



TRAFFIC INCIDENT MANAGEMENT

Cost Management and Cost Recovery

PRIMER



U.S. Department of Transportation
Federal Highway Administration

NOTICE

This document is disseminated under the sponsorship of the U.S. Department of Transportation (USDOT) in the interest of information exchange. The U.S. Government assumes no liability for the use of the information contained in this document. This report does not constitute a standard, specification, or regulation.

The U.S. Government does not endorse products or manufacturers. Trademarks or manufacturers' names appear in this report only because they are considered essential to the objective of the document.

QUALITY ASSURANCE STATEMENT

The Federal Highway Administration (FHWA) provides high-quality information to serve Government, industry, and the public in a manner that promotes public understanding. Standards and policies are used to ensure and maximize the quality, objectivity, utility, and integrity of its information. FHWA periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement.

Technical Report Documentation Page

1. Report No. FHWA-HOP-12-044		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Traffic Incident Management: Cost Management and Cost Recovery				5. Report Date March 2012	
				6. Performing Organization Code	
7. Author(s) Eric Rensel, Dennis Lebo, Brett Graves, Kathy Malarich, Charles Yorks				8. Performing Organization Report No.	
9. Performing Organization Name and Address SAIC Gannett Fleming, Inc 8301 Greensboro Dr. P.O. Box 67100 McLean, VA 22102 Harrisburg, PA 17106				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Federal Highway Administration Office of Operations 1200 New Jersey Ave., SE Washington, DC 20590				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplementary Notes Laurel Radow, COTM					
16. Abstract This publication provides mid-level managers at transportation agencies with the resources they need to explain the benefits of traffic incident management (TIM) and TIM cost management and cost recovery to executive leadership. It also provides the same mid-level managers with information that will help them implement TIM cost management and cost recovery techniques. Costs recovery is the reimbursement for services from sources outside of the direct budget that funds the program seeking reimbursement. Cost management includes all efforts to maximize the cost-benefit relationship of program activities and involves a cyclical loop of cost planning, tracking, analysis, and evaluation and reprogramming. While costs related to responder and motorist injury, disability, fatality, and the related medical and societal costs are not addressed here as those issues are addressed in a variety of ways in the existing literature, "recoverable costs" related to TIM such as tactical and strategic costs are addressed. Costs are classified as being recovered when the program receives full or partial reimbursement from sources outside of the budget. The publication begins with a discussion of the fundamentals of what constitutes a TIM program as well as the more intricate details of what makes a TIM program effective. The document also details information about the fundamentals of cost management and cost recovery, the current state of the practice, and how practitioners can take advantage of opportunities to manage and recover costs. The document concludes by recognizing that the conversation of how to pay for recurring costs of TIM and transportation operations is just beginning, suggesting what research is still needed to progress in TIM cost management and cost recovery.					
17. Key Words Traffic incident Management, TIM, Cost Recovery, Cost Management, recoverable cost, cost tracking, incident response, resource management, cost accounting			18. Distribution Statement No restrictions.		
19. Security Clasif. (of this report) Unclassified		20. Security Clasif. (of this page) Unclassified		21. No. of Pages 66	21. Price N/A

TABLE OF CONTENTS

Introduction	2
Organization	4
Challenges/Issues.....	4
The Cost of Traffic Incidents	6
Chapter 1. TIM Overview	8
TIM Programs.....	9
TIM Goals and Objectives.....	9
Chapter 2. Definitions	12
Cost Recovery	12
Cost Management.....	12
Identifying and Classifying Costs	13
Performance Measurement.....	15
Chapter 3. State of the Practice	20
Legislation	20
Advocacy Groups on TIM Cost Recovery	23
Fire Services and EMS	23
Law Enforcement Agencies.....	26
Transportation Agencies	27
Chapter 4. Translating Cost Management Principles into TIM Practice	32
Roadmap for Managing TIM Costs.....	32
Contracting Emergency Services	40
Chapter 5. Strategies for Recovering TIM Costs	42
Legislation	43
Public-Private Partnerships.....	43
Special Federal Programs.....	44
Chapter 6. Planning for Operations	48
Integrating TIM into Metropolitan and Statewide Transportation Plans.....	49
Inclusion of TIM Projects or Programs in the Transportation Improvement Program (TIP).....	51
Creating Local Line Items	52
Chapter 7. Closing Thoughts	54
Continue to Make the Case for TIM.....	54
Conduct Pilot Projects	55
Dissemination of Research and Lessons Learned Information.....	56
Additional Research	56

LIST OF FIGURES

Figure 1 – Emergency Transportation Operations Continuum	3
Figure 2 – Full Spectrum of TIM Costs	6
Figure 3 – Cost Management Fundamentals	12
Figure 4 – Standard Incident Timeline for Performance Measurement	15
Figure 5 – Sources that may enable TIM cost recovery statutes	20
Figure 6 – Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (As Amended in 1986).....	21
Figure 7 – Example of Cost Tracking Tool at the Florida Highway Patrol.....	26
Figure 8 – Sample of Cost Tracking	28
Figure 9 – Alabama Law for Highway Damage Liability	29
Figure 10 – California Emergency Response Law	30
Figure 11 – Broad Picture of TIM Cost Management Components	32
Figure 12 – Example of Resource Allocation and Utilization Process in Asset Management	34
Figure 13 – Transportation Resource Management	36
Figure 14 – Screen 1 of the Pennsylvania Incident Cost Management System.....	37
Figure 15 – Screen 2 of the Pennsylvania Incident Cost Management System	38
Figure 16 – Screen 3 of the Pennsylvania Incident Cost Management System	38
Figure 17 – Screen 1 of the Pennsylvania Cost Recovery Tracking System	42
Figure 18 – Screen 2 of the Pennsylvania Cost Recovery Tracking System	43
Figure 19 – The Transportation Planning Process	50

LIST OF TABLES

Table 1 – National Incident Estimates by Year, 2005-2010.....6

Table 2 – The Anatomy of a TIM Program.....8

Table 3 – Sources of Costs Associated with the National Unified Goal
for Traffic Incident Management.....10

Table 4 – Input, Output, and Potential Outcome for a TIM Program by NUG Strategy16

Table 5 – Viewpoints on TIM Cost Recovery by Means of User Fees 23

Table 6 – Roadmap to a TIM Cost Management Program..... 33

LIST OF ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ABC	Activity-Based Costing
Cal-B/C	California Life-Cycle Benefit/Cost Analysis Model
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHART	Coordinated Highway Action Response Team
CMAQ	Congestion Mitigation and Air Quality
CMP	Congestion Management Pricing
CPM	Collaborative Performance Management
DOT	Department of Transportation
DUI	Driving Under the Influence
EMS	Emergency Medical Services
ER	Emergency Relief
ETO	Emergency Transportation Operations
FEMA	Federal Emergency Management Administration
FHWA	Federal Highway Administration
FIRE	Firefighter Investment and Response Enhancement
GES	General Estimates System
HOT	High Occupancy Toll
HSIP	Highway Safety Improvement Program
IDAS	ITS Deployment Analysis System
ITS	Intelligent Transportation Systems
MPO	Metropolitan Planning Organization
MTP	Metropolitan Transportation Plan
NHS	National Highway System
NHTSA	National Highway Traffic Safety Administration
NRF	National Response Framework
NTIMC	National Traffic Incident Management Coalition
NUG	National Unified Goal
PennDOT	Pennsylvania Department of Transportation
SAFER	Staffing for Adequate Fire and Emergency Response
SAS	Statistical Analysis Systems
SDDOT	South Dakota Department of Transportation
SHSP	Strategic Highway Safety Plan
STP	Surface Transportation Program
TIM	Traffic Incident Management
TIP	Transportation Improvement Program
TMA	Transportation Management Area
TMC	Traffic Management Center
TSM	Transportation System Management
USDOT	United States Department of Transportation
USFA	U.S. Fire Administration



Credit: iStockphoto



Credit: iStockphoto



Credit: iStockphoto

INTRODUCTION

This publication provides mid-level managers at transportation and other stakeholder agencies with the resources they need to explain the benefits of traffic incident management (TIM) and TIM cost management and cost recovery to executive leadership. It also provides the same mid-level managers with information that will help them implement TIM cost management and cost recovery techniques. This document focuses on “recoverable costs” related to TIM, as there are costs associated with TIM that cannot accurately be measured or replaced; however, costs related to responder and motorist injury, disability, fatality, and the related medical and societal costs are not addressed here as those issues are addressed in a variety of ways in the existing literature. Costs are classified as being recovered when the program receives full or partial reimbursement from sources outside of the budget. Once costs are recovered, they can pay back the originator or be reinvested for future activity. Costs can be recovered from responsible parties (e.g., insurers, property owners), from associated or interested third parties (e.g., government grants for specific activities), or in the form of payment for service (e.g., incentives based on time or effort).

Through numerous discussions with local and State TIM practitioners and a global scan of the issues impacting effective TIM operations throughout the Nation, the Federal Highway Administration (FHWA) recently identified TIM cost management and cost recovery as emerging issues for transportation, law enforcement, and fire agencies engaged in planning for and implementing TIM operations in their communities and regions. As transportation operations, and more specifically TIM, become a more mature part of transportation agency services, jurisdictions must understand the true cost of responding to traffic incidents and identify ways to offset or recoup these recurring costs. FHWA presents this document as a contribution to the sparse body of knowledge on the topic and provides a vision towards which transportation agencies can begin to work as TIM programs become a transportation agency mainstay. The scope of this document is limited to costs directly associated with incident mitigation. Costs associated with responder injuries and long-term health care needs due to traffic incidents are not considered.

The September 2010 FHWA publication “Best Practices in Traffic Incident Management” described TIM as “a planned and coordinated program to detect and remove incidents and restore traffic capacity as safely and as quickly as possible.”¹ When discussing what strategies can be employed by agencies to manage costs related to TIM, planning is a key aspect. It is the factor that makes it possible for agencies to identify opportunities to recover a portion of the total cost of providing TIM services.

But before one can understand how the costs associated with TIM affect an agency, one must be familiar with both the fundamentals of what constitutes a TIM program as well as the more intricate details of what makes a TIM program effective.

For those readers lacking a comprehensive understanding of the elements of a successful TIM program, the following documents provide useful background information for both TIM and cost management/cost recovery:

- Best Practices in Traffic Incident Management
- 2010 Traffic Incident Management Handbook
- Planned Special Events: Cost Management and Cost Recovery Primer
- National Unified Goal for Traffic Incident Management
- Traffic Incident Management Self Assessment

A complete library of TIM and other operations-focused publications is available at <http://ops.fhwa.dot.gov/publications/publications.htm>.

1 FHWA, *Best Practices in Traffic Incident Management*, FHWA-HOP-10-050 (Washington, DC: September 2010), p. 2.

As this document examines the TIM cost elements that may be managed and recovered, the reader should be comfortable with the premise that traffic incident management is a new public safety discipline wherein traditional first responders work with transportation elements to respond on the Nation's roadways. Moreover, TIM is one of a series of emergency transportation operations (ETO) events. This linkage is important because, as the National Response Framework (NRF) indicates, a traffic incident can escalate into a disaster, a widespread emergency, or other significant event.² As Figure 1 shows, a traffic incident is the most probable and most frequent ETO event that occurs. Compared with the other events the chart depicts, traffic incidents tend to be the least severe.

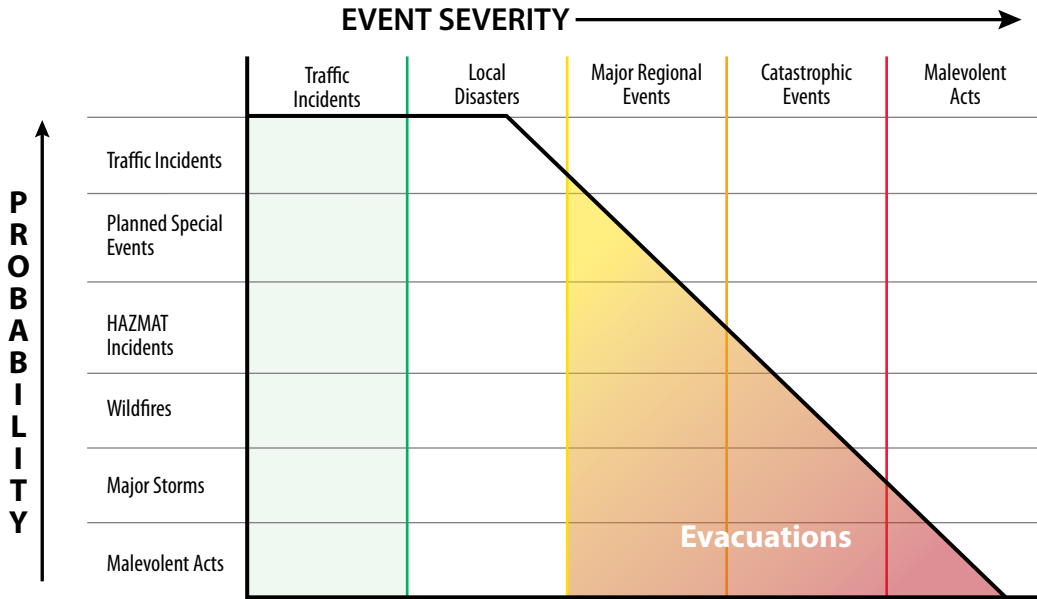


Figure 1 – Emergency Transportation Operations Continuum

It is important to recognize that a TIM event is an ETO event because as more events occur that require coordinated response and recovery efforts, exercising and planning for TIM can become a way of preparing responders for larger ETO events, and this practice can extend to managing and recovering the associated costs. This document does not suggest that the capability of an agency either to manage or recover costs associated with TIM should be an indicator of whether the service is beneficial, but rather that a better understanding will help mid-level managers at transportation agencies understand the effect that TIM is having on the agency and help them demonstrate the effectiveness of their programs.

Planning for operations provides a foundation for explicitly developing TIM goals, objectives, strategies, processes, and opportunities for integration with broader regional operations and safety initiatives. Through these activities planners and operators will have a better starting point for estimating and evaluating TIM cost implication (capital, operational, and support) and revenue options.

Cost management and recovery for planned special events is addressed under separate cover in the Planned Special Events: Cost Management and Cost Recovery Primer, May 2009 on the FHWA Office of Operations website at <http://ops.fhwa.dot.gov/publications/publications.htm>.

² Federal Emergency Management Administration, "NRF Resource Center" web page, accessed November 2011. Available at: <http://www.fema.gov/emergency/nrf/>

Organization

The arrangement of this document provides the reader with a clear understanding of what must be done to manage and recover costs associated with TIM. Chapter 1 presents and summarizes the fundamentals of TIM so that the effects that costs have on these activities can be linked. As discussed on the previous page, this publication is not intended to re-create the content from previous publications; however, some explanation is necessary for the reader to understand the context in which the document addresses TIM costs.

Chapter 1 - Presents and summarizes the fundamentals of TIM so that the effects that costs have on these activities can be linked. As discussed on the previous page, this publication is not intended to re-create the content from previous publications; however, some explanation is necessary for the reader to understand the context in which the document addresses TIM costs operations.

Chapter 2 - Contains information about the fundamentals of cost management and cost recovery. Many types of businesses use these fundamentals, and by examining some of them the reader may begin to identify TIM implementation strategies.

Chapter 3 - Defines the state of the practice and shows that, for the most part, the cost aspects of TIM that are managed and recovered are tactical.

