



# INVEST

## Self-assessment tool for transportation sustainability

Tina Hodges, Federal Highway Administration, Office of Natural Environment, DC  
Joseph Vaughn, Federal Highway Administration, California Division

Webinar with CalTrans  
October 1, 2013



# Agenda



## Activity

Welcome, Introductions, Purpose of Training

Sustainability and Introduction to INVEST

Q&A

Video: Ohio DOT Cleveland Innerbelt Bridge

Demonstration: Stepping Through INVEST

Q&A

Criteria in Action: Discussion of how different agencies used INVEST criteria to evaluate, score, and improve the sustainability of their projects

Q&A

Discussion: How might INVEST help you in your work?

Next Steps: Additional resources, opportunities

# What is Sustainability?



The Sustainability Triple Bottom Line

## Key Elements

- Balance between three principles
- Stewardship for the present and future

# What are Sustainable Highway Systems?



- Integral part of sustainable development; not to be viewed in isolation
- Satisfies functional requirements
- Fulfills transportation goals and needs
- Addresses development and economic growth
- Avoids, minimizes, and reduces impacts
  - › Environment
  - › Consumption of resources

# What is INVEST?



## *INVEST* - Infrastructure Voluntary Evaluation Sustainability Tool

A web-based self-evaluation tool for assessing sustainability over the life cycle of a transportation project or program — from system and project planning through design and construction, to operations and maintenance

# INVEST 1.0 – FHWA’s Sustainability Tool



**Version 1.0**  
Login  
Register

search go

- Home
- Learn
- Browse
- Score
- Glossary
- FAQ
- Case Studies
- FHWA's Sustainable Highways Initiative
- Provide Comments
- Register
- Privacy

**Learn** ▶  
A guided tour through the INVEST website to learn about sustainable highways and integrating sustainability best practices into projects and programs.

**Browse** ▶  
A gateway to browse the complete set of INVEST criteria that can be used to evaluate the sustainability of projects and programs.

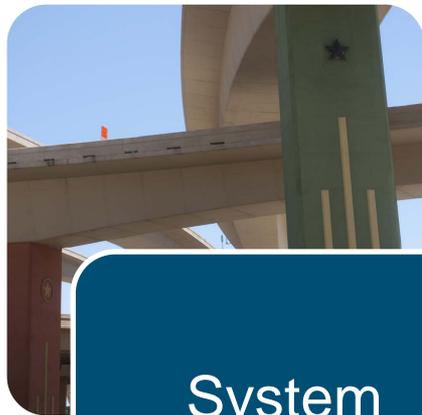
**Announcements**  
The Federal Highway Administration (FHWA) is seeking to partner with State departments of transportation (DOTs), metropolitan planning organizations (MPOs), Federal lands, and local governments on utilizing INVEST 1.0, FHWA's voluntary self-assessment tool, to assess and enhance the sustainability of their projects and programs. For more information, see the [solicitation](#).  
  
FHWA launched INVEST 1.0 on October 10, 2012. View the [webcast launch](#), including remarks from Deputy Administrator Greg Nadeau, video footage of INVEST in action in four parts of the country, an overview of how the tool works, and interviews with transportation agencies that piloted the tool.

INVEST, the FHWA Sustainable Highways Self-

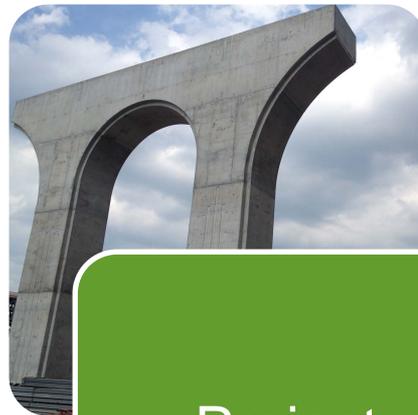
- Translates broad sustainability principles into specific actions
- Web-based self-assessment tool
- Helps transportation agencies assess and improve sustainability (economic, social, environmental outcomes)
- Voluntary
- Free, easy to use
- Practical
- Users: state DOTs, MPOs, local governments, contractors, others

