Access to Destinations:
Rethinking the Transportation Future of our Region

CONGESTION AND ITS EXTENT

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Objectives

“You’re not stuck in a traffic jam, you are the jam!” – German public transport campaign

- How is traffic congestion in metropolitan areas defined?
- How is congestion measured?
- How reliable and accurate are such measures?
- How has congestion and its perception been changing over the past several decades?
ANCIENT ROME

Julius Caesar: Regulations to limit carriage travel.
Historical Framework

LONDON

17th Century: regulations to control standing coaches.

1830’s: Monetary value for congestion.
Historical Framework

NEW YORK

1867: William P. Eno’s first traffic jam on Broadway.

1910: Word “jam” first used to describe automotive congestion, Saturday Evening Post.
Congestion

- Impacts people and freight
- 2002 “wasted” $63.2 billion
- Affects travel decisions
- Background 1980-2000
  - More passenger car travel (VMT +44%)
  - More vehicles (+39%)
  - Not much more lane mileage (+2%)
  - More population (+24%)
  - Real GDP (+90%)
- No absolute definition (relative)
- Measurement problems
Survey to Frame Issues

- On-line survey of transportation professionals & academics.
- 480 responses.
Definition of Congestion

How Is Congestion Defined? (n=557)

- Time: 18%
- Speed: 28%
- Vol: 19%
- LOS: 15%
- Cycle Failure: 16%
- Other: 4%

[Image of a congestion diagram showing the distribution of factors affecting congestion.]
Definition of Congestion

How Is Congestion Defined? (n=557)

- **Time**
- **Point**
  - Volume
  - Time Mean Speed
- **Spatial**
  - Density
  - Travel Time
  - Space Mean Speed

- Cycle Failure 16%
- LOS 15%
- Vol 19%
- Speed 28%
- Time 18%
- Other 4%
Definition of Congestion

How Is Congestion Defined? (n=557)

- “Must be able to define it.”
- “Anything below the posted speed limit.”
- “Below a speed threshold.”
- “A perception.”
- “I know it when I see it.”
- “Should be judged by commonly accepted community standards.”
Measurement of Congestion

How Is Congestion Measured (n=682)

- LOS: 20%
- Speed: 13%
- V/C: 14%
- Travel Time: 14%
- Delay: 29%
- Queue Length: 4%
- Density: 1%
- Other: 5%
Measurement of Congestion

How Is Congestion Measured (n=682)

- Travel Time: 14%
- Speed: 13%
- LOS: 20%
- Delay: 29%
- V/C: 14%
- Queue Length: 4%
- Other: 5%
- Density: 1%

“It is never truly measured.”
Accuracy & Reliability of Measurements

How Accurate Are Congestion Measures?
(n=525)

- Accurate: 18%
- Somewhat Accurate: 33%
- Inaccurate: 14%
- Unknown: 6%
- Subjective: 5%
- Relative: 4%
- Variable: 20%
Accuracy & Reliability of Measurements

How Accurate Are Congestion Measures?
(n=525)

- Accurate: 18%
- Somewhat Accurate: 33%
- Inaccurate: 14%
- Unknown: 6%
- Subjective: 5%
- Relative: 4%
- Variable: 20%

- “Reasonably accurate.”
- “Measure the wrong things.”
- “Based on personal experiences.”
- “A snapshot in time.”
Changes in Congestion

How Has Congestion Changed? (n=446)

- Worse: 79%
- Flat: 4%
- Better: 3%
- More Available Options: 6%
- Varies: 5%
- Unknown: 3%
Changes in Congestion

How Has Congestion Changed? (n=446)

- Worse: 79%
- Flat: 4%
- Better: 3%
- More Available Options: 6%
- Varies: 5%
- Unknown: 3%

- “Western cities increasing.”
- “Some rust belt cities decreasing.”
- “Drivers conditioned to tolerate more.”
- “Need to prepare for the world as it will be.”
- “Focus on accessibility.”
- “Consider options.”
Literature Review

