

# Mitigating Road Congestion: An Overview



**SIRIPHONG (TOI) LAWPHONGPANICH  
INDUSTRIAL AND SYSTEMS ENGINEERING  
UNIVERSITY OF FLORIDA  
GAINESVILLE, FLORIDA 32611**

# Outline

2

- **Background**
  - Types of road congestion
  - Road congestion in the U.S.
- **Strategies for congestion mitigation**
  - Demand Management
  - Supply Management
  - Other

# Background

3

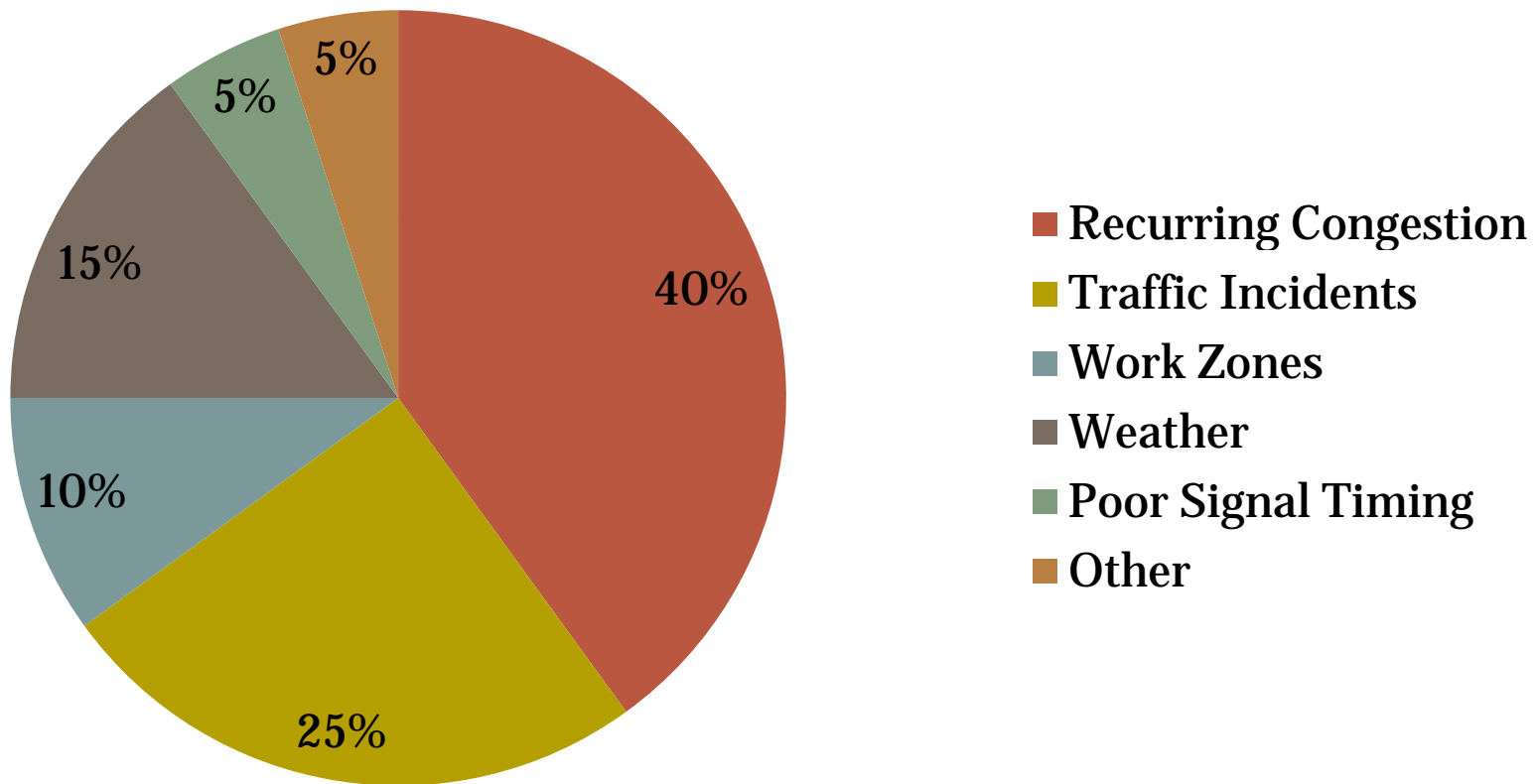
# Types of Road Congestion

4

- **Congestion occurs when**
  - Excessive traffic volume results in travel speeds slower than normal or “free flow” speeds.
- **Recurring congestion**
  - Peak-hour traffic
- **Non-recurring congestion**
  - Traffic incidents
  - Work zones
  - Weather
  - Poor signal timing
  - Other

