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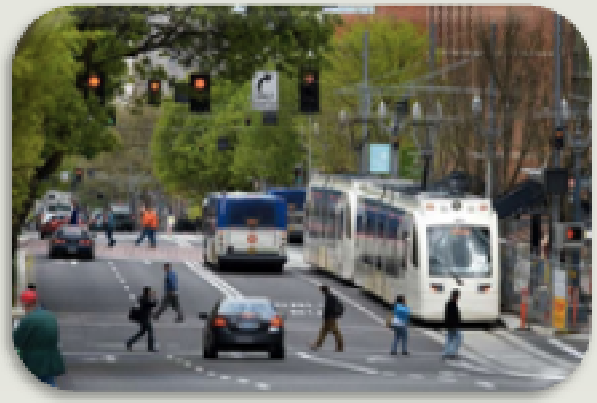

TrafficQuest

Masterclass on the Future of Traffic Management
Noordwijk aan Zee, the Netherlands
16 July 2013

# The Future of Traffic Management in the USA

R.L. Bertini
Portland State University
bertini@pdx.edu

# State of Traffic Management

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# Big Picture Funding

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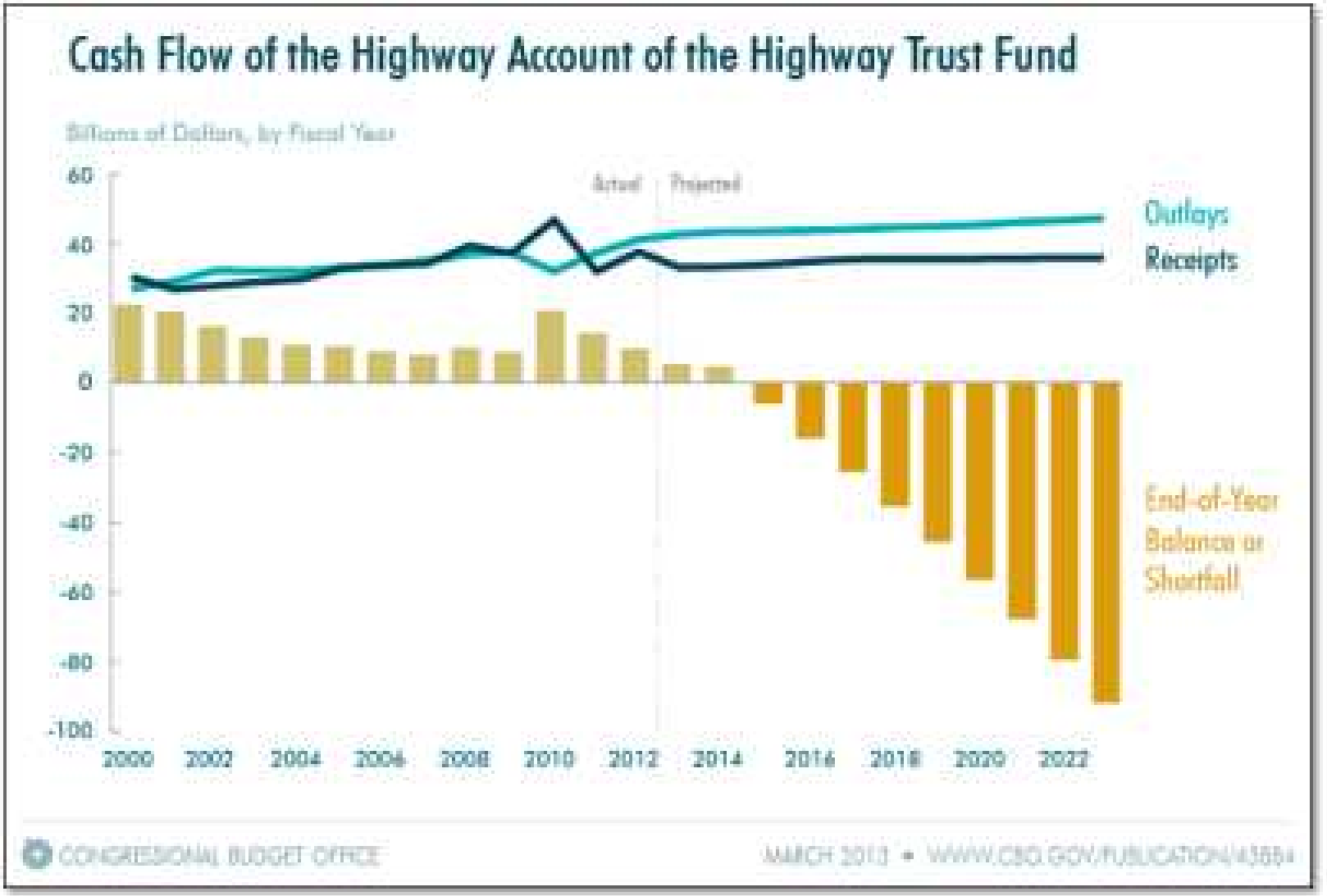
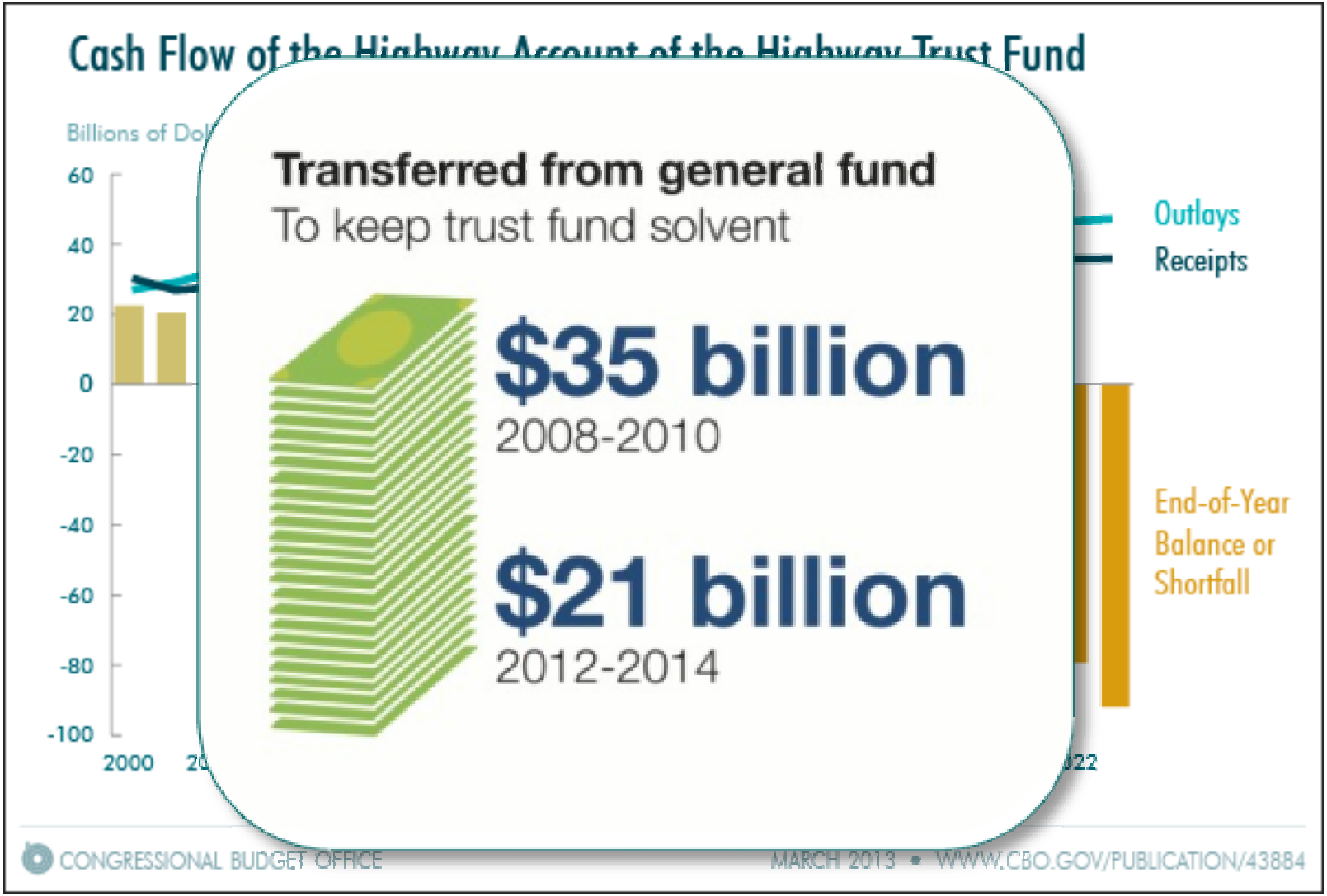


# Big Picture Funding



# Big Picture VMT

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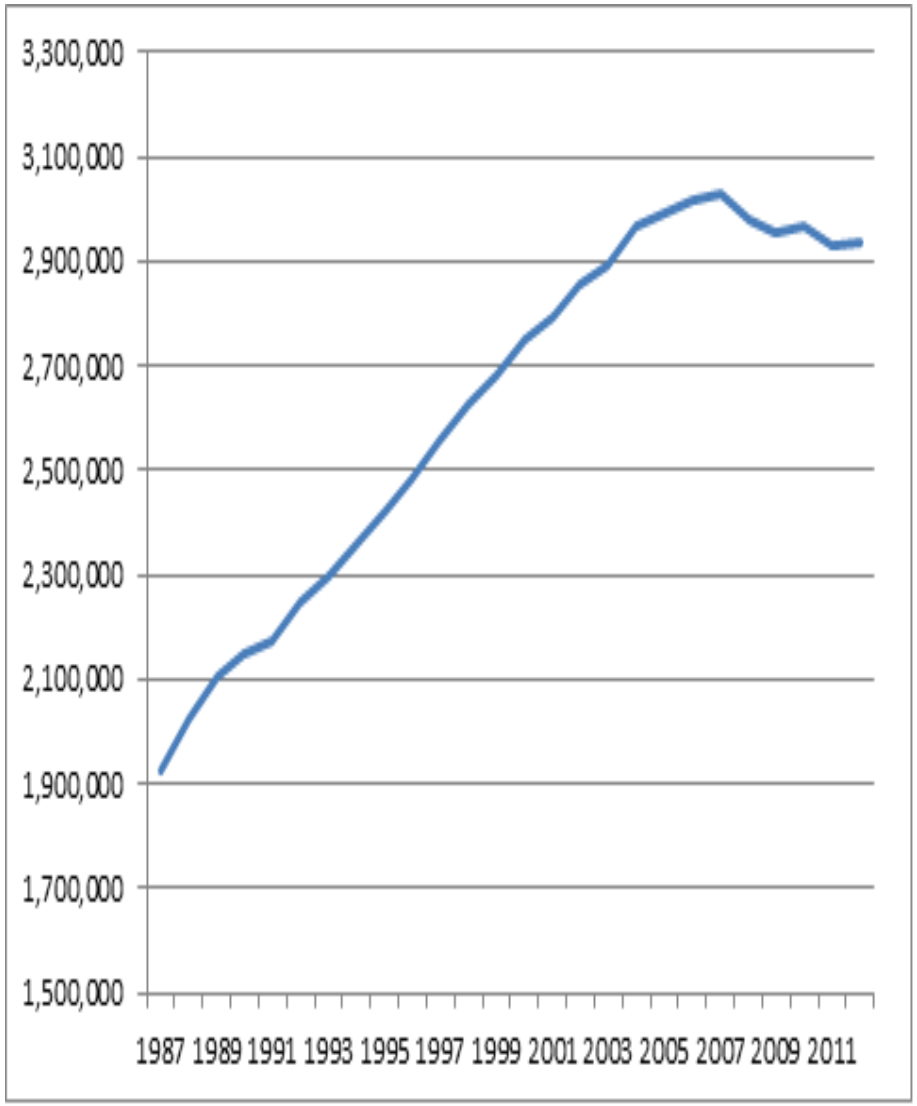
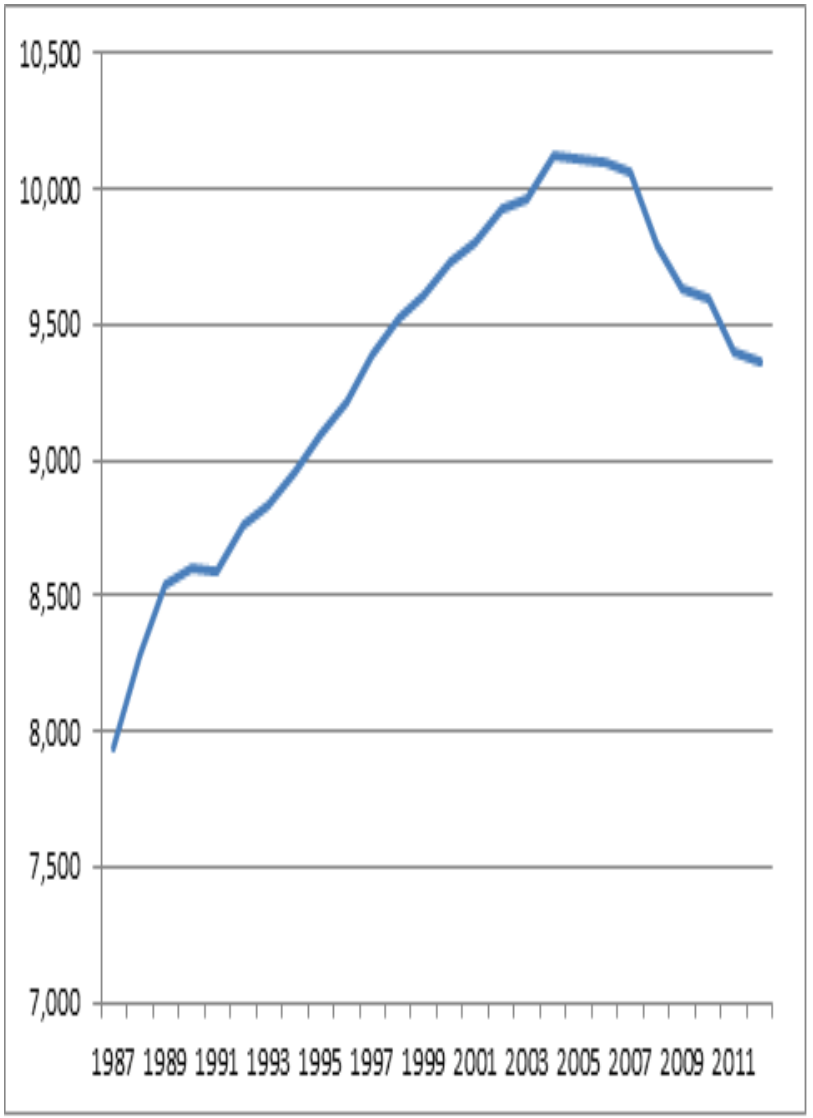
## Total VMT




