Looking Back 5 - Years: Long-Term Trends and Analysis from the Maryland Mobility Report

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Outline

- Introduction
- Maryland Mobility
- Objective
- Congestion and Reliability Measures
- Vehicle Mile Travel (VMT)
- Bottleneck Location
- Congestion Cost
- Mobility Improvement Project
- Summary & Conclusions
Introduction

- Maryland Located in Mid-Atlantic region

- Transportation system
  - 31,000 miles of roadway
  - 5000 bridges and tunnels

- Infrastructure
  - 400 million public trips
  - 58 billion VMT every year
Maryland Mobility

- Key performance area at MD (SHA) and MDTA
- Support Maryland's economy and communities
- Provide reliable movement of people and goods
- UMD CATT develops SHA system’s performance
  - Freeways
  - Arterials
  - Major freight corridors

- Mobility performance measures
  - VMT congestion
  - VMT unreliable
  - Bottleneck location
  - Congestion cost
Congestion

Recurring congestion
Enter or exit from the freeway
Vehicles delay (AM-PM) every weekday
Volume greater than capacity
Influenced by
- Traffic volumes
- Geometrics
- Lane widths
- Shoulder widths

Non-recurring congestion
Slow, stop and go conditions
- Events
- Accidents
- Work zone
- Inclement weather
Maryland Mobility Data

INRIX (real-time and historic) speed data
MDOT detailed traffic volume data

Reference: https://pda.ritis.org/suite/download/
Maryland Major Freeways
Objectives

- Assess 5 year mobility trends in Maryland by leveraging the information from individual annual reports.
- Display improvement or degradation in network performance over 5 years between 2011 and 2015.
- Improve Maryland mobility and safety.
Congestion and Reliability

Congestion Levels Measure

- **Travel Time Index (TTI)** = \( \frac{\text{average travel time}}{\text{free flow travel time}} \)
  - Uncongested (TTI<1.15)
  - Moderate (1.15<TTI<1.3)
  - Heavy (1.3<TTI<2)
  - Severe Congestion (TTI>2)

Travel Time Reliability Levels Measure

- **Planning Time Index (PTI)** = \( \frac{\text{95th percentile travel time}}{\text{free flow travel time}} \)
  - Reliable (PTI<1.5)
  - Moderately Unreliable (1.5<PTI<2.5)
  - Highly to Extremely Unreliable (PTI>2.5)


PTI indicates the factor that should be multiplied with the free flow travel time if one plans to be on time 19 out of 20 times.

PTI is a highway reliability indicator that compares the worst-case scenario travel times with free flow conditions.
Maryland Baltimore-Washington Region Congestion Map
2014 AM Peak Hour (8AM-9AM)
Maryland Freeway/Expressway Reliability Map
2014 PM Peak Hour (5PM-6PM)
Maryland Baltimore-Washington Region Reliability Map
2014 PM Peak Hour (5PM-6PM)
Vehicle Mile Travel (VMT)

VMT: Standard measure of defining roadway usage
VMT = number of vehicles * their travel distance (miles)

VMT growth
   * Economic
   * Gasoline price
   * Population growth
   * Ability to expand the roadway network

Total VMT have been relatively stable over 5 years.

Urban area (VMT) 47 billion
Rural (VMT) 100 million

Urban area roadway (VMT) increased 800 million vehicle miles from 2014
Hypothesis: Growth of population and jobs in the metropolitan area.
### Statewide Freeway/Expressway Network Average Weekday (AM-PM) Congestion Summary (2011-2015)

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<tr>
<td>AM</td>
<td>8%</td>
<td>13%</td>
<td>13%</td>
<td>20%</td>
<td>8%</td>
<td>AM</td>
</tr>
<tr>
<td>PM</td>
<td>13%</td>
<td>20%</td>
<td>12%</td>
<td>13%</td>
<td>9%</td>
<td>+1</td>
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<tr>
<td>AM</td>
<td>8%</td>
<td>13%</td>
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<td>15%</td>
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<td>+2</td>
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<tr>
<td>PM</td>
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<td>23%</td>
<td>33%</td>
<td>16%</td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>16%</td>
<td>22%</td>
<td>24%</td>
<td>18%</td>
<td>27%</td>
<td>+1</td>
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AM congestion increased 1% from heavy to severe in freeway/expressway system.  
PM congestion raised 2% from heavy to severe in freeway/expressway system.  
The percent of peak hour VMT increased 2% in AM and 1% in PM peak hours.
Congestion Trend

Congestion has increased over the past 5 years
  • Limited availability of funding for infrastructure improvements in roads

