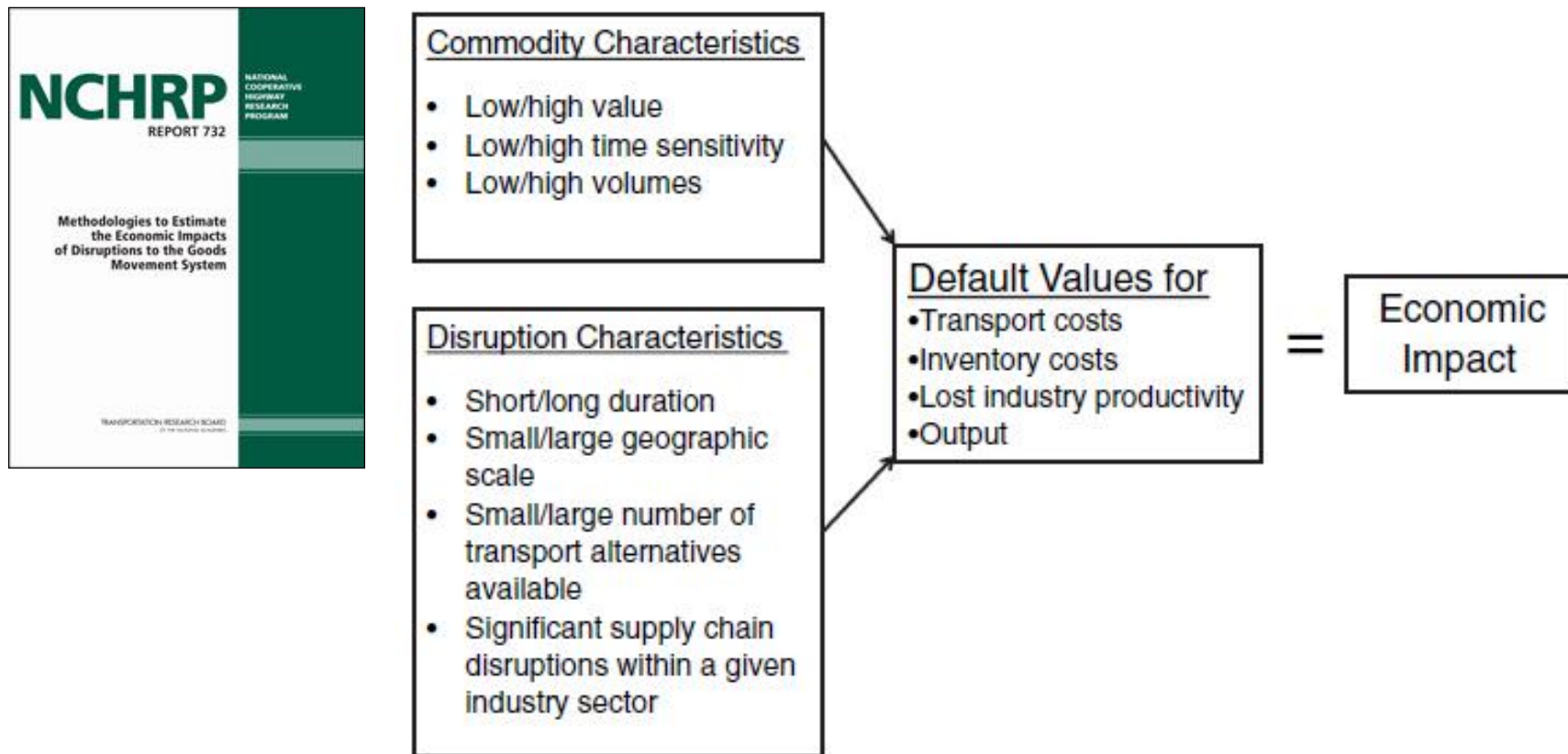


Figure S-1. Basic concepts in a high-level economic impact methodology.

NCHRP Report 753

A Pre-Event Recovery Planning Guide for Transportation (2013)

Objective : to develop a guide that provides pre-event recovery planning principles, processes, tools, and appended resource materials for use by planners and decisionmakers in pre-event planning to support transportation infrastructure recovery.