## VMT Per Capita



# Big Picture Safety

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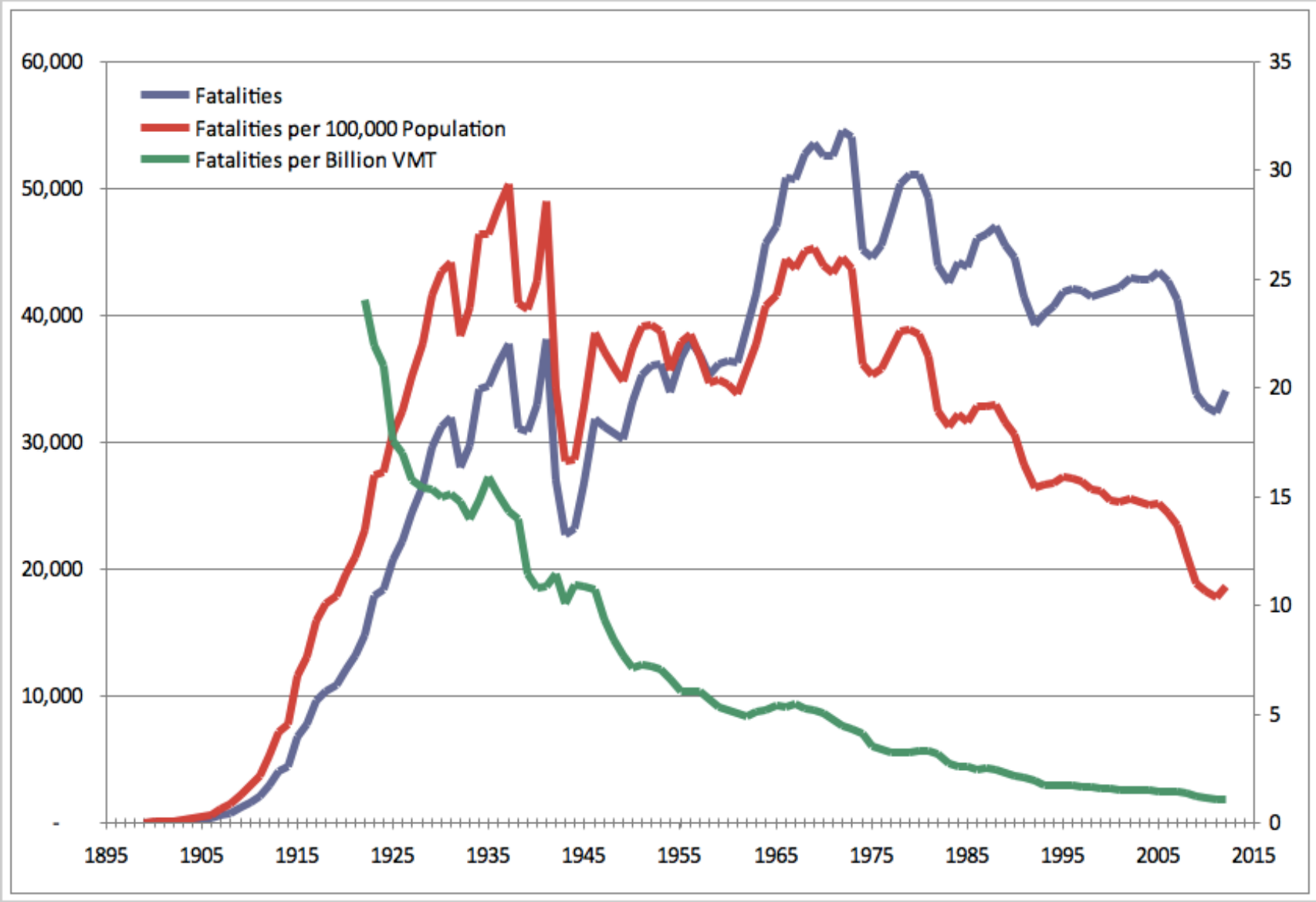
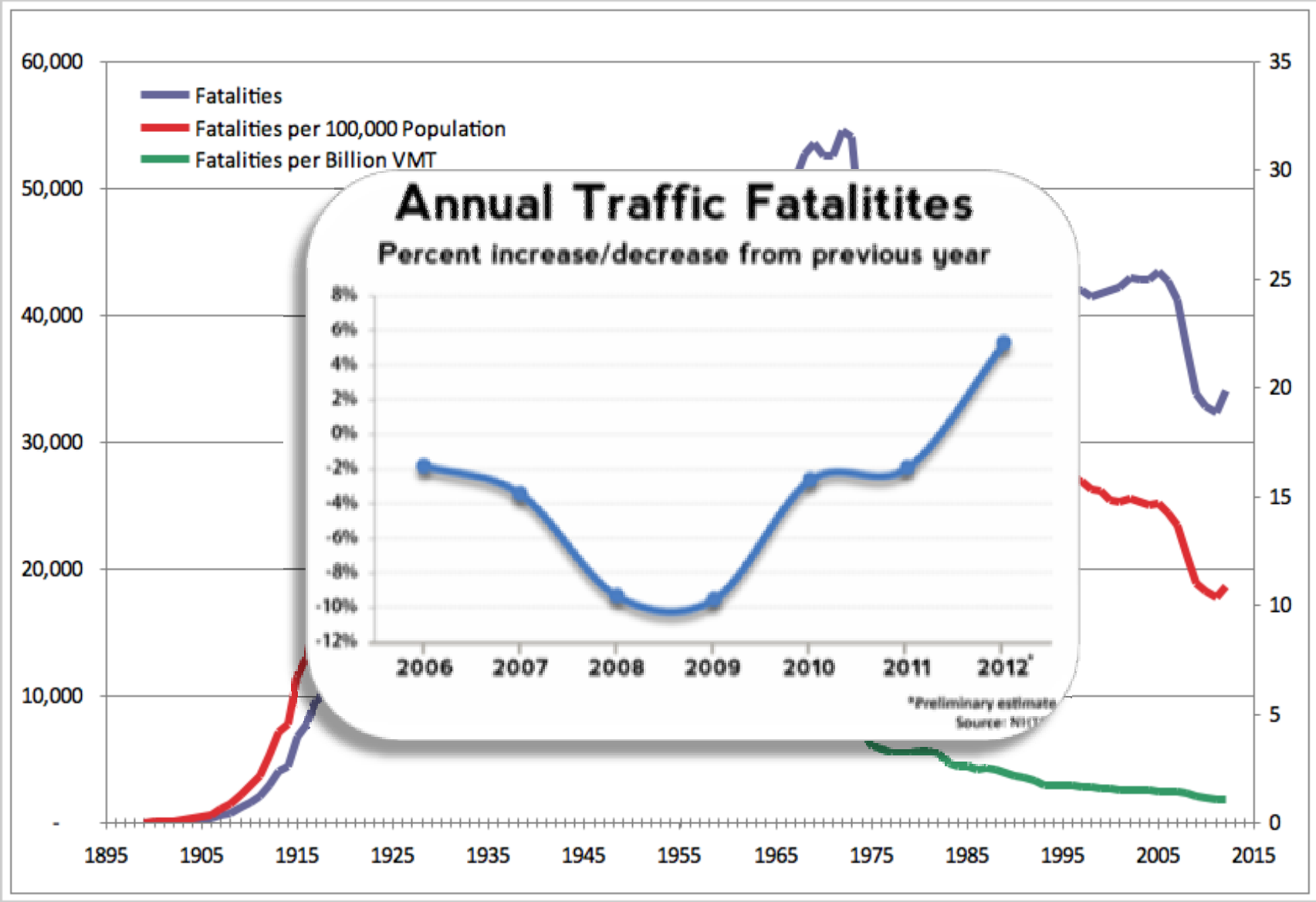


# Big Picture Safety

Portland State UNIVERSITY



# Secretary Foxx's Priorities

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- **Safety**: ensure that our transportation system is the safest in the world.
- **Efficiency and Performance**: boost productivity through better use of technology, data, economic analysis and private sector innovation.
- **Infrastructure**: meet the needs of the next generation, ensure global competitiveness by investing in robust, multimodal transportation system, stronger national freight network and key innovations like NextGen and advanced road and rail technology.
- **Also:** investments and policies that promote opportunity, enhance quality of life, promote environmental sustainability and reduce dependence on foreign oil.

# Evolution of U.S. Policies

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| Congressional Legislation | Dates and Mission |
|---|---|
| Intermodal Surface Transportation Efficiency Act (**ISTEA**) | 1991–1997 (extended to July 1998)<br>▪ Research and Development<br>▪ Operational Tests<br>▪ Technical assistance including architecture and standards |
| Transportation Equity Act for the 21st Century (**TEA-21**) | 1998–2003 (extended to August 2005)<br>▪ Policy and Institutional Challenges to Deployment<br>▪ ITS Deployment Program (Congressionally designated)<br>▪ Model Deployment Initiatives |
| Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (**SAFETEA-LU**) | 2005–2009 (extended to March 31, 2012)<br>▪ Research<br>▪ Mainstreaming ITS |
| Moving Ahead for Progress in the 21st Century (**MAP-21)** | 2012-2014 |

# MAP-21 Performance Measures

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Establishes national goals in seven areas (2 year bill):

- Safety
- Infrastructure Condition
- Congestion Reduction
- System Reliability
- Freight Movement and Economic Vitality
- Environmental Sustainability
- Reduced Project Delivery Delays.


# Deployed Technologies

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- CCTV Cameras
- Traveler Information
  - DMS ~90% of freeways
  - Social Networking 40%
  - HAR 60%
  - Subscription 35%
  - Web 90%
  - Email 50%
  - Phone 20%
  - 511 70%
- Electronic Toll Collection
- Ramp Control
- Sensors/Loops
- Automated Enforcement
- Lane Management
- Archived Data
- Probe Vehicles

