

# Effective Strategies for Congestion Management

*presented to*

**National Cooperative Highway Research Program**

*presented by*

**Cambridge Systematics, Inc.**

*with*

**Resource Systems Group, Inc.**

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# Project Overview

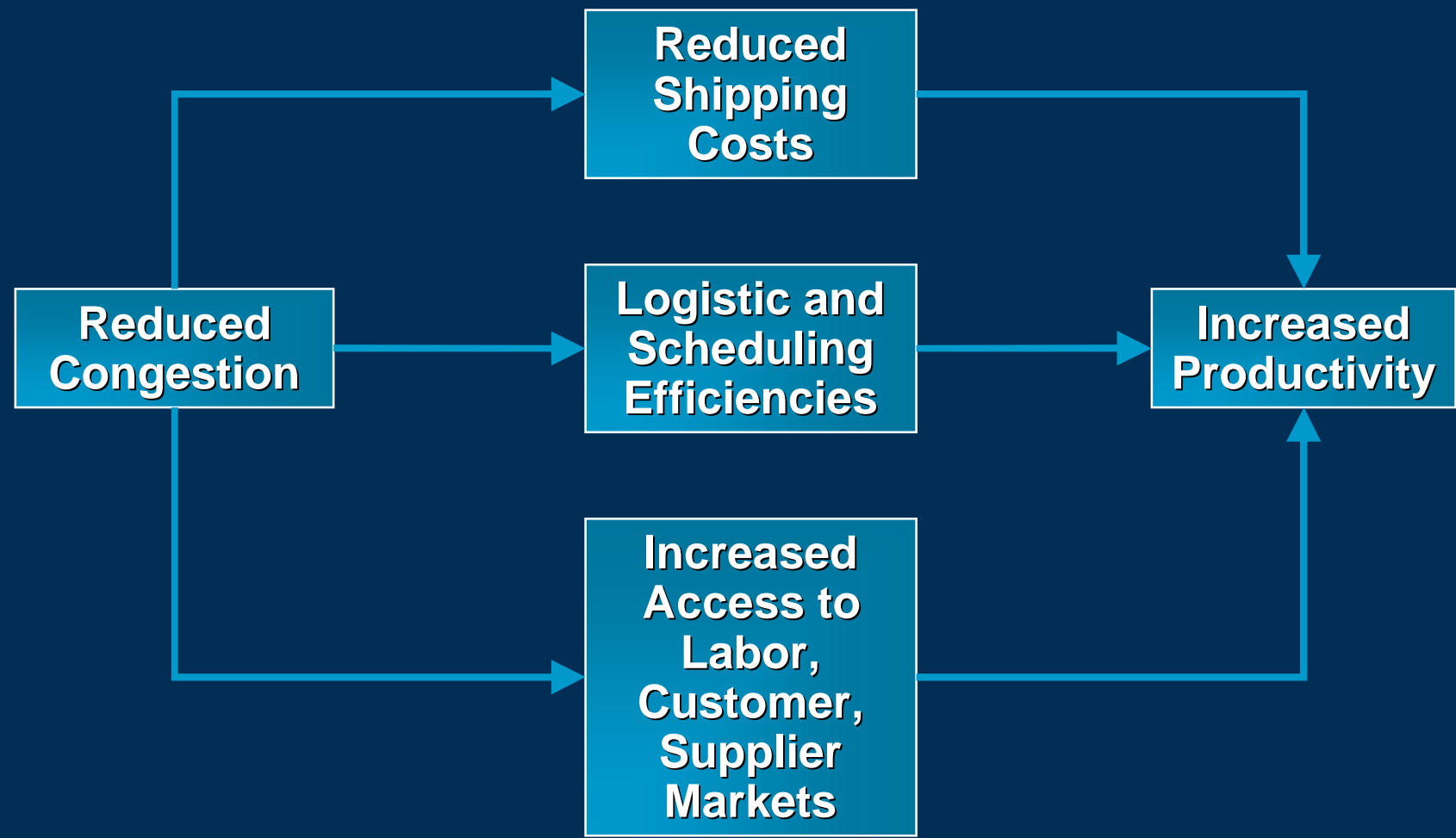
- Research conducted for AASHTO through NCHRP Project 20-24A, Task 63
- Cambridge Systematics with Resource Systems Group, Inc.
- Objectives
  - Review state of knowledge on linkages between congestion and economic growth
  - Review strategies for reducing congestion
  - Assess potential for widespread application and effectiveness