Chapters 4 and 5 - Shows the reader how to take advantage of opportunities to manage and recover TIM costs.

Chapter 6 - Examines the topic of planning for operations. Understanding the role that TIM plays in planning for operations is important because reinforcing this link is a primary objective of mainstreaming transportation operations as a whole. The goal of this chapter is to provide information that will allow TIM cost management and recovery to move beyond the tactical level. The information provided will provide mid-level managers with the knowledge needed to define a process within their own agencies that demonstrates a more complete return on investment in transportation operations, including TIM. It will also allow them to identify ways to offset the costs of TIM by understanding the costs for strategic and support activities associated with TIM.

Chapter 7 - Recognizes that the conversation on how to pay for the recurring costs of TIM and transportation operations is just beginning. This chapter provides additional topics that should be discussed and researched to take the next step in TIM cost management and cost recovery.

Challenges/Issues

Transportation and TIM responder agencies can face many challenges in responding to incidents and crashes on our Nation's roadways, most notably shrinking budgets and the need to maintain an aging infrastructure. Traffic incidents are a significant issue affecting both safety and mobility on our roadways; while quantifying the total impact to society is not possible given current data availability, we may be able to draw some conclusions on the scope of the problem extrapolating smaller datasets.

Economic future shrinking budgets

The United States struggles with an economy that is only now coming out of a recession, and its future remains uncertain. According to the National Association of State Budget Officers, general fund spending among the States remains \$18.7 billion, or 2.7 percent below peak fiscal 2008 levels.³ Fiscal Year 2011 general fund spending saw a decline of 6.3 percent from peak 2008 levels. Balanced budget laws, in effect in most States, require State agencies to cut programs and services to offset decreased revenues and funding. As a result, State and local programs will come under increased scrutiny, and program managers will need to justify funding for each program through

³ National Governors Association and the National Association of State Budget Officers. *The Fiscal Survey of States*. Washington D.C. 2011. <http://nasbo.org/LinkClick.aspx?fileticket=yNV8Jv3X7Is%3d&tabid=38>

performance measurement data and cost-benefit analyses. While this document does not provide a cost-benefit analysis process for TIM, it does begin to address the need to institutionalize the way TIM costs are tracked. Only after a method and data are in place will cost-benefit analyses be possible. State budget cuts affect all first response agencies and entities, which in turn are likely to limit responders' ability to provide an appropriate level of response to traffic incidents across the Nation.

Cost-benefit analyses, when complete and appropriate, may be used effectively to help address the realities of the battle for sustained, increased, or new funding for TIM efforts.

TIM continues to be an issue that impacts livability in communities

According to the National Highway Traffic Safety Administration's (NHTSA) General Estimates System (GES), the number of Reported Motor Vehicle Crashes in 2010 totaled 5,419,000. While many sources suggest that only half of all motor vehicle crashes are reported, typically only those crashes that are reported require a coordinated response and, therefore, result in the expenditure of responder agency resources. Of reported crashes in 2010, 30,196 resulted in fatalities and 1,542,000 included injuries. Each of these fatal and injury crashes resulted in a major incident on the roadway that required a significant level of response—at a minimum police, fire/rescue, and likely towing.

But crashes account for only part of the problem. Breakdowns, debris, and other on-road events create a need for on-scene response to return the roadway to normal operations. Calculating the number of non-crash incidents across the United States or for any particular State is not feasible with the current data collection systems and priorities.

Table 1 shows the result of the extrapolation of the crash to disabled vehicle ratio applied to estimated crash rates from 2005 to 2010. As a substitute for actual data, a sample set of data from the Maryland Coordinated Highway Action Response Team (CHART) program was used to extrapolate an estimate of non-crash related incidents per year. For example in 2010 the CHART program recorded 19,309 emergency response incidents, or crashes; CHART data also indicated 29,699 disabled vehicle responses. The ratio between these data points (1/1.538) was applied to the GES crash estimates for the entire nation, resulting in 8,334,915 disabled vehicle responses and 13,753,915 total incidents needing response across the country in 2010. This extrapolation was also performed for the years 2005 through 2009, with results indicated below. Many incidents and disabled vehicles go unreported, therefore this estimate is likely below the actual number of incidents occurring on roadways each year.

It is important to note that while there may not be cost recovery opportunities for all disabled vehicle incidents, that there is a real cost in any response necessary. The intent of the table below is to quantify the scope of the TIM issue on a national level.

Table 1 – National Incident Estimates by Year, 2005-2010

Year	Crashes	Disabled Vehicles	Total Incidents
2005	6,159,000	6,208,836	12,367,836
2006	5,973,000	6,521,364	12,494,364
2007	6,024,000	5,981,166	12,005,166
2008	5,811,000	9,318,167	15,129,167
2009	5,505,000	7,464,019	12,969,019
2010	5,419,000	8,334,915	13,753,915

Sources: National Highway Traffic Safety Administration, General Estimate System (Crashes); CHART 2010 Data (Disabled Vehicles extrapolated to national estimates).

The Cost of Traffic Incidents

If TIM cost management and cost recovery are to become important to an agency, then it is important to understand exactly what the costs associated with TIM are.

The full spectrum of TIM costs also include strategic and support costs that need to be considered during cost management and recovery. Items such as medical costs, court costs and fines, increased insurance costs, and societal costs due to lost time and revenue due to delay impact the overall cost equation. Those types of costs are important to acknowledge as the focus shifts from cost management and cost recovery to developing benefit-cost ratios. In addition to incorporating the full range of tactical costs, strategic and support costs must also be added to realize the full cost of TIM. Collecting all information across the full cost spectrum shown in Figure 2 will allow agencies to understand the cost of TIM and, ultimately, allow for the partial or whole recovery of costs.



Figure 2 – Full Spectrum of TIM Costs



Credit: iStockphoto



Credit: iStockphoto



Credit: iStockphoto

CHAPTER 1. TIM OVERVIEW

TIM consists of a planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible. Effective TIM reduces the duration and impacts of traffic incidents and improves the safety of motorists, crash victims and emergency responders. A “good” TIM program is one in which responders go home every time, roadways are blocked for the minimum amount of time, and secondary crashes are reduced or eliminated. Sometimes TIM is used interchangeably with the term “transportation operations” or “traffic operations”; however, at a transportation agency, TIM is just one component of an overall transportation operations program or may even be part of the maintenance division. From a national perspective, TIM consists of four primary areas: legislation, policies, training, and outreach.

Regardless of where the responsibility for TIM lies within transportation agencies, operations managers increasingly look upon TIM as a transportation operations solution that promotes more efficient use of the existing roadway infrastructure. However, at agencies that are asked to assume the responsibilities of TIM costs, reduced funding levels continue to limit their ability to execute programs effectively.

TIM Programs can typically be divided into strategic activities, tactical activities, and support activities, as shown in Table 2 below.

Table 2 – The Anatomy of a TIM Program

TIM Strategic Activities	TIM Tactical Activities	TIM Support Activities
<ul style="list-style-type: none"> • Staffing/Resourcing • TIM Teams • Policies and Procedures • Training • Vehicle Purchases • System Deployment • Software Deployment • Asset Purchases • Asset Typing • Resource Typing • Strategic Planning 	<ul style="list-style-type: none"> • Agency Notification • Resource Dispatch • Scene Setup • Device Activations • Traffic Diversions • Queue Monitoring • Investigative Procedures • Victim Extrication and transport • Vehicle Clearance • HAZMAT Mitigation • Vehicle/Equipment Repairs • Traffic Management Center Operations • Infrastructure Repairs 	<ul style="list-style-type: none"> • Data Collection • Data Integration • Data Sharing • Traveler Information • After Action Reviews • Cost Management • Cost Recovery

TIM Programs

An effective TIM program cannot be planned or executed by any single agency or discipline alone. This understanding led to the creation of goals and objectives through the National Unified Goal (NUG), developed by FHWA, AASHTO, the National Traffic Incident Management Coalition (NTIMC), and other Government and industry representatives in 2004.

TIM Goals and Objectives

IM program goals and objectives as documented in the NUG include three overarching goals:

- Responder Safety
- Safe, Quick Clearance
- Prompt, Reliable Interoperable Communications

Each of these goals is supported by cross-cutting strategies or objectives that help to define strategic, tactical, and supporting actions for TIM programs. Table 3 below shows each of the NUG cross-cutting strategies along with considerations for cost management and cost recovery. This examination of the NUG shows that there are many opportunities to manage and possibly recover the costs associated with TIM, and relating these expenses to performance during incidents can better capture the full scope of strategic costs. The key to an effective TIM cost management and cost recovery program is tying these goals to performance measures and an overall performance index.

Table 3 – Sources of Costs Associated with the National Unified Goal for Traffic Incident Management

Strategy	TIM Cost Categories				
	Plans and Procedures	Coordination	Equipment	Technology	Training
TIM Partnerships and Programs	✓	✓			✓
Multidisciplinary NIMS and TIM Training	✓	✓			✓
Goals for Performance and Progress	✓	✓		✓	✓
TIM Technology	✓	✓		✓	✓
Effective TIM Policies	✓	✓			✓
Awareness and Education Partnerships		✓		✓	✓
Recommended Practices for Responder Safety	✓		✓	✓	✓
Move Over/Slow Down Laws	✓	✓	✓	✓	
Driver Training and Awareness		✓		✓	
Multidisciplinary TIM Procedures	✓	✓	✓	✓	✓
Multidisciplinary Communications Practices and Procedures	✓	✓	✓	✓	✓
Response and Clearance Time Goals	✓	✓			
24/7 Availability	✓	✓	✓		
Prompt, Reliable Responder Notification	✓	✓	✓	✓	✓
Interoperable Voice and Data Networks	✓	✓	✓	✓	✓
Broadband Emergency Communications Systems	✓	✓	✓	✓	✓
Prompt, Reliable Traveler Information Systems	✓	✓	✓	✓	✓
Partnerships with News Media and Information Providers	✓	✓		✓	✓

This examination of the NUG shows that there are many opportunities to manage and possibly recover the costs associated with TIM. The key to an effective TIM cost management and cost recovery program is tying these goals to performance measures and an overall performance index.



Credit: iStockphoto



Credit: iStockphoto



Credit: iStockphoto

CHAPTER 2. DEFINITIONS

Cost Recovery

Costs are classified as being recovered when the program receives reimbursement from sources outside of the budget that is then used to fund the program. Understanding the difference between cost recovery and cost substitution is a key consideration. Cost substitution is simply replacing a portion of the budget used for incident response from another source within the same budget, for example moving funds between state agencies. Cost recovery would involve sources outside the Governors budget purview, such as costs recovered from federal grant sources, metropolitan planning organizations, or private interests.

Cost Management

Cost management allows us to view the cost-benefit relationship of various activities, setting the stage for more informed decisions. Cost management generally begins with an initial plan for costs, continues through cost tracking and analysis of the information collected, and includes evaluations and decisions based on information from the previous stages.

The four distinct stages described above are depicted in Figure 3. All of the stages are interdependent, and decisions in any stage will affect the system as a whole. The system is a closed loop, so the last stage leads back to the first stage. The four stages are described below.

- **Cost Planning** is simply estimating future costs and budgeting. Budgets are based on knowledge about historic costs that has been gained in large part from good tracking and analysis. Budgets for new activities or expansions may include detailed analysis of a capital purchase (e.g., equipment, software).
- **Cost Tracking** involves coding discrete activities and their associated costs or cost drivers, such as personnel time sheets, vehicle mileage logs, supplies purchases, and contract payments.
- **Cost Analysis** requires cost data processing to create cost information—information that will be useful in evaluation, decisionmaking, and planning. Analysis can produce any of a wide variety of measures across a number of dimensions, including time trends, percentages, and per-unit measures. Examples of static, per-unit measures include agency employee hours per incident and labor cost per incident. Examples of temporal analysis measures include trends in labor rates and trends in fuel costs. Examples of percentage measures include labor cost and fuel cost as a percentage of total operating costs.
- **Evaluation and Decision.** Cost information produced in the analysis stage is evaluated to support decisionmaking for future programming, resource allocations, and asset management; to support cost recovery mechanisms; and to support appeals to higher level decisionmakers for continued or enhanced funding. Subsequent chapters address these elements.



Figure 3 – Cost Management Fundamentals

A sound cost analysis approach can be a useful tool for performance management, revealing both ways to achieve a more cost-effect level of performance as well as opportunities to improve performance (e.g., incident clearance time) without increasing cost. Agencies may use a variety of cost analysis approaches, one of which is activity-based costing (ABC). ABC first became popular in the late 1980s in the manufacturing sector, eventually becoming of interest to financial and governmental sectors in the 1990s. ABC focuses on discrete processes (activities) and their specific costs, attempting to allocate both direct and indirect costs based on carefully determined process cost drivers. That is, ABC defines “cause and effect” relationships to assign costs objectively. The method can be particularly helpful in revealing “true” costs in instances where there is a great deal of indirect cost sharing (e.g., equipment with multiple uses).

The South Dakota Department of Transportation (SDDOT) implemented an ABC system as one component of a comprehensive management performance program known as “Collaborative Performance Management” (CPM). CPM helps the department run its operations “like a business.” The agency credits CPM with significant improvements in performance, including millions of dollars of savings annually. One benefit of the CPM SDDOT managers have cost and other performance information at their fingertips. They use this business intelligence to reduce the cost of processes, lower the lifetime cost of ownership and operation of specific assets, monitor the effectiveness of the department’s transportation services, maintain the knowledge base as senior staff retire, and prepare performance-based business plans and budgets. Says Roxanne Rice, Fiscal and Public Assistance Director of SDDOT, “We are able to show our stakeholders how we are doing, what we are doing, why we are doing it and what it costs the taxpayer.”⁴

Identifying and Classifying Costs

Costs may be classified several ways. Costs can be either fixed, variable, or “mixed” (“semi-variable”). Another way to break down costs is into the “direct” or “indirect” categories. The classification scheme an agency uses will depend on the type of analysis, planning, or decisionmaking the agency is performing.

- **Fixed costs** are costs that typically do not change (in total) in response to changes in volume of activity. Examples include depreciation, supervisory salaries, and maintenance expenses. In reality, such cost elements may change with a change in the scale of the activity, although this would not typically occur in a 1-year analysis period. In microeconomics, a fixed cost (e.g., rent) is one that cannot be varied in the short run.
- **Variable costs** are costs that change in response to the changes in the volume of activity. We generally assume that the relationship between variable costs and activity is proportional. For example, if the volume of activity increases by 10 percent, then variable costs in total would be expected to rise by 10 percent. The labor cost of employees responding on the scene of an incident would be a variable cost that increases with the number of incidents.
- **Mixed (or “semi-variable”) costs** are costs that contain both a variable cost element and a fixed cost element. An example is a vehicle rental that is billed at a base rate plus a per-mile charge.

⁴ SAS, “Extending the Power of Cost Management in Government,” White Paper available online at http://www.sas.com/resources/whitepaper/wp_3573.pdf

The other common classification scheme for costs is direct versus indirect costs. Direct costs are costs that can be easily and readily linked to a specific activity, while indirect costs are those that cannot easily be linked to a single specific function or objective. The cost associated with setting up and operating a traffic management center is an example of indirect costs because the management center serves several functions, one of which is incident management. Other examples of indirect costs are the costs of supervisory staff, administrative support staff, and administrative support facilities.

