Benefits of Traffic Incident Management

ntimc
National Traffic Incident Management Coalition

NATIONAL UNIFIED GOAL (NUG) FOR TRAFFIC INCIDENT MANAGEMENT

Traffic Incident Management (TIM) programs address issues that are of vital concern to the American public: congestion and travel delay, public health and safety, the nation's economic health, energy savings, public safety resources, responder safety, and citizen satisfaction with government services. Yet decision-makers at all levels of government generally do not have TIM on their "radar screen," in part because the benefits of TIM programs have not been articulated succinctly and strongly.

Before they vote for, or budget for, TIM program elements, public officials want to know the cost-benefits of TIM investments. While we can safely assume that no one wants "unsystematic, unplanned, uncoordinated" traffic incident management, the reality is that investment in the elements of TIM programs must compete with other worthy public investment opportunities.

This paper summarizes currently available information about TIM benefits. A major challenge in documentation of the "Benefits of TIM" is the broad scope of the traffic incident management discipline. Formally defined as "The systematic, planned and coordinated use of human, institutional, mechanical, and technical resources to reduce the duration and impact of incidents, and improve the safety of motorists, crash victims, and incident responders,"[1] TIM is a catch-all phrase. Programs and program elements that may fall under the general rubric of "TIM" include development of unified policies, procedures, operations and / or communication systems among TIM responders; the application of Intelligent Transportation System (ITS) technologies to traffic incidents; motorist assistance patrols; interdisciplinary training in traffic control, unified command and the National Incident Management System (NIMS); improved towing industry procedures and practices; and traveler information. Among these, motorist assistance patrols have the best documented cost and benefit data.

Most of the TIM benefits information available is based on studies of elements of state or metropolitan TIM programs. Lack of uniformity in measurement and analysis methods prevents comparison and generalization. Although TIM benefits are difficult to quantify precisely, enough is known to make the case that TIM should be strongly supported at the federal, state and local levels.

Congestion Relief

Traffic incidents account for about one-quarter of all congestion on U.S. roadways. For every minute that a freeway travel lane is blocked during a peak travel period, four minutes of travel delay results after the incident is cleared. Reduced incident-related travel delay is a key benefit of TIM programs.

- Maryland's DOT's Coordinated Highways Action Response Team (CHART), a robust incident management program that includes motorist assistance patrols, reduced average incident duration by 23 percent in 2005. CHART assisted in 20,515 lane blockage incidents where average incident duration in 2005 was approximately 22 minutes, compared to 29 minutes for similar incidents responded to by other agencies. Using a traffic simulation program, analysts determined that MDOT TIM program reduced travel delay on major Maryland corridors by 37 million vehicle-hours in 2005.[2]
- The Hudson Valley's Highway Emergency Local Patrol (H.E.L.P), a motorist assistance patrol,

REDUCTION DUE TO CHART	AMOUNT		UNIT RATE	DOLLARS (MILLIONS)
Delay (million vehicle hours)	Trucks	2,383	$19.59 / hr driver cost $45.40 / hr cargo cost	$ 46.72 $108.33
	Cars	26,276	$14.34 / hr driver cost	$376.80
Fuel Consumption (million gallons)		4.84	$1/gal	$ 4.84
Emissions (tons)	HC	487	$6,700/ton	$ 41.11
	CO	5,476	$6,460/ton	
	NO	233	$12,875/ton	
TOTAL				**$577.79**

Figure 1. 2005 Direct Benefits to Highway Users from Maryland's CHART Program1

PATROL LOCATION	PATROL NAME	YEAR PERFORMED	RESULTS
Charlotte, NC	Incident Management Assistance Patrol	1993	3:1 - 7:1
Chicago, IL	Emergency Traffic Patrol	1990	17:1
Dallas, TX	Courtesy Patrol	1995	3:1 - 36:1
Denver, CO	Mile High Courtesy Patrol	1996	20:1 to 23:1
Detroit, MI	Freeway Courtesy Patrol	1995	14:1
Fresno, CA	Freeway Courtesy Patrol	1995	13:1
Houston, TX	Motorist Assistance Program	1994	7:1 - 23:1
Los Angeles, CA	Metro Freeway Service Patrol	1993	11:1
Minneapolis, MN	Highway Helper	1995	5:1
New York, NY	Highway Emergency Local Patrol	1995	24:1
Norfolk, VA	Safety Service Patrol	1995	2:1
Oakland, CA	Freeway Service Patrol	1991	4:1
Orange County, CA	Freeway Service Patrol	1995	3:1
Riverside County, CA	Freeway Service Patrol	1995	3:1
Sacramento, CA	Freeway Service Patrol	1995	6:1

