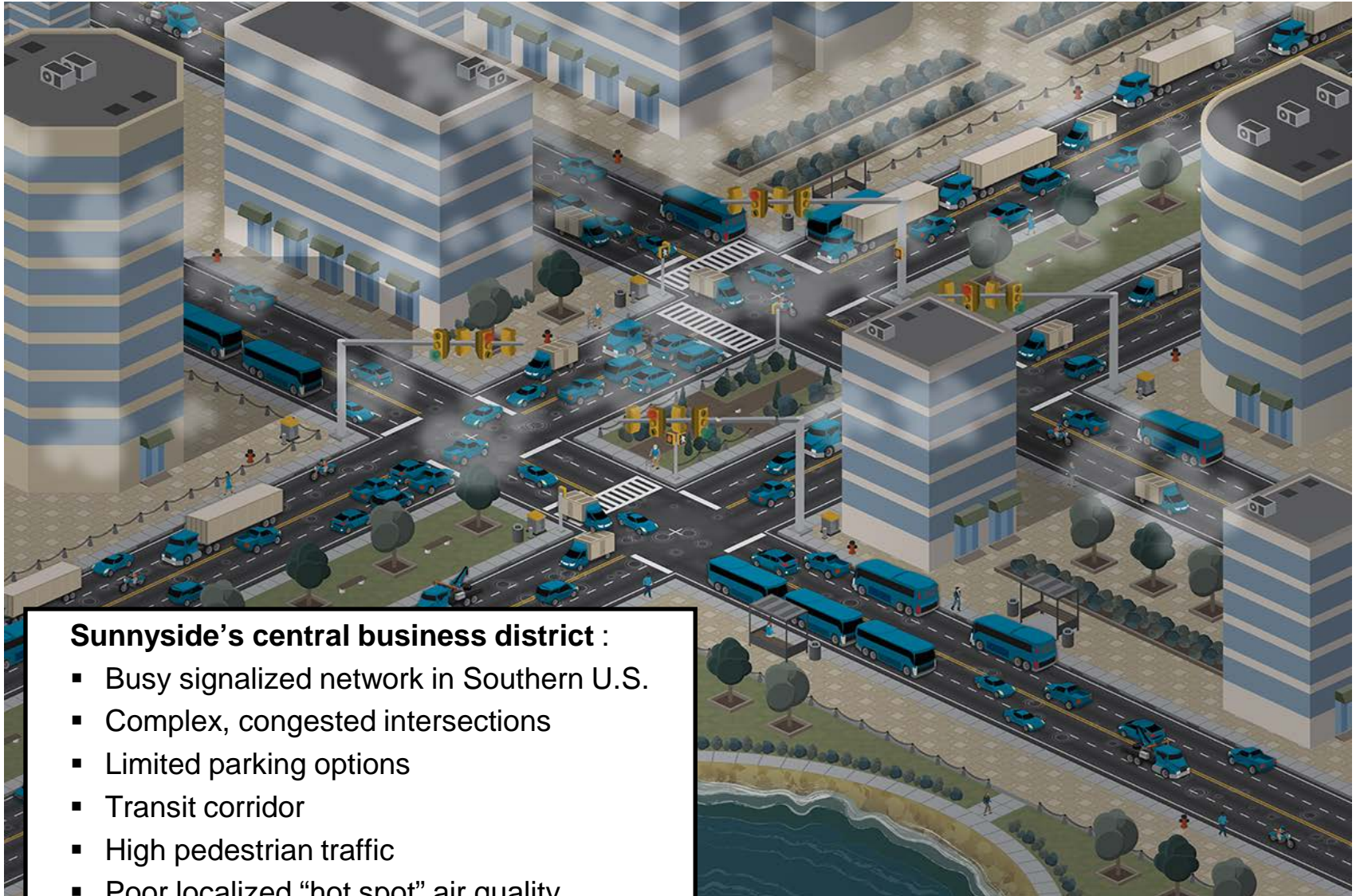




# Example CV Pilot Deployment Concepts: Downtown Sunnyside

# 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

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- **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

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| Goal                         | Performance Measure          | Performance Target                           |
|------------------------------|------------------------------|--|
| Increase transit reliability | Transit schedule adherence   | Transit vehicles on schedule 90% of the time |
| Improve pedestrian safety    | Pedestrian-vehicle conflicts | Reduce pedestrian-vehicle conflicts by 50%   |
| Improve hot spot air quality | Emissions                    | 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-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