Tracking direct costs is usually a straightforward process. It is in the tracking and allocation of indirect costs that agencies typically have most room for improvement. In some cases, indirect costs might not be allocated to some activities at all. In others, they may be allocated based on some rule of thumb that does not accurately capture the true linkages between the resource use and the activity. Proper tracking and allocation of direct and indirect costs is particularly important and difficult in the case where TIM functions are not housed in a dedicated department but rather are conducted and budgeted within a broader agency department or division, such as maintenance or ITS. In such situations, an ABC system offers the opportunity to provide improved cost information and promote more well-informed decisions about resource allocation.

In an activity-based cost system, the focus of interest is on the activities performed by a business or agency. For example, one activity associated with TIM is operating dynamic message boards. The ownership cost of the equipment (maintenance, communication costs and depreciation of the signs and the software) is a cost that should be divided among the various operations elements that use the signs, including construction and special events as well as incident management. In an ABC system, analysts first identify the cost driver for the activity. The cost driver is the unit of measure that most correlates with the resource cost of the activity. For dynamic message signing, the cost driver might be staff time at the traffic management center. In such a case, the indirect costs of the dynamic message signing activity would be allocated to the "cost objective" (i.e., incident management, construction work zone management, planned special events management) in proportion to the staff hours spent addressing each of these functions at the TMC. An alternative method of applying the cost driver is using the proportion of total time that the equipment is in use in the service of each of the activities' cost objectives. In the case of the signage, however, it may be more appropriate to keep the indirect costs broken down; software costs may correlate best with staff hours of application, while the signs themselves may correlate best with hours in use. In setting up an ABC system, designers will face the tradeoff of the costs of creating more detailed information like that described above to the benefits of better-informed decisionmaking. In fact, the chief criticism of ABC systems is that they can be costly to implement. In any case, managers may still improve cost management by applying some of the principles of activity-based costing, even if the agency does not choose to undertake the full implementation of an ABC system.

The U.S. Marine Corps implemented an Activity Based Costing system, using proprietary software from SAS, starting in 2000. Its aim was to determine the true costs of the services each based provided, to identify ways to increase efficiency and reduce costs. The ABC system saved the Marines about \$89 million from 2000 to 2002, said Maj. Rod Brewster of the Marines' Center for Business Excellence at the Navy Annex in Arlington, Virginia. The Marine Corps' goal was ultimately to reduce the operating expenses of its bases by \$634 million.⁵

⁵ *Washington Technology*, "SAS helps Marine Corps budgets get lean: activity-based costing software offers enterprise-wide visibility," February 24, 2003. Available online at http://goliath.ecnext.com/coms2/gi_0198-49918/SAS-helps-Marine-Corps-budgets.html

Performance Measurement

Performance monitoring and measurement are critical in today's transportation agencies, and this monitoring extends to traffic incident management. A great deal of the focus of performance measurement for TIM is related to the incident timeline, as shown in Figure 4.

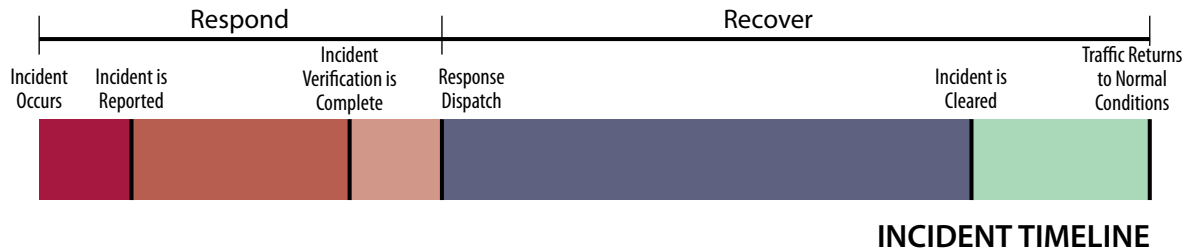


Figure 4 – Standard Incident Timeline for Performance Measurement

By examining the project delivery process as shown in Figure 12 of this document, an agency can make the connection between the timeline from Figure 4 to a TIM program.

With so much focus on implementing the NUG in TIM programs it is also useful to understand how each strategy from the NUG can be measured. The inputs, outputs, and outcome-based performance measures from the NUG are shown on the following pages.

It is important that the measurement of performance in each area of response activity is connected to the financial needs of any agency involved in that response. The study, implementation, and review of each activity have a cost. Some of the potential outcomes listed in Table 4 are associated with customer satisfaction and public perceptions and are therefore challenging to quantify. A more complete understanding of TIM activities from planning to preparedness to operation to measurement empowers analysts to make real budgetary decisions.

Table 4 – Input, Output, and Potential Outcome for a TIM Program by NUG Strategy

NUG Strategy	Input	Output	Potential Outcome for a TIM Program
<p>TIM partners at the national, State, regional and local levels should work together to promote, develop, and sustain effective TIM Programs.</p>	<ul style="list-style-type: none"> • Written agreements • Program definition 	<ul style="list-style-type: none"> • Training requirements • Meetings 	<ul style="list-style-type: none"> • Customer satisfaction increased • Negative public perception decreased • Executive acceptance
<p>TIM responders should receive multi-disciplinary NIMS and TIM training.</p>	<ul style="list-style-type: none"> • Number of personnel to be trained • Frequency of training 	<ul style="list-style-type: none"> • Percentage of personnel trained • Increased efficiency in incident verification • Increased fiscal responsibility for dispatched services 	<ul style="list-style-type: none"> • Improved communications and scene management
<p>TIM partners should work together to establish and implement performance goals at the State, regional and local levels for increasing the effectiveness of TIM, including methods for measuring and monitoring progress.</p>	<ul style="list-style-type: none"> • High level tasks • Data-driven tasks • Efficiency tasks 	<ul style="list-style-type: none"> • Measures of performance at all levels of program 	<ul style="list-style-type: none"> • Increased or decreased funding • Improved data for analysis • System, protocol, procedure needs, and verification
<p>TIM partners at the national, state, regional and local levels should work together for rapid and coordinated implementation of beneficial new technologies for TIM.</p>	<ul style="list-style-type: none"> • Concept of Operations • Architectures • Stakeholder needs 	<ul style="list-style-type: none"> • Number of incidents responded to • Efficiency of response • Reduced incident response timeline 	<ul style="list-style-type: none"> • Right-sized TMCs • Increased efficiencies for interagency communication and coordination • Increased funding
<p>TIM partners at the national, state, regional and local levels should join together to raise awareness regarding proposed policies and legislation that affect achievement of the NUG objectives of Responder Safety; Safe, Quick Clearance; and Prompt, Reliable Traffic Incident Communications.</p>	<ul style="list-style-type: none"> • Responder safety statistics • Incident duration statistics • Communication protocol architectures (human and system) 	<ul style="list-style-type: none"> • Number of responders injured responding to traffic incidents • Time to identify, verify, dispatch, clear, and return traveling conditions to normal • Protocols for real-time communications 	<ul style="list-style-type: none"> • Increased customer satisfaction • Changes in responder safety protocols • Memorandums of understanding
<p>Broad partnerships should be developed to promote public awareness and education regarding the public's role in safe, efficient resolution of incidents on the roadways.</p>	<ul style="list-style-type: none"> • Benchmark of customer satisfaction 	<ul style="list-style-type: none"> • Percentage of customer satisfaction • Increase in customer knowledge based on marketing principles 	<ul style="list-style-type: none"> • Improved public perception of the DOT • Reduced customer complaints • Responder safety campaigns • Quick clearance campaigns

NUG Strategy	Input	Output	Potential Outcome for a TIM Program
<p>Recommended practices for TIM Responder Safety and for traffic control at incident scenes should be developed, and widely published, distributed and adopted.</p>	<ul style="list-style-type: none"> Existing status of TIM responder practices National best practices 	<ul style="list-style-type: none"> Responder manuals Standard drawings for incident scenes Reduced infrastructure costs Reduced responder fatalities, injuries, and asset damage 	<ul style="list-style-type: none"> Benefits paid due to fatalities and injuries are reduced
<p>Drivers should be required to Move Over/ Slow Down when approaching traffic incident response vehicles and traffic incident responders on the roadway.</p>	<ul style="list-style-type: none"> Laws Standards for delineation 	<ul style="list-style-type: none"> Reduced shoulder collisions Reduced rate of vehicle to responder collisions 	<ul style="list-style-type: none"> Improved safety of freeway service patrol and police responders
<p>Driver training and awareness programs should teach drivers how to react to emergencies on the roadway in order to prevent secondary incidents, including traffic incident responder injuries and deaths.</p>	<ul style="list-style-type: none"> Revised driver training curriculum Secondary incident rates 	<ul style="list-style-type: none"> Reduction in incident durations Reduction in queues and back logs 	<ul style="list-style-type: none"> Increased driver awareness reducing program costs
<p>TIM partners at the state, regional and local levels should develop and adopt multidisciplinary procedures for coordination of TIM operations, based on national recommended practices and procedures.</p>	<ul style="list-style-type: none"> Stakeholder agreements National bench marks 	<ul style="list-style-type: none"> More efficient coordination Meetings 	<ul style="list-style-type: none"> Cost sharing among agencies Better overall use of State resources
<p>TIM partners at the state, regional and local levels should commit to achievement of goals for traffic incident response and clearance times (as a component of broader goals for more effective TIM, see Strategy 3).</p>	<ul style="list-style-type: none"> Incident timeline milestones and duration goals Stakeholder agreements 	<ul style="list-style-type: none"> Actual incident milestone durations Task durations 	<ul style="list-style-type: none"> Measured success and direct evidence of resources in use positive outcomes
<p>Traffic incident responders and resources should be available 24/7.</p>	<ul style="list-style-type: none"> Hours of operations Resource types 	<ul style="list-style-type: none"> Money spent on resource availability Resource area of responsibility and coverage 	<ul style="list-style-type: none"> Increased customer satisfaction and reduced costs of mobility Determination of staffing and resource levels as they tie directly to customer service

NUG Strategy	Input	Output	Potential Outcome for a TIM Program
<p>Traffic incident responders should develop and implement standardized multidisciplinary traffic incident communications practices and procedures.</p> <p>All traffic incident responders should receive prompt, reliable notification of incidents to which they are expected to respond.</p>	<ul style="list-style-type: none"> • Communication types • Reliability • Policies and procedures • Notification time latency • Notification accuracy • Stakeholder identification 	<ul style="list-style-type: none"> • Training opportunities • Enhanced protocols • Communication inventories • Percentage of time notification is beyond the notification goal • Percentage of time notifications (inbound and outbound) are accurate • Stakeholder satisfaction 	<ul style="list-style-type: none"> • Systems and protocols that reduce the amount of lost time • Maintaining current and efficient communication devices • Systems and/or protocols to speed up notifications and enhance the accuracy of notifications • Stakeholder relationships can be improved • Resources can be used more efficiently
<p>State, regional and local TIM stakeholders should work together to develop interoperable voice and data networks.</p>	<ul style="list-style-type: none"> • Voice and data architectures from each stakeholder agency 	<ul style="list-style-type: none"> • Multiagency voice and data architecture 	<ul style="list-style-type: none"> • Appropriate technologies can be instituted to maintain or enhance communications • Less lost time when new technologies are implemented
<p>National TIM stakeholders (working through the NTIMC) should work together to reduce the barriers to integrated broadband emergency communications systems development and integration (both wired and wireless).</p>	<ul style="list-style-type: none"> • Communication barriers • Communication costs • National comparisons • Relationship with the NTIMC 	<ul style="list-style-type: none"> • Communication plan • Percentage of communications below national standards • Gaps in communication 	<ul style="list-style-type: none"> • Communication benchmarks • Identification of overarching communication needs • Implementation of communications to reduce lost time
<p>TIM partners should encourage development of more prompt and reliable traveler information systems that will enable drivers to make travel decisions to reduce the impacts of emergency incidents on traffic flow.</p>	<ul style="list-style-type: none"> • Customer satisfaction • Traveler information portals • Traveler information statistics 	<ul style="list-style-type: none"> • Customer satisfaction with traveler information system and the aspects that support it 	<ul style="list-style-type: none"> • Implementation of additional traveler information services and cancellations of ones that are not effective • Refined protocols
<p>TIM partners should actively partner with news media and information service providers to provide prompt, reliable incident information to the public.</p>	<ul style="list-style-type: none"> • Stakeholder group identification • Customer satisfaction 	<ul style="list-style-type: none"> • Public-Private partnerships 	<ul style="list-style-type: none"> • Favorable reporting by media partners • Greater recognition of DOT Traffic Operations in promoting mobility • Reduced recurring congestion levels



Credit: iStockphoto



Credit: iStockphoto



Credit: iStockphoto

CHAPTER 3. STATE OF THE PRACTICE

The high profile development of the NUG for TIM and the subsequent outreach efforts by the National Traffic Incident Management Coalition (NTIMC), the FHWA as well as other agencies, associations, and organizations has led to a renewed and intensified focus on TIM. Increased attention has particularly focused on promoting best practices to improve responder safety, promoting safe quick clearance policies and legislation, and improving the interoperability of incident communications and performance measurement. However, to date efforts to promote best practices and discussions about performance measurement have not identified long-term funding streams that agencies may use to pay for services.

To understand the state of the practice with regard to funding TIM programs, the study team conducted an extensive search for and evaluation of documents available in the public domain. This evaluation documents the legislation related to TIM cost recovery, advocacy group positions, and how individual TIM disciplines approach funding for TIM. The search yielded valuable information upon which to base the synthesis of current suggested or implemented practices.

Overall, the study team identified and reviewed 39 documents to determine their applicability and gather any relevant follow-up documentation or specific practices deemed worthy of replication. The majority of published material dealt with the topic of cost recovery, which was typically described:

- As it applies to infrastructure damage repair costs;
- In terms of hazardous materials incident response and mitigation;
- Relative to EMS transport costs; or
- As it is associated with fire service response for performing life-saving actions.

A summary table and the document abstracts are included in the Appendix.

Legislation

Legal considerations are an important part of any decision that TIM agencies face because the risk of litigation and the possibility of negligence can cause negative publicity and hurt the ability of the agency to deliver services.

Cost Management

Research did not reveal any evidence of legislation that requires agencies to manage the costs associated with TIM.

Cost Recovery

Figure 5 shows the levels of government where legislation has been enacted to address TIM. As the figure shows, the authority to seek reimbursement for TIM can be granted from almost every level of government; however, the type of costs that can be recovered can be as specific as the exact type of actions taken at the scene.

The Federal Government, through Federal law and rulemaking, has enacted legislation designed to safeguard the environment and overall public safety. State legislation is enacted by State Legislatures and is assigned to an agency for policy development and enforcement. These policies have been aimed at providing guidance to local governments regarding their latitude for implementing ordinances. Finally, ordinances enacted by local governments define from whom costs may be recovered, the types of costs that may be recovered, and the applicable fee structures.



Figure 5 – Sources that may enable TIM cost recovery statutes

TIM Cost Recovery: Federal Legislation

The best documented type of TIM cost recovery is related to the release of chemicals from vehicles. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (amended in 1986) and the Oil Pollution Act of 1990 provide the basis for authorization to recover costs associated with the release of hazardous materials into the environment. Each Act specifically addresses the authority of jurisdictions to respond to emergencies with impending or actual substance release, and each Act also addresses the responding agencies' right to reimbursement. An excerpt from the CERCLA Chapter 103 in Figure 6 outlines local authority parameters. The Oil Pollution Act has wording similar to that in the example below. Notably, no Federal legislation exists to recover costs associated with TIM when the environment is not at risk.