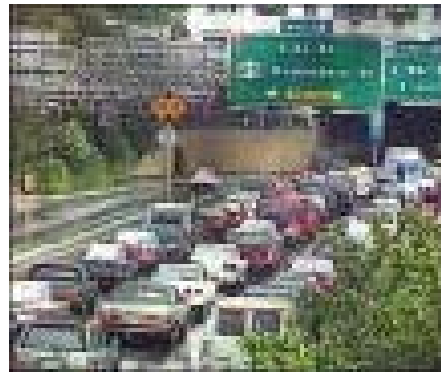
# Types of Road Congestion

5



# Road Congestion in the U.S.

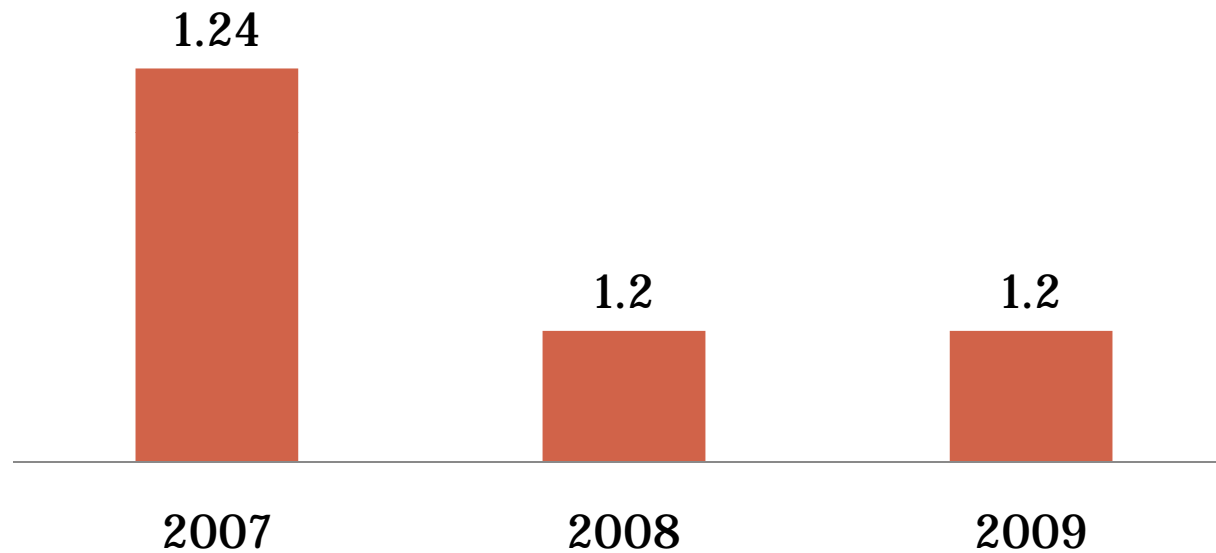
6



# 2010 Urban Mobility Report

7

## Travel Time Index

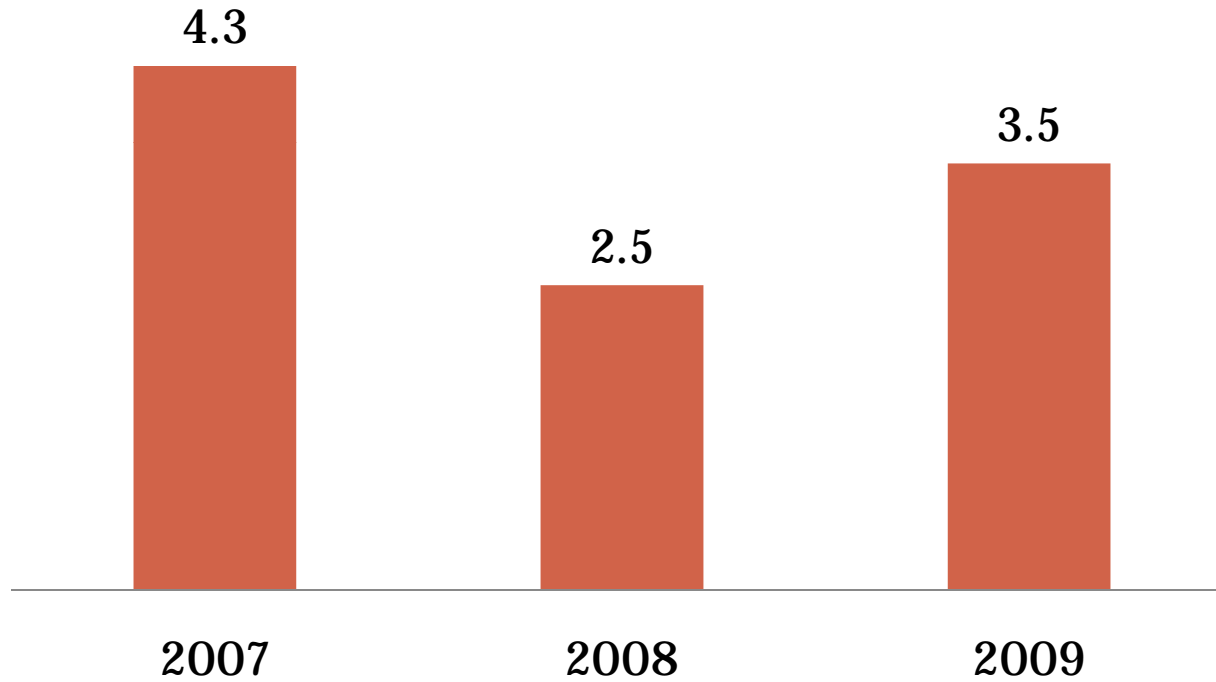