**Transit Reliability**

## 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  
 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 (EVA-C)  
**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-**Pedestrian Vehicle Conflicts**
- Con-**Wireless Inductive Power Transfer 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

## 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
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## Mobility

- Advanced Traveler Information System
- Intelligent Traffic Signal System (I-SIG)
- Signal Priority (transit, freight)
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- Dynamic Ridesharing (D-RIDE)
- Freight-Specific Dynamic Travel Planning and Performance
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## Smart Roadside

- Wireless Inspection
- Smart Truck Parking



# Applications Considered for Improving the Environment



## V2I Safety

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 Curve Speed Warning  
 Stop Sign Gap Assist  
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 Reduced Speed/Work Zone Warning  
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## V2V Safety

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## Road Weather

Motorist Advisories and Warnings (MAW)  
 Enhanced MDSS  
 Vehicle Data Translator (VDT)  
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## 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-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

## Agency Data

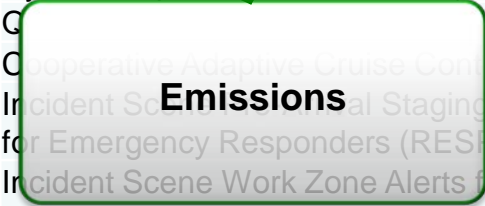
Probe-based Pavement Maintenance  
 Probe-enabled Traffic Monitoring  
 Vehicle Classification-based Traffic Studies  
 CV-enabled Turning Movement & Intersection Analysis  
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 Work Zone Traveler Information

## Mobility

Advanced Traveler Information System  
 Intelligent Traffic Signal System (I-SIG)  
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## 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)

