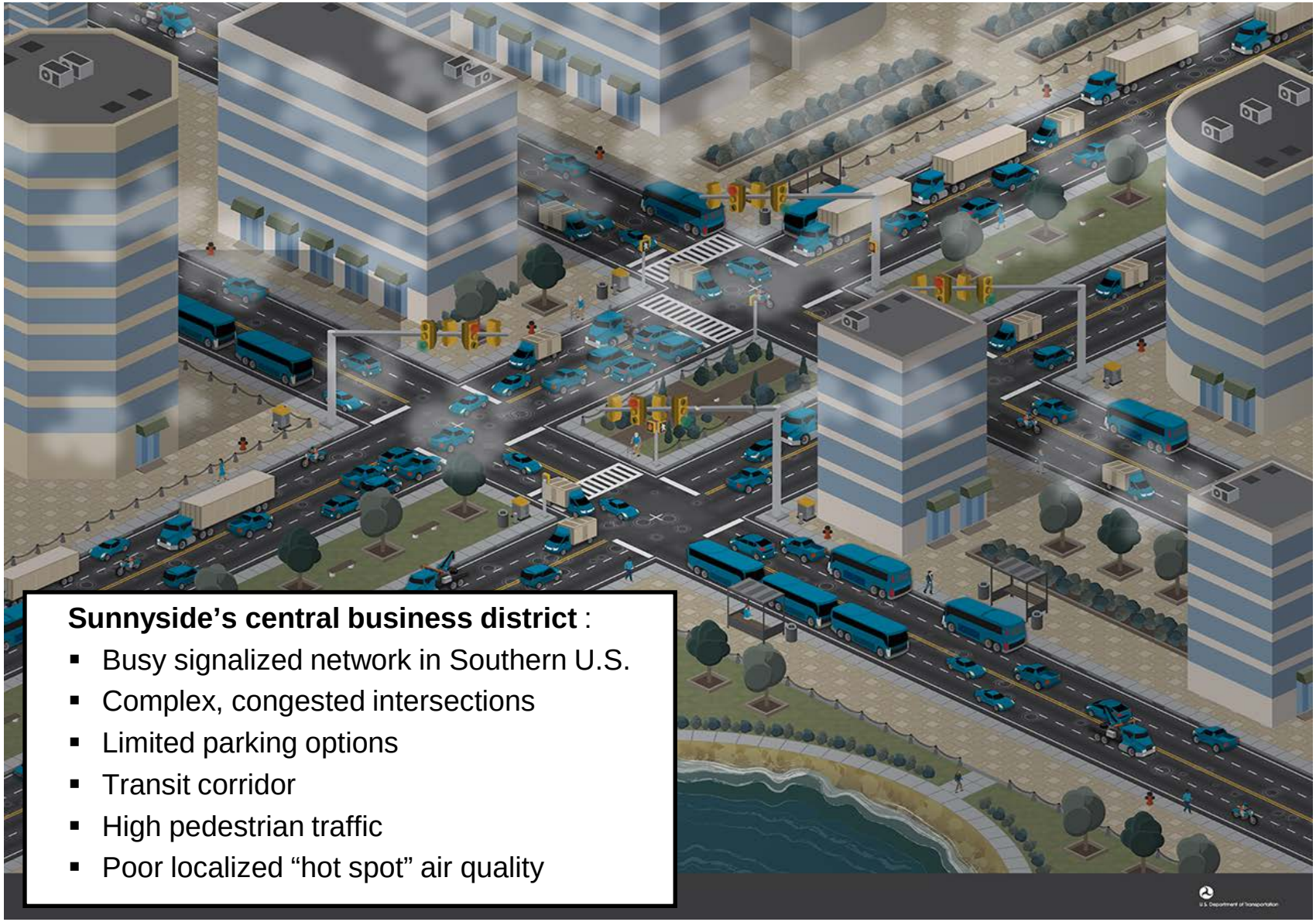
Example CV Pilot Deployment Concepts:

Downtown Sunnyside

Ben McKeever (FHWA)

Downtown Sunnyside



Sunnyside's central business district :

- Busy signalized network in Southern U.S.
- Complex, congested intersections
- Limited parking options
- Transit corridor
- High pedestrian traffic
- Poor localized "hot spot" air quality

Stakeholders Convene and Identify Key Transportation Challenges

- **Mobility**
  - Heavy congestion at peak times
  - Transit vehicles schedule reliability