# ITS By the Numbers

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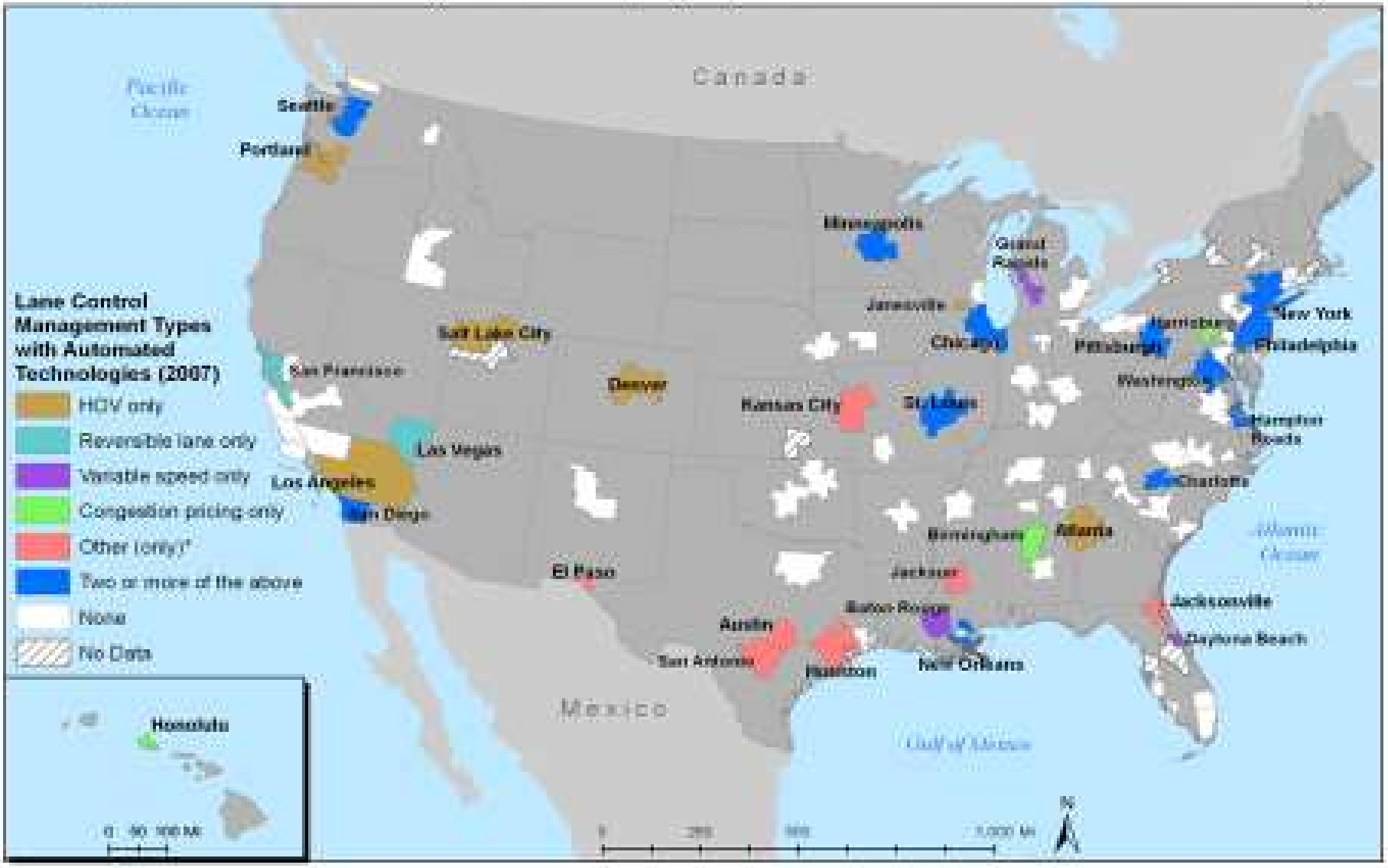
| | |
|---|---|
| Years: | **20**+ |
| Funding: | $**3**B federal + $**18**B by **75** top metro areas |
| Market: | $**48**B ITS end-use products and servivces |
| Federal Programs: | **3** (ISTEA, TEA21, SAFETEA-LU) |
| Electronic Toll Collection: | **99**% of plazas/**94**% of lanes |
| Transit Automatic Vehicle Location: | **77**% of **117** fixed route bus agencies |
| Transit Smart Cards: | **16,00**0+ buses/**451** rail stations |
| Commercial Vehicle Electronic Screening: | **40** states/**360** weigh stations/**70,000** companies/**500,000** trucks |
| Professional Capacity Building: | **2,500** participants in 2010 |
| Standards Participation: | **106** published since 1995 |
| Traffic Management Centers: | **266** |
| Freeway Miles Under Surveillance: | **7,70**0 roadside/**4,500** probe vehicles/**54**% of freeways in **75** metropolitan areas |
| Arterial Miles Under Surveillance: | **2,500** roadside/**1,700** probe vehicles/**50**% of intersections in **75** metropolitan areas |
| 511 Coverage: | All or part of **38** states (**70**% of population) |
| Dynamic Message Signs: | **4,200**/**109** freeway management agencies post information/**36** of **40** metro areas post travel times |

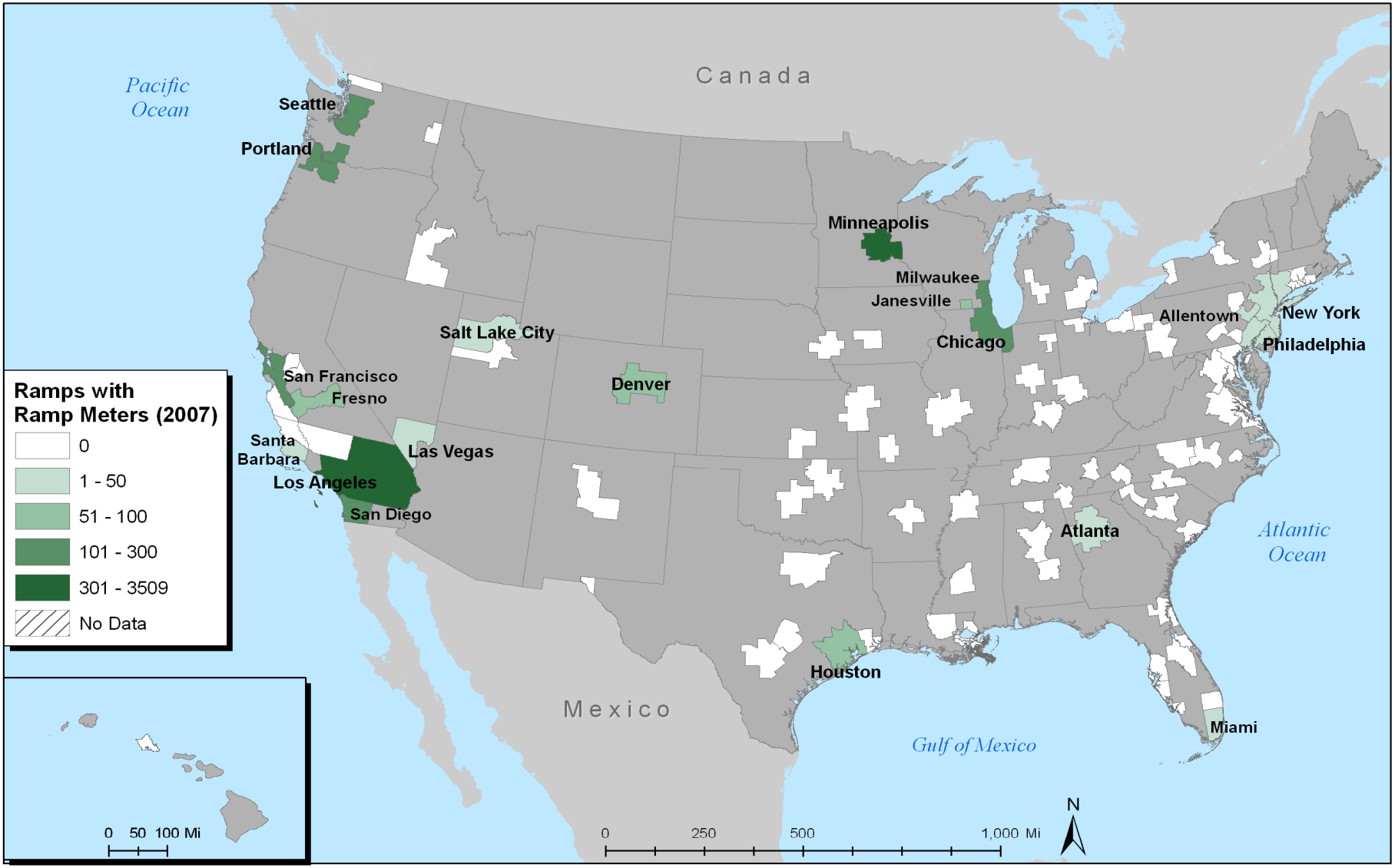
# Metropolitan Areas with Agencies Employing Automated Lane Control Technologies




* Other (only) indicates the presence of freeway lanes equipped with: (a) lane management measures such as reversible flow lanes and lane control management to support emergency evacuations or (b) lane control signs, supported by surveillance and detection technologies, to allow the temporary closure of lanes.

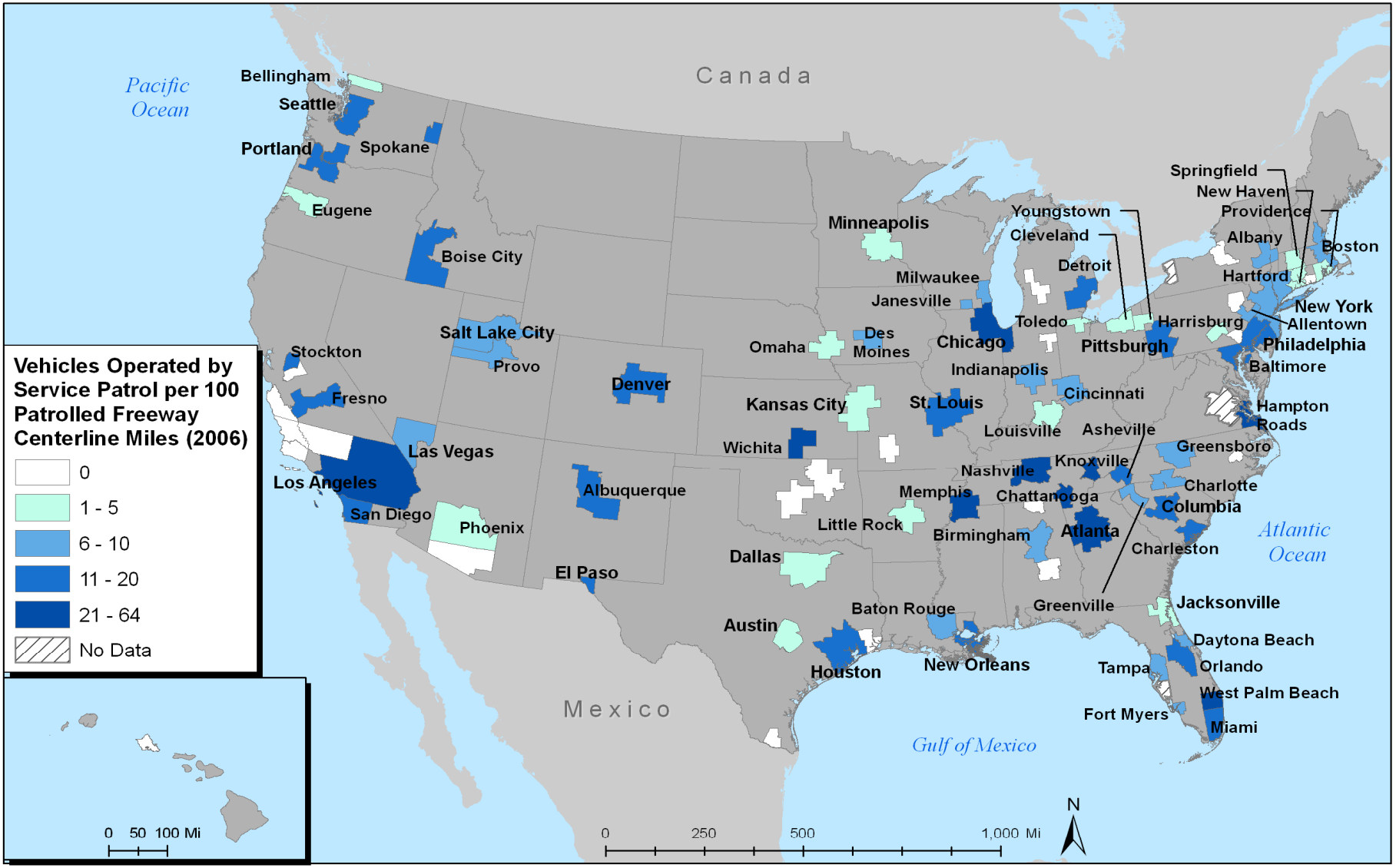
Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