CERCLA Chapter 103 Section 9623

(a) Application

Any general purpose unit of local government of a political subdivisions which is affected by a release of threatened release at any facility may apply to the President for reimbursement under this section.

(b) Reimbursement

(1) Temporary emergency measures

The President is authorized to reimburse local community authorities for expenses incurred (before or after October 17, 1986) in carrying out temporary emergency measures necessary to prevent or mitigate injury to human health or the environment associated with the release or threatened release of any hazardous substance of pollutant to contaminant. Such measure may included, where appropriate, security fencing to limit access, response to fires or explosions, and other measures which require immediate response at the local level.

(2) Local funds not supplanted

Reimbursement under this section shall not supplant local funds normally provided for response.

(c) Amount

The amount of any reimbursement to any local authority under subsection (b)(1) of this section may not exceed \$25,000 for a single response. The reimbursement under this section with respect to a single facility shall be limited to the units of local government having jurisdiction over the political subdivision in which the facility is located.

(d) Procedure

Reimbursement authorized pursuant to this section shall be in accordance with rules promulgated by the Administrator within one year after October 17, 1986.

**Figure 6 – Comprehensive Environmental Response, Compensation, and Liability Act of 1980
(As Amended in 1986)**

TIM Cost Recovery: State Legislation

A number of States have enacted legislation addressing TIM cost recovery. The two types of laws that jurisdictions at the State and local level must abide by are either enacted laws or common law doctrine. Enacted laws are those which are introduced by elected officials of the legislative branch of government and are signed by the chief executive (Governor or Mayor). Common law doctrine embodies precedents that have been set based on decisions made by courts. When a court makes a decision, if a similar case comes before the same court or a lower court in the same jurisdiction in the future, the court is bound by the precedent set by the earlier case.

Common law doctrine is applicable to TIM cost recovery because of the municipal cost recovery model or free public services doctrine,⁶ which has been defined by court cases dating back to the 1970s. Opponents of TIM-related cost recovery argue in support of this doctrine, which states that public expenditures made in the performance of governmental functions are not recoverable because this would represent a form of double taxation. Proponents of TIM cost recovery argue that the doctrine is only applicable for situations where the jurisdiction would sue for recovery. If user fees are instead implemented, this would not be a form of double taxation as only those who choose to use the roadway and operate a vehicle in a way that causes a crash would be charged the fee. Proponents further argue that these fees are needed to supplement depleted emergency responder budgets and that the allocation of tax money to support them is solely for the purpose of making the service available and sustaining the infrastructure to support it.

The free public services doctrine does not apply in cases where damage to public property occurs because of the crash. In this case, the doctrine allows States to recover the cost to repair the infrastructure. A summary of the way States have interpreted this doctrine and addressed it with legislation is summarized in the Appendix.

The types of cost recovery different States have allowed include:

- Emergency Medical Services – the ability to recover costs associated with response and patient transport.
- Fire – the ability to recover the cost associated with response and recovery activities. Items that are deemed medically necessary are typical exempt if this type of recovery is prohibited. “Medically necessary” has been defined in some contexts as actions that are essential to the survival of the vehicle occupants, such as extrication.
- HAZMAT – The legal right to recover costs associated with the emergency response and recovery efforts due to the release of hazardous materials from responsible parties.
- Infrastructure – The ability to recover costs associated with the repair or replacement of the roadway or roadway components from liable drivers.
- Law Enforcement – the ability to recover costs associated with response and/or crash investigation from involved parties or insurance companies.
- Transportation – the ability to recover costs associated with response and traffic control.

Many States have not enacted legislation either permitting or prohibiting specific types of cost recovery. This means that in these States the free public services doctrine governs, and allowable procedures are dictated by local court decisions. Where legislation exists, it can be classified into the categories shown below:

- All drivers can be charged by all responding agencies.
- The at-fault driver can be charged by all responding agencies.

⁶ Lytton, Timothy D. “Should Government Be Allowed to Recover the Costs of Public Services from Tortfeasors?: Tort Subsidies, the Limits of Loss Spreading, and the Free Public Services Doctrine,” *Tulane Law Review* (76 Tul. L. Rev. 727) February 2002.

- The at-fault driver can be charged by all responding agencies, except DOTs.
- If the at-fault driver is under the influence of drugs or alcohol they can be charged by all responding agencies, except the DOTs.
- Drivers can be charged by all agencies except law enforcement.
- Drivers can be charged by all agencies except fire departments.

Advocacy Groups on TIM Cost Recovery

There are both proponents and opponents to legislation that allows agencies involved with TIM to recover costs. The most often stated arguments focus on the enactment of ordinances by local jurisdictions that allow response agencies to charge a fee for response. Table 5 shows common arguments used by both the opponents and proponents of accident recovery fees.

Table 5 – Viewpoints on TIM Cost Recovery by Means of User Fees

Proponent Viewpoints	Opponent Viewpoints
<ul style="list-style-type: none"> • The alternative is to reduce service • Represents a true user fee • Taxes are for making the resource available only • The reduction in property and other tax revenues has placed additional stress on the emergency response community • Education can change the view point of the public • Responder and motorist safety can be compromised • There are no alternatives 	<ul style="list-style-type: none"> • Constitutes double taxation • Increases insurance rates • Is ineffective • Increases citizen financial stress • Re-victimizes those affected by vehicle crashes • Could cause motorists not to seek emergency services • Is not successful • Creates a negative public opinion of government

Fire Services and EMS

Fire departments bear a significant amount of cost when it comes to traffic incidents. They purchase and maintain some of the most expensive equipment at the crash scene, have rigid training requirements, and are often put in harm’s way for the longest duration. Firefighters often experience many of the same costs whether they are career or volunteer personnel.

The U.S. Fire Administration (USFA) developed a publication that identifies sources of funding from Federal and local revenue sources with potential to supplement EMS agencies and fire departments budgets, including the Firefighter Investment and Response Enhancement (FIRE) Act, the Staffing for Adequate Fire and Emergency Response (SAFER) Act grant program(s), as well as other important grant programs.⁷ Many of these sources identified by the USFA may be applicable to TIM response resource needs.

Cost Management

According to the U.S. Fire Administration, emergency medical incidents comprise two-thirds to three-quarters of fire department calls.⁸ As described in the sample of a rural volunteer fire company shown at the right,⁹ there is no effort or emphasis placed on cost forecasting and tracking costs related to TIM because in many cases there is a large discrepancy between the costs to do business versus the amount that can be recovered. Similarly, at career fire departments where salaries are a major portion of costs, the emphasis is not usually placed on the type of call being

⁷ Federal Emergency Management Agency, United States Fire Administration, *Funding Alternatives for Fire and Emergency Services*. Available online at: http://www.usfa.fema.gov/downloads/pdf/publications/fa_331.pdf

⁸ Ibid.

⁹ Personal interview with Thomas Schofield, May 14, 2011.

responded to but on the pure volume of calls. In both the case of volunteer fire departments and career fire departments, the knowledge of how much of their operating budget is dedicated to TIM is seen as being of little benefit. Instead, the emphasis is on paying salaries (in career departments) and determining what the needs will be for gear and equipment.

The accurate assessment of costs associated with a fire company's TIM responses could, in fact, be useful in working with local and State officials to help identify not only fire company funding sources and levels, but the importance of a coordinated overall TIM approach.

Cost Recovery

The U.S. Fire Administration's publication on funding alternatives offers 10 different ways that fire departments can recover costs:¹⁰

1. Taxes – property, local income, and general sales;
2. Borrowing – such as bonds and certificates of participation;
3. Leasing – to avoid large capital costs;
4. Benefit assessment charges – designed to supplement policies allowable by property tax laws, these fees assign values to conveniences or benefits such as having the fire station near a property or having special services;
5. Fees – costs imposed on users for the purpose of building small amounts of revenue based on services provided;
6. Fines and citations – revenue generated by penalizing individuals for code violations;
7. Cost sharing – working with other jurisdictions to share common costs;
8. Strategic alliances – joining together with other jurisdictions to service other areas;
9. Consolidation – reducing the amount of individual resources in an area for covering the same geographical area; and
10. Sales of assets and services – including the sale or auctioning of equipment, training services, facility rental, and delinquent tax certificates.

While none of the 10 cost recovery methods mentioned above is directly linked to TIM, these methods are all ways that fire departments can recover costs in general. This recovery allows them to offer their services in their jurisdictions and can be enacted at the local government level.

In addition to the local cost recovery methods mentioned above, the U.S. Fire Administration's publication also highlighted eight methods that individual States can use to help fire departments offset operating costs.¹¹

RURAL VOLUNTEER FIRE COMPANY EXPERIENCE

Q: How does your fire department manage the costs associated with responding to crashes?

A: We don't really track the differences in the type of events that we respond to. When we are planning for the next budget, we look at what our costs were from last year and add a percentage for inflation and rising costs, what we want to invest in next year and what the needed level of revenue will be to obtain our goals. For instance, we currently need to purchase a new rescue unit so we looked at the average amount of new and used rescue units then divided up the cost until the yearly amount that we need to save fits into what we think we can collect with fund raisers and other revenue sources. Currently, it may be 8 years or more until we can afford to get the vehicle we need, so we also have to consider what will need to be done to maintain the current rescue unit we have. Another important aspect to consider is that even though we know that an ambulance call will cost us approximately \$450 - \$500 and a response to a crash will cost \$750, often we cannot collect that because Medicare for example, only pays \$80 per call. So we have to write-off and subsidize the rest of the cost in other ways.

*Thomas J. Schofield, President
Factoryville Fire Department, Factoryville, PA*

¹⁰ FEMA, *Funding Alternatives for Fire and Emergency Services*, pp. 1-2 – 1-3.

¹¹ FEMA, *Funding Alternatives for Fire and Emergency Services*, p. 3-1.

1. Low interest loans;
2. Insurance surcharges (fire only);
3. Driving related fees and fines (EMS only);
4. Surplus vehicles and equipment;
5. Special purpose grants;
6. Matching grants;
7. Technical assistance/support; and
8. Subsidized training.

On June 8, 2010 the Madison County Board of Supervisors enacted an ordinance, pursuant to Section 32.1-111.14 of the Code of Virginia, to authorize an Emergency Medical Services (“EMS”) Cost Recovery Program. Under this program the County will obtain financial reimbursement for the cost of providing emergency medical services and medically necessary ambulance transportation. EMS Cost Recovery will allow Madison County to recoup costs from individuals who benefit directly from these emergency services, including many non-County residents. The vast majority of costs collected will be reimbursed from Medicare, Medicaid and private insurance companies. Madison County will begin billing for EMS services, effective August 1, 2010.

Q: How will billing for EMS services work?

A: Beginning August 1, 2010, Madison County will generate a bill each time EMS services, including ambulance transports, are provided to a patient by the staff of the County’s Department of Emergency Medical Services (“MEMS”). Madison County has contracted with Diversified Ambulance Billing, LLC (“DAB”). Following receipt of EMS services, a patient will receive correspondence asking for confirmation of residence address and insurance coverage. Once information about a patient’s insurance coverage has been verified, a claim form will be forwarded to his insurance provider, Medicare, or Medicaid as may be applicable. Patients themselves will not be billed until all insurance options have been exhausted.

Q: Will I be billed for amounts not covered by insurance?

A: A County resident will be billed only to the extent of his or her Medicare, Medicaid or other health insurance coverage. Any remaining cost-sharing amounts (e.g., co-payments, deductibles) will be waived for County residents. If you are a County resident who is not covered by Medicare, Medicaid or any other health insurance coverage, charges for EMS services will be waived. If you are a non-resident, then your insurance company will be billed and you will subsequently receive a bill for applicable cost-sharing amounts remaining after insurance claims have been processed. Any non-resident who is without any form of insurance coverage will be billed for the entire amount of the EMS services delivered. If a patient who receives a bill is unable to pay, then the patient may apply for a financial hardship waiver.

Q: What are the billing rates for EMS services?

A: Madison County will charge a fee of \$9.00 per mile for each ambulance transport and a fee of \$350 to \$575 for EMS services provided in connection with the transport, depending on the level of EMS care required by the patient. There are three levels of EMS care: (1) Basic Life Support (BLS); (2) Advanced Life Support-1 (ALS1); and (3) Advanced Life Support-2 (ALS2). Madison County’s fees are established by resolution of the Board of Supervisors, consistent with rates allowed by the Center for Medicare and Medicaid Services (CMS) for our geographic region.

Q: I receive requests from the Volunteer Rescue Squad for donations. Does this program replace the need for volunteer funding?

A: No. Revenue recovered as a result of this program goes into the County’s General Fund. Although the County’s Volunteer Rescue Squad receives financial support from the County’s General Fund each year, a significant portion of the volunteer agency’s costs must be covered by donations received from the community.

The services associated with TIM are included in the recovery methods shown above since they are all efforts to recover the cost of providing service.

Since many fire departments also provide EMS service, the cost of operating the ambulance service is included in annual budget planning. Below is an example of fees being implemented for responding to emergencies by Madison County, Virginia.¹²

¹² Madison County Virginia Website, “EMS Cost Recovery” page, accessed June 2011. Available at: http://www.madisonco.virginia.gov/index.php?option=com_content&view=article&id=320:ems-cost-recovery&catid=63:emergency-medical-services&Itemid=62

The example from Madison County, Virginia, shows that jurisdictions see the need to implement these types of fees but are very careful to be explicit in describing how the fees will be imposed, how and when they will be collected, and how much will be charged.

Overall, the state of the practice for TIM cost recovery within public safety groups such as volunteer and career fire departments and EMS providers is based on local ordinances and is typically not divided into a separate category for TIM.

Law Enforcement Agencies

As with fire and EMS services, law enforcement agencies provide staffing on a 24/7 basis regardless of the specific needs of citizens. For that reason, no significant emphasis is placed on cost management of TIM activities at law enforcement agencies unless the costs are being managed for a specific reason, such as grant reimbursement or targeted enforcement.

For cost recovery the experience is similar. Some States have enacted legislation that prohibits cost recovery associated with incident response while others are silent on the matter. The practice of recovering costs associated with TIM is not widespread among law enforcement agencies.

The Florida Highway Patrol provided the following example of a cost management tool. Figure 7 shows an example of the system they use to record the agency's time spent dealing with a crash. This system combines the need to track time spent at crashes with elements that are usable as performance measures for elements on the standard incident timeline. Key data points collected include time of event, report, dispatch, arrival on scene, roadway clearance, and scene clearance.