- **Safety**
  - Pedestrian-vehicle conflicts
  - Crashes in unprotected left hand turns

- **Environment**
  - Emissions/Air Quality hot spots
  - Poor progression results in wasted fuel

Stakeholder Set Three Key Improvement Targets

Metrics	Targets
Increase transit reliability	Transit vehicles on schedule 90% of the time
Improve pedestrian safety	Reduce pedestrian-vehicle conflicts by 50%
Improve hot spot air quality	Reduce emissions by 20%

Applications Considered for Improving Transit Reliability

V2I Safety

Red Light Violation Warning
Curve Speed Warning
Stop Sign Gap Assist
Spot Weather Impact Warning
Reduced Speed/Work Zone Warning
Pedestrian in Signalized Crosswalk Warning (Transit)

V2V Safety

Emergency Electronic Brake Lights (EEBL)
Forward Collision Warning (FCW)
Intersection Movement Assist (IMA)
Left Turn Assist (LTA)
Blind Spot/Lane Change Warning (BSW/LCW)
Do Not Pass Warning (DNPW)
Vehicle Turning Right in Front of Bus Warning (Transit)

Road Weather

Motorist Advisories and Warnings (MAW)
Enhanced MDSS
Vehicle Data Translator (VDT)
Weather Response Traffic Information (WxTINFO)

Environment

Eco-Approach and Departure at Signalized Intersections
Eco-Traffic Signal Timing
Eco-Traffic Signal Priority
Connected Eco-Driving
Wireless Inductive/Resonance Charging
Eco-Lanes Management
Eco-Cooperative Adaptive Cruise Control
Eco-Traveler Information
Eco-Ramp Metering
Low Emissions Zone Management
AFV Charging / Fueling Information
Eco-Smart Parking
Dynamic Eco-Routing (light vehicle, transit, freight)
Eco-ICM Decision Support System

Agency Data

Probe-based Pavement Maintenance
Probe-enabled Traffic Monitoring
Vehicle Classification-based Traffic Studies
CV-enabled Turning Movement & Intersection Analysis
CV-enabled Origin-Destination Studies
Work Zone Traveler Information

Transit Reliability

Mobility

Advanced Traveler Information System
Intelligent Traffic Signal System (I-SIG)
Signal Priority (transit, freight)
Mobile Accessible Pedestrian Signal System (PED-SIG)
Emergency Vehicle Preemption (PREEMPT)
Dynamic Speed Harmonization (SPD-HARM)
Queue Warning (Q-WARN)
Cooperative Adaptive Cruise Control (CACC)
Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
Emergency Communications and Evacuation (EVAC)
Connection Protection (T-CONNECT)
Dynamic Transit Operations (T-DISP)
Dynamic Ridesharing (D-RIDE)
Freight-Specific Dynamic Travel Planning and Performance
Drayage Optimization

Smart Roadside

Wireless Inspection
Smart Truck Parking

Applications Considered for Improving Pedestrian Safety

V2I Safety

- Red Light Violation Warning
- Curve Speed Warning
- Stop Sign Gap Assist
- Spot Weather Impact Warning
- Reduced Speed/Work Zone Warning
- **Pedestrian in Signalized Crosswalk Warning (Transit)**

V2V Safety

- Emergency Electronic Brake Lights (EEBL)
- Forward Collision Warning (FCW)
- **Intersection Movement Assist (IMA)**
- Left Turn Assist (LTA)
- Blind Spot/Lane Change Warning (BSW/LCW)
- Do Not Pass Warning (DNPW)
- Vehicle Turning Right in Front of Bus Warning (Transit)

Road Weather

- Motorist Advisories and Warnings (MAW)
- Enhanced MDSS
- Vehicle Data Translator (VDT)
- Weather Response Traffic Information (WxTINFO)

Environment

- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing
- Eco-
- Con
- Wireless Inductive/Resonance Charging
- Eco-Lanes Management
- Eco-Speed Harmonization
- Eco-Cooperative Adaptive Cruise Control
- Eco-Traveler Information
- Eco-Ramp Metering
- Low Emissions Zone Management
- AFV Charging / Fueling Information
- Eco-Smart Parking
- Dynamic Eco-Routing (light vehicle, transit, freight)
- Eco-ICM Decision Support System