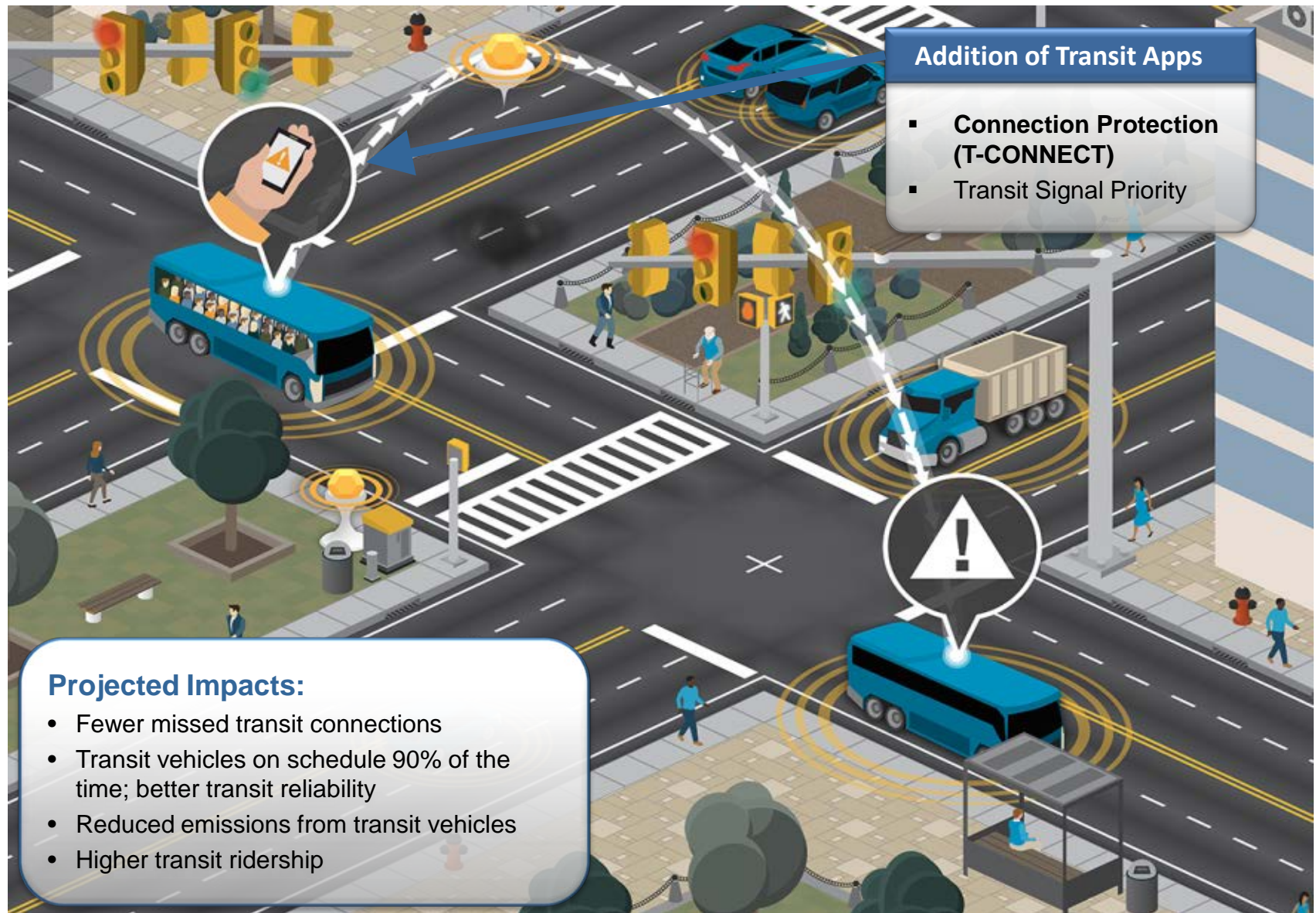
## Improve Hot Spot Air Quality

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

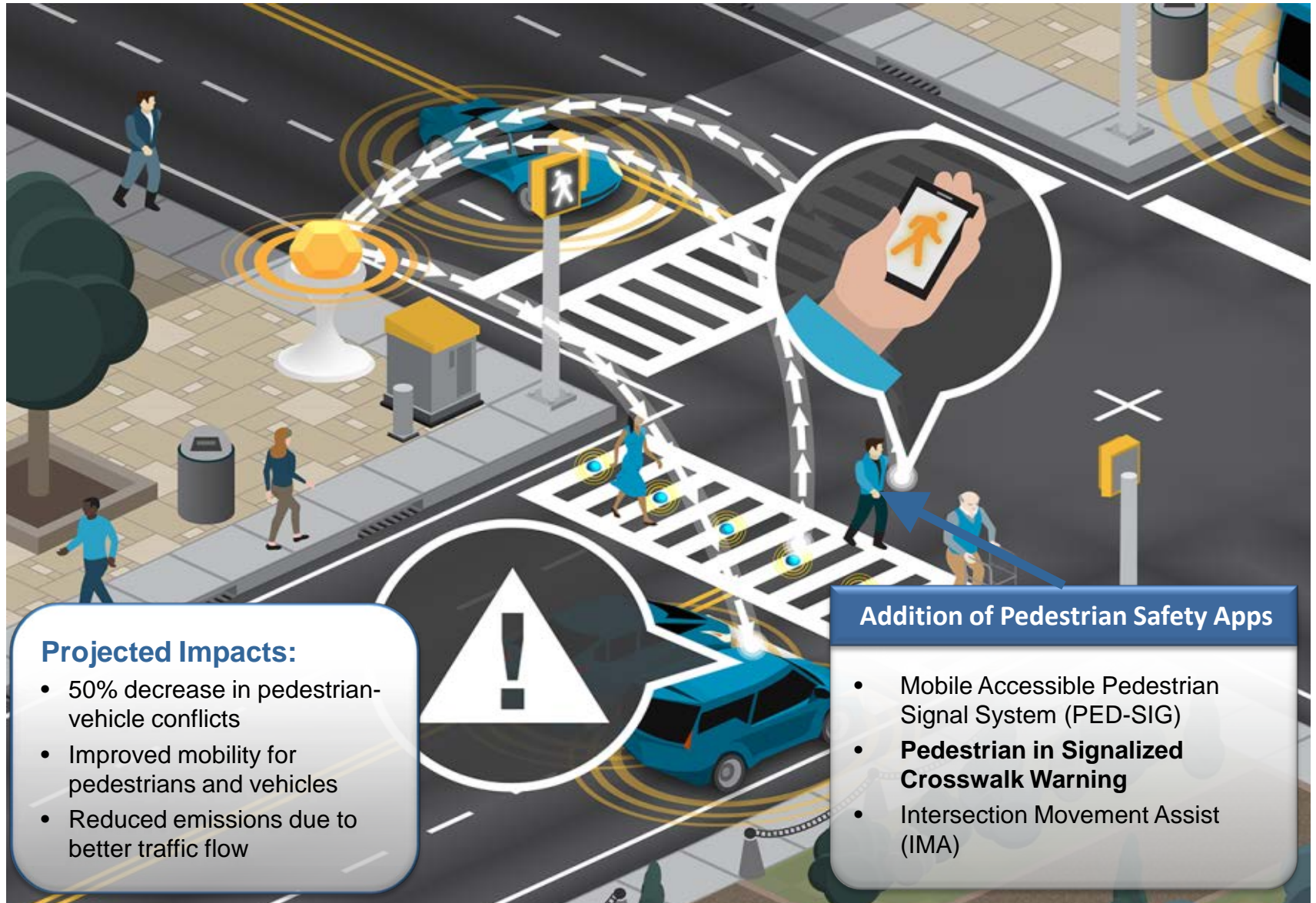




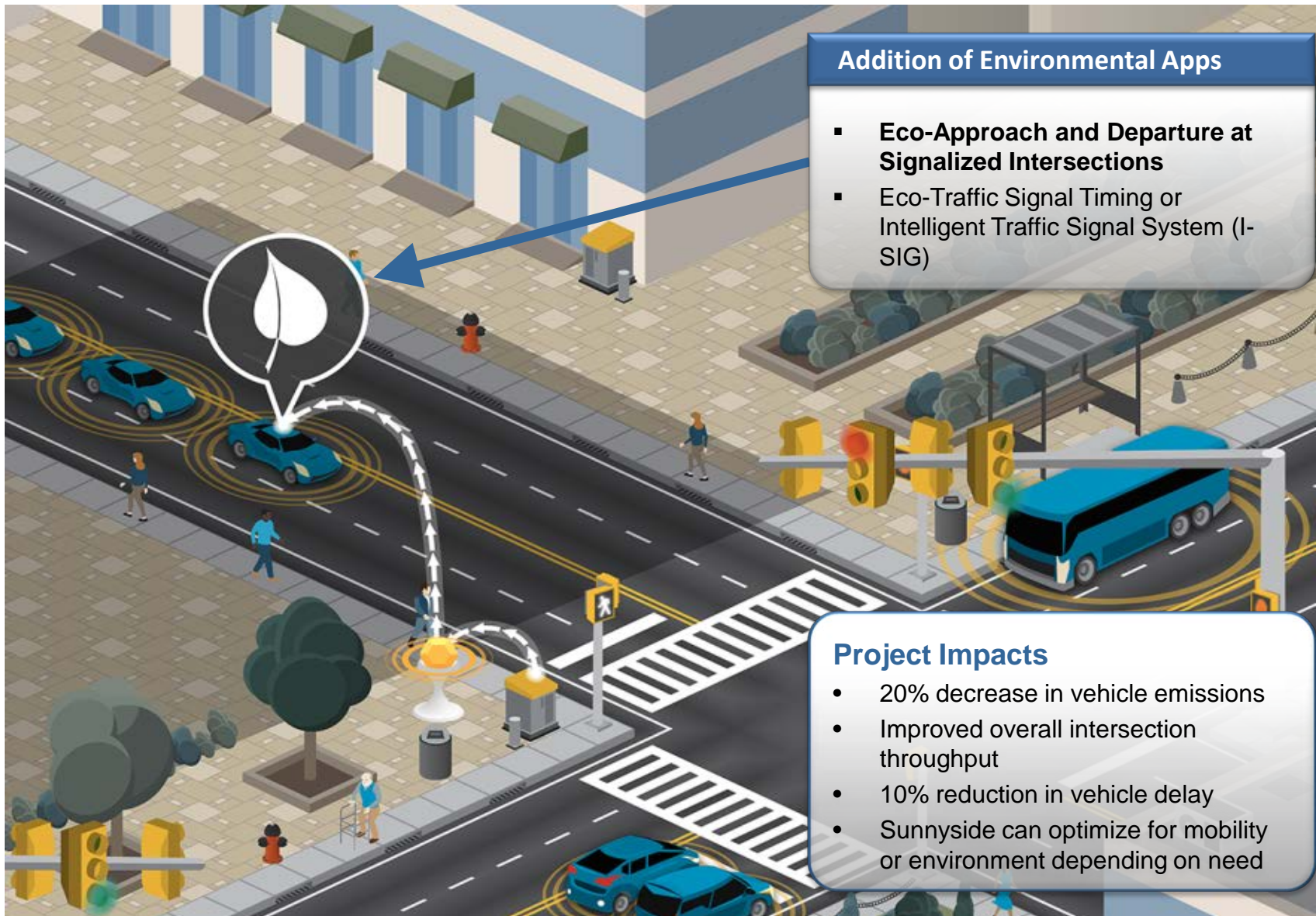
# Projected Synergies and Impacts from Transit Applications in the Deployment Concept



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



# Projected Synergies and Impacts from Environmental Apps in the Deployment Concept



# Integrated Concept for Downtown Sunnyside