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# Congestion Trends

- **Congestion estimated to waste 4.2 billion hours of time nationwide**
- **Between 1982 and 2005, delay per traveler in larger cities nearly tripled – from 14 to 38 hours annually**
- **Large metro regions – 105% increase in travel vs. 45% increase in major road capacity, 1985-2005**
- **Congestion increasing in areas of all size**
- **Reliability getting worse – in some cases, need to plan for 2x travel time vs. average conditions**

# Benefit of Congestion Relief to the Economy



# Impact of Congestion on the Economy

- **Businesses adapt to increasing congestion, but these adaptations incur costs**
- **Congestion may affect U.S. competitiveness by making goods and services more expensive**
- **High levels of congestion can impact the competitiveness of individual regions**
- **Direct costs of congestion may be in range of \$30-\$80 billion dollars nationwide**
- **Significant additional indirect costs**

## Impact of Congestion on the Economy (continued)

- Highway and transit investment programs to relieve congestion have shown favorable cost-benefit ratios as well as measurable increases in regional economic output
- **Portland, Oregon** – Double planned investment levels = \$844 million annual benefit (2025), B/C ratio 2:1
- **Chicago** – Compact land use + transit investment + congestion pricing = increase of \$2.4 billion in personal income, \$4.3 billion in GRP
- **Los Angeles** – Plan investments (highway and transit) show net benefit of \$30 billion 1998-2020, B/C ratio 4:1

# Impact of Congestion on the Economy (continued)

- Difficult to link individual congestion management strategies to overall economic growth and productivity
- Impact roughly proportional to congestion reduction
- Disproportionate impacts
  - **Nonrecurring congestion** – reliability valued 1-6x normal travel time
  - **Freight** – Truck traffic represents 5 percent of VMT, but freight sector experiences ~27 percent of congestion costs



# Congestion Management Strategies and Effectiveness

- 32 strategies identified, categorized, and researched
- Category A – Adding capacity/physical improvements
- Category B – Using existing capacity more efficiently/operational improvements
- Category C – Reducing demand for vehicle travel
- Category D – Strategies for reducing congestion on transit vehicles



# Strategy Information

- **Brief description**
- **Evidence on congestion relief benefits**
- **Extent of current implementation**
- **Potential applicability**
- **Approximate costs**
- **Other implementation issues (institutional, political, etc.)**
- **Potential solutions to implementation issues**

# Strategy Summary Assessment Matrix

Strategy	Effectiveness		Implementation Issues		
	Local	Areawide	Cost	Noncost Barriers	Timeframe
New Roads and Roadway Widening	High	High	High	High	Mid- to Long-Term
Intersection Improvements	High	Medium to High?	Low to Medium	Low to Medium	Mid- to Long-Term
Traffic Signal Timing and Coordination	High	Medium to High	Low	Low	Short-Term
Incident Management	High	High	Low to Medium	Low	Short-Term
Traveler Information	Low to Medium	Low to Medium	Low to Medium	Low	Short-Term
Road Pricing	High	High	High/Revenue-generating	High	Mid-Term
Commuter Choice/ Workplace TDM	Low to Medium	Low	Low to Medium	Medium	Short-Term

# Some General Findings

- **Adding capacity/physical improvements**
  - High effectiveness
  - High costs and other implementation issues
- **Operational improvements**
  - A number with high effectiveness and low to moderate costs (relative to physical improvements)
  - Institutional barriers
- **Reducing demand**
  - Low to moderate effectiveness
  - Low to moderate costs
  - A number with significant other benefits

# Example

## Traffic Signal Timing and Coordination

### Effectiveness

Can reduce travel time 7-25% along a corridor

Poor signal timing accounts for estimated 5-10% of all delay

### Applicability

~60% of agencies have good signal management practices

Over 75% of traffic signals in the U.S. could be improved

### Costs

~\$2,500 to \$3,100 to retime an intersection

Optimize 12,000 signals in CA – \$16.1 million

Computerized synchronization systems – \$2.2-8.3 million

# Example

## Traffic Signal Timing and Coordination (continued)

### Implementation Issues

Technical and financial resources especially in smaller jurisdictions

Institutional coordination

Political issues, e.g., equity vs. efficiency

### Solutions

Set aside of regional transportation funding to local jurisdictions

Technical assistance from regional agency staff

Regional traffic operations center

Regional management and operations committee

# Example Incident Management

## Effectiveness

51% reduction in incident duration for detection and response  
Incidents cause ~25% of all congestion

## Applicability

63/100 metro areas have some of freeway system under surveillance, covering 38% of lane miles  
Potentially could be applied everywhere