- FHWA
  - Level at which transportation system performance is no longer acceptable due to traffic interference.
  - May vary by facility type, location and/or time of day.
- Recurrent/Nonrecurrent
- Variability
  - Duration
  - Extent
  - Intensity
  - Reliability
- Speed Thresholds
  - Minnesota: below 45 mph during peak periods
  - California: below 35 mph for 15 minutes on weekdays
  - Proposed California: below 60 mph
  - Washington: 95th percentile travel time
Point Measurements

- Top Five Bottlenecks
  (American Highway Users Alliance)
- Identified Via Survey
- Confirmed with HPMS Data
Segment Level: Point Observer

- Flow
- Capacity
- LOS
- Time Mean Speed
- Extrapolated Travel Time
- Delay
Segment Level: Spatial Observation

- Density
- Space Mean Speed
- Actual Travel Time
- Delay
Corridor Level

(a) Northbound I-5

- Cumulative Travel Time
- Cumulative Free Flow Travel Time
- Travel Time
- Free Flow Travel Time

Mean: 28:58
S.D.: 11.85
Variance: 140.35
Corridor Level

- Delay = 8 min
- 8 min < Delay < 16 min
- Delay > 16 min

Actual Travel Time - Free Flow Travel Time (min)

Time

Delay = 8 min
8 min < Delay < 16 min
Delay > 16 min
Corridor Level: Data Fusion
Consideration of Total Trip

<table>
<thead>
<tr>
<th>Segment</th>
<th>Time (min)</th>
<th>Distance (mi)</th>
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<td>0.01</td>
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<td>Local</td>
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<td>Collector</td>
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<td>Arterial</td>
<td>9.4</td>
<td>2.76</td>
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<td>Freeway</td>
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<td>8.76</td>
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<tr>
<td>Arterial</td>
<td>28.3</td>
<td>10.26</td>
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<tr>
<td>Park</td>
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<td>10.51</td>
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<td>Walk</td>
<td>36.1</td>
<td>10.61</td>
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Segment speed and travel time index information is also provided in the diagram.
### Journey to Work Data

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<th>1980</th>
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<td><strong>Average</strong></td>
<td>21.4</td>
<td>22.4</td>
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+14%  
+18%  
+18%
Metropolitan Level Mobility Measures

Portland Area Trends 1982-2002

Minneapolis Area Trends 1982-2002
Metropolitan Level Mobility Measures

Portland Freeway and PAS VMT and Lane Miles, 1982-2002

Minneapolis Freeway and PAS VMT and Lane Miles, 1982-2002
Metropolitan Level Mobility Measures

Major Road Congestion Delay, 1982-2002

Annual Hours of Delay Per Peak Period Traveler

Year

Atlanta
Baltimore
Denver
Minneapolis
Phoenix
San Diego
Seattle
St. Louis
Tampa
Other
LUA Average

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Metropolitan Level Mobility Measures

Trends in Travel Time, 1982-2002

Annual Hours of Travel Time Per Peak Period Traveler

Year


Phoenix
Portland
Sacramento
San Diego
San Jose
Seattle
Other
Average
Metropolitan Level Mobility Measures

### Travel Time Index, 1982-2002

<table>
<thead>
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<th>Year</th>
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<td>1982</td>
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<td></td>
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<td>1997</td>
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<td>2002</td>
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</tbody>
</table>

#### TTI = Actual/Free Flow

**Portland State University**
Metropolitan Level Mobility Measures

Travel Time and Population 2002

Travel Time and Travel Time Index 2002

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Beyond Congestion Measures

Travel Time Budget

Source: Ausubel, Marchette and Meyer
Other Viewpoints

- Congestion occurs where people pursue economic and social interactions.
- Sign of healthy economy.
- Link measures to alternative mode availability.
- Impact of non-work trips in peak.
- Define the problem.
Conclusions

- Reality and perception.
- Can no longer build our way out.
- Need new methods for system performance measurement.
- Consider impacts on individual users and on individual trips (passenger and freight).
- Travel time and reliability.
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Questions?