# Freeway Ramps with Ramp Meters Operated by Agencies in Metropolitan Areas



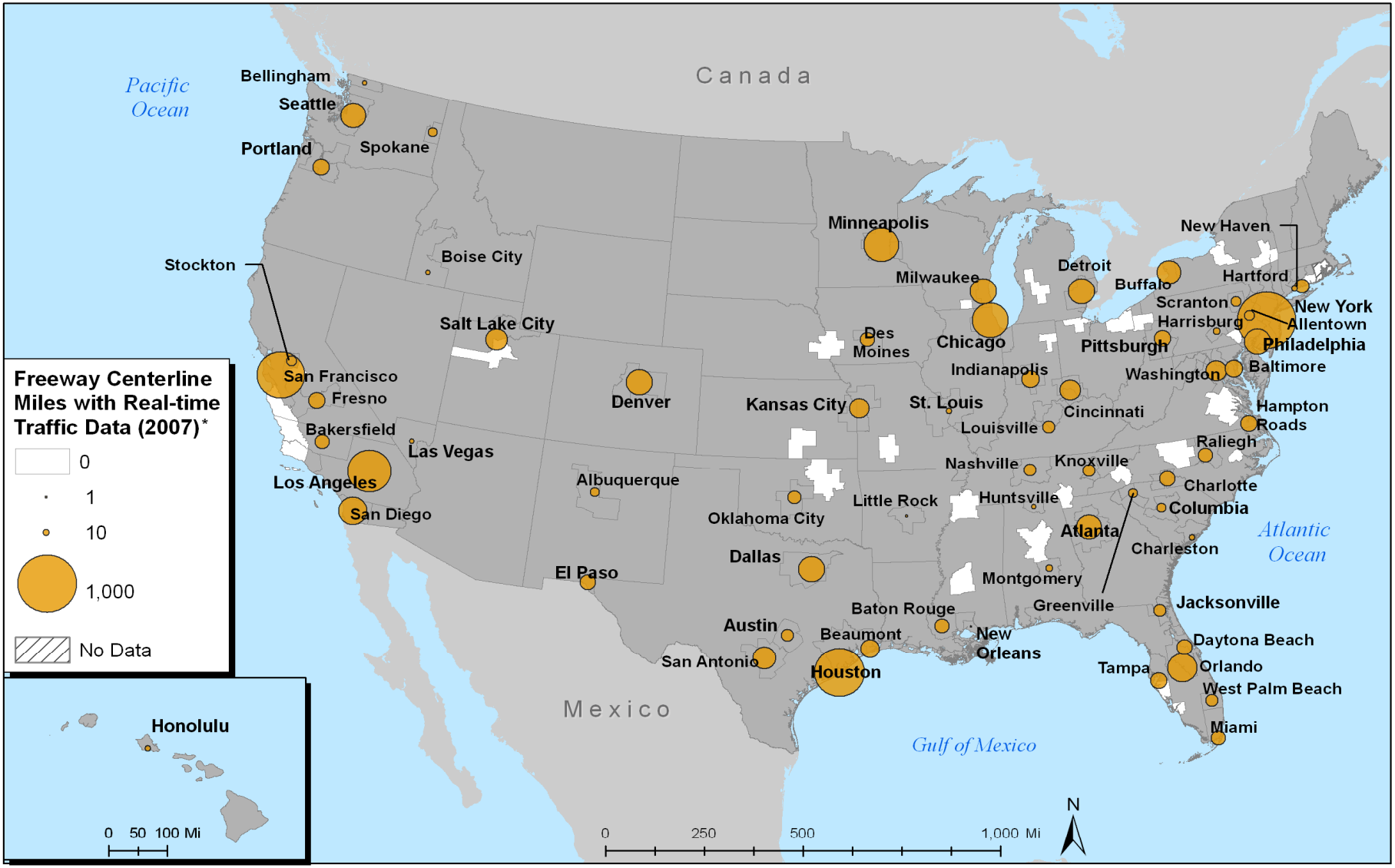

Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

# Service Patrols per 100 Freeway Centerline Miles by Metropolitan Area




Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

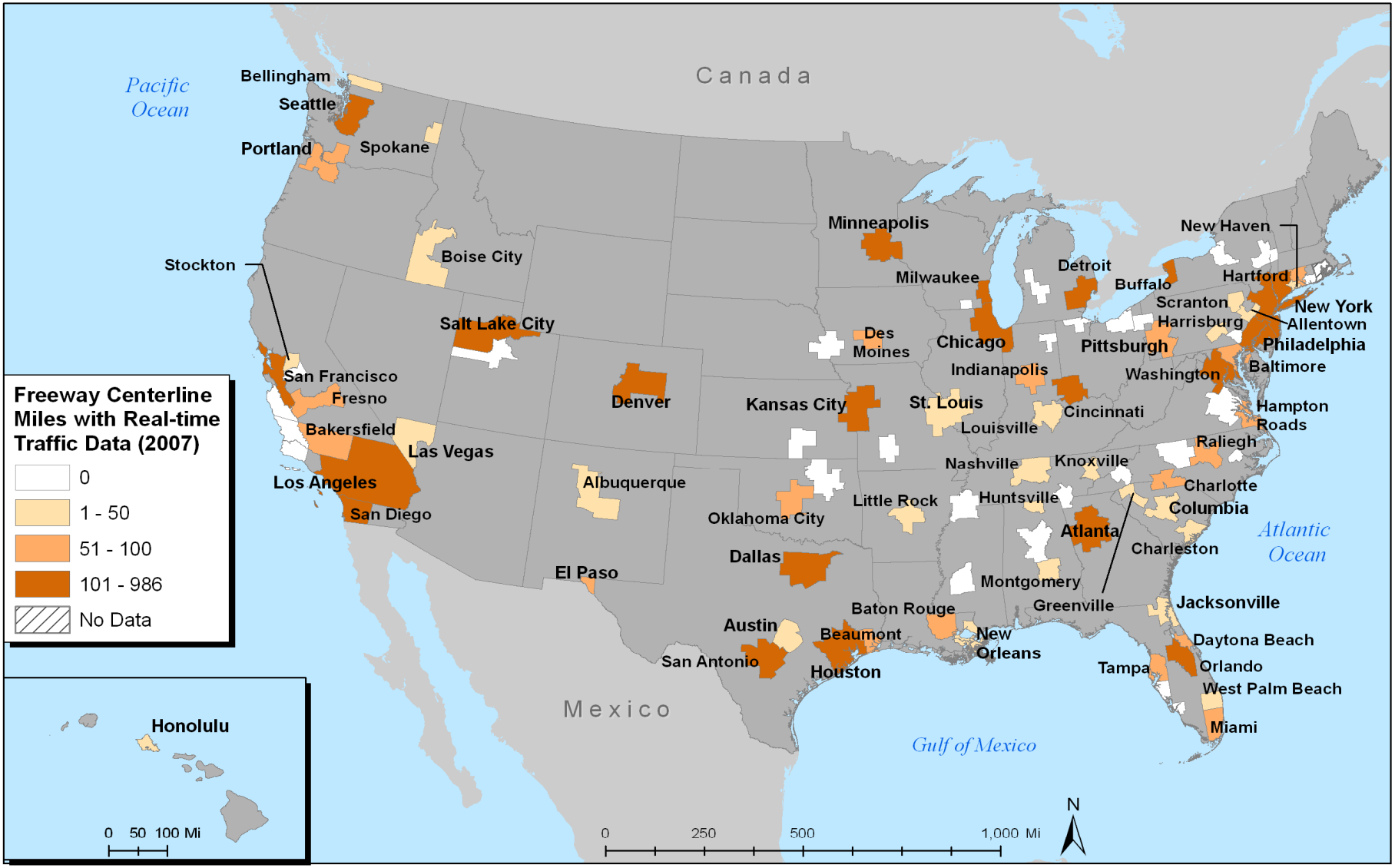
# Freeway Centerline Miles with Real-Time Data Collection Technologies by Metropolitan Area




* Does not include CCTV

Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

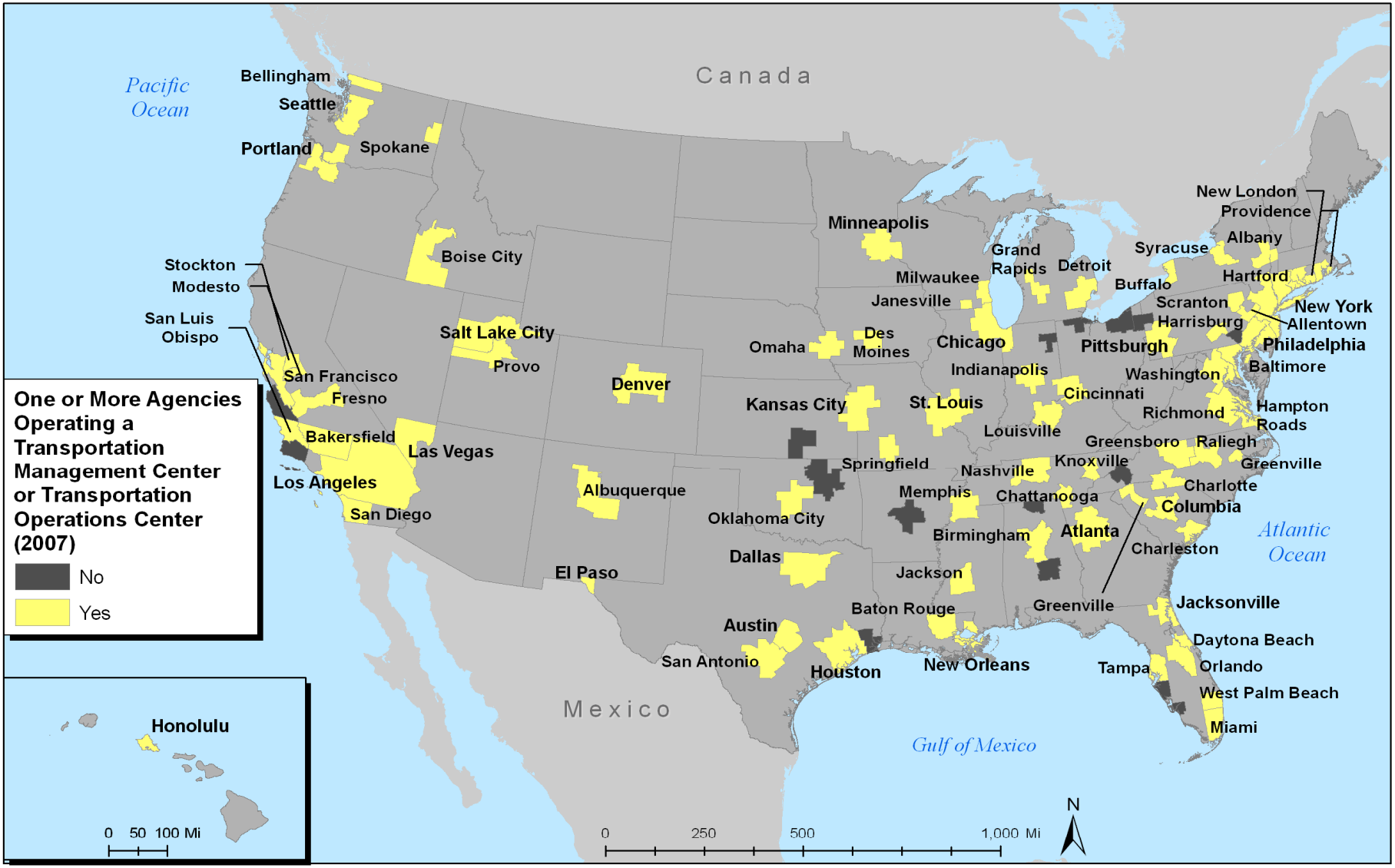
# Freeway Centerline Miles with Real-Time Data Collection Technologies by Metropolitan Area




* Does not include CCTV

Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

# Metropolitan Areas with a Transportation Management or Transportation Operations Center




Source: US Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Intelligent Transportation Systems Deployment Survey, 2007

# Active Traffic and Demand Management

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- Dynamic management, control & influence of travel & traffic demand and traffic flow on transportation facilities.
- Traffic flow managed and traveler behavior influenced in real-time to achieve operational objectives:, preventing or delaying breakdown, improving safety, promoting sustainable travel modes, reducing emissions, or maximizing system efficiency.
- Transportation system is continuously monitored.
- Using archived data and or/predictive methods, actions performed in real-time to achieve or maintain system performance.


| Active Demand Management | Active Traffic Management | Active Parking Management |
|---|---|---|
| Dynamic Ridesharing | Dynamic Lane Use/Shoulder Control | Dynamically Priced Parking |
| On-Demand Transit | Dynamic Speed Limits | Dynamic Parking Reservation |
| Dynamic Pricing | Queue Warning | Dynamic Way-Finding |
| Predictive Traveler Information | Adaptive Ramp Metering | Dynamic Parking Capacity |

# Active Traffic Management

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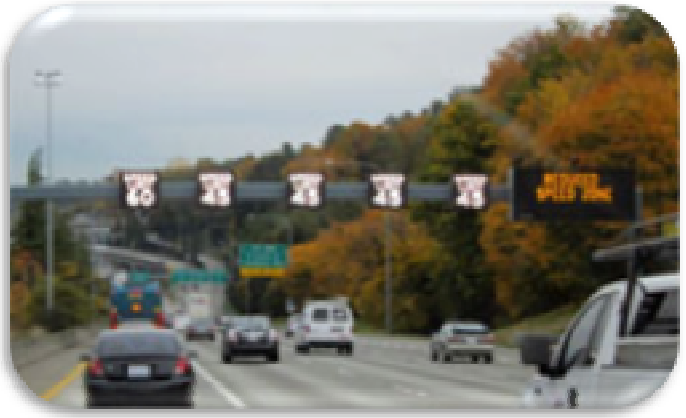
- **Dynamic lane use/shoulder control**: dynamic opening of shoulder lane or dynamic closure of travel lanes in response to increasing congestion or incidents.
- **Dynamic speed limits**: dynamic change in speed limits based on road, traffic & weather conditions.
- **Queue warning:** dynamic display of warnings to alert drivers of congestion & queues ahead.
- **Adaptive ramp metering**: dynamic adjustment of ramp signals to proactively manage vehicle inflow.
- **Dynamic rerouting**: dynamic alternate route information in response to bottlenecks/incidents.
- **Dynamic junction control**: lane access based on traffic present and merging/diverging traffic to give priority to facility with higher volume to minimize impact of merging/diverging movement.
- **Adaptive traffic signal control**: optimization of signal timing plans based on prevailing conditions to increase throughput along an arterial.