[www.sustainablehighways.org](http://www.sustainablehighways.org)

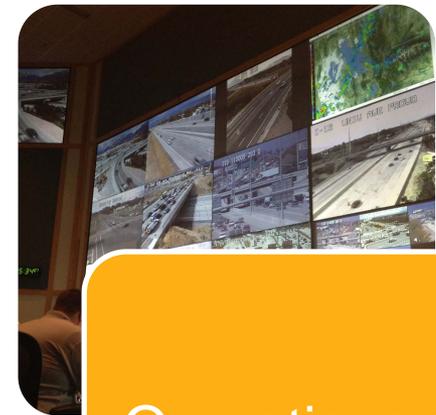
# Supporting the Entire Life Cycle



System  
Planning &  
Processes



Project  
Development



Operations &  
Maintenance

# INVEST's Niche among Sustainability Tools

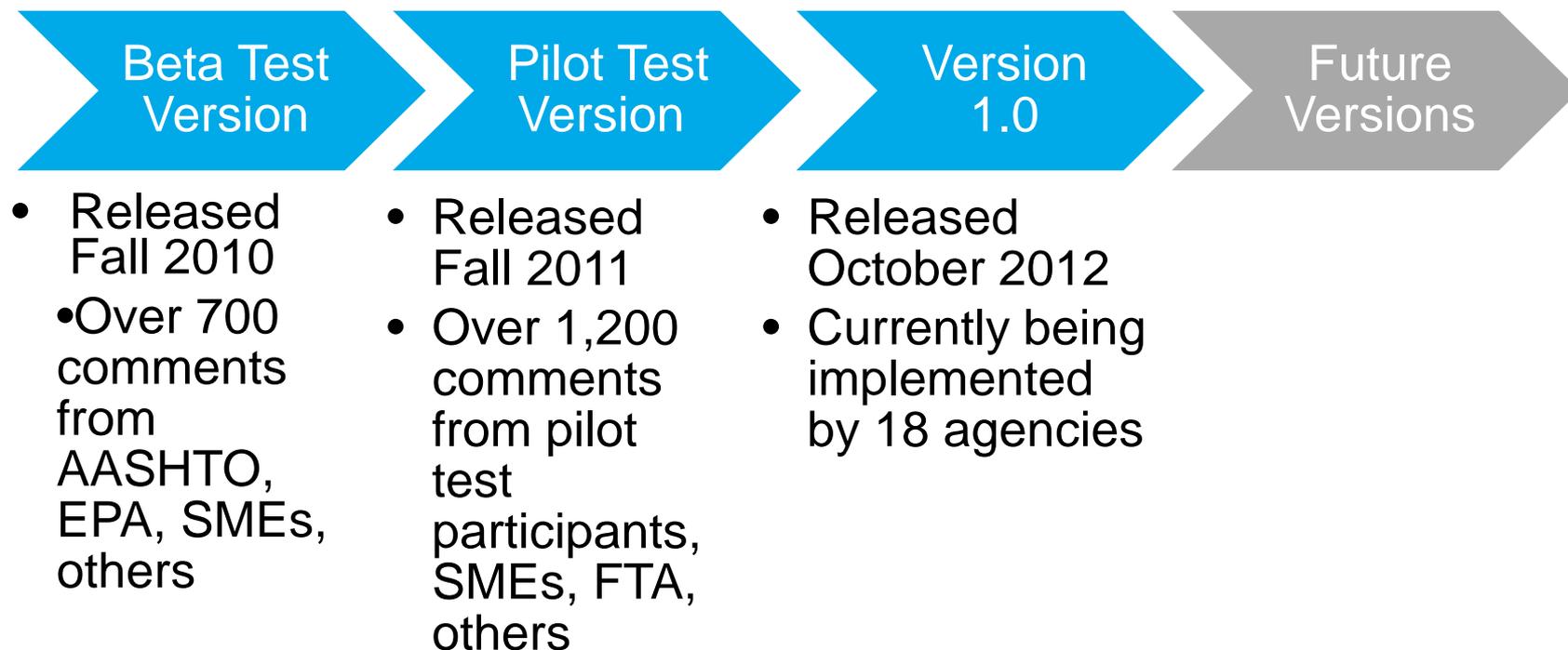


## Transportation System Life Cycle

| Evaluation Tool | Type of Tool                      | Required Criteria | System Planning & Programming      | Project Development                |                |                      | Operations & Maintenance |  |
|-----------------|-----------------------------------|-------------------|------------------------------------|------------------------------------|----------------|----------------------|--------------------------|--|
|                 |                                   |                   |                                    | Project Planning                   | Project Design | Project Construction |                          |  |
| Envision™       | Voluntary 3rd Party Certification | n/a               |                                    | [Green bar]                        |                |                      |                          |  |
| GreenLITES      | Mandatory Internal Certification  | n/a               |                                    | [Grey bar with dashed yellow line] |                |                      | [Green bar]              |  |
| Greenroads      | Voluntary 3rd Party Certification | 11                |                                    | [Grey bar with dashed yellow line] |                |                      |                          |  |
| I-LAST          | Voluntary Self Assessment         | n/a               |                                    | [Grey bar with dashed yellow line] |                |                      |                          |  |
| <b>INVEST</b>   | Voluntary Self Assessment         | n/a               | [Grey bar with dashed yellow line] |                                    |                |                      |                          |  |
| LEED-ND®        | Voluntary 3rd Party Certification | n/a               |                                    | [Green bar]                        |                |                      |                          |  |
| SITES™          | Voluntary 3rd Party Certification | n/a               |                                    | [Green bar]                        |                |                      |                          |  |
| STARS           | Voluntary 3rd Party Certification | 5                 | [Grey bar with dashed yellow line] |                                    |                |                      |                          |  |

