IntelliDrive<sup>SM</sup> for the Environment: Environmental Impacts and Mobility Impacts

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IntelliDrive is a service mark of the U.S. Department of Transportation.
• 2.9 billion gallons of wasted fuel each year => 3 weeks worth of gas for every traveler
• Transportation accounts for approximately 28% of US greenhouse (GHG) emissions
• Vehicles represent nearly 80% of the CO₂ emissions
AERIS Vision and Objectives

Vision
• Transform environmental management of the transportation system by facilitating green choices by transportation system users and operators

Objectives
• Support generation, capture, standardization, and use of real-time data from connected travelers (e.g., pedestrians, bicyclists, transit passengers), vehicles (light vehicles, transit, freight) and infrastructure
• Leverage existing research to determine most effective use of Intelligent Transportation Systems (ITS) to reduce negative environmental impacts
• Assess whether further investment is justified for addressing future, long-range efforts to conserve energy, address air quality issues, and mitigate other environmental impacts
USDOT’s IntelliDrive AERIS Program Research Focus

• Improve air quality, and reduce greenhouse gas (GHG) emissions and fuel consumption

US-EU Sustainability Working Group Research Focus

• Reduce negative environmental impacts, improve mobility benefits, and enhance societal benefits
ITS Strategies Can Reduce Environmental Impacts

- Traffic Signal Coordination
  - Emissions reduced by up to 22% (National Traffic Signal Report Card)
- Ramp Metering
  - Emissions decreased by 3-8% on typical day and 2-3% on high demand day (Minneapolis, MN)
- Speed Management
  - NOx emissions reduced by 17% by reducing speed limit from 65 mph to 55 mph on Ozone Action Days (Austin, TX)
- Incident Management
  - Saved 5 million gallons of fuel by reducing incident duration by 28% (CHART, MD)
- Transit Signal Priority
  - Fuel consumption reduced by 2% to 19%, and bus emissions by up to 30% (Arlington, VA; Eastleigh, England; Helsinki, Finland)
ITS Strategies Can Reduce Environmental Impacts (cont.)

• Electronic Toll Collection
  – Emissions reduced by more than 16% at plazas with electronic toll systems (Baltimore, MD)

• Low Emissions Zone
  – 13% reduction in NOₓ and 15% reduction in PM (London Congestion Charging Zone, 2002 vs. 2003)
  – 30% reduction in PM emissions (Milan Access Control Scheme)

• Green Enhanced Navigation
  – 8% reduction in fuel consumption by using fuel-optimized route

• Advanced Driving Alert System (ADAS) for “Time-to-Red” (TTR)
  – 12-14% reduction in fuel consumption (CA)

• Adaptive Cruise Control (ACC)
  – 10% reduction in fuel consumption (Southeast Michigan)
Reducing Emissions by Improving Operations

• Improve flow of vehicles (cars, trucks, buses, trains) to minimize emissions
  – Minimize accelerations (specially hard accelerations)
  – Maximize optimal speeds (varies by emission)
• Meet travel demand through lower emission modes
  – Enhance transit, bike and pedestrian attractiveness to increase mode share
  – Enhance economic competitiveness of rail over truck travel
• Make full use of engine diagnostics and information to minimize vehicle emission rates under full range of operating conditions
• Reduce the amount of travel by fossil fueled vehicles
Environmental Data Supports Transformative Applications

Data Capture and Management

- Vehicle Status Data
- Infrastructure Status Data
- Weather Data
- Truck Data
- Transit Data
- Location Data

Environmental Applications

- Transit Signal Priority
- Real-Time Travel Info
- "Green" Routes
- "Green" Fleet Management
- Eco-driving
- Signal Phase & Timing Adjusts Real-Time Conditions
- Low Emission ZONE
Convergence/Divergence: Mobility and Environment

• AERIS must discover where Mobility and Environment can work together, and where they diverge, and this workshop audience can help.
• The DMA program and breakouts focus on apps/scenarios that provide maximum mobility benefits, and which might also benefit environment.
• The AERIS program must focus on apps/scenarios that provide maximum environmental benefits, even if reduced mobility is a result.
• AERIS will quantify the environmental benefits from apps/scenarios derived to help mobility (from DMA) as well as to help environment (from AERIS).
• This research will provide authoritative information on these benefits so that tradeoffs between mobility and environmental benefits can be understood.
Improving mobility doesn’t always imply increased emissions or fuel consumption

– Most applications prioritized at the previous breakout session can likely reduce emissions and fuel consumption (e.g., transit signal priority or drayage optimization)

BUT, emissions and fuel consumption can also be reduced by strategies that can negatively impact mobility or productivity:

– Charging motorists a fee to enter a restricted zone can severely impact mobility (London, Milan)
– Restricting heavy vehicles entry into the city center can reduce productivity (Prague)
– Dynamic route guidance based on fuel optimization may not be the best alternative for individual mobility
Convergence/Divergence: Mobility and Environment

• Assuming that AERIS finds that tradeoffs between mobility and environmental benefits are likely, the research must determine:
  – For what apps/scenarios do these occur, and with what impacts?
  – If the mobility and environment are in conflict, how can we balance?
  – What techniques might be used to manage the tradeoffs?
  – Must the tradeoffs be managed all the time, or just in certain situations?
  – What are the minimum thresholds that must be met for BOTH the environment and mobility in order for an app/scenario to be acceptable for deployment? (and system-wide or individual person?)
  – How can AERIS best model and evaluate these?
  – How can the environmental and mobility communities work together?
**Applications for the Environment: Real-Time Information Synthesis (AERIS) High-Level Roadmap**

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**Do the applications/strategies show enough environmental benefits to warrant further investment? Are the stakeholders engaged?**

**Do the benefit/cost analyses indicate need for continued research?**

**Legend:**
- Decision point
- Coordination with FHWA/FTA/FMCSA/NHTSA Research
- Coordination with Data Capture and Management and Dynamic Mobility Applications programs
- Resource from Data Capture and Management program

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Next Steps

• AERIS has just awarded seven (7) projects from the Broad Agency Announcement, with objectives to:
  – Foster innovative research on ITS applications that improve environmental performance
  – Promote capture and management of real-time data that are relevant to environmental applications development and performance measurement
  – Support development and enhancement of evaluation techniques, performance measurement, and technologies to capture environmentally-relevant data

• AERIS will also identify and assess applications and strategies that reduce negative environmental impacts
Questions?

• Thank you