# Active Traffic Management

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# Integrated Corridor Management

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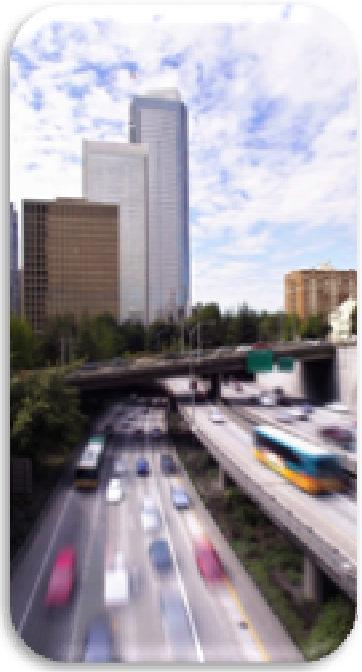


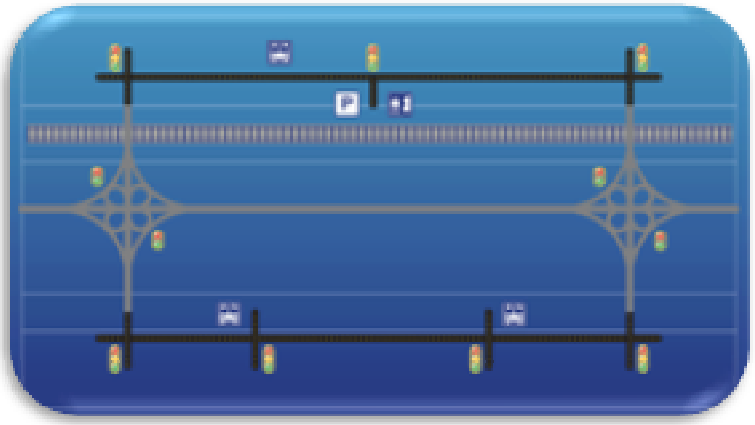

- Integrated management of freeway, arterial, transit, and parking systems within a corridor
- Management of corridor as a system, rather than more traditional approach of managing individual assets
- Increase multi-agency collaboration and coordination for overall corridor management
- Coordinate incident management
- Coordinate operations for planned and special events
- Optimize corridor mobility by promoting shifts in departure time, mode, and routes
- Manage demand

# Supporting ITS Technologies

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- HOT lanes/congestion pricing
- Transit signal priority
- Multimodal traveler information/actionable traveler information
- Real-time traffic signal coordination, timing, and control
- Adaptive ramp metering
- Integrated electronic payment


# Eight U.S. DOT ICM Pioneer Sites

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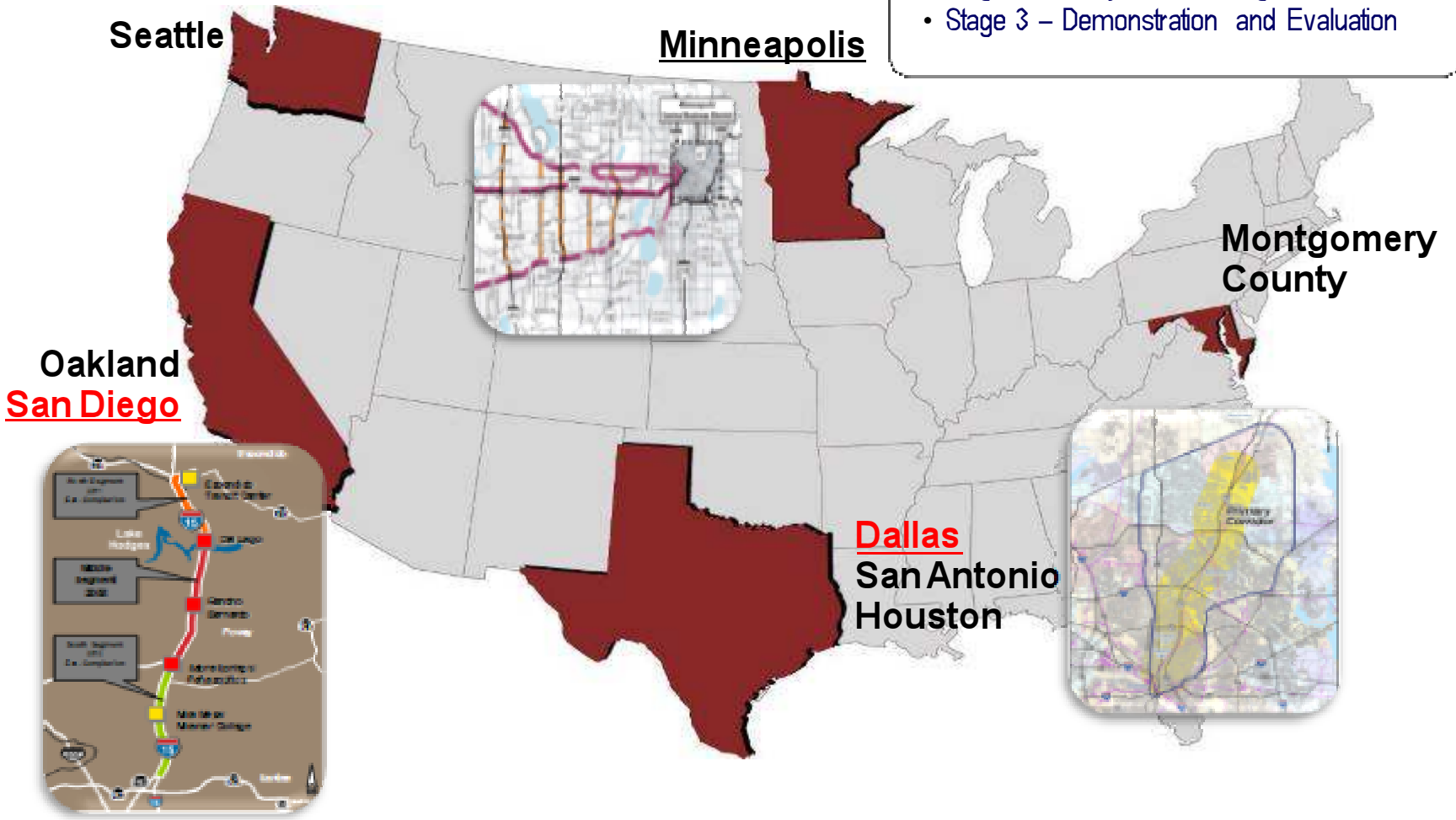
**3 Stages for the Pioneer Sites:**

- Stage 1 – Concept of Operations, Sample Data, and Requirements
- Stage 2 – Analysis, Modeling, and Simulation
- Stage 3 – Demonstration and Evaluation



# EDC Project Delivery Opportunities

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Planning → NEPA → ROW / Utilities → Design / **Construction**

- Warm Mix Asphalt
- Prefabricated Bridge Elements & Systems
- Geosynthetic Reinforced Soil
- Safety Edge
- Adaptive Signal Control

innovation · ingenuity · invention · imagination · Every Day Counts

# SHRP 2 Implementation

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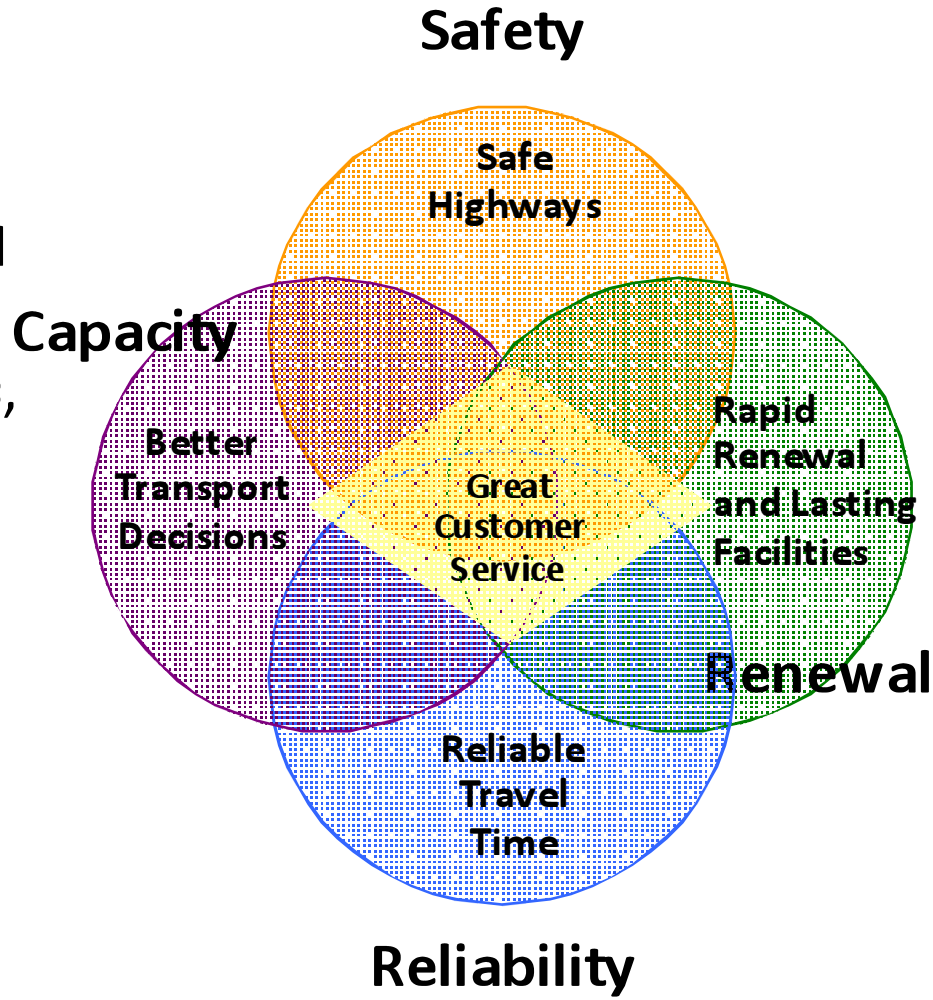
- Strategic Highway Research Program 1987-1992
  - $150 million paid by states contributing 0.25% of federal aid highway funds
  - Asphalt, concrete and structures, highway operations, pavement performance
- Strategic Highway Research Program 2
  - Research authorized to 2009
  - Implementation through 2015
- Authorized $232.5 million
- Administered by TRB under cooperative agreement with FHWA




SHRP2 STRATEGIC HIGHWAY RESEARCH PROGRAM

www.trb.org/shrp2

# Vision for Connected Future

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- Multi-modal surface transportation system—connectivity as its core.
- Vehicles (cars, trucks, buses, fleets of all kinds) ←→ Drivers and operators ←→ Infrastructure ←→ Mobile Devices
- Leverage technology to maximize safety, mobility and the environment—enabled through wireless communications—in all modes.
- First priority is safety: crash and injury prevention (80% of crash scenarios).

# Connected Vehicles and Travelers

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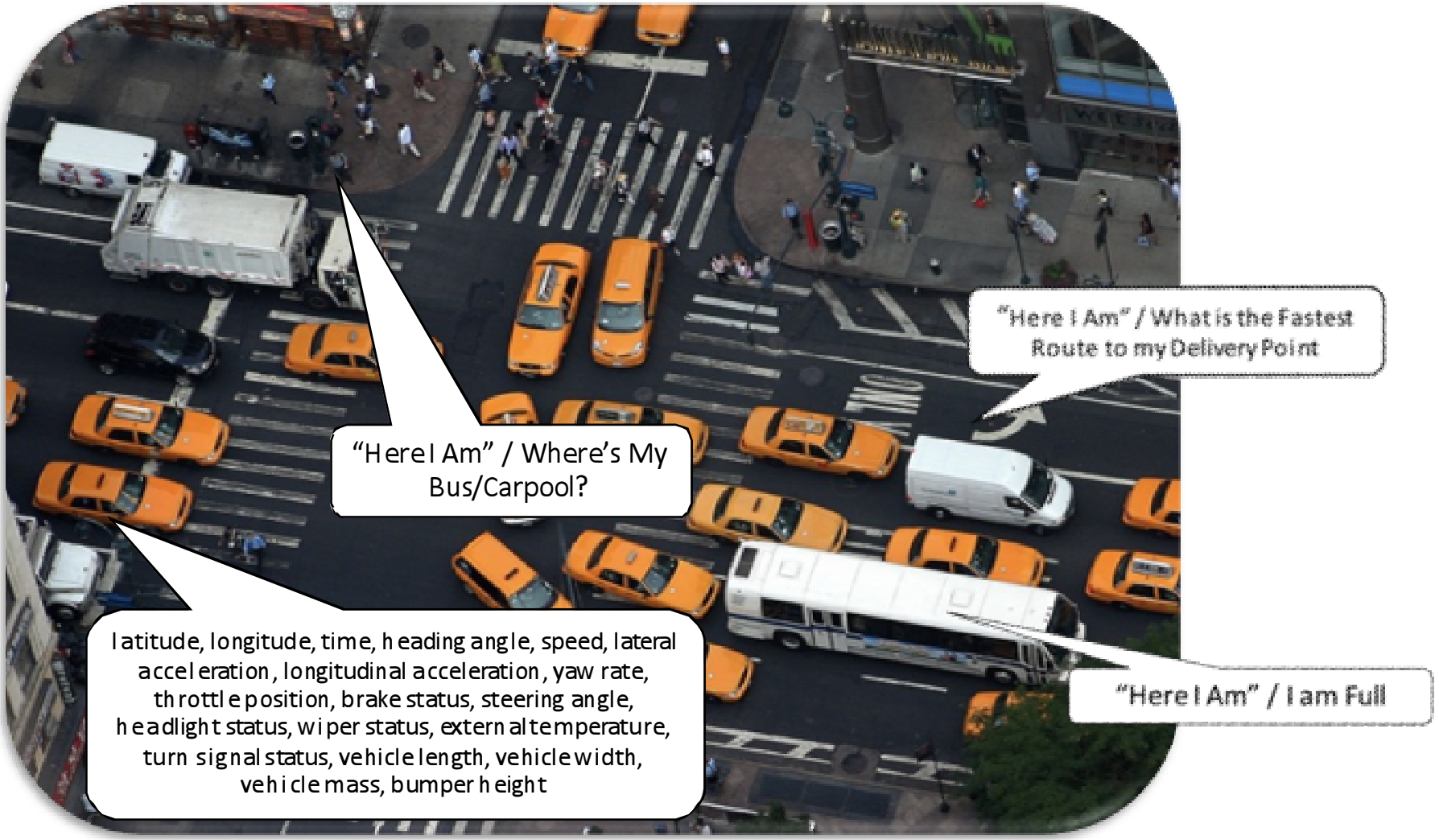

# Basic Safety Message

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SAE J2735 Basic Safety Message


| Major Attributes |
| --- |
| Temporary ID |
| Time |
| Latitude |
| Longitude |
| Elevation |
| Speed |
| Heading |
| Acceleration |
| Brake System Status |
| Vehicle Size |