Pedestrian Vehicle Conflicts

Agency Data

- Probe-based Pavement Maintenance
- Probe-enabled Traffic Monitoring
- Vehicle Classification-based Traffic Studies
- CV-enabled Turning Movement & Intersection Analysis
- CV-enabled Origin-Destination Studies
- Work Zone Traveler Information

Mobility

- Advanced Traveler Information System
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Smart Roadside

- Wireless Inspection
- Smart Truck Parking

Applications Considered for Improving the Environment

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Emissions

Smart Roadside

Wireless Inspection
Smart Truck Parking

Connected Vehicle Applications Selected in Performance-Driven Approach

Improve Transit Reliability

- Connection Protection (T-CONNECT)
- Transit Signal Priority

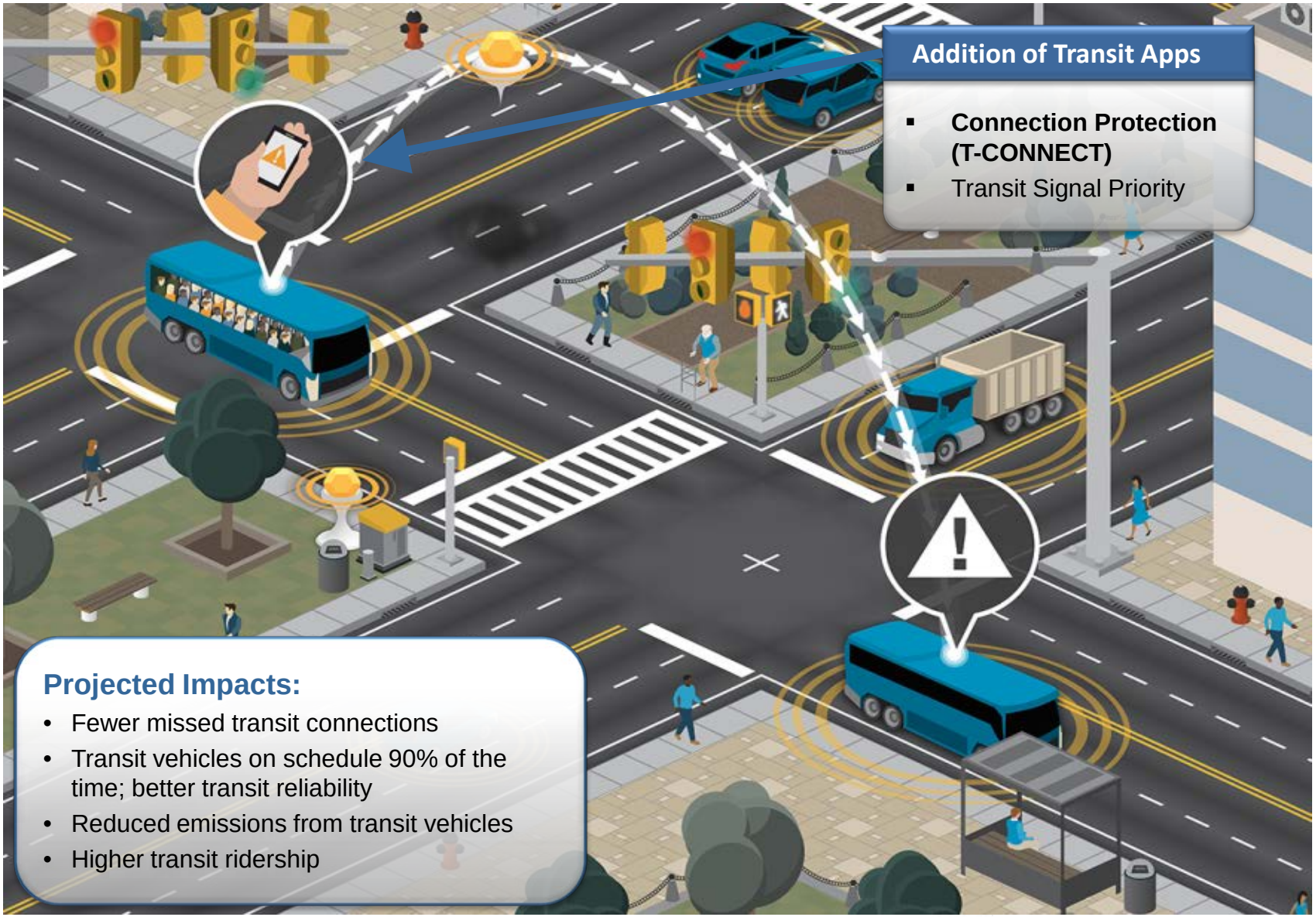
Improve Pedestrian Safety

- Mobile Accessible Pedestrian Signal System (PED-SIG)
- Pedestrian in Signalized Crosswalk Warning
- Intersection Movement Assist (IMA)

