Active Direction to Managing Transportation
ATDM: Ohio’s Perspective

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Presentation Agenda

- What is ATDM?
- Strategies
- Benefits
- Applications
- Methodology
- ODOT Context
- Next Steps
- Question and Answers

OTEC: Active Direction to Managing Transportation
DEFINITION: What is Managing Travel Demand?

Managing travel demand is about providing travelers, regardless of whether they drive alone, with travel choices, such as work location, route, time of travel and mode. In the broadest sense, “demand management is defined as providing travelers with effective choices to improve travel reliability.” *

* FHWA, 2006
TRAVEL DEMAND STRATEGIES PROVIDE: Choices

- **Mode Choice**
  - Drive alone
  - Car- and vanpool
  - Shuttle buses
  - Bike/walk

- **Location Choice**
  - Telework
  - Transit-oriented development
  - Location-efficient mortgages
  - Proximate commute

- **Time Choice**
  - Traveler info
  - Travel time prediction
  - Event scheduling
  - Flex-time

- **Route Choice**
  - Traveler info
  - Active Traffic Mgmt.
  - HOV lanes
  - Congestion pricing
A range of reasonable alternatives
(Potential ATDM Strategies)

• Hard Shoulder Running
• Contra Flow Lanes
• High Occupancy Vehicle Lanes
• Bus Only Lanes
• Priced Lanes
• TMC Improvements
• Incident Response
• Integrated Corridor Management

• Truck Only Lanes
• Speed Harmonization
• Dynamic Message Signs providing real-time traffic information
• Dynamic Route Planning
• Ramp Metering
• Dynamic Lane Assignment
• Queue Warning
Dynamically manage recurrent and non-recurrent freeway congestion

- Maximize effectiveness / efficiency
- Increase throughput and safety
- Integrated systems with new technology
- Automated dynamic deployment

**Individual Lanes**
- Dedicated Shoulder Lanes
- Dynamic Shoulder Lanes
  - All Traffic
  - HOV Dynamic Shoulder Lanes
  - Priced Dynamic Shoulder Lanes
- Bottleneck Control

**All Lanes**
- Dedicated Shoulder Lanes
- Speed Harmonization
- Queue Warning
- Dynamic Re-routing
ATDM strategies can assist in:

**Application**
- Expands capacity
- Shifts demand
- Meters traffic

**Outcome**
- Restored travel speeds
- Improved safety
- Travel time reliability
- Long term Return on Investment
Managed Lanes Projects in the U.S.
Managed Lane Benefits

User Benefits
- Time Savings
- Improved reliability
- Reduced delay
- More Choices

System Benefits
- Greater throughput
- Increased transit & carpool use
- More modal options
- Improved air quality
- Revenue generation

I-10 / Katy Freeway, Houston, TX

SR-91, Orange County, CA
Managed Lane Benefits cont’d

Maximize Transportation Investments

- Maintain capacity performance of New Facilities
- Revenue Generation to offset Costs
- Seek Logical Financial Partners
- Seek and Leverage Grant Opportunities
Applications of ATDM

I-35W (Minneapolis, MN)
- Inside shoulder was converted to a Priced Dynamic Shoulder Lane
- Utilizes variable speed limits
- MnDOT states that the facility is operating safely and more efficiently

I-66 (between Merrifield, VA and Washington D.C.)
- Outside shoulder used as a HSR
- Signs are placed strategically
- Shoulder lane is also paved with red pavement material to distinguish
- double white lines were placed to indicate areas where merging and diverging is allowed
Applications cont’d

I-110/I-10 L.A. Metro Expresslanes

- Congestion Reduction Pilot Project
- Originally a 1 year demonstration project
- Conversion of the existing HOV to HOT
- Increased speeds in the general purpose lanes

I-595 Reversible Expresslanes

- Opened March 2014
- 10 mile E.B./W.B. commute
- Utilizes a series of gate at entry
- Enhanced signage (digital and static)
ODOT’s Study Need

• Evaluate the use of Active Traffic and Demand Management and Managed Lanes Strategies

• Ohio's overall and major regional transportation networks

• MAP-21 requirements

• Streamlined solution-based methodologies

• Develop an implementation strategy, identifying potential projects for implementation
AO40 Vision Identified Six Goals

The six goals were:

1. **Preservation** – Promote cost-effective preservation of multimodal assets
2. **Mobility and Efficiency** – Reduce congestion and increase travel reliability
3. **Accessibility and Connectivity** – Increase customer access to Ohio's multimodal transportation system and improve linkages between modes
4. **Safety** – Continue to improve transportation system safety
5. **Stewardship** – Advance financial, environmental, and social objectives for transportation investments
6. **Economic Development** – Develop and operate a state transportation system that supports a competitive and thriving economy, attracts new businesses, and provides for predictable freight movements
Project Goals

1. Improve travel time reliability
2. Preserve reliable capacity in the future
3. Improve freight travel
4. Improve transit travel
5. Reduce vehicle delays
6. Financial feasibility
7. Reduce overall travel times
8. Improve person/passenger throughput
9. Reduce passenger travel time
10. Reduce overall VMT
11. Public support
12. Improvement in driving safety
Methodology: Screening Process
Study Areas