Higher level of congestion in 2012 is related to some construction activities on the freeway system. An improvement in congestion AM-PM from 2012 to 2013

Congested System Impact
  Increased individual user costs
  Environmental impacts
  Degrading overall quality of life

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<tr>
<td>Percent of roadway miles</td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
</tr>
<tr>
<td>8%</td>
<td>11%</td>
<td>2%</td>
<td>4%</td>
<td>9%</td>
<td>13%</td>
<td>9%</td>
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<tr>
<td>Percent of peak hour VMT impacted</td>
<td>18%</td>
<td>26%</td>
<td>16%</td>
<td>29%</td>
<td>17%</td>
<td>22%</td>
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No changes in AM reliability in freeway/expressway system.
PM reliability increased 3% in freeway/expressway system
The percent of peak hour VMT decreased 1% in AM and No changes in PM peak hours.
Reliability Trend

Maryland State network experienced highly to extremely unreliable conditions in 2012.

A slight decrease in AM and huge increase in PM performance measure for past 5 years.

Reliability System Impact

- Incidents
- Vehicular breakdowns
- Crashes
- Weather conditions
- Lane reductions through work zones

*Variations in travel time* make it difficult for transit operators to provide reliable schedules. This can lead to a decrease in rider confidence and the potential to reduce ridership on the impacted routes.
Bottleneck location

- Number of occurrences of speed reductions due to capacity or incident issues, average length of queue that occurs and duration of event.

- Bottleneck ranking algorithm in (RITIS) is speed-based and uses Min by Min speeds available across the state highway system.

- Impact factor
  Maximum queue length formed by bottleneck, times the bottleneck duration
Top 30 Ranked Bottleneck in Maryland

One year (2014)
- I-95 more bottlenecks than I-495

Over past 5 years
- I-495 had more bottlenecks than I-95

Provided the short list congested locations for MD (SHA)
Maryland Top 30 Bottlenecks Map

Highest number of severe bottlenecks
- I-695
- I-495

Lowest number of severe bottlenecks
- US-29
- US-50
- I-895
Statewide Cost of Congestion

2015 Urban Mobility Scorecard (Texas A&M)
Baltimore Metropolitan area nationwide ranked

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<td>Auto Delay</td>
<td>1193</td>
<td>974.8</td>
<td>664</td>
<td>1486</td>
<td>1937</td>
<td>+744</td>
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<td>Truck Delay</td>
<td>167</td>
<td>147.5</td>
<td>58.5</td>
<td>100.1</td>
<td>114</td>
<td>-53</td>
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<tr>
<td>Wasted Fuel</td>
<td>129</td>
<td>107</td>
<td>31.2</td>
<td>64.8</td>
<td>58</td>
<td>-71</td>
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<td>Air Emission</td>
<td>37.3</td>
<td>21.5</td>
<td>47.1</td>
<td>58</td>
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<td>+58</td>
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2014, Washington, DC region number one in the nation

Delay per auto commuter
Increase fuel consumed
Travel in congested conditions
Congestion cost per auto commuter

Fuel prices went down after their initial increase due to economy condition.

The Washington DC metropolitan area experienced the 4th highest congestion costs for highway freight movement.
Statewide congestion cost estimated $2.05 billion in 2015. Statewide congestion cost increased over the past 5 years. Highest congestion cost is in Baltimore-Washington region.

The congestion cost is rapidly increased in Baltimore-Washington. But Eastern shore, Southern and Western Maryland is decreased.
Major Accessibility Improvement Project

Intercounty Connector (MD 200)
Traffic Volumes Growth on ICC (MD 200)

**Volume reduction**

Major roadways by 5%
- I-270
- I-495
- I-95

Local roadways (8% -13%)
- Shady Grove Road
- MD 108
- MD 28/MD 198
Summary

- Traffic volumes and congestion continue to increase in Maryland.
- To address these mobility issues, SHA employs a variety of strategies to meet the needs of the traveling public.
- There are many challenges involved in developing projects including the cost of projects, right-of-way impacts and environmental constraints.
- SHA constructs major capital projects and uses programs that implement bottleneck solutions in a systematic and responsible manner.
Conclusions

- Identify and plan/design/construct congestion mitigation solutions from a practical design standpoint.

- SHA identify both short and long term solutions to address transportation issues.

- In 2015, it was 13 new major capital projects have been funded to improve traffic operations.

- To solve the congestion problem, SHA provides capacity and operational enhancements.

- Reconstruction of interstate highways and interchanges to minor geometric improvements at intersections.
Question?

Thank you!

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