$$\text{Travel Time Index} = \frac{\text{Travel time during peak period}}{\text{Travel time at free-flow speed}}$$

# 2010 Urban Mobility Report

8

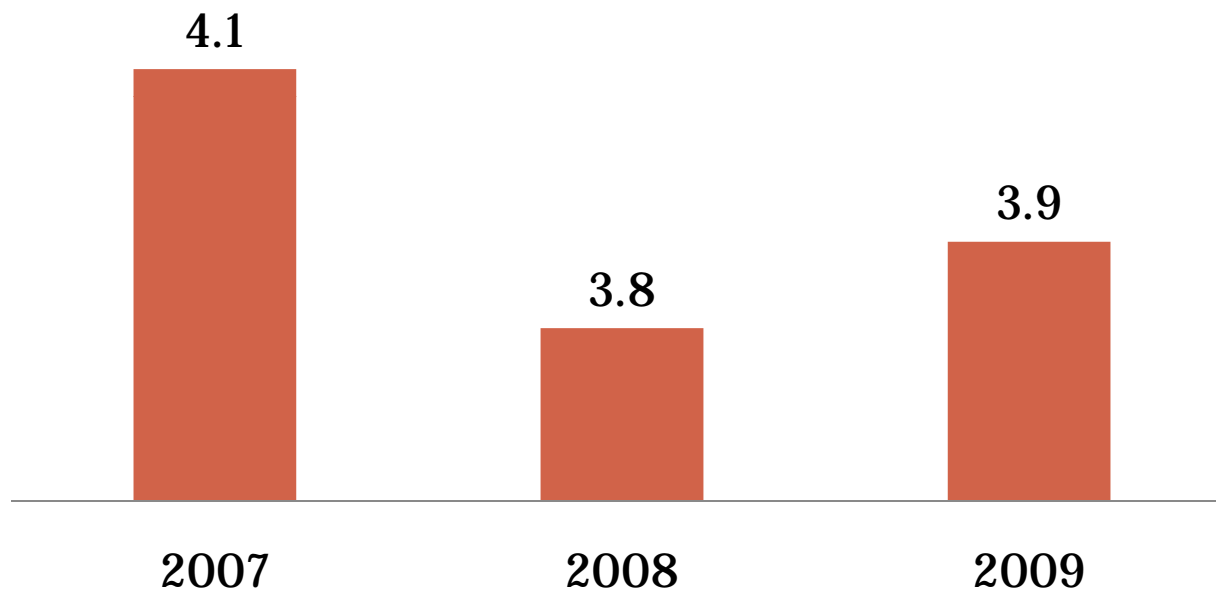
## Travel Delay (Billion hours)