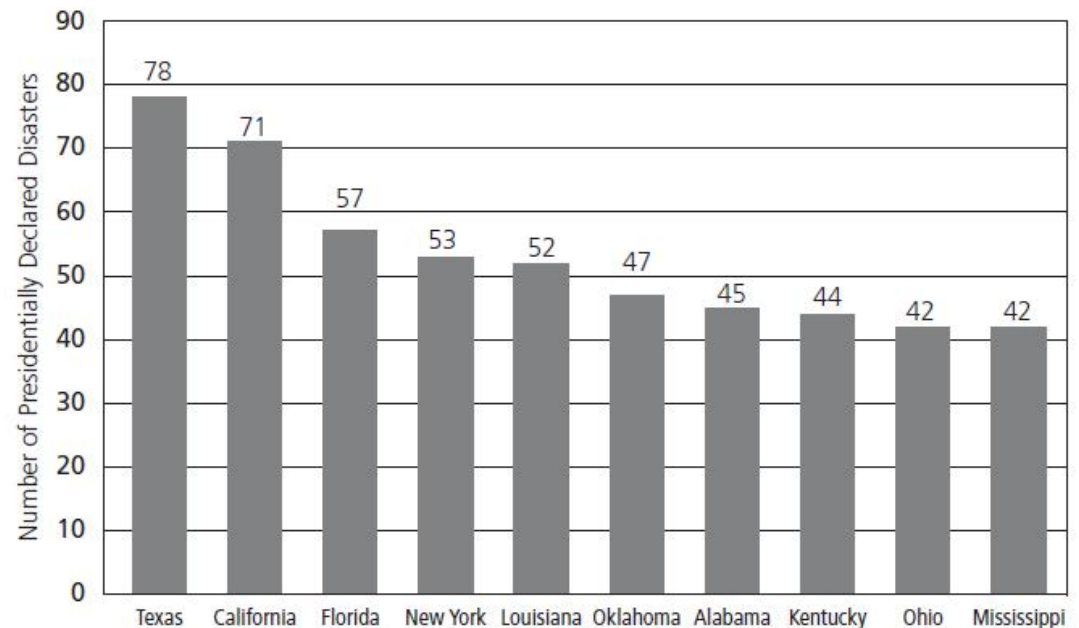


FIGURE 2-2

Presidentially declared disasters, top 10 states, 1953–2007.

NOTE: Declared disasters in these 10 states represent 32 percent of all disasters.

(SOURCE: Federal Emergency Management Agency, U.S. Department of Homeland Security, www.fema.gov/news/disaster_totals_annual.fema.)

NCHRP 20-7 Task 365

Strategic Transportation Systems Management & Operations Program Planning Lead States Initiative Development & Evaluation (2015)

The Strategic Highway Research Program (SHRP) created a capability maturity modeling (CMM) method for organizational assessment and development of state DOTs, which is being applied through the ***AASHTO Guide to System Operations & Management***. The application of the guide is being facilitated through numerous SHRP Implementation “CMM Workshops”, and also coordinated with SHRP multi-state “Regional Operations Forums”. The CMM Workshops generate implementation action plans, which are being utilized by state DOTs to guide incremental development of organizational capacity to develop and deliver TSM&O programs.

The objectives of the project are to:

- Coordinate incorporation of the AASHTO Guide to System Operations Management CMM methodology into the application of the TSM&O Program Planning Framework in transportation agencies of several lead states.
- Coordinate peer comparison and evaluation of these lead state application experiences.
- Summarize lessons learned and opportunities for refinement of both the CMM methodology and the Program Planning Framework, as well as the agency-specific program planning processes utilized.
- Document guidance for continued integrated application of the CMM and Framework techniques.

NCHRP Web-Only Document 215

Incident Command System (ICS) Training for Field Level Transportation Supervisors and Staff (December 2015)

NIMS/ICS: Perform Reliably & Effectively

- Goal of NIMS/ICS: Reliable and effective response to an event, emphasizing safety of DOT staff
- Achieved through
 - Safety
 - Check-in, check out, demobilization
 - Personnel accountability
 - Reimbursement
 - The job you save may be your own
 - MAP-21 changes, debris removal reimbursement



Check-In, Check-Out, and Demobilization at ICP



NCHRP 20-59(14)B

***Research Support for the AASHTO Special Committee on
Transportation Security and Emergency Management
(SCOTSEM) (2015)***

The objective of this research is to produce three products to be considered for use by the AASHTO Special Committee on Transportation Security and Emergency Management (SCOTSEM): (1) the *National Needs Assessment for Ensuring Transportation Infrastructure Security (2016-2022)*; (2) the *All Hazards Security and Emergency Management Research Implementation Plan (2014-2016)*; and (3) *Fundamentals of Effective All Hazards Security Management for State DOTs (Second Edition)*.