# Data Sources and Uses

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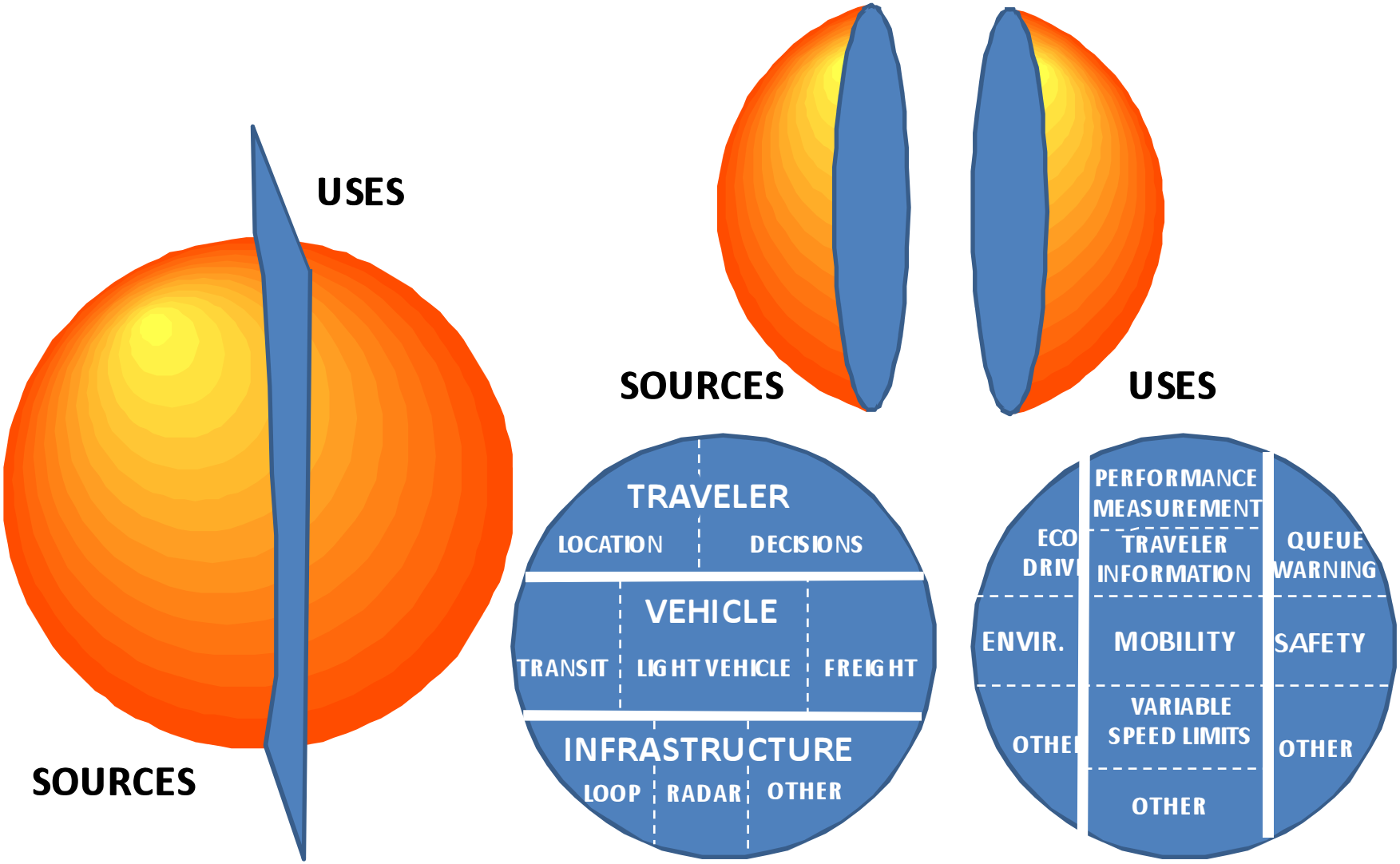

# Data Environment Evolution

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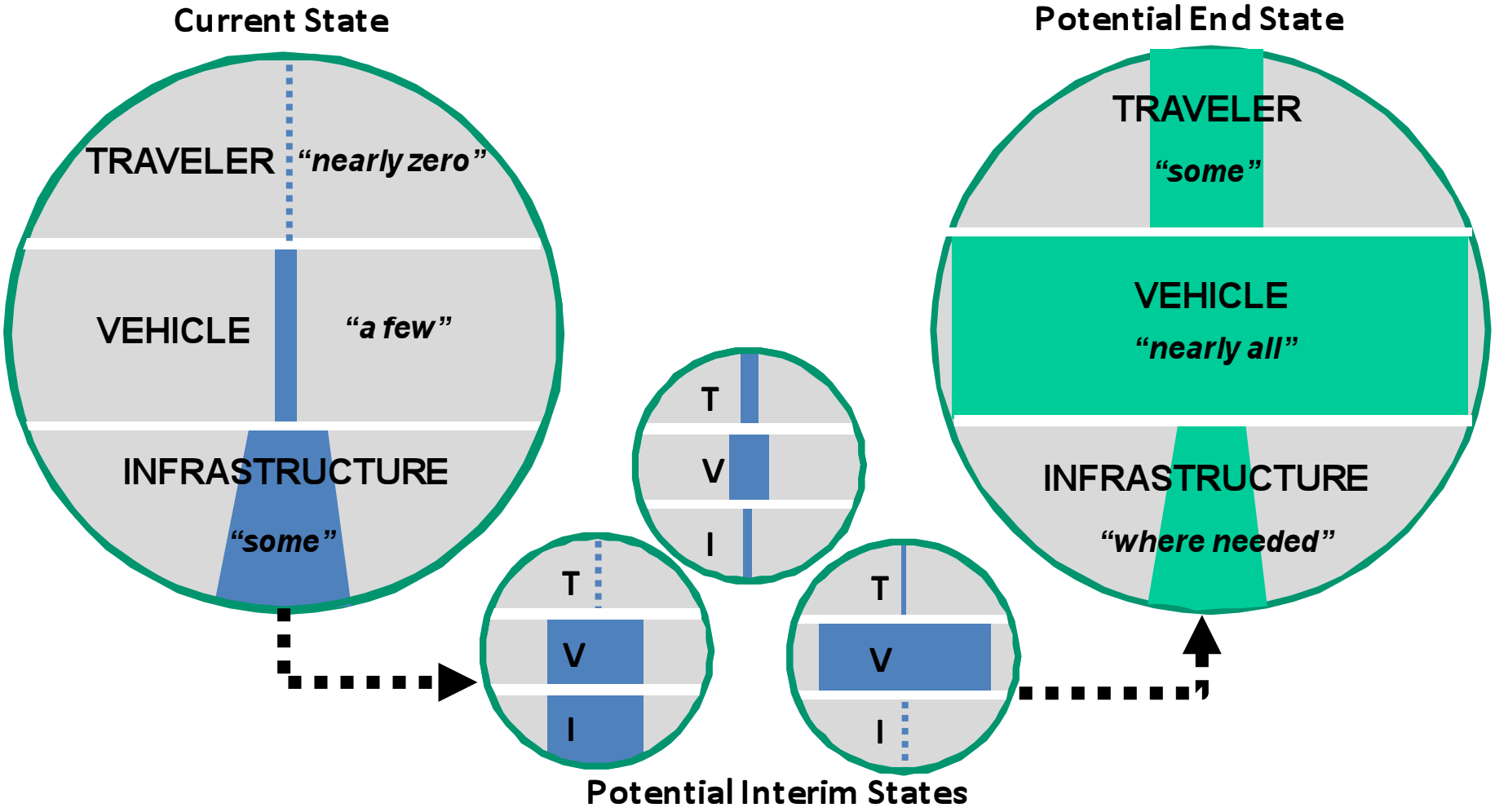

# Mobility Program

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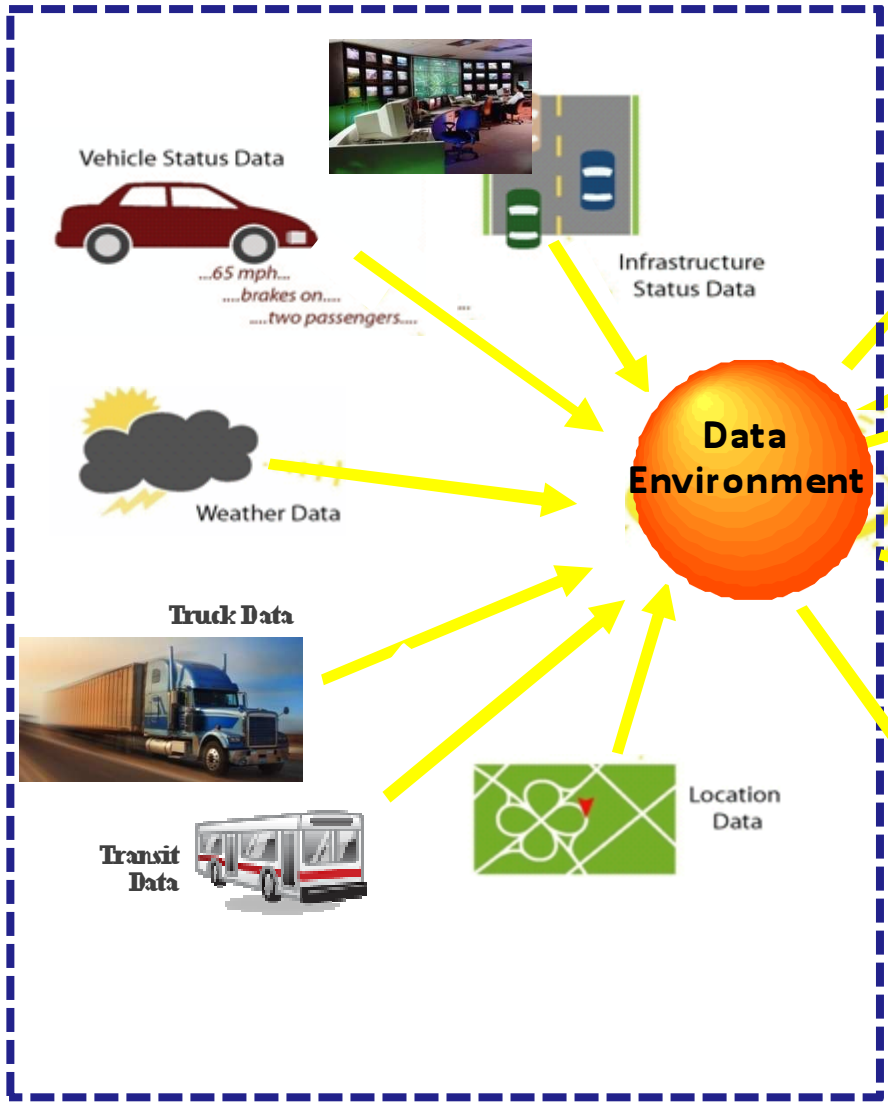
## Real-time Data Capture and Management




## Mobility Applications

# High Priority Mobility Applications

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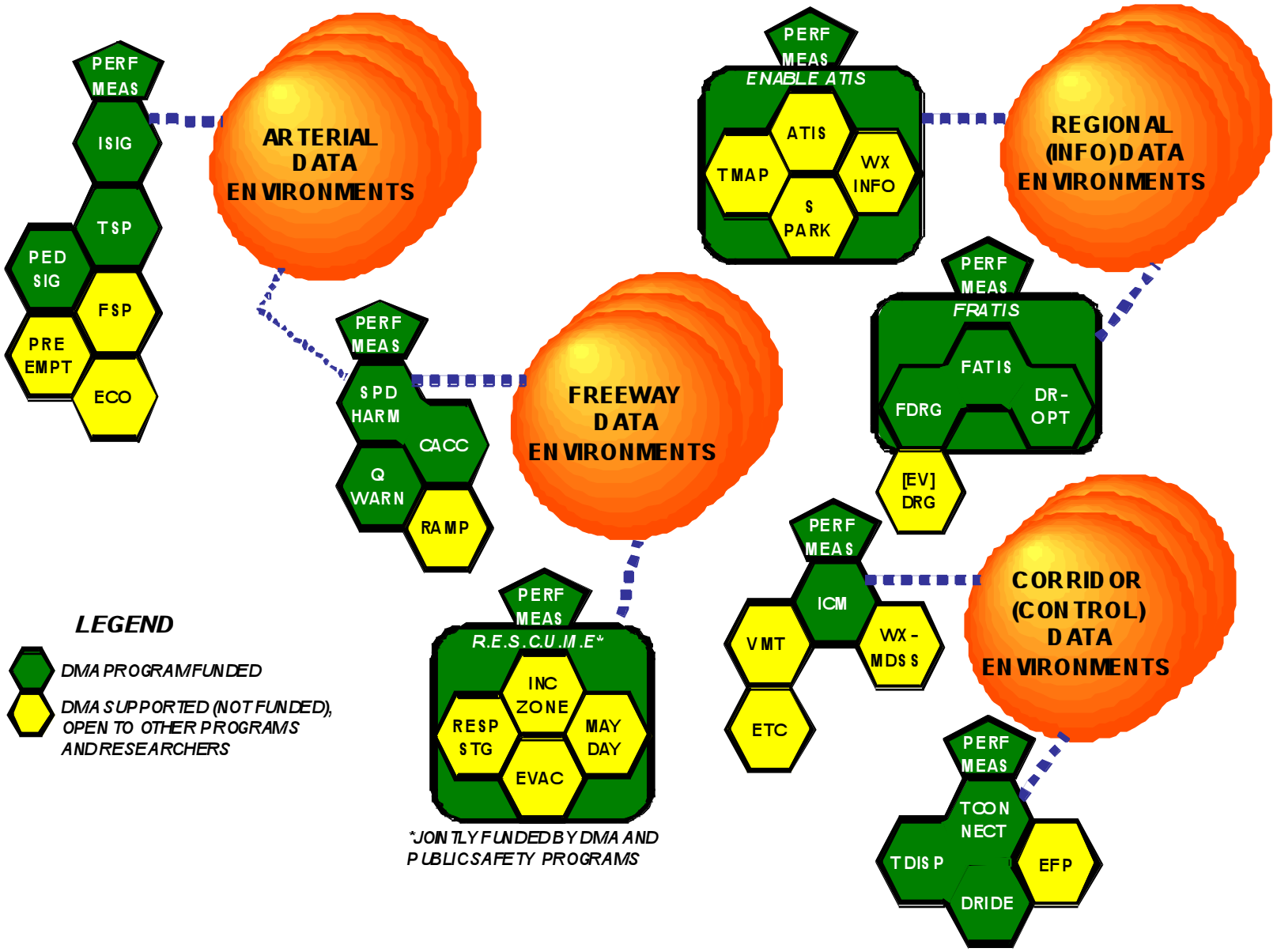