The screenshot displays a 'Crash Report' form with the following sections and fields:

- Header:** 'NEW CRASH REPORT CREATED BY OFFICER' and '82035877-01'.
- Navigation:** 'Print', 'Mark Finished', 'Transmit', 'Import & Export', 'Close' buttons on the left; 'Prev Page', 'Next Page' buttons on the right.
- Form Type:** Includes checkboxes for 'Vehicles', 'Csfv', 'HR & Run', 'Motorists', 'Non-Motorists', 'Witnesses', 'Other Persons', 'Injured', 'Fatalities', 'Violations', 'Businesses', 'Drugs/Medication/Alcohol Driver(s)', 'NonMotorist(s)', and 'Crash Severity'.
- General Tab:** Includes 'Crash Identifiers & Roadway', 'Crash Information', 'Violations', 'Pictures', 'Attachments', and 'Approval' sub-tabs.
- Crash Identifiers & Roadway Section:**
 - Form Type: [Dropdown]
 - County: [DUVAL]
 - CAD Lookup: [Dropdown]
 - City: [JACKSONVILLE]
 - Crash in City Limits: [Checkbox]
 - Agency Case No: [Field]
 - Agency CAD No: [Field]
 - Crash Date/Time: [Field]
 - Reported to Agency Date/Time: [Field]
 - Dispatched Date/Time: [Field]
 - On Scene Date/Time: [Field]
 - Roadway Blocked by Crash: [Field]
 - Roadway Cleared Date/Time: [Field]
 - Cleared Scene Date/Time: [Field]
 - Report Date/Time: [02/16/2012 03:07 PM]
 - Investigation Complete Date/Time: [Field]
 - Reason Investigation not Complete: [Field]
 - Source of Information: [LAW ENFORCEMENT AGENCY]
 - Law Enforcement Source ORI: [Field]
 - Crash Sequence Order: [PRIMARY]
 - Latitude: [N 30 17.8374]
 - Longitude: [W 81 46.1422]
 - Roadway Description for Location of Occurrence: [Field]
 - Intersecting Roadway Description for Location of Occurrence: [Field]
 - Distance to Crash Location: [Field]
 - Direction: [Field]
 - Functional Class Type: [TYPE]
 - Functional Class Detail: [Field]
 - Type of Shoulder: [Field]
 - Flag for FDOT: [Checkbox]

Figure 7 – Example of Cost Tracking Tool at the Florida Highway Patrol¹³

¹³ Provided by Chief Grady Carrick of the Florida Highway Patrol

Transportation Agencies

To determine the extent to which TIM cost management and cost recovery is taking place at State transportation agencies, the Research Team conducted a survey of practitioners who belong to the NTIMC's TIM Network. The TIM Network is comprised of practitioners from all disciplines of traffic incident management. With responses received from 21 separate agencies, 15 respondents indicated that their agency performs at least one type of cost management while 9 agencies attempt to recover costs.

Cost Management

According to the agencies that indicated they manage TIM costs, the most frequently used type of cost management is planning. These agencies plan for TIM costs in a variety of categories, but the most common type of cost that is managed is for personnel overtime. Those costs are seen as most controllable when costs are being managed or eliminated. The most common types of TIM operational costs tracked are equipment time and personnel overtime.

Some discrepancy exists in the current practice between the costs that are planned for versus the costs that are tracked. As discussed in previous sections, most of the costs that are tracked fall under the tactical portion of a traffic incident. Costs for strategic and support activities are less documented.

TIM cost planning and tracking information were examined by asking three questions relative to how TIM cost information is collected and reflected through transportation agencies:

- At what budget level is the cost of TIM reflected?
- Are employees required to record TIM activities individually?
- Does the agency budget management procedure or software show costs for TIM as a separate category?

In most cases, the amount budgeted for TIM is typically only known at the local level, where employees are usually not required to record TIM activities individually. This indicates that it would be very difficult for many transportation agencies to determine total annual TIM expenditures. Only three of the responding agencies have specified areas within their budget management process or system that show a breakdown of these costs.

The solution for TIM cost management appears to coincide with the larger issues that face TIM regarding organizational visibility. As mid-level managers search for ways to express the overall benefit of a TIM program, a way to identify resources is needed to demonstrate the value of cost management and show how the knowledge of cost management activities can translate into a better understanding of the true return on investment.

As previously mentioned, the survey indicated that cost tracking is taking place at agencies. Figure 8 on the next page shows an example of cost tracking by the Kansas Department of Transportation for a crash where a truck hauling a backhoe struck a bridge. This event resulted in a long-term closure for at least a portion of the roadway while repairs were made to the bridge. As the image in Figure 8 shows, cost are tracked for four categories: direct labor, travel expense, equipment usage and materials. A hand-written note indicates that the majority of the labor costs were for traffic control.

Alabama Code - Section 32-5-9 — Liability for damage to highway or structure.

(a) Any person driving any vehicle, object or contrivance upon any highway or highway structure shall be liable for all damage which said highway or structure may sustain as a result of any illegal or careless operation, driving or moving of such vehicle, object or contrivance, or as a result of operating, driving or moving any vehicle, object or contrivance weighing in excess of the maximum weight prescribed by law but authorized by a special permit issued as provided in Section 32-9-29.

(b) Whenever such driver is not the owner of such vehicle, object or contrivance, but is so operating, driving or moving the same with the express or implied permission of said owner, then said owner and driver shall be jointly and severally liable for any such damage.

(c) Such damage may be recovered in a civil action brought by the authorities in control of such highway or highway structures.

Figure 9 – Alabama Law for Highway Damage Liability

Another example of cost recovery can be found in California, where public agencies are allowed to collect fees from drivers that crash, require emergency response, and are found to be driving under the influence of drugs or alcohol. The applicable sections of the law are summarized in Figure 10.¹⁶

¹⁶ Justia US Law Website, "2009 California Government Code - Section 53150-53159: Article 8. Costs of Emergency Response." Available at: <http://law.justia.com/codes/california/2009/gov/53150-53159.html>

California Code: Government Code Article 8. Costs of Emergency Response

53150. Any person who is under the influence of an alcoholic beverage or any drug, or the combined influence of an alcoholic beverage and any drug, whose negligent operation of a motor vehicle caused by that influence proximately causes any incident resulting in an appropriate emergency response, and any person whose intentionally wrongful conduct proximately causes any incident resulting in an appropriate emergency response, is liable for the expense of an emergency response by a public agency to the incident.

53153.5. (a) Any person 18 years of age or older who is convicted of making a false police report, in violation of Section 148.3 of the Penal Code, and that false police report proximately causes an appropriate emergency response by a public agency, is liable for the expense of the emergency response made by the responding public agency to the incident.

53154. The expense of an emergency response shall be a charge against the person liable for expenses under this article. The charge constitutes a debt of that person and is collectible by the public agency incurring those costs in the same manner as in the case of an obligation under a contract, expressed or implied, except that liability for the expenses provided for in this article shall not be insurable and no insurance policy shall provide or pay for the expenses.

53155. In no event shall a person's liability under this article for the expense of an emergency response exceed twelve thousand dollars (\$12,000) for a particular incident.

53156. As used in this article:

(a) "Expense of an emergency response" means reasonable costs incurred by a public agency in reasonably making an appropriate emergency response to the incident, but shall only include those costs directly arising because of the response to the particular incident. Reasonable costs shall include the costs of providing police, firefighting, rescue, and emergency medical services at the scene of the incident, as well as the salaries of the personnel responding to the incident.

(b) "Public agency" means the state and any city, county, municipal corporation, district, or public authority located, in whole or in part, within this state which provides or may provide firefighting, police, ambulance, medical, or other emergency services.

Figure 10 – California Emergency Response Law



Credit: iStockphoto



Credit: iStockphoto



Credit: iStockphoto

CHAPTER 4. TRANSLATING COST MANAGEMENT PRINCIPLES INTO TIM PRACTICE

Based on the survey responses, it is evident that there is no widespread practice of managing and recovering TIM costs. With State transportation funding uncertain due to current economic conditions, agency budget authorities and elected officials are likely to continue to examine closely those services that transportation agencies provide. Since capacity-enhancing projects will likely continue to decrease in frequency, good TIM practices are likely to replace that void. As a result, a good TIM program that incorporates the NUG is very likely to become more crucial to transportation agencies that are striving to maintain their capabilities. The following roadmap presents a good approach to shifting toward a managed TIM cost approach. A plan for managing and recovering TIM costs must address how agencies can maintain a service that has become a necessity in a time of limited staffing and financial constraints.

Roadmap for Managing TIM Costs

To prepare for this eventual future, good TIM cost management will be necessary and will entail a shift in agency preparedness over the next few years. While the components of cost planning, tracking, analysis and evaluation, and decision discussed in Chapter 2 represent the mechanics of TIM cost management, three primary elements also need to be managed: asset utilization, resource utilization, and performance measurement. It is true that some of the broad TIM cost management components shown in Figure 11 below can overlap with other parts of the broad definition of transportation operations, but that makes them no less important. The three primary elements are defined as follows:

- Asset management – consists of the process to understand costs of devices, facilities and other physical, non-human TIM program elements;
- Resource management – consists of the process to understand costs associated with personnel (including both in-house and consultant) situations; and
- Performance measurement – consists of understanding what benefit assets and resources are providing to the system or what implications that lack of assets and resources are having on overall performance.

Through the application of each of these aspects, it is important not to lose sight of the importance of visualization. Political leaders and the public need to be provided with graphical representations of information that is easy to understand and interpret. For this reason, it is useful to pre-plan what message will be well received by the target audience as agencies execute this roadmap to TIM cost management.

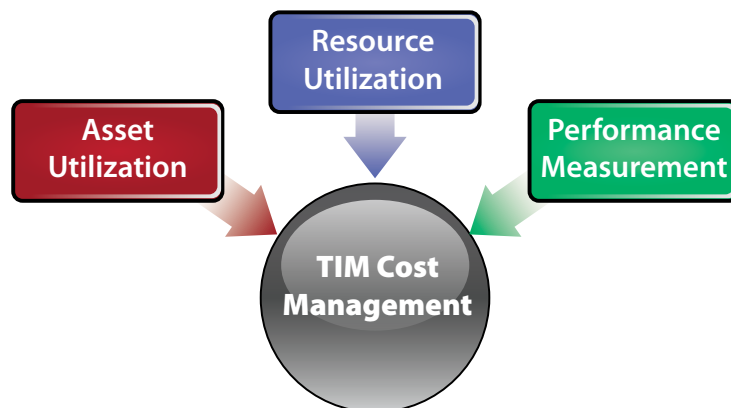


Figure 11 – Broad Picture of TIM Cost Management Components

Table 6 – Roadmap to a TIM Cost Management Program

Category	Start-up Plan	Transition Plan	Established Program
Asset Utilization	<ul style="list-style-type: none"> • Determine TIM Inputs for asset management • Collect baseline requirements 	<ul style="list-style-type: none"> • Complete TIM system inventories • Maintain maintenance costs and operating costs for historical reference 	<ul style="list-style-type: none"> • Use asset life-cycle and replacement cost estimates to plan for costs on an annual basis • Use visualization tools to convey the cost of assets versus performance
Resource Utilization	<ul style="list-style-type: none"> • Determine discrete TIM functions by discipline and by position • Determine shared resources and interdependent resources 	<ul style="list-style-type: none"> • Baseline employee capabilities versus each identified discrete function • Identify gaps in functions provided • Develop resource training lifecycle • Include systems to include discrete coding functions for direct and indirect 	<ul style="list-style-type: none"> • Use cost center accounting to track and analyze TIM resource costs • Assign a charge code for TIM strategic, tactical and support activities
Performance Measurement	<ul style="list-style-type: none"> • Determine how the NUG should be measured • Determine what input and output gaps exist for NUG reporting 	<ul style="list-style-type: none"> • Implement a NUG Performance Measurement Program • Collect baseline information to establish a performance index 	<ul style="list-style-type: none"> • The performance measures from other sections

Asset Utilization

Assets are defined as quantifiable physical objects, and resources are defined as people and time. The reason for making the distinction for TIM is that TIM assets often fall into the tactical and supporting categories, while TIM resources are present in all TIM categories. Asset management is a decisionmaking framework focused on the purchase, construction, maintenance, replacement, and retirement of fixed assets. Asset management covers an extended time horizon and draws from economics as well as engineering. Asset management incorporates the economic assessment of trade-offs between alternative investment options, both at the project level and at the network or system level, and uses this information to help make cost-effective investment decisions. The American Association of State Highway and Transportation Officials hosts a website on transportation asset management (<http://assetmanagement.transportation.org/tam/aashto.nsf/home>) and has published a guide to asset management (<http://downloads.transportation.org/AMGuide.pdf>). The examples in the guide are predominantly oriented toward pavement and bridges, but the guide explicitly includes all transportation assets, including ITS assets. Figure 12 shows an example of the process to allocate resources for asset management.

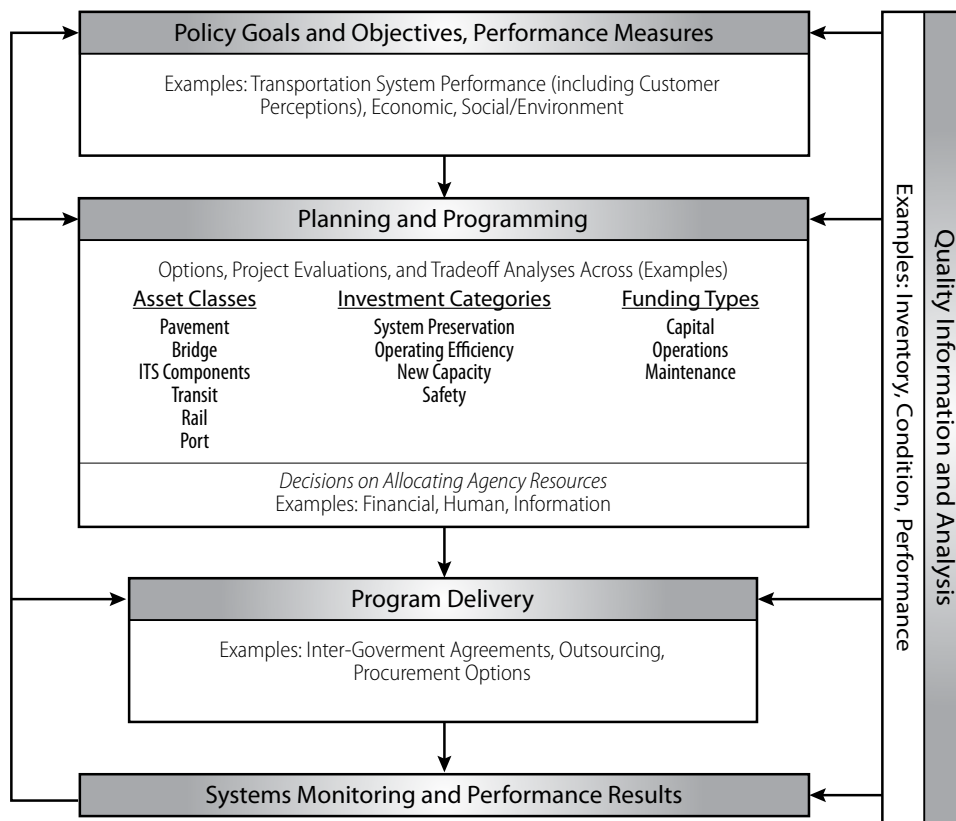


Figure 12 – Example of Resource Allocation and Utilization Process in Asset Management

The U.S. DOT Intelligent Transportation Systems Joint Program Office maintains an online knowledgebase of links to summaries that detail the benefits and costs of deploying various types of ITS, including those deployed for incident management. The web page also contains links to summaries of lessons learned and lists ITS deployments by type. The knowledgebase is available at <http://www.itskrs.its.dot.gov/its/itsbcllwebpage.nsf/krhomepage#>.

In addition, the FHWA also houses its own Office of Asset Management, which has three key responsibilities:

- Provide national leadership in asset management principles for highway program administration;
- Develop asset management policies for pavement, bridge, and system preservation; and
- Partner with the American Association of State Highway and Transportation Officials (AASHTO), other FHWA offices, and others to conduct nationwide programs.