Security Research Plan Reviewed at August 2007 Summit Led to 3-year Research Plan 2008-2010 Accepted by AASHTO Standing Committee on Research (SCOR)

Chairman Henry Hungerbeeler and Members of the Security Task Force:

In 2002, the AASHTO Transportation Security Task Force adopted twelve highway and bridge security research priorities. After adopting the highway and bridge projects, the Task Force initiated the development of intermodal security research projects. On behalf of the Task Force, the Research Working Group initiated this follow-on process to the 2002 security research priorities.

Two steps were taken to prepare these priorities. First, the Task Force cooperated with the TRB Committee on Critical Transportation Infrastructure Protection to sponsor a one-day workshop on intermodal security research needs. The workshop was held on January 12, 2003. The following day, the AASHTO Transportation Security Task Force approved a one-day working session to refine the problem statements for Task Force consideration. The candidate projects were those intermodal projects with a highway and bridge component. For this reason, the proposed research projects are described as "intermodal highway and bridge" priorities. The working session was held on February 19, 2003, in Washington, DC. The research priorities were presented at the April 17 meeting of the Task Force, where it was recommended that they should be forwarded to the NCHRP 20-59 panel for funding consideration.

This report presents the eleven research problem statements as supported by the AASHTO Transportation Security Task Force. We appreciate the opportunity to support the research mission of the AA

Mary Lou Ralls, Texas
Tom Hicks, Maryland
David Albright, New Me

May 30, 2003

Contractor's Report

Intermodal Highway and Bridge Security Research Priorities for FY '04

Requested by:

AASHTO
Transportation Security Task Force

Prepared by:

TransTech Management, Inc.
125 South Elm Street, Suite 200
Greensboro, NC 27401

May 30, 2003

The information contained in this report was prepared as part of NCHRP Project 20-59, Task 14, National

NCHRP Project 20-59(25)
Security Research Plan

"Gap Analysis"

FINAL REPORT

Requested by:

American Association of State Highway
and Transportation Officials (AASHTO)
Special Committee on Transportation Security

Prepared by:

**Mineta Transportation Institute
San Jose, California**

October 2007

The information contained in this report was prepared as part of NCHRP Project 20-59, Task 25, National Cooperative Highway Research Program, Transportation Research Board

National Needs Assessment for Ensuring Transportation Infrastructure Security *Contractor's Final Report* (2009-2015)

National Needs Assessment for Ensuring Transportation Infrastructure Security (2009—2015)

Contractor's Final Report

National Needs Assessment for Ensuring Transportation Infrastructure Security

Requested by:

Association of State Highway and Transportation Officials
(AASHTO)
Transportation Security Task Force

Prepared by:

Douglas B. Ham & Stephen Lockwood
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7900 Science Applications Court
Vienna, VA 22182

October 2002

Information contained in this report was prepared as part of NCHRP Project 20-59, Task 5, National Cooperative Highway Research Program, Transportation Research Board.

Requested by:

American Association of State Highway and Transportation Officials
(AASHTO)
Special Committee on Transportation Security

Prepared by:

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Stephen Lockwood
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Washington, DC 20005

Final Report

August 29, 2008

Information contained in this report was prepared as part of NCHRP Project 20-59, Task 26, National Cooperative Highway Research Program, Transportation Research Board.

White Paper on Highway Security Issues for Reauthorization

Project Number: NCHRP 20-59 (4)

Prepared For
National Cooperative Highway Research Program (NCHRP)

Prepared By
Parsons Brinckerhoff – PB Farradyne

April 14 2002

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Publications

NCRRP Web-Only Document 4

Legal Research Digest 49

NCRRP Research Report 668 Pre-Publication Draft—Subject to Revision
An Expanded Functional Classification