USDOT: Current Capabilities and Future Plans for Surface Transportation Weather Support

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Kenneth Leonard
Director, ITS Joint Program Office
U.S. Department of Transportation (USDOT)

Presentation Overview

- Today's Transportation Challenges
- The World of ITS
- Connected Vehicle Research
  - Technology
  - Weather Applications That Can Make a Real Difference
- Weather-related ITS Activities
- AMS Recommendations
- Transportation Weather Challenges
- Conclusion

Today's Transportation Challenges

Safety
- 33,561 highway deaths in 2012
- 5.615 million crashes in 2012
- Leading cause of death for ages 4, 11-27

Mobility
- 5.5 billion hours of travel delay
- $121 billion cost of urban congestion

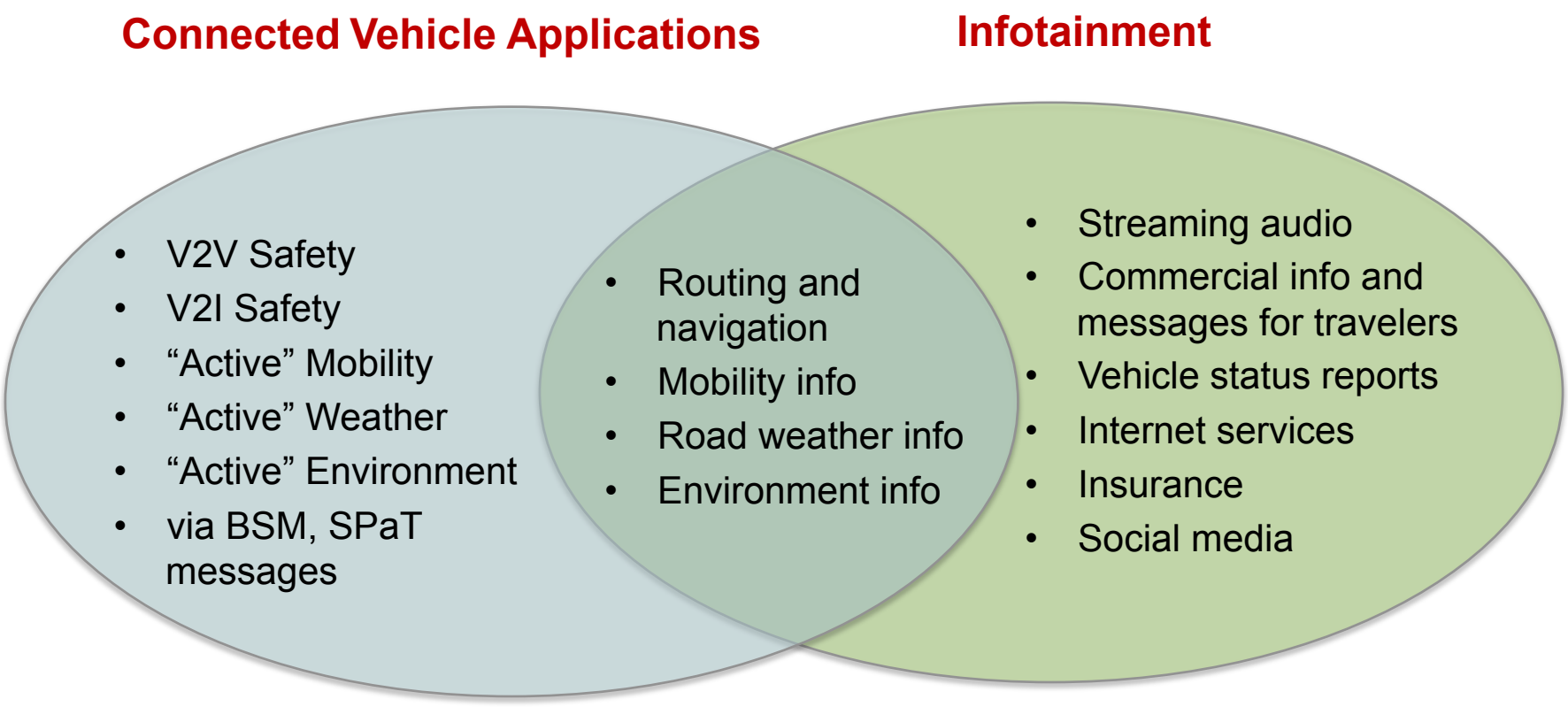
Environment
- 2.9 billion gallons of wasted fuel
- 56 billion lbs of additional CO_2