The FHWA Office of Asset Management maintains an asset management website, which is available at <http://www.fhwa.dot.gov/infrastructure/asstmgt/asstfact.cfm>.

Resource Utilization

A complicating factor in TIM cost management is the fact that incident management is a multi-party function, typically involving, at a minimum, the State transportation agency, local police, and local fire fighters/EMS. The FHWA publication *Traffic Incident Management Resource Management*¹⁷ demonstrates the methods and benefits of adopting a multi-disciplinary approach to managing the resources for TIM. The document describes how the efficient and effective management of TIM resources relies on four key guidelines for resource utilization:

1. Use personnel who are best qualified (i.e., capable but not over-qualified) for the various tasks (this, in turn, allows alternately skilled personnel to focus on other incident management functions);
2. Use appropriate technology capable of supporting various on-site resource tasks;
3. Use appropriate equipment by function (i.e., use of the least costly equipment capable of performing the function); and
4. Reduce the overall resources required through reduced redundancy across disciplines.¹⁸

Moving towards a multi-disciplinary approach to TIM resource utilization may lower overall costs, but can increase costs for one or more agencies. Several options for cost-sharing arrangements to address this disparity exist. The *Traffic Incident Management Resource Management* guidebook explores these options in some depth, noting that, at present, most examples of multi-agency cost-sharing are limited to those in related domains outside of TIM, such as emergency management. The best examples that relate to TIM are the jointly managed traffic management centers (TMC) that exist in numerous metropolitan areas across the country.

For many transportation agencies, providing stand-by personnel who are ready to respond to an incident at a moment's notice is difficult. Resource utilization is based on the amount of time that active resources are dedicated to a specific task, the number of times that stand-by resources have to be activated, and the duration of their activation period.

Use Cost Center Accounting

Use of the multi-disciplinary approach to TIM resource utilization would create a need to track costs closely, especially with transportation agencies. For this reason, implementing a "cost center" accounting practice is appropriate. This type of accounting can begin to be integrated into transportation agencies for capturing TIM costs from different divisions within the agency. This type of cost accounting will also be applicable as multi-disciplinary TIM resource utilization occurs. A cost center is defined as an area, machine, or person to whom direct and indirect costs are allocated. Each cost center is a distinctly identifiable department, division, or unit of an organization whose managers are responsible for all associated costs and for ensuring adherence to its budgets.¹⁹ Dividing an organization into cost centers helps the agency determine where its costs are incurred within the organization. Furthermore, if costs are planned at the cost center level, cost efficiency can be checked at the point where costs are incurred.²⁰

¹⁷ FHWA, *Traffic Incident Management Resource Management*, FHWA-HOP-08-060 (Washington, DC: January 2009). Available at <http://ops.fhwa.dot.gov/publications/fhwahop08060/default.htm>.

¹⁸ Ibid. pp. 12-13.

¹⁹ WebFinance, Inc., "BusinessDictionary.com" Web site. "Cost center" definition. Available at: <http://www.businessdictionary.com/definition/cost-center.html>

²⁰ SAP AG, The SAP Help Portal, "Cost Center Accounting" Web page. Available at: http://help.sap.com/saphelp_45b/helpdata/en/08/513e4243b511d182b30000e829fbfe/content.htm

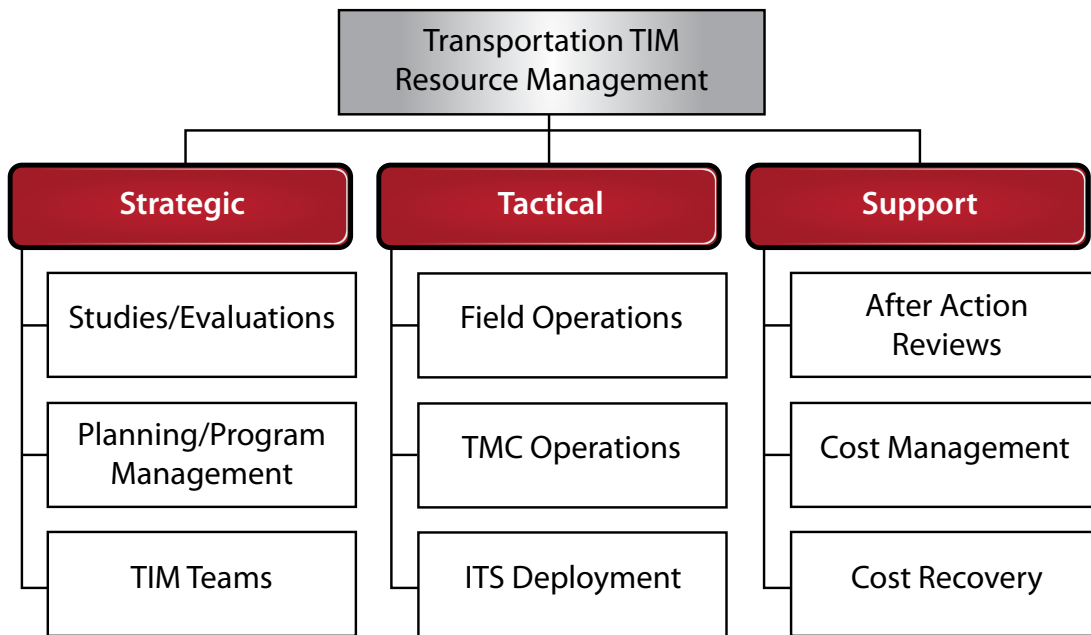


Figure 13 – Transportation Resource Management

Figure 13 breaks down transportation resource management into the Strategic (Planning and Preparedness), Tactical (Response), and Support (Recovery) Activities categories, with Cost Management and Cost Recovery opportunities housed under the Support category.

Many examples of effective cost management exist, and, although several focus only on managing tactical costs, some current systems are capable of supporting cost center accounting practices. One example is from Pennsylvania. The Pennsylvania Department of Transportation (PennDOT) captures all reimbursable activities in their cost accounting system. PennDOT maintenance personnel who respond to crashes that involve damage to department property are required to fill out a form that describes the damage, the people liable for the damage, and an estimate of how much it will cost to restore the affected area to its previous condition.

The forms shown here are used to capture the information filled out by maintenance personnel. Figure 14 shows the location data, identifies who is responsible for the follow-up work, and provides a description of what took place. Figure 15 shows which internal tracking number has been assigned to the event, when it occurred, information about the liable party, and a detailed estimate of what the needed repairs will involve. Costs are not shown as part of this screen because the prevailing rates for each pay item will be used at the time cost recovery action and/or litigation is pursued. Finally, Figure 16 shows a document overview of how the incident is tracked.

Of particular interest in Figure 16 is the information shown in the box at the top of the screen. This shows that there are extensive electronic systems in place to manage the costs associated with repairing public property after a crash occurs. The money that is collected is deposited into the State's general fund account.

Display PM Notification: Reimbursable Act.

Notification: 1500451342 RA CRASH TORT county site 770
 Status: NOPR

Navigation: Ri Information | Damage Details | Bridges/Pipes

Reference object

Functional loc.	734-0050-H-0022	State Route 0022 Highways
Equipment		
Assembly	612253991	Other Accident Dmg

User Data

Segment/Offset
 From: Seg/Offset 0000
 To: Seg/Offset 0000
 Revision
 No. Days Planned

Planned Production 0.0 Actual 0.0 Remaining 0.0 Units H

M-213 Indicator Side Location Ref no.
 Agility Agreement Customer Care #

Responsibilities

Planner group / 7822
 Main WorkCtr /
 Reported by Notif date 01/08/2011 06:47:02

Start/End Dates

Required Start
 Required End Priority

Subject

Description: CRASH TORT county site 770

01/24/2011 11:28:19 David Christensen (P00006341) Phone 717-787-5391
 Fatal accident SR 022E near Rt. 325 Contractor 6R repair Contractor
 repair of large sign (estimated cost) and safety 2 County crews
 01/24/2011 12:48:34 Richard Ebeling (P00359816)

SENT TO COUNSEL 1/24/11
 02/03/2011 13:13:41 Trevor Bills (P00638576)
 occ approved to bill

Figure 14 – Screen 1 of the Pennsylvania Incident Cost Management System

Display PM Notification: Reimbursable Act.

Notification: 1500451342 RA CRASH TORT county site 770
 Status: NOPR

RI Information | Damage Details | Bridges/Pipes

Incident Details

Incident Number: H011985576
 Date of Accident: 11/13/2010
 Crash Number: F0140408

Driver/Vehicle Details

Driver Name: JOSE LOPEZ-VAZQ | Vehicle Owner: MANFREDI MUSHRI
 Vehicle Year: 2010 | Make: KENWORTH
 Registration Number: AF69737 | Country: US | State: PA

Debtor Details

Debtor Name: JOSE LOPEZ-VAZQUEZ
 Address 1: 114 FOREST AVE | Address 2:
 City: WILMINGTON | State: DE | Country: US | Zip: 19805

Referral Agency

Referral Agency: OCC
 Referral Date:
 Ins Claim No:

Invoice Number: 1801058717 | Invoice Amt: 0.00 | Calculated Amt: 10994.88

Repair Item	Code	Repair Description	Actual Qty	Item Amt	Text
78-RAR	Z99	Other Repairs (see text) \$1.00	2,380	9620-0551 34 POSTS@ 70	
78-RAR	Z99	Other Repairs (see text) \$1.00	4,211	9620-0575 237'@ 17.73/LF	
78-RAR	Z99	Other Repairs (see text) \$1.00	680	0620-0530 34 PLASTIC OFF	
78-RAR	Z99	Other Repairs (see text) \$1.00	35	9901-0001 MPT	
78-RAR	Z99	Other Repairs (see text) \$1.00	23	9917-0001 6R DELINEATOR	
78-RAR	Z99	Other Repairs (see text) \$1.00	10	9608-0001 MOBILIZATION	
78-RAR	Z99	Other Repairs (see text) \$1.00	600	CONT. REMOVE EXISTING	
78-RAR	Z99	Other Repairs (see text) \$1.00	1,200	CONT. RESET DEPT. SUPPL	
78-RAR	Z99	Other Repairs (see text) \$1.00	530	CONT. PARTS AND MATERIA	
78-RAR	L04	Foreman-OT per hour \$45.96	6	2 FOREMEN @ 3 HRS.	
78-RAR	L01	Equipment Operator per hour \$27.72	12	4 OPERATORS	
78-RAR	L02	Equipment Operator-OT per hour \$35.62	10	4 OPERATORS	
78-RAR	E01	Crew Cab per hour \$12.32	12	2 CREW CABS @ 3 HRS	
78-RAR	E05	Impact Attenuator per hour \$13.34	16	3 CRASH TRUCKS	

Figure 15 – Screen 2 of the Pennsylvania Incident Cost Management System

Document Overview - Display

Doc. Type: DR (Cust Invoice) Normal document
 Doc. Number: 1801058717 Company Code: COPA Fiscal Year: 2010
 Doc. Date: 02/04/2011 Posting Date: 02/04/2011 Period: 00
 Calculate Tax:
 Ref. Doc.: 001500451342
 Doc. Currency: USD
 Doc. Hdr Text: H011985576

Ita	PK	Account	Account short text	Amount	Ita	Parent Fnd	PRR	Fund	Cost Ctr	Order	URS element	Payee/ar	Value date	Text
1	01	ONETIME	ONETIME CUSTOMER	10,994.88				1058210612					02/04/2011	732 - DOT-INDIV & COS-RECOVERED DAMAGES (-
2	50	4435623	Reliab-Accident Damag	275.76				1058210612	7840850000				02/04/2011	Foreman-OT per hour
3	50	4435623	Reliab-Accident Damag	332.64				1058210612	7840850000				02/04/2011	Equipment Operator per hour
4	50	4435623	Reliab-Accident Damag	356.20				1058210612	7840850000				02/04/2011	Equipment Operator-OT per hour
5	50	4435623	Reliab-Accident Damag	147.84				1058210612	7840850000				02/04/2011	Crew Cab per hour
6	50	4435623	Reliab-Accident Damag	213.44				1058210612	7840850000				02/04/2011	Impact Attenuator per hour
7	50	4435623	Reliab-Accident Damag	530.00				1058210612	7840850000				02/04/2011	CONT. PARTS AND MATERIALS
8	50	4435623	Reliab-Accident Damag	1,200.00				1058210612	7840850000				02/04/2011	CONT. RESET DEPT. SUPPLIED BEAMS (2)
9	50	4435623	Reliab-Accident Damag	600.00				1058210612	7840850000				02/04/2011	CONT. REMOVE EXISTING INSTALL NEW SIGN
10	50	4435623	Reliab-Accident Damag	10.00				1058210612	7840850000				02/04/2011	9608-0001 MOBILIZATION
11	50	4435623	Reliab-Accident Damag	23.00				1058210612	7840850000				02/04/2011	9917-0001 6R DELINEATOR 7@ 3.25 EA.
12	50	4435623	Reliab-Accident Damag	35.00				1058210612	7840850000				02/04/2011	9901-0001 MPT
13	50	4435623	Reliab-Accident Damag	680.00				1058210612	7840850000				02/04/2011	0620-0530 34 PLASTIC OFFSET BLOCKS@ 20.0
14	50	4435623	Reliab-Accident Damag	2,380.00				1058210612	7840850000				02/04/2011	9620-0551 34 POSTS@ 70.00
15	50	4435623	Reliab-Accident Damag	4,211.00				1058210612	7840850000				02/04/2011	9620-0575 237'@ 17.73/LF

Figure 16 – Screen 3 of the Pennsylvania Incident Cost Management System

Performance Measurement

In the future, performance measurement will be a fundamental aspect of doing business for any organization that receives funding from the Federal government in the years ahead. In addition, identifying opportunities to recover costs in the wake of reduced funding will help organizations make better informed decisions about how services can be provided.

While not strictly “cost management,” developing performance measures and making comparisons to TIM costs provide useful information to TIM managers and, perhaps more importantly, help to “sell” TIM to the public and those making funding allocation decisions. As with most transportation agency efforts, TIM must be able to show what benefit is being realized when compared to the cost being incurred. Performance measurement is a key component to being able to demonstrate the benefit of money spent. Understanding the costs of TIM through a cost management process that is linked to the performance result will ultimately become one of the key factors of cost-benefit analysis.

An FHWA program called the “TIM Performance Measures Focus States Initiative” convened incident management professionals from 15 States to develop a set of commonly defined performance measures.²¹ The initiative identified and defined the following three core performance measures:

1. Roadway Clearance Time - The time between first recordable awareness of an incident (detection/notification/verification) by a responsible agency and first confirmation that all lanes are available for traffic flow.
2. Incident Clearance Time - The time between the first recordable awareness and the time at which the last responder has left the scene.
3. Secondary Crashes - The number of crashes that occur during the period beginning with the time of detection of the primary incident through the clearance of the primary incident where a collision occurs either a) within the incident scene or b) within the queue, including among vehicles traveling in the opposite direction, resulting from the original incident.

Producing these measures can be hampered by the need to share data across responder agencies, including law enforcement and fire protection; however, these performance measures are informative by themselves as stand-alone measures. They also can be combined with cost information to yield cost-effectiveness measures such as labor cost per minute reduction in roadway clearance time.