# Dynamic Mobility Applications

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**MMITSS:**
Multimodal Intelligent Traffic Signal System

**INFLO:**
Intelligent Network Flow Optimization

**R.E.S.C.U.M.E.:**
Response, Emergency Staging and Communications, Uniform Management, and Evacuation

**Enable ATIS:**
Enable Advanced Traveler Information Systems

**IDTO:**
Intelligent Dynamic Transit Operations

**FRATIS:**
Freight Advanced Traveler Information Systems

**Other Programs:** ICM ATDM

**Weather**

# AERIS Program

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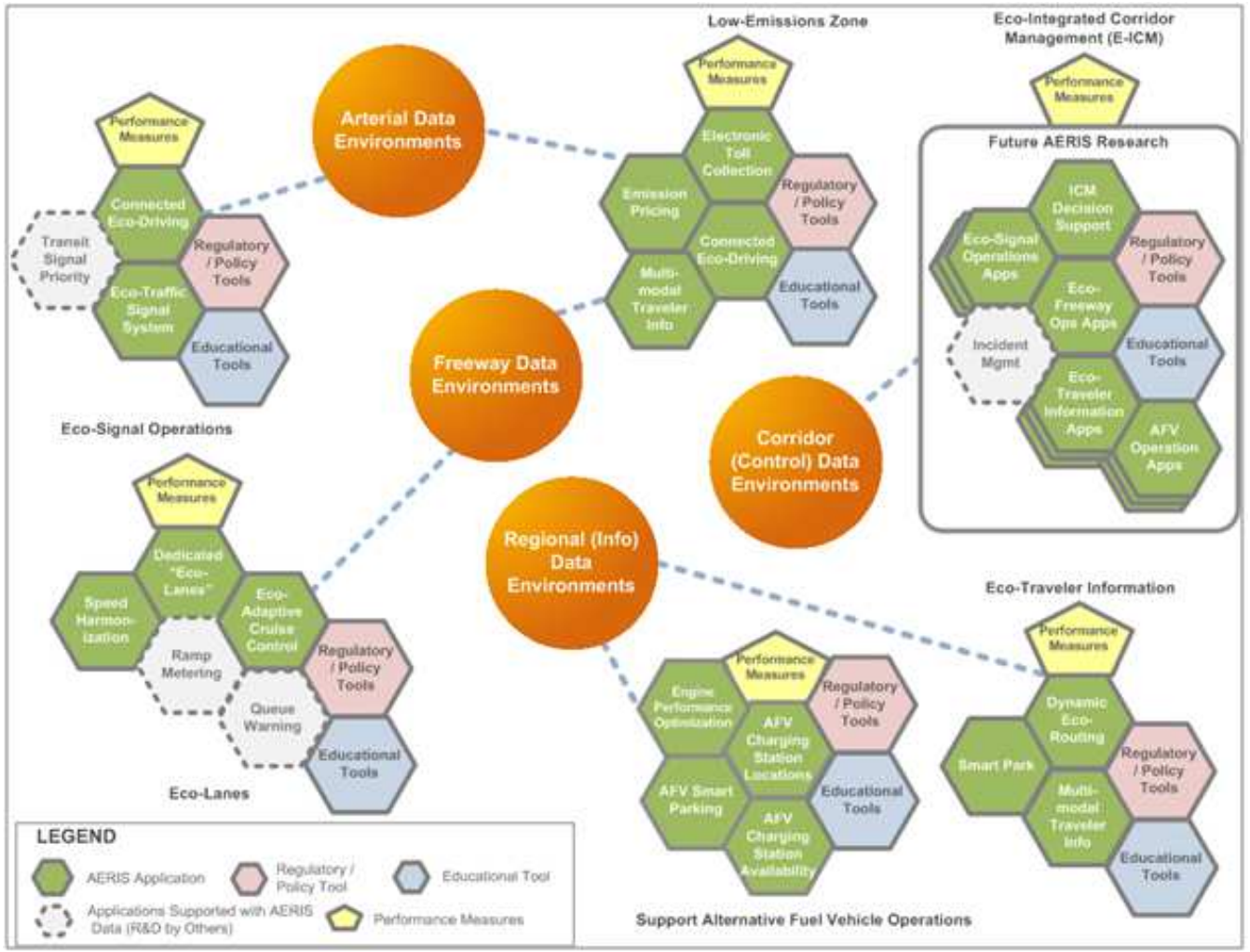
- Low Emission Zone
- Eco-integrated Corridor Management
- Eco-Signal Operations
- Eco-Lanes
- Support Alternative Fuel Vehicle Operations
- Eco-Traveler Information



# Archived Data Investments

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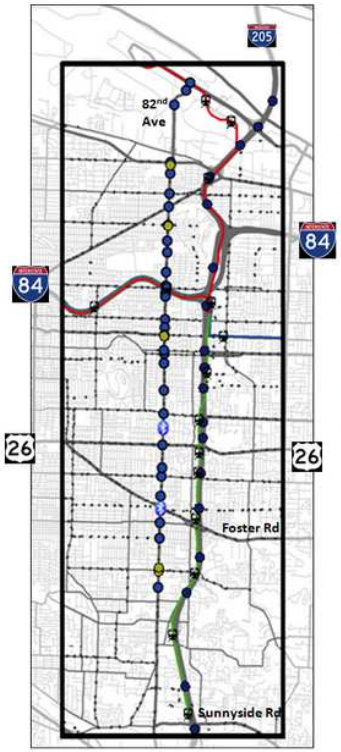
PORTAL Home Systems Highways Stations Downloads FHWA Data Data Quality News & Info Support

**Multimodal Data Set for Portland Oregon Region**
**Test Data Set for the FHWA Connected Vehicle Initiative**
**Real-Time Data Capture and Management Program**

U.S. Department of Transportation Federal Highway Administration

The Portland State University Multimodal Test Data Set submission contained on this web site consists of Freeway, Transit and Arterial data for the I-205 Corridor in Portland, Oregon. The selected corridor ranges along the I-205 Freeway from Sunnyside Road near milepost 14 to the end of the detection, near the Oregon/Washington State line. The corridor is approximately 10 miles long. The figure below displays many of the data sources that are included in the data set submission. The data set contains freeway loop detector data, weather data, incident data, arterial count data, signal phase and timing data, limited Bluetooth traveltime data and bus and light rail data. As shown in the figure, I-205 is the major north-south freeway in the corridor and 82nd Avenue is the primary north-south arterial. Transit service consists of busses running along and across 82nd Avenue and light rail lines that run along the I-205 freeway. This data set provides a two-month multi-modal data set for use in testing Connected Vehicle Applications.




**Arterial**

Documentation

Arterial Data Documentation.pdf
82nd Avenue Timing Plans.zip

Data

ArterialData.zip
AterialPhaseTimingData.zip

**Freeway**

Documentation

Freeway Data Documentation.pdf
RampMeterPlans.zip
AggregationAnalysis.pdf

Data

IncidentWeatherData.zip
FreewayData.zip

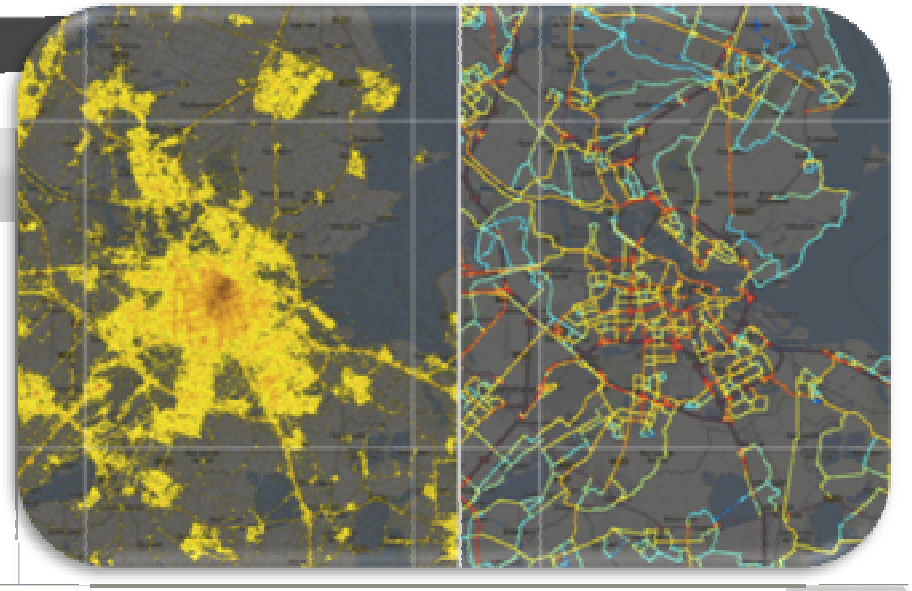
**Transit**

Documentation

Transit Data Documentation.pdf

Data

TransitBusData.zip
TransitLightRailData.zip




Source: INRIX

# DMA-ATDM AMS Test Bed

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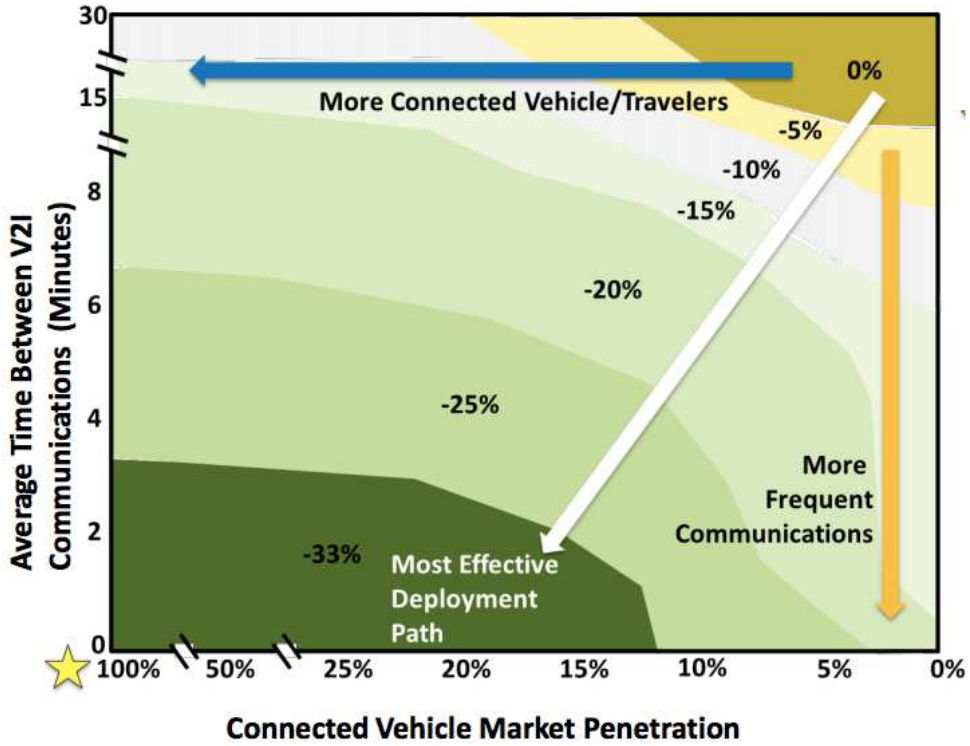
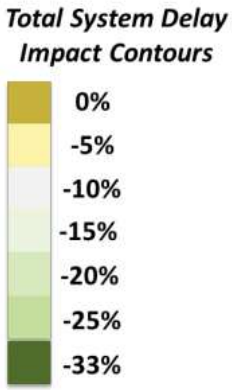
- ATDM and DMA programs have invested in development of advanced concepts and foundational research
- Analysis, Modeling, and Simulation (AMS) Testbed provides a virtual computer-based simulation environment for targeted, integrated testing prior to field deployment
- AMS Testbed used to identify impacts of:
  - Predictive, more active systems management (ATDM Strategies)
  - Integrating transformative applications enabled by new data from wirelessly connected vehicles, travelers, and infrastructure (DMA Applications)