## Costs

Emergency Response Center/TMC – \$5-10M capital,  
\$0.5-1.5M annual operating

# Example Incident Management (continued)

## Implementation Issues

**Institutional – requires coordination among transportation operators, state and local emergency response, private-sector information providers, etc.**

**Costs/funding**

## Solutions

**Regional coordination committee**

**Adoption of the National Unified Goal for Traffic Incident Management**



# Case Study Topics

- **Planning process, including consideration of congestion relief in developing programs and selecting projects**
- **Congestion management approaches**
- **Performance measures, monitoring, and evaluation**
- **Partnerships supporting effective congestion management**
- **Funding for congestion relief projects and programs**



# Case Studies



# Dallas-Fort Worth Thoroughfare Assessment Program

- Low-cost intersection and traffic signal improvements along arterials
- Partnership with several city governments and Texas DOT
- 300 intersection and 1,000 traffic signal improvements funded in current TIP
- 16 – 31% decrease in travel time, 39 – 67% decrease in delay along improved corridors



# Minneapolis-St. Paul Freeway Management

- **Ramp metering**

- **First implemented in 1970s**
- **430 meters on 210 miles of freeways**
- **Ramp meter benefits – 16% higher mainline throughput; net savings of \$32-37 million/year, B/C ratio 15:1**



- **Transit travel time advantage**

- **88 ramp meter bypasses for buses and HOVs**
- **>223 miles of bus-only shoulders**
- **Direct access to park-and-ride lots**

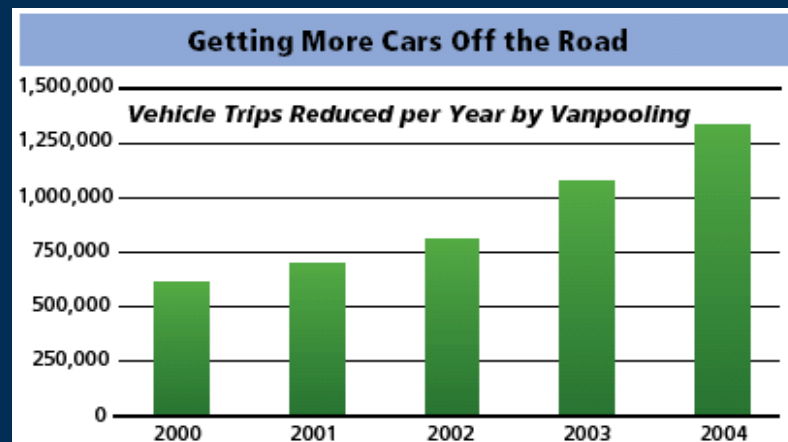
# Orlando Incident Management

- **FDOT – Traffic Incident Management teams**
  - Representatives from all responding agencies and service providers in FDOT District
  - Review past response actions, explore ways that incident management can be improved
- **Metroplan – Tri-County Area Open Roads Policy**
  - Agreement to clear all incidents within 90 minutes
- **“MOVE IT...Yes You Can!” campaign**



# San Diego Travel Demand Management

- SANDAG – RideLink outreach and technical assistance to employers
- Regional ridematching, vanpooling, guaranteed ride home
- Vanpool program operates 500 vanpools, eliminating nearly 114 million VMT in 2007



# Key Findings

- **Congestion management is an overall approach – not just individual technical solutions**
  - Planning, engineering, information infrastructure, data/analysis, funding, public involvement, partnerships, outreach
- **Strong working partnerships are critical**
  - Dallas-Ft. Worth and Orlando (signal coordination) – MPO, state DOT, local jurisdictions
  - Minneapolis-St. Paul (transit operations) – “Team Transit” – MPO, Mn/DOT, transit agency
  - Orlando (incident management) – MPO, local agencies, emergency responders

## Key Findings (continued)

- **Effective congestion management goes beyond capacity expansion**
  - “Tried and true” – ramp metering, corridor-level traffic signal coordination, incident management
  - Innovative/unproven – e.g., integrated corridor management
- **Collection of quality data is important**
  - Support problem identification, strategy analysis, performance monitoring
- **Communication with the public is critical for building and maintaining support for key programs**

# Conclusions

- **Congestion affects the economy (but difficult link specific congestion reduction strategies to economic growth)**
- **Range of congestion management strategies identified with varying costs, effectiveness, feasibility**
- **Strategies affecting freight traffic and reliability will have disproportionate economic impacts**
- **Some traffic operations strategies noteworthy for high effectiveness vs. modest costs**
- **Many areas demonstrating good aspects of congestion management practices – but no one doing everything well**