Credit for graphic: Lisa Reid, Anneke Davis, Tim Bevan, CH2MHill

# Evolution of INVEST



# INVEST Pilot Sites

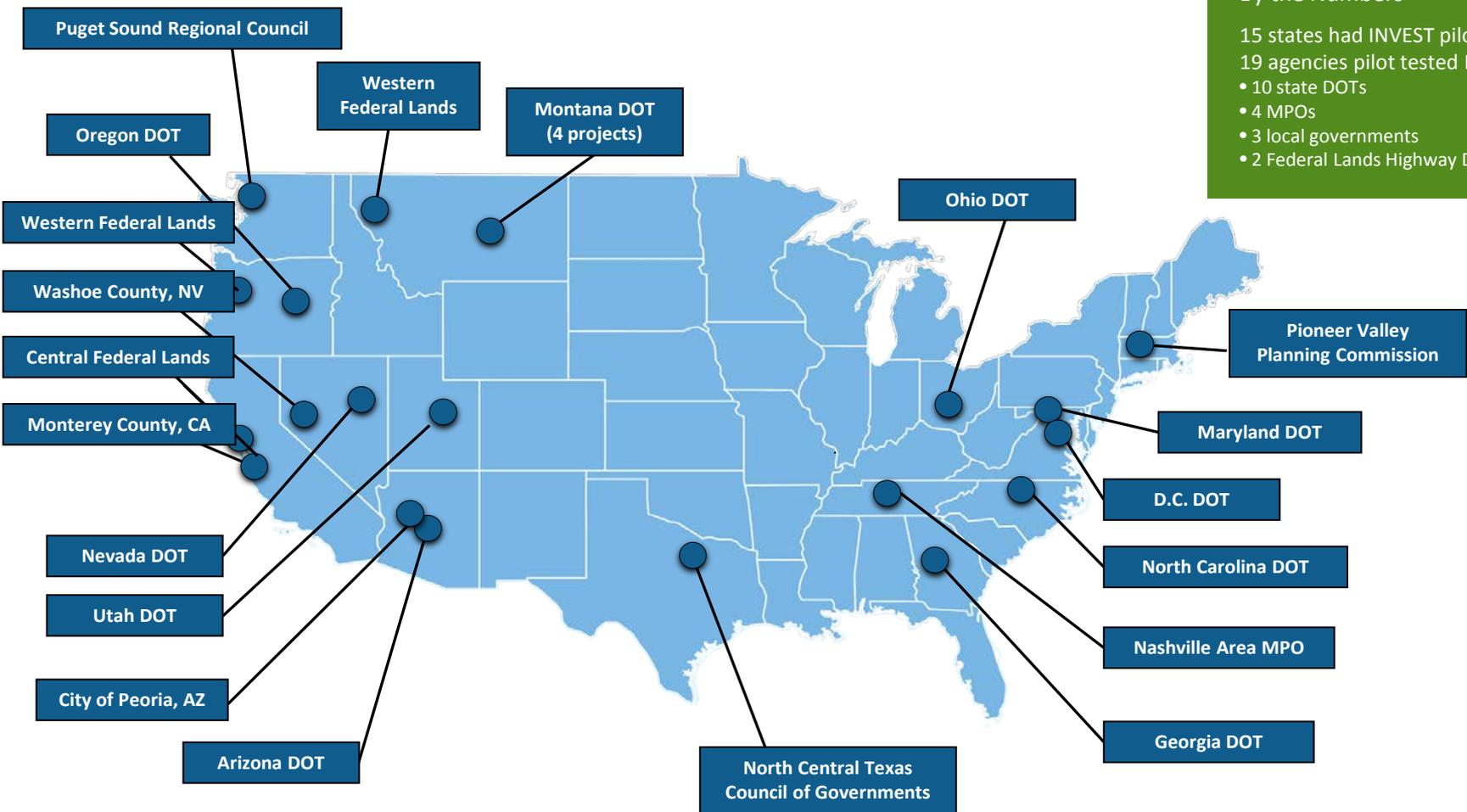


## By the Numbers

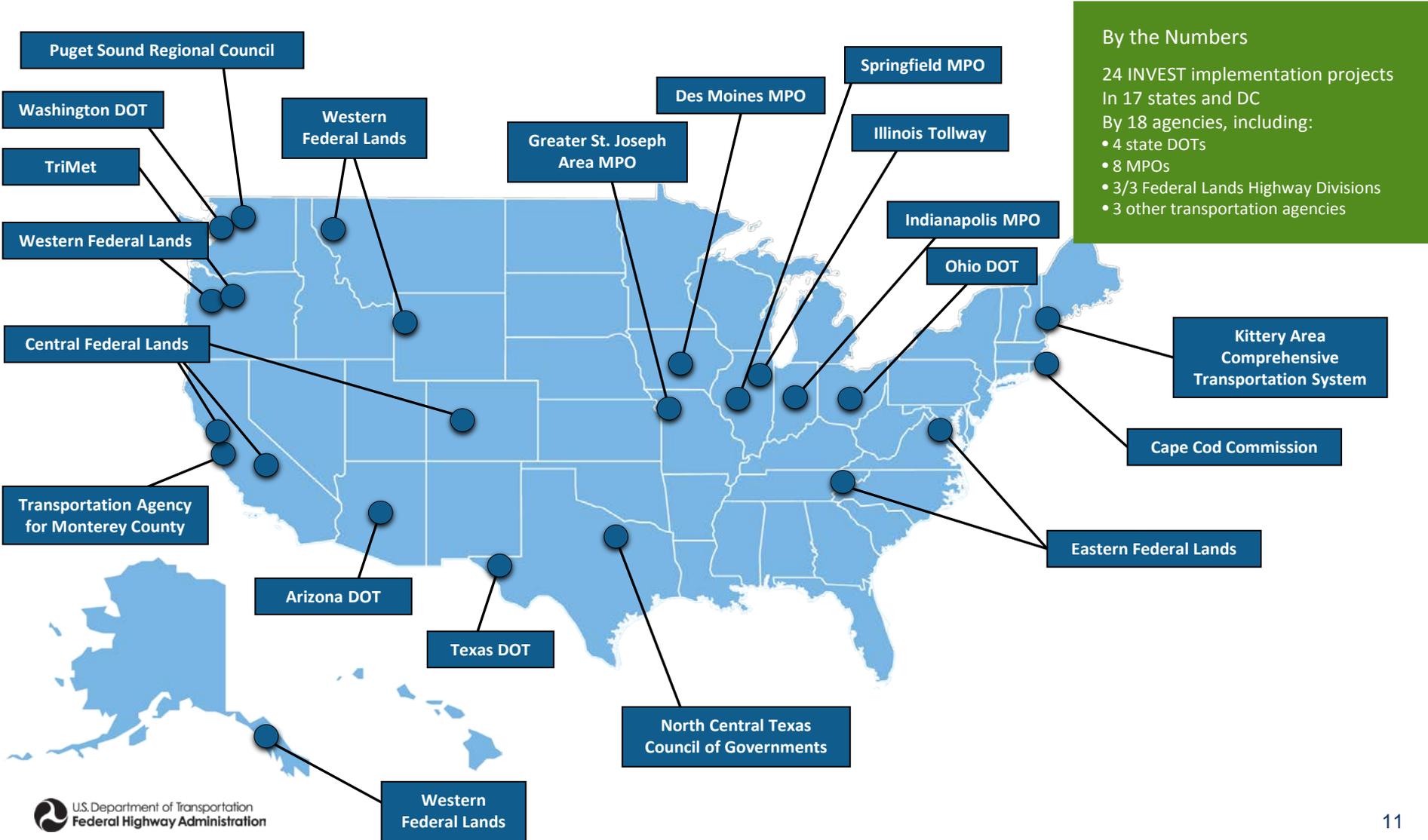
15 states had INVEST pilot projects

19 agencies pilot tested INVEST:

- 10 state DOTs
- 4 MPOs
- 3 local governments
- 2 Federal Lands Highway Divisions



# INVEST Implementation Sites



**By the Numbers**

24 INVEST implementation projects  
 In 17 states and DC  
 By 18 agencies, including:

- 4 state DOTs
- 8 MPOs
- 3/3 Federal Lands Highway Divisions
- 3 other transportation agencies

# Evaluate – Score - Improve

- Evaluate – Using the collaborative process can provide the most important outcome