# ITS Benefits and Costs

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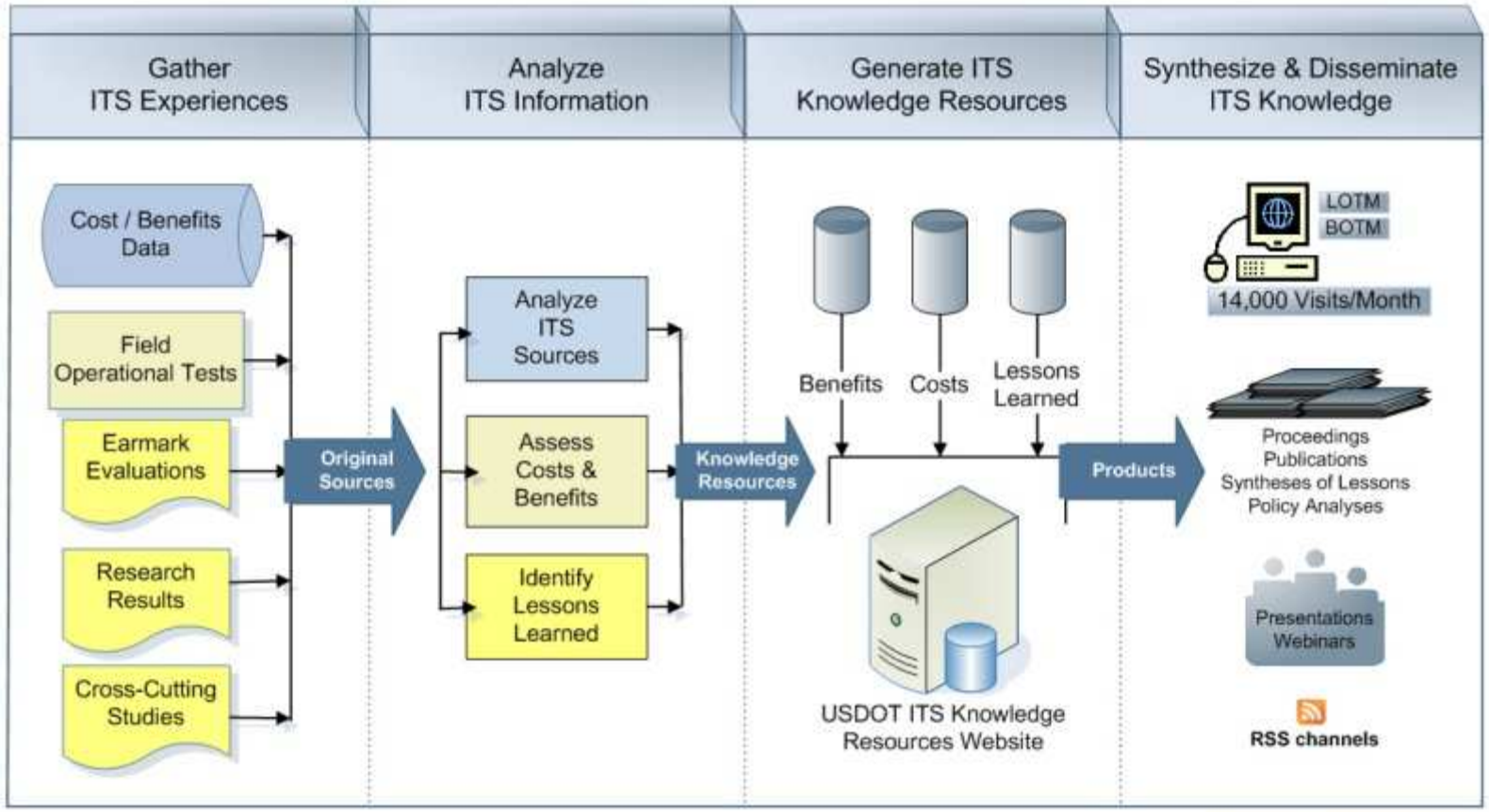


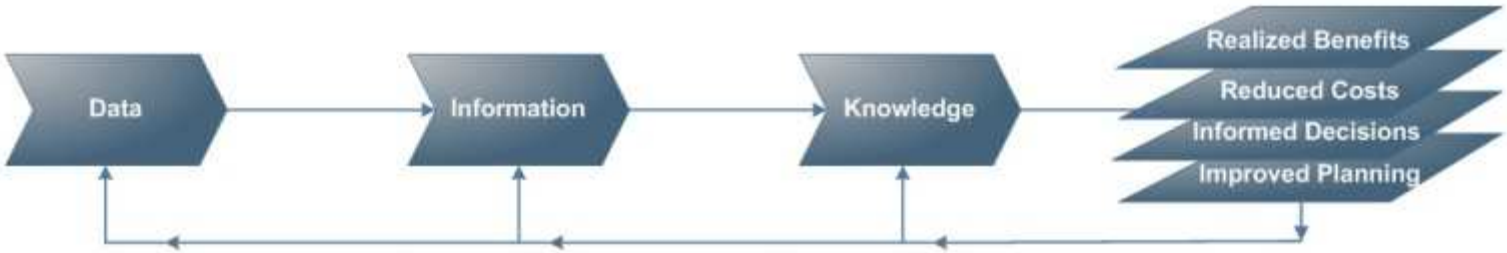


http://www.itsknowledgeresources.its.dot.gov

# Combined Objectives

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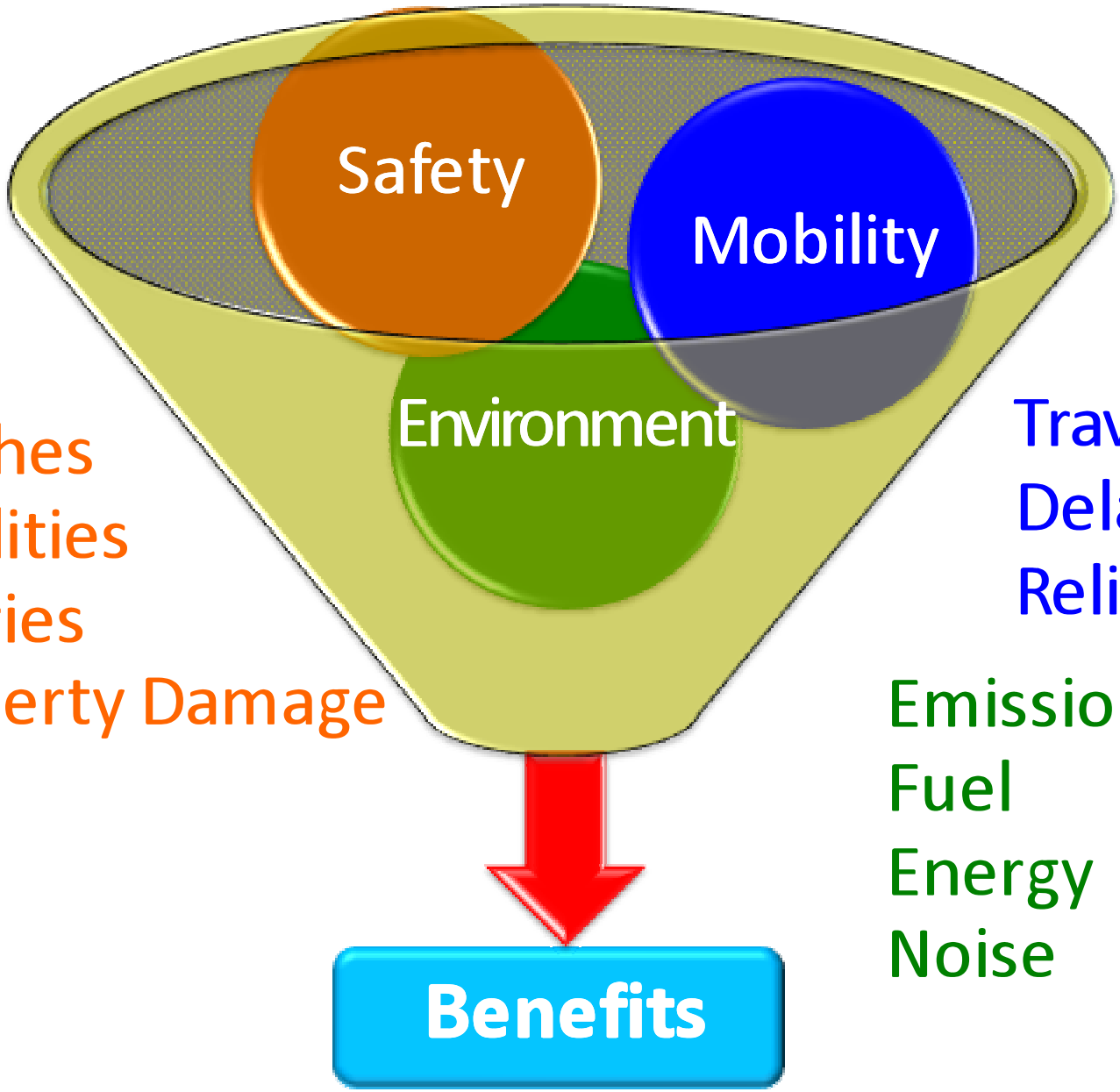


Crashes
Fatalities
Injuries
Property Damage

Travel Time
Delay
Reliability

Emissions
Fuel
Energy
Noise

# Connected Vehicle Policy Issues

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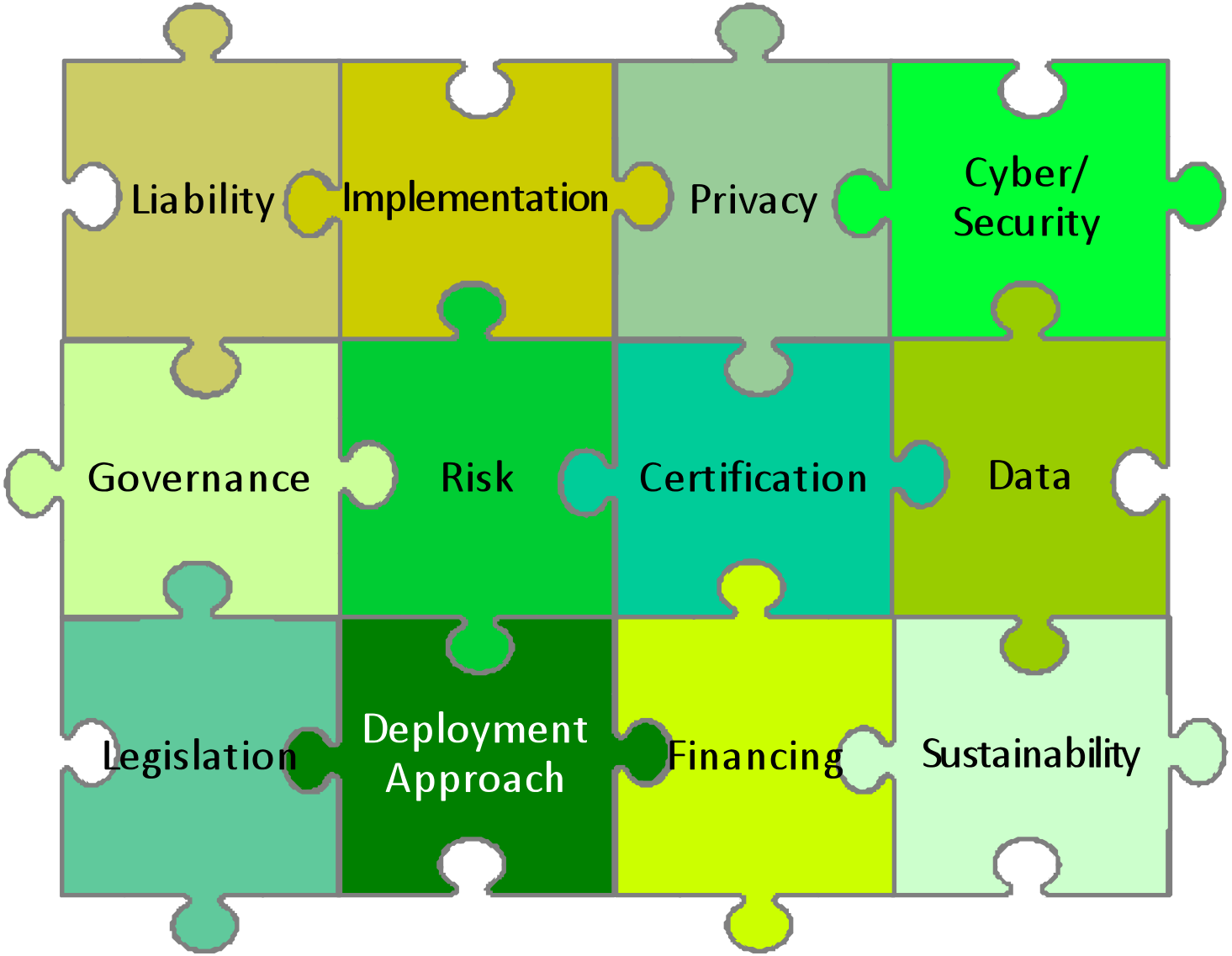

# State of Traffic Management

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# What Does the Future Hold?

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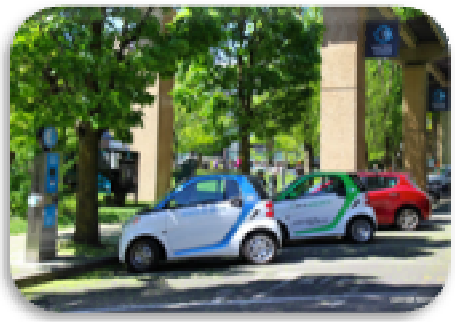
- Safety first
- Emphasis on performance measurement
- Tease out and quantify benefits and their interactions (simulation and measurement)
- Short term, decreasing federal funding
- Bottom up: creative financing and innovation by state/regional/local agencies
- Multimodal collaboration: highway/transit/bike/pedestrian
- Agency/university/private roles in data ownership and management
- Education/engagement/trust with the public
- Connected vehicle road map






# Thank You for Your Attention

Portland State UNIVERSITY