Figure 2. Summary of Motorist Assistance Patrol Benefit-Cost Studies.[10] The underlying methodologies and assumptions used in the studies varied widely, producing a broad range of results. Results are not comparable, but do support the assertion that Motorist Assistance Patrols are cost-effective.

responded to 129 incidents in June 2005, where average clearance time was approximately 36 minutes. This compared to average clearance time of 42 minutes for 86 incidents that occurred after the HELP program's operating hours on weekdays, and a 50 minute average for 39 incidents on the weekends.[3]

Economic Savings

By reducing travel delay, fuel consumption, emissions, and secondary incidents, TIM programs boost the national and regional economy. According to Texas Transportation Institute's (TTI's) *Urban Mobility Report 2005*, travel time value for each person-hour of travel was $13.45 in 2004; for trucks the value was $71.05. In 2004, trucks idled due to traffic delay (incident-related and other) cost the U.S. trucking industry 243 million hours, and cost $7.8 billion. The costs of travel delay drive up freight costs, which are passed on to consumers through product and commodity price increases.[4]

TIM saves highway users money: Total direct benefits to highway users from Maryland's CHART program in 2005 due to travel delay reductions alone were estimated at $578 million. Figure 1 above shows the benefit breakdown.[5] Delay savings from Florida's Road Ranger motorist assistance patrol program were reported at $25.8 million a month in 2005.[6]

Motorist Service Patrols are Cost-Effective: In 2005, the overall benefit/cost ratio for the Florida Road Ranger program was 26:1.[7] Highway Helper, a $600,000 / yr. motorist assistance patrol program in Minnesota,

reduced the average duration of stall incidents by 8 minutes, saving $1.4 million/year in delay costs.[8] Figure 3 shows benefit/cost ratios for similar programs in other locations. In a 1998 analysis [9] based on data obtained from a telephone survey of 53 patrol managers in 22 states, benefit-to-cost ratios of Motorist Assistance Patrols were reported to range from 2:1 to 36:1.

Energy Conservation and Environmental Benefits

Shorter incident durations reduce fuel consumption, fuel costs, and emissions. Florida's Road Ranger program saves 1.7 million gallons of fuel valued at $3.4 million monthly.[11] CHART saved Maryland highway users 6.4 million gallons of fuel in 2005, including 4.8

BENEFITS BY STAKEHOLDER SECTORS

A key to effective incident management is strong interdisciplinary partnerships to develop joint TIM operating policies, procedures, communications networks and training. Because TIM programs are usually initiated by transportation agencies, it can be difficult to motivate other responders to dedicate their scarce time and resources to TIM programs unless the benefits to the emergency responders can be articulated persuasively. Figure 3 below summarizes how TIM benefits major stakeholder sectors.

	Firefighters	Law Enforcement	Emergency Medical Services	Private Sector Towing & Recovery: and Traffic Control Services	Transportation Agencies	Highway Users
Congestion Relief	●	●	●	●	●	●
Economic Savings	●	●	●	●	●	●
Fuel Savings	●	●	●	●	●	●
Personnel Savings	●	●	●			
Emissions Reductions						●
Crash / Secondary Crash Reductions	●	●	●	●	●	●
Faster Incident Detection, Verification, Dispatch & Response Time	●	●	●	●	●	●
Reduced Mortality	●	●	●		●	●
Reduced Morbidity	●	●	●		●	●
Increased Responder Safety	●	●	●	●	●	
Increased Customer Satisfaction	●	●	●	●	●	●

Figure 3. How Traffic Incident Management (TIM) benefits major TIM stakeholder sectors.

million gallons saved from delay reductions (see Figure 1), and additional fuel savings from reduced running time in the Baltimore and Washington regions.