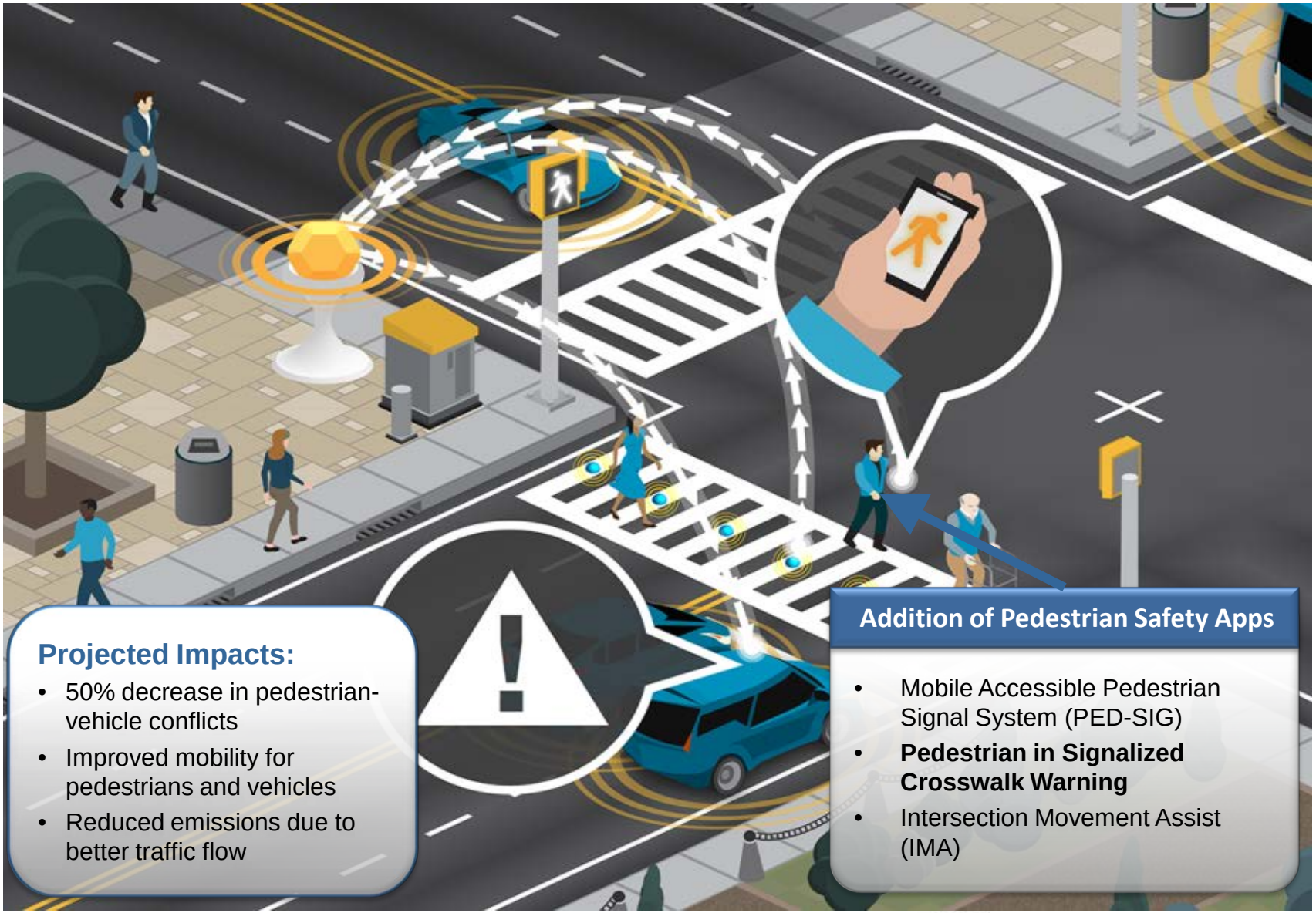
Improve Hot Spot Air Quality

- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing

Projected Synergies and Impacts from Transit Applications in the Deployment Concept