FHWA's TIM Performance Measurement Knowledgebase is a highly useable, online reference that provides transportation professionals the knowledge and tools they need, including sample documents and models from other states, to encourage the successful implementation of program-level TIM performance measures in their state. The Knowledgebase can be found at http://ops.fhwa.dot.gov/eto_tim_pse/preparedness/tim/knowledgebase/

Beyond the cost-effectiveness analysis is the cost-benefit analysis, which compares the costs of a TIM program to a monetary valuation of its benefits. A number of agencies have produced cost-benefit analyses for an aspect of their TIM program, most commonly for service patrols. The calculated cost-benefit ratios have uniformly been greater than 1, indicating benefits exceed costs. The examples below show how monetized benefits include fuel cost savings and the value of travel-time savings. Measured benefits often include savings in costs (damages) related to secondary crashes and reduced pollutant emissions.

²¹ FHWA, Federal Highway Administration Focus States Initiative: Traffic Incident Management Performance Measures Final Report, FHWA-HOP-10-010 (Washington, DC: December 2009). Available at: <http://www.ops.fhwa.dot.gov/publications/fhwahop10010/sec3.htm>

“The California Life-Cycle Benefit/Cost Analysis Model (Cal-B/C) is an Excel workbook-based tool for preparing economic evaluations on prospective highway and transit improvement projects within the State of California. An extension to the model added the ability to evaluate certain ITS projects, include an incident management component. The ITS evaluation module uses the IDAS (ITS Deployment Analysis System) model, developed for the U.S. FHWA. IDAS is an ITS sketch-planning analysis tool that can be used to estimate the impacts, benefits and costs resulting from the deployment of ITS components. IDAS operates as a post-processor to travel demand models. The set of impacts evaluated by IDAS include changes in user mobility, travel time/speed, travel time reliability, fuel costs, operating costs, accident costs, emissions, and noise. The incident management component of IDAS is based on the application of a simplified set of benefits measures for three possible levels of incident management system deployment.”²²

“A vehicle queuing and traffic bottleneck analysis was applied to determine cumulative vehicle delays.” The model is based on procedures provided in the Highway Capacity Manual and Traffic Incident Management Handbook (USDOT, 2000) and considers incident characteristics, roadway geometry, and traffic flow characteristics at the incident location to calculate the impact of each incident on vehicle queuing and delay. The results obtained from the model are then used to calculate cost of unproductive time, vehicle emissions, fuel consumption, and occurrence of secondary incidents attributable to analyzed primary incidents. The effects of the Maintenance Operations responding to incidents are calculated as a difference between the impacts of incidents with and without their response. The benefits of the response are therefore the differences in time, emissions, fuel consumption, and secondary incidents of the with-response versus without-response model results. The reduction in incident clearance time is modeled at levels ranging from one minute to 30 minutes. Applied over the 974 incidents in the study database, the one minute incident time savings translates into 16 hours of reduced incident time, with associated travel delay savings valued at over \$555,000, plus an additional savings of \$113,000 in fuel use, emissions, and accidents, for a total savings of over \$668,000. The labor cost of using the maintenance operations staff to responds to these incidents was estimated at \$510,000. The resulting benefit-cost ratio for a one-minute incident reduction time is thus 1.31.”²³

Contracting Emergency Services

Another approach to ensuring that TIM services are always available is for the transportation agency to contract with local emergency responder agencies for services as a cost-management strategy. By paying a retainer fee for services, performance can be guaranteed by contractual obligations and budgeting is clearer. An example would be the pre-positioning of contracted special equipment in advance of anticipated winter weather events or other weather-related scenarios. Freeway service patrols, when contracted, are also a cost-management strategy that has predictable costs for specific service periods. Use of these strategies can also help reduce the overall societal costs of TIM activities by improving incident response times and clearing lanes for operational reflow sooner.

²² System Metrics Group, Inc., Cal-B/C Technical Supplement Volume 2, *Transportation Management Systems (TMS), Operational Improvements, Pavement Rehabilitation, and Economic Value Updates*, 2004.

²³ Spasovic, L.T., *Evaluation of NJ DOT Incident Management Support System*, 2009.



Credit: iStockphoto



Credit: iStockphoto



Credit: iStockphoto

CHAPTER 5. STRATEGIES FOR RECOVERING TIM COSTS

Good TIM cost management and cost recovery include good incident response management. Outlining the most effective TIM coordination techniques and how they help reduce the cost of TIM will help establish a capability for better predicting costs associated with the unpredictable events. The Pennsylvania Cost Recovery and Tracking System, shown in Figure 18 below, demonstrates that the capability exists to expand how much TIM cost information can be collected.

Figure 17 shows the first screen of the Pennsylvania cost recovery tracking system.

Address and Bank Data

Bank data | IBAN

Customer: ONETIME ONETIME CUSTOMER G/L: 1300000
Company Code: CDPA COMMONWEALTH OF PA

Item 1 / Business partner data

Title	<input type="text"/>	Language Key	<input type="checkbox"/>
Name	<input type="text"/>		
	<input type="text"/>		
	<input type="text"/>		
Street	<input type="text"/>		
PO Box	<input type="text"/>	<input type="checkbox"/> PO w/o no.	PO Box PCode <input type="text"/>
City	<input type="text"/>	Postal Code	<input type="text"/>
Country	US	Region	<input type="text"/>
Bank Key	<input type="text"/>	Bank Country	<input type="checkbox"/>
Bank Account	<input type="text"/>	Control key	<input type="checkbox"/>
Reference	<input type="text"/>	Instruction key	<input type="checkbox"/>
		DME Indicator	<input type="checkbox"/>
Tax Number 1	<input type="text"/>	Tax type	<input type="checkbox"/>
Tax Number 2	<input type="text"/>	Tax number type	<input type="checkbox"/>
Tax Number 3	<input type="text"/>	<input type="checkbox"/> Natural person	
Tax Number 4	<input type="text"/>	<input type="checkbox"/> Equalizati tax	

Figure 17 – Screen 1 of the Pennsylvania Cost Recovery Tracking System

Document Overview - Display

Doc.Type : DZ (Cust Pmt w/ Remit) Normal document

Doc. Number 1400704280 Company Code COPA Fiscal Year 2010
 Doc. Date 06/22/2011 Posting Date 06/23/2011 Period 12
 Calculate Tax
 Ref.Doc. RT95225385
 Doc. Currency USD
 Doc. Hdr Text 87T

Itm	PK	Account	Account short text	Amount	Itm	Earmd Fnds	PBk	Fund	Cost Ctr
1	40	1003000	Cash in Transit	10,994.88					
2	15	ONETIME	ONETIME CUSTOMER	10,994.88-				1058210612	

Figure 18 – Screen 2 of the Pennsylvania Cost Recovery Tracking System

Figure 18 shows the second screen from the Pennsylvania cost recovery tracking system. These two figures demonstrate how the financial transaction is tracked to completion when crashes occur. This system is most closely associated with recovering costs for infrastructure and the tactical costs of TIM.

Legislation

An agency may suggest or support legislation that will enable TIM cost recovery by:

- Modifying existing systems to include reimbursement for traffic control, TMC operator time, etc.; and
- Allowing an agency to charge a surcharge for DUI crashes.

However, agency TIM managers and decisionmakers cannot rely on legislation as a way to recover the costs of TIM. It remains the responsibility of the transportation agency to understand the grant process and to continue to explain the benefits of TIM to stakeholders, such as metropolitan planning organizations (MPO), so that funding can be made available.

Public-Private Partnerships

Private industry and government entities continue to search for ways to partner on projects. Industry and government have discussed partnering in the context of infrastructure maintenance, but the concept has not been fully explored in the context of transportation operations or TIM beyond safety service patrol vehicles and HAZMAT response capabilities. An opportunity to expand this relationship is based on the approaches described below.

Safety Service Patrol Programs

This type of partnership is already in place in many areas around the country and provides the opportunity to recover costs for TIM. Generally, fees are not assessed to customers of these services; however, leasing advertising space on the patrol vehicles or allowing the vehicles to be branded by a sponsor demonstrate two ways that these services can be self sustaining.

Selling Traffic Data

The private sector continues to show interest and value in providing information that has traditionally been supplied by the government. Examples of this include many of the items in the support portion of TIM such as traffic data providers. If a transportation agency can verify that the information it possess is reliable, the information can be sold to traffic data providers. This data can be metered and adjusted to reflect the demand from the area. Though no demonstrated practice was identified, it is feasible that private providers would find value in partnering with transportation agencies to provide more reliable information to customers.

High Occupancy Toll (HOT) lanes

The ability to change the price of travel in a given lane represents an opportunity to include the cost of TIM in the fee formula. However, to have TIM as part of the fee formula, an agency must have complete awareness of the magnitude of TIM costs. Otherwise, the service cannot be accurately represented in the fee formula and the agency misses the opportunity for full cost recovery.

Special Federal Programs

Although the availability of Federal funds to recover TIM-related costs may be more closely identified with larger scale emergency transportation events, it is helpful to understand what programs are available and when events may qualify. There are specific cases of nationally declared disasters which provide opportunities to recover TIM costs through application for special Federal funding. The two potential sources are FHWA Emergency Relief Funding and Federal Emergency Management Agency (FEMA) funding.

Emergency Relief Program: In Title 23, United States Code, Section 125, Congress authorized a special program for the repair or reconstruction of Federal-aid highways and roads on Federal lands that have suffered serious damage as a result of (1) natural disasters or (2) catastrophic failures from an external cause. The program, commonly referred to as emergency relief (or the ER program), assists States or their political subdivisions in paying for unusually heavy expenses resulting from extraordinary disaster events that sometimes result in the catastrophic failure of the infrastructure, which is defined as the sudden and complete failure of a major element of the highway system that causes a disastrous impact on transportation services

Examples of natural disasters include floods, hurricanes, earthquakes, tornados, tidal waves, severe storms, and landslides, although disaster events can also result from man-made or external causes. A bridge suddenly collapsing after being struck by a barge is an example of a catastrophic failure from an external cause.

While the primary purpose of ER funds is to repair the damage caused by the disaster, certain TIM-related services may be eligible. Among the eligible costs for ER funding are Transportation System Management (TSM) strategies. This can include efforts to monitor and control traffic and to manage transportation on streets and highways during and immediately following a disaster to restore traffic. The elements of a TSM plan may include highway advisory radio, closed circuit television, video image process surveillance, installation of changeable message signs, a public awareness program, etc.

ER funds are eligible to provide emergency traffic management services by the police during and immediately following a disaster if those services are 1) directly related to the disaster and 2) represent added costs above and beyond costs related to normal, day-to-day responsibilities.

ER funds for the costs associated with restoring essential highway traffic, minimizing the extent of damage, or protecting the remaining facility, which are incurred in the first 180 days after the disaster, are available at a 100 percent Federal share. For permanent repair and costs incurred after the first 180 days, the Federal share is based on the type of highway, normally 80 or 90 percent.

The process for ER application normally starts with the Governor issuing a formal disaster proclamation. A presidential declaration, or the Governor's request for the declaration, can serve the same purpose. The State transportation agency then works with the FHWA to assess the damage and make a determination of eligibility. Further detail on ER funding and the application process can be found at: <http://www.fhwa.dot.gov/programadmin/erelief.cfm>.

FEMA Disaster Relief Program: Recovering costs through either the FHWA Emergency Relief or FEMA Disaster Relief program requires good cost management to be in place, especially the ability to track costs related to a particular declared disaster. Having charge codes in place to track personnel, equipment, or other related costs is a prerequisite to being able to seek reimbursement for these costs.

Federal assistance for public roads not covered by the FHWA's ER program is available through the disaster relief program administered by FEMA under the Stafford Disaster Relief and Emergency Assistance Act. FEMA funding is available for those events where the focus is on non-Federal-aid highways.

The process for FEMA assistance also starts a presidential declaration, or the Governor's request for the declaration, that there is a major disaster. Application is through the Governor's Authorized Representative, normally the State emergency management agency. The Federal share is normally 75 percent, however during immediate response, often the Federal Government covers 100 percent of the TIM Operations cost during immediate life-saving, life-sustaining operations. This includes moving people out of danger via evacuation and clearing roads.



Credit: iStockphoto



Credit: iStockphoto



Credit: iStockphoto

CHAPTER 6. PLANNING FOR OPERATIONS

The pressures of a rapidly changing world now require that we optimize the use of our existing and planned transportation infrastructure. Planning for operations provides a foundation for explicitly developing TIM goals, objectives, strategies, processes, and opportunities for integration with broader regional operations and safety initiatives. Through these activities planners and operators will have a better starting point for estimating and evaluating TIM cost implications (capital, operational, and support) and revenue options.

The transportation planning process is a forum through which transportation decisions are made. Transportation planners develop long-range transportation plans at both the statewide and regional levels. Developing long-range plans has been evolving from a traditional process focused on large capital projects that increase capacity to a more balanced approach that addresses all available strategies to meet increasing transportation demands. The pressures of a rapidly changing world now require that we optimize the use of our existing and planned transportation infrastructure. Planning for operations provides a foundation for explicitly developing TIM goals, objectives, strategies, processes and opportunities for integration with broader regional operations and safety initiatives. Through these activities planners and operators will have a better starting point for estimating and evaluating TIM cost implications (capital, operational, and support) and revenue options.

SAFETEA-LU included specific requirements for incorporating management and operations strategies in statewide and regional transportation plans. FHWA has developed a series of publications that discuss how to integrate operations into long-range planning at both the State and metropolitan levels. It is important to understand how TIM can and should be part of this planning process, and how cost management can play an essential role.

State long-range transportation plans and metropolitan transportation plans (MTP) provide key opportunities for integrating planning with operations through identifying goals and objectives that address system management and operations, data sharing opportunities, operational needs or strategies, funding opportunities for TIM, and other means. MTPs form the building blocks for the State and help local agencies develop operations objectives that direct the ways that managers view operational performance and consider integrating operations solutions with investment decisions. These decisions in turn support reaching agency operations objectives. By planning for and investing in strategies to manage and operate the existing infrastructure, regions can use what they have more efficiently and can improve mobility for the public during both daily operations and emergencies.

For Transportation Management Areas (TMAs) – urbanized areas with populations greater than 200,000 – a congestion management process (CMP) is also required. The CMP is an integral part of the planning process that informs the MTP. The CMP is intended to address congestion through a course of action that provides for effective management and operations based on cooperatively developed travel demand reduction and operational management strategies. In corridors where incidents are a major contributor to congestion, the CMP may recommend the application of TIM strategies as essential to improving the overall performance of the system.

The Strategic Highway Safety Plan should also provide input to the statewide and metropolitan plans. SAFETEA-LU established the Highway Safety Improvement Program (HSIP) as a core Federal program. A Strategic Highway Safety Plan (SHSP), a major component and requirement of the HSIP, is a statewide coordinated safety plan that provides a comprehensive framework for reducing highway fatalities and serious injuries on all public roads. It is a data-driven, 4- to 5-year plan that is developed by the State DOT in a cooperative process with stakeholders. Incorporating TIM strategies into the SHSP can provide appropriate solutions in corridors with high incident rates.

Performance measures have become increasingly important factors in the development of statewide and metropolitan transportation plans and in the CMP. As a result, analysis tools are vital to developing objective assessments of transportation investment and performance. Performance measurements are a key means of assessing the effectiveness of the strategies contained in the transportation plans.

A sound TIM cost management approach can be an essential tool for performance measurement, revealing ways to achieve a more cost-effective level of performance. Cost management and cost recovery could even provide opportunities to improve performance without increasing cost. Fully understanding the costs associated with TIM is critical to being able to evaluate TIM strategies and to determining where TIM stands among all potential strategies when considering which investments are most efficient and cost effective.