Public Health and Safety Benefits

About 43,000 Americans die in highway crashes every year. Good traffic incident management reduces traffic congestion, which improves roadway safety and reduces crashes. When crashes do occur, TIM mitigates impacts by speeding detection, response, and clearance.

TIM reduces crashes: A before-and-after analysis of the San Antonio TransGuide System in 1996 showed a 35 percent decrease in crashes.[12]

TIM reduces secondary crashes: The likelihood of a secondary crash increases by 2.8 percent for each minute the primary incident continues to be a hazard.[13] Causes include the dramatic change in traffic conditions, including the rapid spreading of queue length, and the substantial drop in traffic speed, as well as rubbernecking. Secondary crashes due to congestion resulting from a previous crash are estimated to represent 20 percent of all crashes. Incident management programs prevent secondary incidents by reducing the duration of traffic incidents, and by publicizing the incident using changeable message signs and traveler information systems.[14] Maryland's CHART incident management program resulted in an estimated 290 fewer secondary incidents in 2005.[15]

TIM reduces incident detection, verification, dispatch and response time: Closed Circuit Television (CCTV) cameras, motorist assistance patrols, and integrated public safety/transportation dispatch and communications networks are among the many tools that TIM programs use to speed incident detection and verification, and dispatch. San Antonio's TransGuide ITS system combines a communications network and CCTV to improve incident detection. In the first year of deployment, TransGuide reduced incident response times by 20 percent.[16] A 2006 analysis comparing the Hudson Valley's H.E.L.P. motorist assistance patrol's average response time to weekend response times showed an average 12 minute difference, with H.E.L.P. responding in approximately 8 minutes, compared to 20 minutes on the weekends, and 12 minutes on weekday evenings, both times when the service patrol is not on duty. Maryland's CHART motorist assistance patrol program reported an average response time in 2005 of 5.8 minutes, compared to 6.7 minutes in 2004, despite the worsening congestion and the increasing number of incidents in the Washington-Baltimore region.

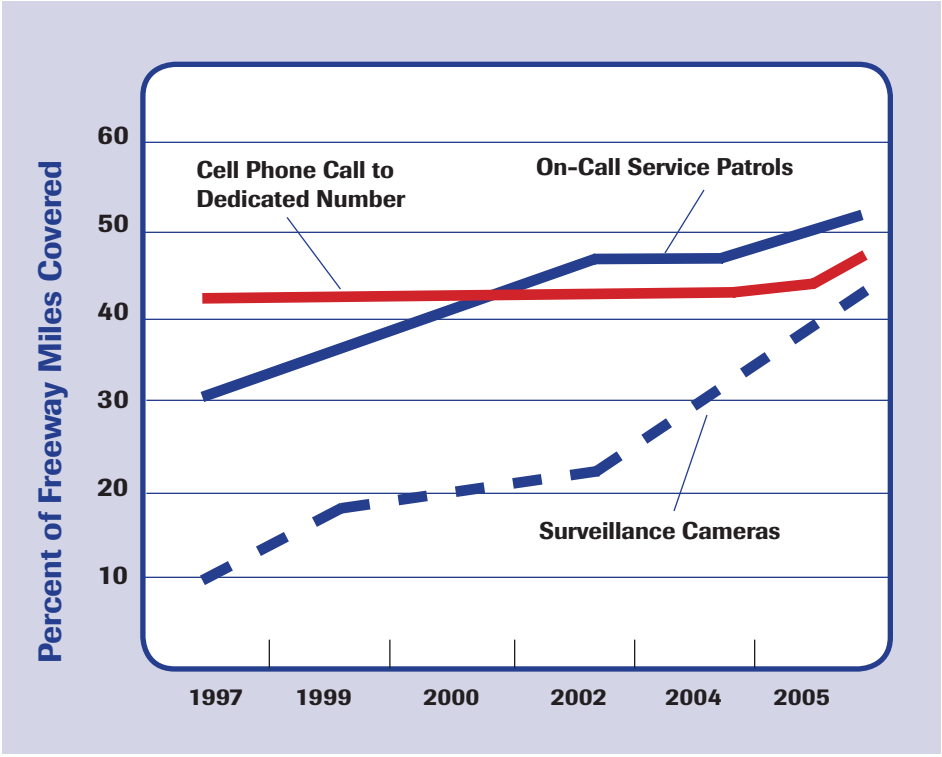

Figure 4. Closed Circuit Television (CCTV) surveillance cameras, on-call service patrols, and cell phone reportage are rapidly emerging technologies for reducing incident detection times on freeways.[17]