Data Sources:
•Traffic Safety Facts: 2012 Data, National Highway Traffic Safety Administration (Nov 2013)
•2011 Annual Urban Mobility Report, Texas Transportation Institute (Feb 2013)

The World of ITS

- Integrated Corridor Management
- Connected Vehicle Research
  - Safety
    - Vehicle to Vehicle (V2V)
    - V2I (Vehicle to Infrastructure)
    - V2X
  - Mobility
    - Dynamic Mobility Applications
    - Real-Time Data Capture
  - Environment
    - AERIS
    - Road Weather / Clarus
- ITS Architecture and Standards
- ITS Professional Capacity Building
- ITS Knowledge Resources
- Automated Vehicle

“Connected Vehicle” vs. “Connected” Vehicles



How the Technology Works

- **What it is**
  - Wi-Fi radio adapted for vehicle environment
  - Inexpensive to produce in quantity
  - Original 5.9GHz DSRC FCC spectrum allocated in 1999
  - FCC revised allocation in 2004 and 2006

Source: USDOT

- **How the technology works**
  - Messages transmitted 10 times/sec
    - *Basic Safety Message*: vehicle position, speed, heading, acceleration, size, brake system status, etc.
    - Privacy is protected
- **Benefits of DSRC technology compared to radar/laser technology**
  - Reduced price
  - Improved reliability (fewer false alarms; works in all weather conditions)
  - Increased range performance (addresses more crash scenarios)
- **Drawback of the technology**
  - Both vehicles need to be equipped to gain safety benefit

Technology for Safety

- The following applications enable a vehicle to issue a warning to the driver based on wireless messages received from other vehicles:

  Forward Collision Warning – Vehicle immediately ahead is braking hard/ stopped

  Emergency Electronic Brake Light – Unseen vehicle two or more cars ahead is braking hard/stopped

  Blind Spot/Lane Change Warning – Unseen vehicle in the driver's blind spot during a lane change maneuver

  Intersection Movement Assist – Potential collision with another vehicle entering the intersection perpendicular to the vehicle

  Do Not Pass Warning – Unseen vehicle approaching in opposite direction during an attempted passing situation on a two-lane road

  Left Turn Assist – Vehicle making an unsafe left-hand turn at an intersection across the path of an oncoming vehicle

- For different vehicle manufacturers to trust and react upon each others' messages, **a security system will be needed** to manage security functions and mitigate misbehavior due to malfunction or malfeasance

Weather Relevant Data

- Many cars collect data such as:
  - Temperature
  - Windshield Wiper Use
  - Anti-lock Brake Use
  - Steering patterns
  - Speed

Image: USDOT

- The USDOT's Road Weather Management Program (RWMP) is assessing how to collect, process, and share weather data with:
  - Transportation Managers
  - Drivers
  - Travelers
- Transforming connected vehicle data from vehicles into a picture of current weather and road conditions
- Personalized weather information for drivers to reduce risk.

Data Usage to Improve Driver Safety in Dangerous Weather

- Enhanced Maintenance Decision Support
- Information for Maintenance and Fleet Management Systems
- Weather-Responsive Traffic Management
  - Variable Speed Limits
  - Signal Timing Optimization
- Motorist Advisories and Warnings
- Information for Freight Carriers
- Information and Routing Support for Emergency Responders

Image: Thinkstock

Weather-Related ITS Research and Development Activities

- Integrated Mobile Observations (IMO)
- Vehicle Data Translator (VDT)
- Weather Data Environment (WxDE)
- Weather Responsive Traffic Management
- Data Capture and Management
- Prototype Operational Data Environment
- AERIS

  Addresses issues related to climate change, greenhouse gases emissions, etc.)

Image: Thinkstock

AMS Recommendations

- **AMS Mobile Observations Subcommittee identified "priorities" for the ITS Strategic Plan (2015-2019):**

  Standardization of mobile weather observation data

  Standardization and collection of meta data and quality control algorithms

  Collaboration between the transportation and weather communities

  Research and resources provided for further VDT development

  Research and resources provided for the inclusion of mobile observations for decision support and situational awareness

  Broad Agency Announcements (BAAs) to solicit broader participation in weather research

  Management of state DOTs' fixed Road Weather Information System – Environmental Sensor Stations (RWIS-ESS) governed by meteorological standards