All State DOTs engage in planning studies as part of the long-range transportation plan development process. These studies may take the form of corridor, small area, or modal studies to address a particular part of the transportation system. They provide an analysis of transportation system deficiencies and needs and propose potential new investments to meet those needs. These studies present a more specific opportunity to include TIM as a potential investment option. While the implementation of a TIM program may not eliminate the need to expand the system, the use of TIM as a complimentary transportation operations approach does enhance overall roadway performance. Showing that TIM can be a cost-effective way to improve overall system performance increases the potential of including TIM and other operational improvements either as alternatives or, more likely, as complementary strategies for addressing system deficiencies. This can advance the possibilities for funding for TIM operations. Being able to provide complete and detailed cost data for TIM can be vital to these types of analyses.

The link between the MTP and the transportation improvement program (TIP) is also important. The MTP may identify funding sources that can be set aside for projects that will be selected in more short-range planning analyses to address congestion and reliability issues. The TIP may include short-term projects that directly or indirectly support TIM. Sound data, including cost data, is essential to justifying the benefits of TIM investments.

Integrating TIM into Metropolitan and Statewide Transportation Plans

FHWA is currently developing guidance on how to link TIM to the planning process; however the financial aspects of this linkage are worth discussing here. The long-range transportation planning process can be most effective through collaboration among an appropriate range of stakeholders. TIM managers need to be part of that collaborative process. Planners may often be able to supply data about where current or future mobility issues will arise, and TIM managers can provide input on the operations objectives and strategies they believe would be most effective to implement. The following points in the transportation planning process could benefit from the involvement of TIM managers.

- **Alternative Improvement Strategies** – Provide TIM Strategies – TIM managers have the opportunity to suggest operational solutions for the investment decisions that support the objectives. TIM managers can best give input on the operations strategies that can be most effective in particular situations.
- **Evaluation & Prioritization of Strategies** – Provide TIM Cost Data and Performance Index Information – TIM managers can provide data that yields a better understanding of the effectiveness of operational strategies and the advantages in relation to or in complement to other strategies.

- **Development of the Statewide/Metropolitan Transportation Plan** – Provide Support for Consideration of TIM – TIM managers can provide supporting information during the process for inclusion of policies, goals, objectives, and strategies that facilitate TIM. Resulting MTPs should be the proper mix of capital and operational projects to optimize system performance within the fiscally constrained plan.
- **Project Development** – Provide TIM Project Detail – TIM managers can provide detailed information necessary for project development.
- **Systems Operations** – Operate the System – TIM managers can operate their program.
- **Monitor System Performance** – Track Performance Measures - Performance measurements are a key means of assessing the effectiveness of the strategies. TIM managers need to provide input to system performance.

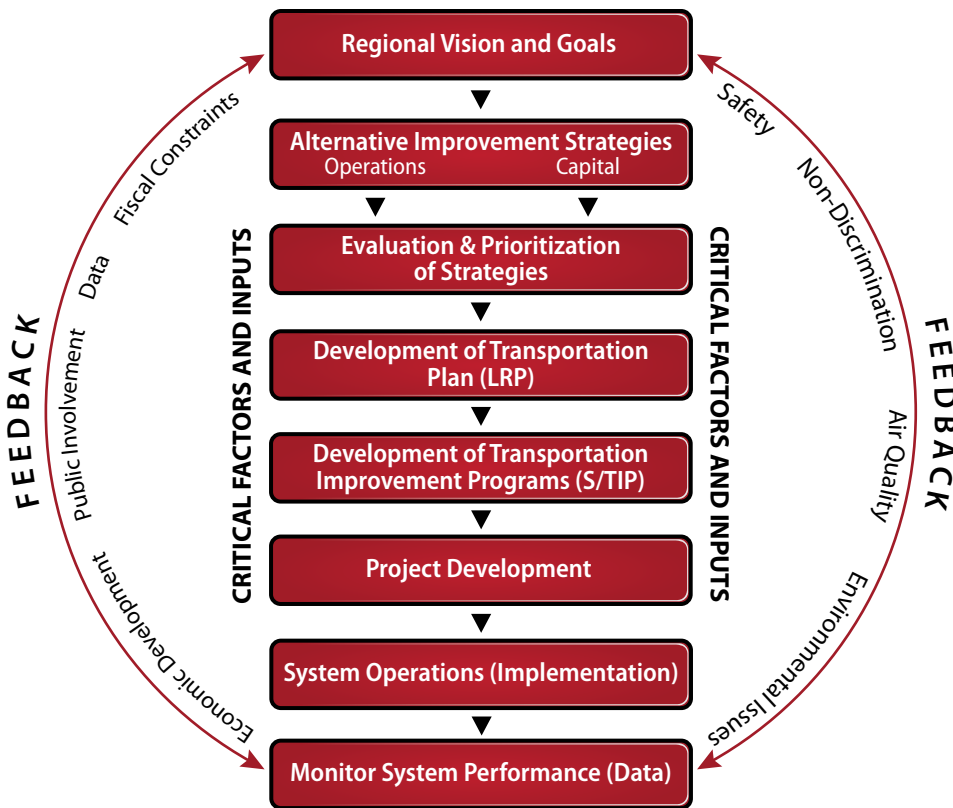


Figure 19 – The Transportation Planning Process²⁴

²⁴ Federal Highway Administration, *The Transportation Planning Process, A Briefing Book for Transportation Decisionmakers, Officials, and Staff*, FHWA-HEP-07-039 (Washington, DC: September 2007). Available at: <http://www.planning.dot.gov/documents/briefingbook/bbook.htm>

Inclusion of TIM Projects or Programs in the Transportation Improvement Program (TIP)

The statewide or regional transportation improvement program (TIP) may include projects that address the operational objectives and strategies in the long-range transportation plan. The TIP is based on the MTP and includes all transportation projects from the MTP that a region plans to undertake over a 4-year period. The TIP is more realistic, given the available Federal, State, and local funding; is approved by the MPO and the governor; and is incorporated directly into the Statewide Transportation Improvement Program.

Consideration of TIM projects in the TIP should be a direct extension of the process to integrate TIM into long-range transportation plans. TIP projects are drawn from the long-range plan or included to implement a strategy identified in the plan. It is critical for TIM managers to be involved in the transportation planning process to facilitate the consideration of Federal funding in the TIP for TIM projects or line items. It may be advantageous to educate the TIP committee or decisionmaking body on the merits of the TIM projects.

If the proposed TIM projects or line items relate specifically to an urbanized area of the State, they will need to be considered in the regional TIP within the MPO designated for that region. TIM projects that apply statewide or in non-urbanized areas of the State will normally need to be considered in the statewide TIP by the State transportation agency.

TIM operational costs or related capital costs may be included in the TIP as a line item or specific project. Their inclusion is based on funding eligibility and available funding. Funding is generally provided at an 80 percent Federal share. The following Federal-aid categories include eligibility for TIM related costs:

Congestion Mitigation and Air Quality (CMAQ)

Purpose: Provides funding for projects and programs in air quality nonattainment and maintenance areas for ozone, carbon monoxide, and particulate matter which reduce transportation-related emissions.

Specific Eligibility: Traffic management/monitoring/congestion relief strategies.

National Highway System (NHS)

Purpose: Provides funding for improvements to rural and urban roads that are part of the NHS.

Specific Eligibility: Capital and operating costs for traffic monitoring, management, and control facilities and programs.

Surface Transportation Program (STP)

Purpose: Provides flexible funding that may be used by States and localities for projects on any Federal-aid highway.

Specific Eligibility: Capital and operating costs for traffic monitoring, management, and control facilities and programs.

The competition for available TIP funding makes decisions on project inclusion extremely difficult. This reinforces the need for TIM managers to be involved in the transportation planning process, for a solid for cost management process, and for using performance measures for TIM.

Creating Local Line Items

Regardless of a local jurisdiction's cost recovery process, including a line item in an agency or city/county budget can be helpful as a cost management tool. A TIM line item is an excellent way for administrators, elected officials, and the general public to account for and acknowledge the cost of TIM services so they can be measured against the benefits they bring to the community. It can also motivate those involved in the tracking process to provide an accurate account of the appropriate costs. This can facilitate decisionmaking by State and local leaders.

From an administrative perspective, including a well-justified line item in the budget clearly states the anticipated costs of TIM services and ensures that policy makers recognize the costs of such services. Accurately categorizing and forecasting costs will reduce unexpected expenditures. A TIM line item is a natural next step from cost tracking because it only requires analyzing the data collected, estimating changes to individual items, and presenting the results.

An agency's process for formulating a line item will vary, but the ability to develop a rational forecast will depend on the level of detail within the cost information that the agency currently collects. At a minimum, an agency can modify its current-year expenses by applying an inflation adjustment. If the detail is available, a better forecast can be made based on trends extrapolated from the number of events responded to and the cost of providing the response. More detailed line items may include several cost categories as well as indicators of future costs. For example, a line item may include overtime and regular hours as well as fuel, equipment, administrative overhead, and any other costs. Predictions for these costs for the upcoming year could incorporate historical trends of costs and events and the effects of any policy changes towards TIM. Performance measures developed for the transportation planning process may be a critical input to this process.

The use of a budgetary line item is not only a sound cost management tool, it is also imperative for justifying additional resources for TIM programs.



Credit: iStockphoto



Credit: iStockphoto



Credit: iStockphoto

CHAPTER 7. CLOSING THOUGHTS

Overall, the research conducted for this publication did not reveal a practice of managing and recovering costs associated with traffic incident management across any of the TIM disciplines. However, in reviewing the current status of TIM programs across the Nation, the topic of TIM cost management and cost recovery is and will soon become critically important to all TIM stakeholders. This document offers a road map with potential solutions for the TIM community to employ in addressing this topic, and FHWA hopes that its contents will encourage a dialog within the TIM community about how to pay for this necessary service.

The community's needs are easy to define:

- Volunteer and career fire departments face decreasing property tax revenue and increasing safety costs associated with training and equipment;
- Law enforcement agencies face reduced funding for staff and support systems and increased numbers of reportable crimes not associated with TIM;
- EMS must deal with an aging population that, when transported, often costs more than is permissibly reimbursable through insurance or Medicare, affecting these services' ability to sustain their function and reducing the resources available to respond. Fewer resources available results in a reduced ability to provide service during the "golden hour";
- The future of transportation funding at all levels of government is uncertain, and traditional sources of money may not be available in the future. This will require agencies to reevaluate the benefit of services offered in a constant and ongoing manner;
- Towing and recovery operators continue to face new safety and equipment costs while trying to maintain competitive rates that allow them to stay in business; and
- Considerable pressure exists for all organizations to make their operational, tactical, and strategic processes more efficient and effective.

However, there are some things that the TIM community can continue to do to help identify solutions to these and other TIM challenges.

Continue to Make the Case for TIM

The transportation landscape is changing very quickly as the traveling public's mobility demands sharpen and tolerance for delay diminishes. It is likely that the visibility for TIM will continue to become more prevalent. It is already becoming a major focus related to the freight industry. Freight Analysis Framework projections show that freight movement will increase by more than 60 percent by 2040. With these increases, maintaining system performance for goods movement by truck will be a major challenge. Shippers will demand that the roads be cleared of incidents as quickly as possible (as will those receiving the goods, whether manufacturers or retail outlets) – for simple economic reasons.

The question will be whether TIM budgets will be sufficient to increase their operations consistent with the anticipated growth in the need for TIM. Federal transportation revenues have not increased given that the Federal gas tax rate has not changed since the 1993. Although there have been some increases at State levels, State revenue sources likewise have not kept pace.

Further, even though operations have become mainstreamed, operations still needs to compete with infrastructure for an ever decreasing pot of funds. This is exacerbated by the fact that operations are labor intensive and are therefore costly to run. For TIM, however, which requires not just significant labor resources but also costly specialized equipment and specialized operator and responder training, State DOTs may view continued funding for TIM programs with more reservations than other operations components.

As a result, there will be a continuing need for collaboration between MPOs and DOTs on TIM along with all transportation operations strategies as an alternative to the ever more expensive planning and construction of new capacity. Collaboration will need to be directed towards developing operations objectives that take into account operations performance during the planning process and incorporating operations solutions into investment decisions that support identified operations objectives.

TIM practitioners understand that TIM provides a good value for expenditures; however, the planning process will require that the case for TIM be documented in performance measures. Calculating these performance measures will require a new level of information only available through cost management activities.

Conduct Pilot Projects

One way to gain real world experience, particularly in the area of cost management, is for one or more State transportation agencies to undertake focused pilot projects to test these concepts. This would allow for dedicated and purposeful tests that would address individual elements of cost management.

The focus would be on one or more of the different phases of cost management:

- Cost planning – how good tracking and analysis can aid in estimating future costs and budgets;
- Cost tracking – how transparent the process can be for better cost data tracking;
- Cost analysis – create cost information across a range of measures that can be used in planning, evaluating and decisions; and
- Evaluation and decision – how the process can support future programming and resource allocation.

These pilot projects could test how well cost management can be integrated into an agency's processes or identify the benefits of implementing these ideas and provide success stories that can be further communicated through the industry. The pilots would provide the practical experience necessary to gain acceptance within and among agencies. Multiple pilot projects could address the most significant aspects of cost management:

- Asset management – illustrates how TIM cost data could be used in an agency's overall management of assets;
- Resource management – promotes a fuller understanding of costs associated with personnel;
- Performance management – demonstrates the establishment of TIM performance measures and the cost data inputs to those measures; and
- Visualization – provides illustrative tools to make the message better understood by various audiences.

Dissemination of Research and Lessons Learned Information

This primer was undertaken to share the concepts of cost management and cost recovery, but without the existence of a deeply ingrained practice in this area, for the most part, it presents model policies driven by best practices in related areas. An important observation is that State transportation agencies adopt innovations over time, and different parts of an organization do not adopt an innovation simultaneously. As with other new methods, agencies can expect cost management and cost recovery techniques to continue to become more important over time.

Practitioners, especially TIM mid-level managers, should consider adopting policies and incorporating the lessons presented in this primer. Readers are encouraged to visit the primary sources for information about the principles of TIM cost management and cost recovery to obtain detailed information on related issues:

- The *FHWA Office of Operations* (<http://ops.fhwa.dot.gov/>), which has a mission to advance the operational practices and capabilities of State transportation agencies. The FHWA will continue to advance these concepts to the TIM community through future training, workshops, and other outreach activities.
- The *National Traffic Incident Management Coalition* (www.transportation.org/Default.aspx?SiteID=41), which includes representatives from many of the industry groups that can disseminate the information to a broad audience.

Additional Research

The subject of cost management and cost recovery could benefit from additional research in areas such as:

- Minimum standards for cost management – this project would identify a minimum set of parameters that are necessary to have a good cost management process for TIM. Items would include the specific cost tracking datasets that are necessary and the range of cost analysis tools that could be used to create the cost information that is most valuable to a transportation department. A useful product would be a basic template for cost management similar to a project planning checklist.
- Strategies for visualization – this project would involve developing simple tools that a TIM manager could employ to present TIM cost management data to agency officials or political leaders to make the case for the value of TIM. These tools would assist in displaying key information for use in asset management, resource utilization, and performance measurement.



U.S. Department of Transportation
Federal Highway Administration

U.S. Department of Transportation
Federal Highway Administration
Office of Operations

1200 New Jersey Avenue, SE
Washington, D.C. 20590

March 2012
FHWA-HOP-12-044