Reduced Mortality

Faster highway incident detection and response saves lives. Response time has a well-documented relationship to likelihood of crash survival. For seriously injured patients, arrival at the hospital within the "golden hour" after the crash is considered a strong predictor of patient outcome. The average notification time [e.g., the time elapsed from the crash or the onset of an emergency until emergency medical service (EMS) is notified] is 9.6 minutes for rural crashes, compared to a national average of 5.2 minutes. The average time between notification and arrival at a fatal crash scene is 11 minutes in rural areas, versus 3.4 minutes in urban areas. By reducing

both notification and response times, TIM saves lives.

Reduced Patient Morbidity

Faster incident detection and response prevents injuries and reduces health care costs. Particularly in cases of head trauma or internal injury, faster EMS response can dramatically improve a crash survivor's prognosis and reduce the collateral costs to society. Traffic crashes injured 2.7 million Americans in 2005. Crash survivors often sustain multiple injuries and require long hospitalizations. Crashes cost society more than $150 billion a year and consume a greater share of the nation's health care costs than any other cause of illness or injury.

Reduced Public Safety Personnel Requirements

Reducing the number of crashes and clearing them more quickly and efficiently frees public safety personnel resources needed for other duties.

Increased Responder Safety

The emergency response community is increasingly concerned with "struck-by" incidents where fire, law enforcement, EMS, transportation and other responders are killed or injured at incident scenes by passing vehicles.

Improved on-scene procedures reduce struck-by deaths and injuries: TIM programs promote responder safety by improving incident traffic control practices, procedures, and resources, as well as encouraging responders to follow safety procedures and use safety apparel and equipment.

Improved emergency communications networks increase responder safety: What responders don't know can hurt them. Recent advances in networking technology and public safety spectrum availability allow a broad range of transportation, public safety, public health, and emergency management agencies to share voice, video, graphic and text data in real time. Sharing information through Regional Emergency Communications Networks makes it easier to monitor the incident and manage resources safely and appropriately.

Increased Customer Satisfaction

TIM increases public satisfaction with government services. Clearing the road after an incident ranked as the top priority among SHA functions in a 2006 statewide citizen survey by MDOT, with 98 percent of respondents ranking road clearance as "very important." [18]

Motorist assistance patrols are very popular with travelers. Tennessee has reported that of 1,572 comment cards regarding their HELP service patrol in FY 1995, 99.9 percent rated the service "excellent." [19] Washington State DOT reports hundreds of positive comments and letters every year, including checks from some pleased motorists who offer to pay for the service. "...like a guardian

angel. He replaced the tire, checked the air, and...within 15 minutes of the 'disaster' we were on our way home...." read one of hundreds of letters received each year by Virginia DOT.

MEASURING BENEFITS

Status of Performance Measurement

"Things that get measured get performed" is an often-quoted truism of organizational management. Performance metrics and performance goals are important tools for developing and maintaining strong traffic incident management programs.

Currently, the most frequently used performance metric for TIM programs is incident clearance time—either average, or maximum. California, Washington State, and Florida have set statewide goals of 90-minute incident clearance times. Utah's state performance goals are based on incident severity: 20 minutes for fender-benders; 60 minutes for injury crashes; 90 minutes for fatalities. Idaho takes a similar approach, with a statewide program for 30, 60, or 120-minute maximum clearance times, based on incident severity.

States have found that tracking and reporting improvements in average incident clearance times is a powerful tool for communicating with their state legislatures and with their customers. The Maryland and Washington State transportation departments have made progress in securing steadier funding from their state legislatures for their traffic incident management activities as a result of clearance data reporting. Washington State DOT (WSDOT) also has had some notable success in improving public perception of the agency.