- Cincinnati
- Dayton
- Columbus
- Toledo
- Akron-Canton
- Cleveland
## Criteria Considered

<table>
<thead>
<tr>
<th>Resources</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity addition and/or resurfacing</td>
<td>ODOT TRAC/Transportation Plan</td>
</tr>
<tr>
<td>From INRIX Bottleneck Report for Ohio</td>
<td>ODOT</td>
</tr>
<tr>
<td>Congestion and Safety Lists and Databases</td>
<td>ODOT</td>
</tr>
<tr>
<td>Travel Time Reliability Index from ODOT - Top 10 per region</td>
<td>ODOT</td>
</tr>
<tr>
<td>Inside or outside shoulder width</td>
<td>ODOT Basic Road Inventory</td>
</tr>
<tr>
<td>Time savings to be worth the change in behavior or cost</td>
<td>Modeling</td>
</tr>
<tr>
<td>Commuting trips are longer rather than shorter</td>
<td>Modeling</td>
</tr>
<tr>
<td>Relatively high percentage of through trips</td>
<td>Modeling</td>
</tr>
<tr>
<td>TIMS Right-of-way, Volumes, Speed, etc.</td>
<td>ODOT</td>
</tr>
<tr>
<td>Public support appears likely</td>
<td>Surveys, Reports, Prior Project Public Meetings, News Papers,</td>
</tr>
<tr>
<td>Ratio of travel time in peak period/travel time in free-flow</td>
<td>2012 TTI Mobility Report by region</td>
</tr>
<tr>
<td>Existing/Under Constr/Planned Managed Lanes/HOT Lanes</td>
<td>FHWA</td>
</tr>
</tbody>
</table>
Screening Elements for Ohio Managed Lanes

Primary

• Travel speeds in the general purpose lanes are unacceptable to motorists, due to congestion
• Potential time savings is perceived to be worth the change in behavior or the cost
• Commuting trips are longer rather shorter
• Relatively high percentage of through trips
• New capacity being provided
• Right-of-way Available
• Public support appears likely
Modeling Process

• Modeling Tool
  – ODOT Statewide Model

• Calibration
  – Focus on corridors of interest
  – Review and update Number of Lanes, Capacity/Weave, and Free Flow Speeds
  – Calibrated to 2010 Speed Data by Direction and Time Period

• 2010 and 2040 No Build – Network and Trip Tables

• Highway assignments for AM, MD, PM and EV
Performance Measures

- Mobility measures to evaluate base and horizon year conditions.
  - Reliability
  - Vehicle Hours of Delay
  - Peak Speed
  - Vehicle Hours Travelled
  - Vehicle Miles Travelled
  - Vehicle/Person Throughput
  - Average Trip Length

\[
y = 0.0034x^2 - 0.6044x + 25.401 \\
R^2 = 0.8414
\]
Secondary Screening

• Fatal Flaws - HOVs
• “Qualitatively Quantitative”
  – Direct Impact/High Benefit
  – Ancillary or Indirect Impact/Moderate Benefit
  – No Impact/Low Benefit
• Yes or No
• Quantitative
• Corridor Congestion Considered
• Mixed Use HSR
  – Requires Dynamic Lane: Assignment and Speed Harmonization
  – Triggers Choice Lanes
Tertiary Screening

- Benefit/Cost Analysis: Monetization
- Local Government Support
- Public Support

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Economic Analysis Overview

• Quantitative —Preliminary Benefit Cost Ratio (BCR)
  – Preliminary screening process using traditional benefits
    ➢ Travel time savings (truck/auto)
    ➢ Travel time reliability (truck/auto)
    ➢ Emissions (reduced truck/auto VMT)
    ➢ Travel cost savings (reduced truck/auto VMT)
    ➢ Safety (reduced truck/auto VMT; crash reduction/increase with ATDM)
  – Make sure the strategies have BCR above 1.0

• Qualitative Rating—Potential for Wider Economic Benefits
  – Productivity/agglomeration
  – Economic competitiveness
  – Investments avoided/delayed

• Overall Ranking

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Regional Improvements

- Traffic Management Center Improvements
- Incident Response
- Integrated Corridor Management
- Dynamic Route Planning
Screening Recommendations for ATDM Strategies in Ohio
Cincinnati
Hard Shoulder Running

OTEC: Active Direction to Managing Transportation
Mobility Benefits (2040)

- Peak Reliability Travel Time Savings: 5.6 to 6 minutes
- Decreased Peak Vehicle Hours of Delay: 30% to 39% (1,220 to 1,700 Vehicle Hours)
- Annual Vehicle Hours of Delay Reduction: 18,510
- Increased Peak Vehicle Miles Travelled: 5% to 6%
- Decreased Peak Vehicle Hours Travelled: 14% to 16% (less time wasted)
Cleveland

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Hard Shoulder Running
Mobility Benefits (2040)