Projected Synergies and Impacts from Pedestrian Safety Apps in the Deployment Concept



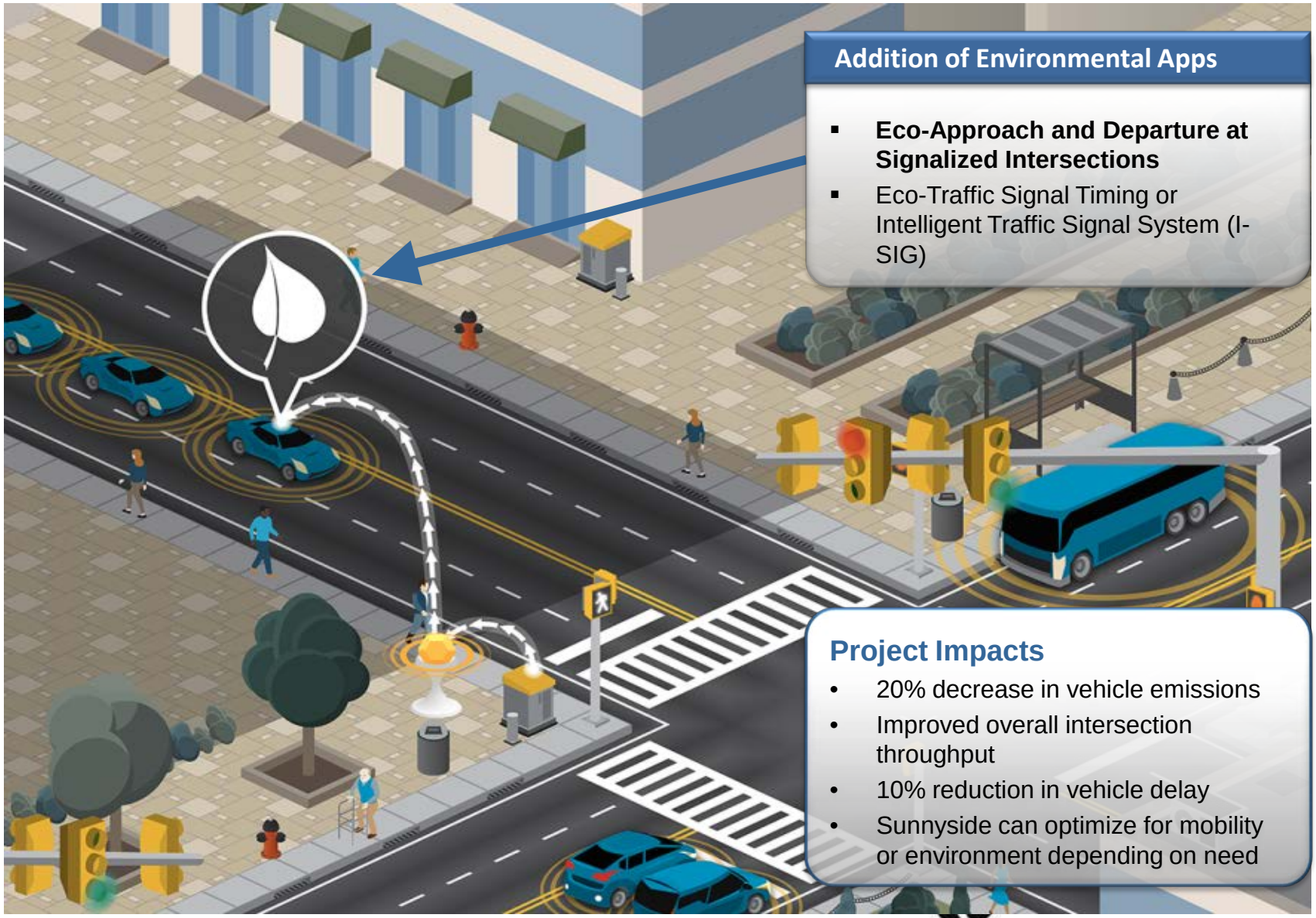
Projected Impacts:

- 50% decrease in pedestrian-vehicle conflicts
- Improved mobility for pedestrians and vehicles
- Reduced emissions due to better traffic flow

Addition of Pedestrian Safety Apps

- Mobile Accessible Pedestrian Signal System (PED-SIG)
- **Pedestrian in Signalized Crosswalk Warning**
- Intersection Movement Assist (IMA)