# 2010 Urban Mobility Report

9

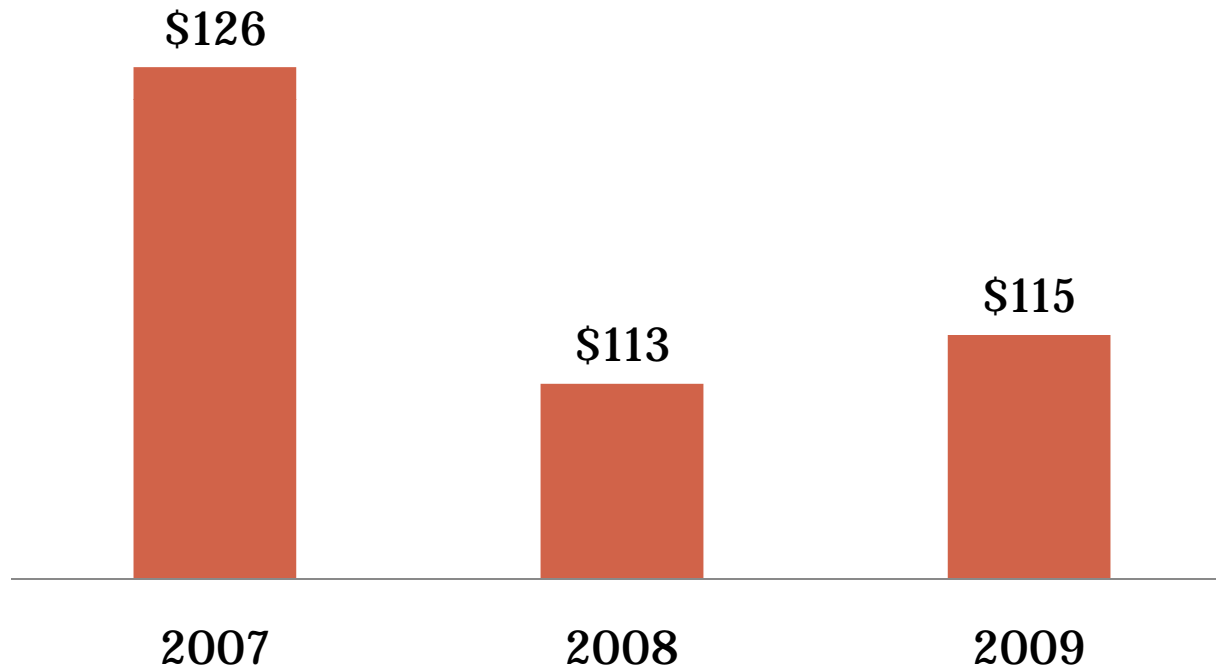
## Wasted Fuel (Billion gallons)



# 2010 Urban Mobility Report

10

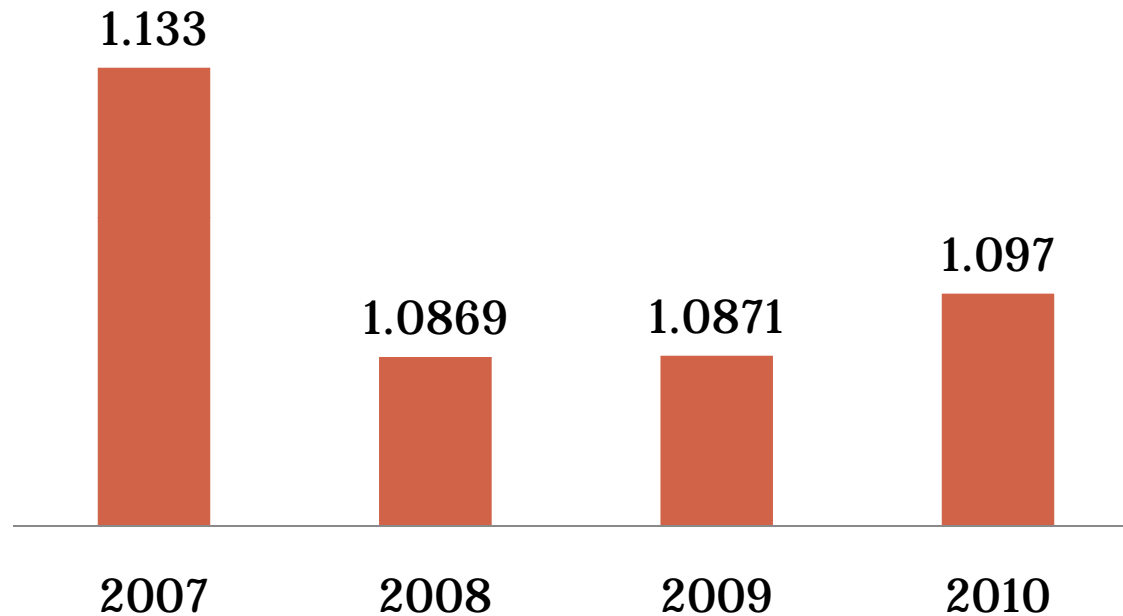
## Cost (\$B-2009)