Effective performance measurement requires additional supporting resources that are not currently available in many states and localities, including capability for continuous collection and analysis of supporting data. If performance data are to be shared, agreement must be reached on the definitions of performance metrics, and on a uniform and structured reporting method.

In 2005, the FHWA launched the Focus States Initiative for Traffic Incident Management Performance Measures to initiate development of a set of nationally recognized, consensus-based performance measures for TIM. Through a series of workshops, participants from 11 states (with representatives from transportation and law enforcement) identified two initial program-level performance measures:

- **Roadway Clearance Time:** the time between the first recordable awareness (detection/notification/verification) of an incident by a responsible agency and first confirmation that all lanes are available for traffic flow.
- **Incident Clearance Time:** the time between the first recordable awareness and the time at which the last responder has left the scene.

The 11 Focus States currently are working through their State Action Plans to implement and test the two measures for eventual adoption by other states. This initiative will likely impact other TIM program areas as well. The multi-agency coordination and technical integration necessary for performance measure data collection will be brought about by advances in strategic planning and communications.

At the same time, the National Transportation Operations Coalition (NTOC)

MEASURE	DEFINITION	SAMPLE UNITS OF MEASUREMENTS
Incident Duration	The time elapsed from the notification of an incident until all evidence of the incident has been removed from the incident scene.	Median minutes per incident
Non-Recurring Delay	Vehicle delays in excess of the recurring delay for the current time-of-day, day-of-the-week, and day-type. [21]	Vehicle-hours
Travel Time-Reliability (Buffer Time)	The Buffer Time is the additional time that must be added to a trip[22] to ensure that travelers making the trip will arrive at their destination at, or before, the intended time 95percent of the time.	Minutes. This measure also may be expressed as a percent of total trip time or as an index.

Figure 5. NTOC-Proposed Performance Measures for Incident-Related Travel Delay

is developing a common set of about 10 performance measures for evaluating the management and operations activities of participating NTOC members. The performance measures that NTOC has proposed[20] that relate directly to incident-related travel delay are summarized in Figure 5.

Barriers to Performance Measurement

Where officials fear public controversy over failure to meet the goals, or unfair comparisons to results from other jurisdictions, there can be resistance to performance goals and performance measurement. While performance measurement is relatively new to transportation operations professionals, other TIM responders (fire, EMS, law enforcement) long have been publicly accountable for their response times.

Recommendations for Sharing and Comparing Performance Measurement Data

NTOC's 2006 report on *Measuring Performance Among State DOTs*[23] suggests "basic principles" to help advance successful adoption of comparative performance measurement within the DOT community. Based on input from workshop participants and others, the principles are:

- **Participation in comparative performance measurement should be voluntary.** Strong marketing and leadership must be included in implementation planning to encourage sufficient participation by DOTs.
- **Focus on knowledge-sharing, not number crunching.** Results should be used to enable transfer of successful management practices rather than to rank DOTs. Systems for sharing qualitative information about best practices, innovations, and lessons learned should be just as important as the collection and reporting of data.
- **Ensure comparisons are between peers.** State DOTs are far from homogeneous and each agency's performance is aided and constrained by its unique operating environment, including factors that may not be apparent in the comparative performance measurement data. These factors include physical geography/climate, land use/demographic/ socio-economic patterns; labor and materials costs; state legislative requirements; agency management structures and responsibilities; and system size.
- **Consider creating peer groupings by topic.** The factors that determine appropriate peer states may vary from issue to issue. For example, in TIM performance measurement, land use and demographic patterns are particularly important—managing incidents in highly urbanized areas with high levels of congestion differs significantly from TIM in smaller cities or in rural areas. However, it is important to note that road users in rural and remote areas have the same expectations as road users in urban areas: that roadway incidents be well managed through coordinated, efficient response.
- **Ensure methodologies for measurement are rigorous.** The success of comparative performance

measurement rests heavily on the credibility of results. Methodologies for collecting data among states must be carefully formulated to ensure accurate comparisons.

- **Build on DOT's current efforts.** The state-of-the-art for performance measurement in state DOTs is rapidly evolving. Comparative performance measurement should focus on those areas where consensus is emerging on the value of measurement and where reasonable techniques for measurement are available.

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