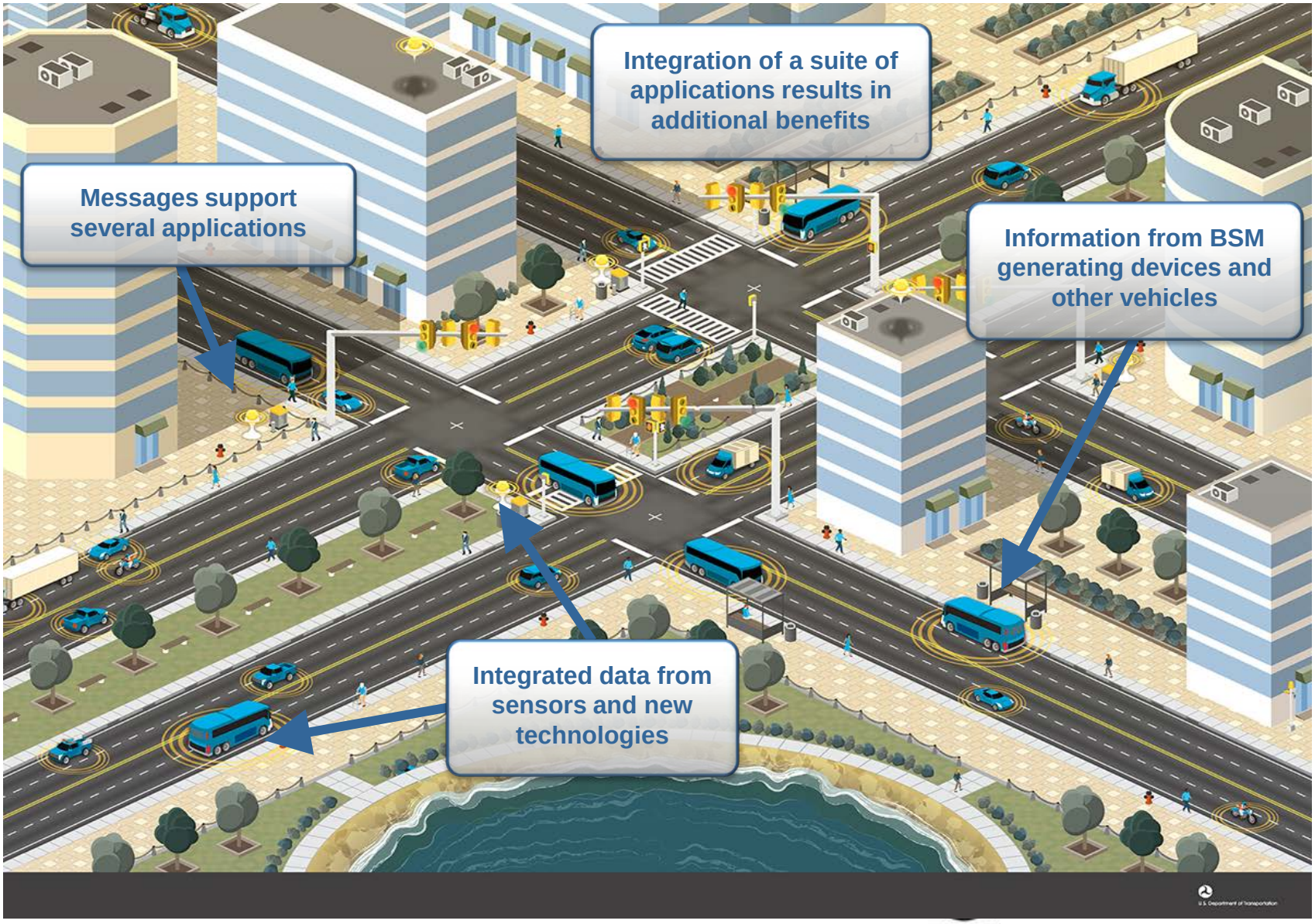
Projected Synergies and Impacts from Environmental Apps in the Deployment Concept



Addition of Environmental Apps

- **Eco-Approach and Departure at Signalized Intersections**
- Eco-Traffic Signal Timing or Intelligent Traffic Signal System (I-SIG)

Project Impacts

- 20% decrease in vehicle emissions
- Improved overall intersection throughput
- 10% reduction in vehicle delay
- Sunnyside can optimize for mobility or environment depending on need

Integrated Concept for Downtown Sunnyside