# 2010 National Traffic Scorecard Annual Report, INRIX Corporation

11

## Travel Time Index



From 2007 to 2008,  
4% reduction in total traffic volume  $\Rightarrow$  30% decrease in congestion

# Strategies for Congestion Mitigation

12

“Congestion Reduction Strategies: Identifying and Evaluating Strategies to Reduce Traffic Congestion,”  
**TDM Encyclopedia,**  
**Victoria Transport Policy Institute.**

# Demand Management Strategies

13

- **Congestion pricing**
  - Market-based approach, first proposed by Pigou (1920)
  - Many forms, e.g., area and cordon based
  - Successful implementations
    - ✦ **London:**
      - The number of vehicle trips has fallen by 17%
      - Congestion has fallen by 26%
    - ✦ **Stockholm**
      - Ave. reduction across control points reduced by 22%
  - Public acceptance is still a major obstacle
  - Presentations
    - ✦ **Session 2: Mahut, Yin**
    - ✦ **Session 4: Marcotte, Yao, Lindberg, Hau, Garcia**
    - ✦ **Session 5: Ben-Akiva, Lo, Wong, Voss**
    - ✦ **Session 6: Bell**
    - ✦ **Session 9: Holguin-Veras**

# Demand Management Strategies

14

- **Commute trip reduction programs**
  - Encourage commuters to use alternative modes for trips to work and school
  - Particularly effective when there are suitable financial incentives such as transit benefits or parking pricing
- **Parking Management and Pricing**
  - Driving and parking are virtually perfect complements
  - On-street parking and road congestion
- **Transit improvements and rideshare programs**
  - Particularly effective when implemented with other incentives such as HOV priority and congestion pricing

# Demand Management Strategies

15

- **Successful programs**
  - Bellevue, WA: The drive alone commute rate fell by 30% from 1990 to 2000.
  - Boulder, CO: Since 1995, the drive-alone rate from downtown employees has fallen nearly 36%.
  - Portland, OR: Limits of downtown parking increase transit ridership from 20% to 48%.

# Demand Management Strategies

16

- **HOV Priority**
  - Favor bus, vanpool and carpool travel
  - Common features
    - ✦ Dedicated traffic lanes
    - ✦ Queue-jumping lanes
    - ✦ Access to, e.g., favorable parking locations
  - HOT Lanes
  - **Session 2: Bar-Gera**

# Demand Management Strategies

17

- **Distance Based Fees**

- Converting vehicle insurance and registration fees into distance-based charges provides a significant financial incentive to reduce driving.
- Unlike congestion pricing, distance-based fees affect all travel

- **Fuel Pricing**

- In 2008, a 28% increase in fuel price contributed to a 3% reduction in the Travel Time Index.

# Demand Management Strategies

18

- **Freight Transport Management**
  - Freight trucks make a relatively large contribution to congestions
  - Reduce total freight traffic and/or shift it to less congested routes.
- **Pilot program sponsored by NYC DOT**
  - Have trucks make off-hour deliveries (7 PM – 6 AM)
  - Travel speed improved by up to 75%
  - Delivery time decreased from 100 to 30 minutes
  - Sharp reduction in parking tickets and fine
- **Session 6: Yao/Friesz**

# Demand Management Strategies

19

- **Other strategies**
  - Credit based
    - ✦ Allocate road-usage credits to individuals
    - ✦ Pay road tolls with these credits
    - ✦ **Session 9: Yang**
  - Road space rationing
    - ✦ Limit the number of vehicles that use the roadway each day.
  - Traffic control measures
    - ✦ Signal timing (**Session 6: Osorio**)
    - ✦ Speed Reductions
      - Reducing traffic speeds to 55 mph or less can increase traffic flow
    - ✦ Ramp metering
  - Flexible work hours (Flextime)

# Supply management and other strategies

20

- **Road Capacity Expansion**
  - Public-private partnership
- **One-way streets**
- **Road closures, e.g., Braess' paradox**
- **Reversible lanes**
- **Intelligent transportation systems**
  - Traffic information
  - Electronic tolling
- **Incident detection and management**
- **Urban planning, e.g., Smart Growth**

Thank you  
and  
Have a productive workshop