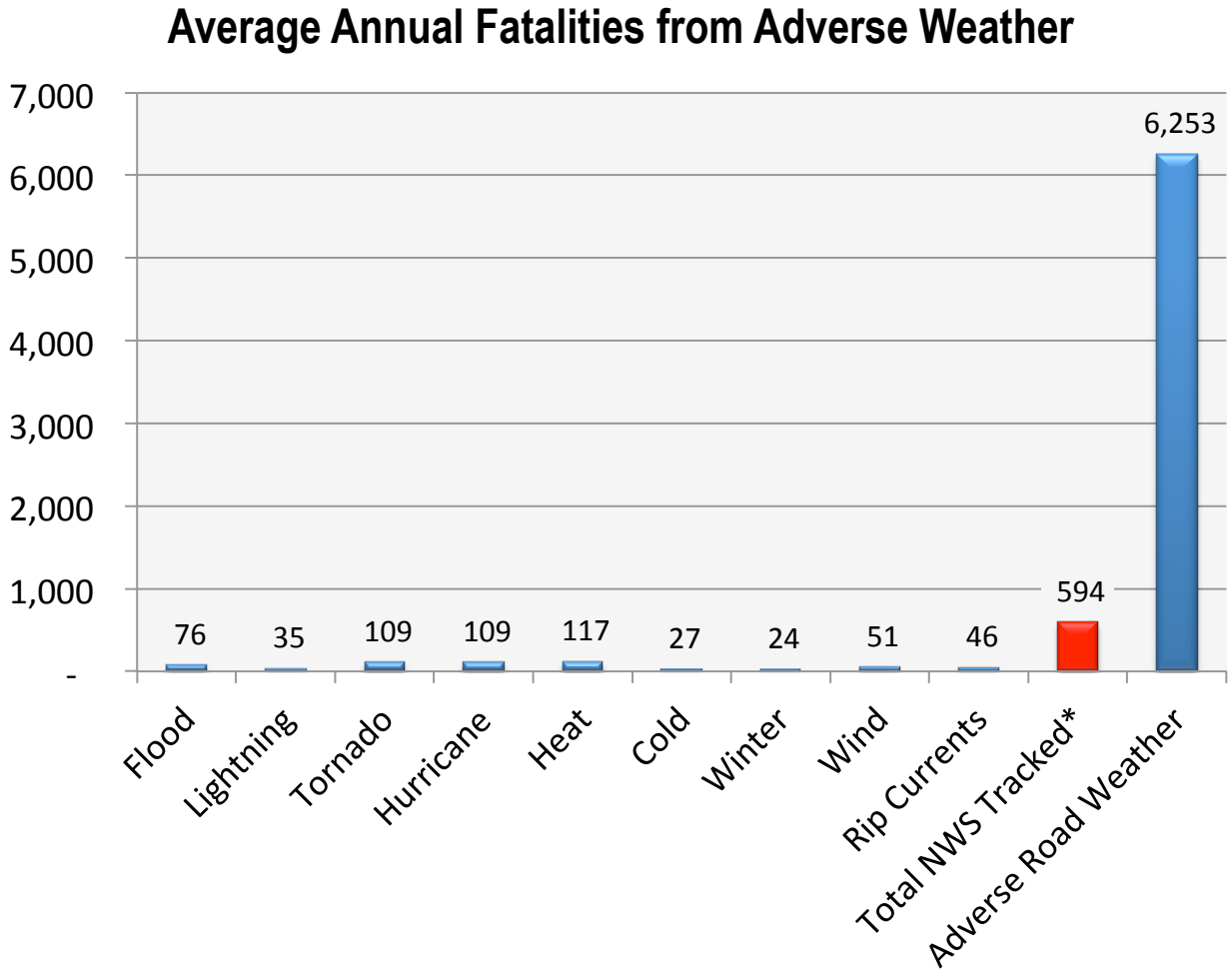
Weather-Related Fatalities

Improve

- Safety
- Mobility
- Productivity

Reduce

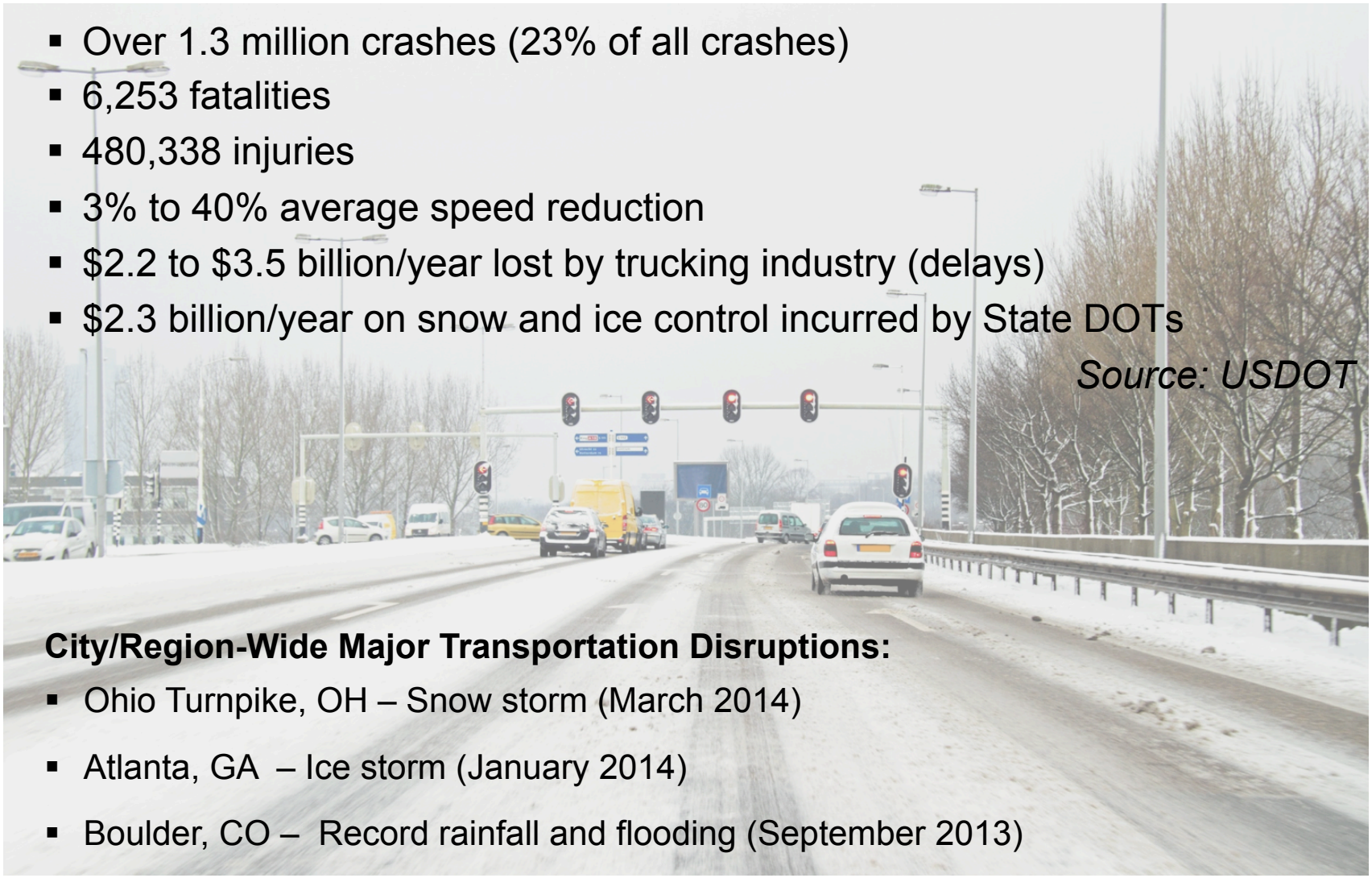
- Delay Costs
- Fatalities
- Environmental Impacts



Adverse Road Weather Impacts

- Over 1.3 million crashes (23% of all crashes)
- 6,253 fatalities
- 480,338 injuries
- 3% to 40% average speed reduction
- $2.2 to $3.5 billion/year lost by trucking industry (delays)
- $2.3 billion/year on snow and ice control incurred by State DOTs

Source: USDOT



City/Region-Wide Major Transportation Disruptions:

- Ohio Turnpike, OH – Snow storm (March 2014)
- Atlanta, GA – Ice storm (January 2014)
- Boulder, CO – Record rainfall and flooding (September 2013)

Image: Thinkstock

Final Thoughts

- The USDOT initiated a game changer through connected vehicle research
  - NHTSA Agency Decision (February 2014)
- Opportunity for interdisciplinary collaboration
  - Great opportunities for the transportation and weather communities to contribute to each others mission
  - Maintain and expand partnership among public, private, and academic sectors
  - Build operational capabilities through technology transfer of effective road weather advances
  - Coordinate with transportation weather research programs in other modes, such as aviation
  - Explore value of mobile observations in Numerical Weather Prediction

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