- Peak Reliability Travel Time Savings: 0.6 to 1.8 minutes
- Decreased Peak Vehicle Hours of Delay: 42% to 56% (210 to 350 Vehicle Hours)
- Annual Vehicle Hours of Delay Reduction: 3,870
- Increased Peak Vehicle Miles Travelled: 1% to 6%
- Decreased Peak Vehicle Hours Travelled: 10% to 12%
Columbus

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Mobility Benefits (2040)

- Peak Reliability Travel Time Savings: 5.1 to 5.7 minutes
- Decreased Peak Vehicle Hours of Delay: 33% to 45% (180 to 260 Vehicle Hours)
- Annual Vehicle Hours of Delay Reduction: 3,240
- Increased Peak Vehicle Miles Travelled: 8% to 13%
- Decreased Peak Vehicle Hours Travelled: 1% to 9%
DYNAMIC RAMP METERING

Recommendation: Incorporate into Future Projects

Akron  Dayton  Toledo
Recommendations

Hard Shoulder Running

- Cincinnati
  - I-275
- Cleveland
  - I-271
- Columbus
  - I-670
  - I-70
  - I-71

Dynamic Ramp Metering
(incorporate with planned improvements)
- All Cities

Bus on Shoulder
- Likely viable when other criteria is used
  - Existing or planned transit service
Policy Considerations

- Stakeholder Support
- Regional Consistency
- Legal
- Inter-agency Alignment
- Financial
- Phasing

OTEC: Active Direction to Managing Transportation
Policy Considerations

- Current System Situation
- Operational Needs
- Concept for ATDM System
- Operational Scenarios
- ATDM System Needs
- Implementation Plan
Concept for ATDM System

- System Architecture
- System Elements
- Operational Policies
- Operations Staff Training
- Performance Measures
Concept for ATDM System

- Normal Conditions
- Bottlenecks/Congestion
- Minor/Major Accidents
- Work Zones
- Weather Events
- Enforcement
- Failure Conditions
# ATDM System Needs

## Hard Shoulder Running

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane control signals (color)</td>
<td></td>
</tr>
<tr>
<td>Decision support system software</td>
<td></td>
</tr>
<tr>
<td>Overhead gantries spaced at ½ mile (continuous viewing)</td>
<td></td>
</tr>
<tr>
<td>Supplementary incident status and delay messages (DMS)</td>
<td></td>
</tr>
<tr>
<td>Static vehicle eligibility signs</td>
<td></td>
</tr>
<tr>
<td>Vehicle detection (all lanes including shoulders)</td>
<td></td>
</tr>
<tr>
<td>CCTV camera surveillance (full coverage)</td>
<td></td>
</tr>
<tr>
<td>ATMS software compatible with required TMC functions</td>
<td></td>
</tr>
</tbody>
</table>
## ATDM System Needs

### Speed Harmonization

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable speed limit signs (color)</td>
<td></td>
</tr>
<tr>
<td>Decision support system software (automatic</td>
<td>based on ops. rules)</td>
</tr>
<tr>
<td>Overhead gantries spaced at ½ mile</td>
<td>(continuous viewing)</td>
</tr>
<tr>
<td>Supplementary incident status and delay</td>
<td>messages (DMS)</td>
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<tr>
<td>Vehicle detection (all lanes)</td>
<td></td>
</tr>
<tr>
<td>CCTV camera surveillance (full coverage)</td>
<td></td>
</tr>
<tr>
<td>ATMS software compatible with required TMC</td>
<td>functions</td>
</tr>
<tr>
<td>Speed changes in 5 mph increments</td>
<td>(≤ 15 mph in single interval)</td>
</tr>
<tr>
<td>Speed range: 5 mph to 30 mph less than</td>
<td>speed limit</td>
</tr>
</tbody>
</table>
# ATDM System Needs

## Dynamic Ramp Metering

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp metering field hardware</td>
<td></td>
</tr>
<tr>
<td>Communications</td>
<td></td>
</tr>
<tr>
<td>Dynamic ramp metering software/firmware</td>
<td></td>
</tr>
<tr>
<td>Vehicle detection (all lanes plus on-ramps and queue detectors)</td>
<td></td>
</tr>
<tr>
<td>Static signs with regulatory information</td>
<td></td>
</tr>
<tr>
<td>CCTV camera surveillance (covering ramp queue)</td>
<td></td>
</tr>
<tr>
<td>ATMS software compatible with required TMC functions</td>
<td></td>
</tr>
</tbody>
</table>
Concept of Operations- Next Steps

- TMC Operations Review
- Operations Workshops
- System Requirements
- O&M Staffing Requirements
- Public Education & Outreach
- ConOps
Develop Concept of Operations

HOW: will the system operate (TMC requirements),
WHO: will operate and maintain the system,
WHAT: elements will the system incorporate,
WHEN: will the system operate, and
WHERE: will the system be in operation

- Operational policies and constraints
- ITS Systems Functionalities
- TMC Operations
- Performance Measures and Monitoring (Travel Time Reliability, Optimizing Person Throughput)
- Operational Scenarios
- Enforcement
QUESTIONS?

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Teaming Partners

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