- Score – Provides recognition for implementing sustainability best practices and identifying gaps
- Improve – Using the process to improve in practice and identify cost effective measures



- Most MPOs are applying INVEST to:
  - › evaluate past LRTP
  - › target areas in planning process for enhancing sustainability
  - › scoring LRTP update to measure progress
- DOTs, others using INVEST on
  - › Projects or sets of projects
    - Arizona DOT evaluation on roundabouts statewide
    - Washington State DOT looking at corridor studies and specific projects
  - › Complete agency practices (SP, PD and OM)
    - Illinois Tollway evaluating all aspects, considering making INVEST evals a standard for all major projects, programs
  - › TriMet (Portland, OR) first major application on major transit project

# System Planning Criteria



- SP-1 Integrated Planning: Economic Development and Land Use
- SP-2 Integrated Planning: Natural Environment
- SP-3 Integrated Planning: Social
- SP-4 Integrated Planning: Bonus
- SP-5 Access & Affordability
- SP-6 Safety Planning
- SP-7 Multimodal Transportation and Public Health
- SP-8 Freight and Goods Movement
- SP-9 Travel Demand Management
- SP-10 Air Quality
- SP-11 Energy and Fuels
- SP-12 Financial Sustainability
- SP-13 Analysis Methods
- SP-14 Transportation Systems Management & Operations
- SP-15 Linking Asset Management and Planning
- SP-16 Infrastructure Resiliency
- SP-17 Linking Planning and NEPA

# Project Development Criteria



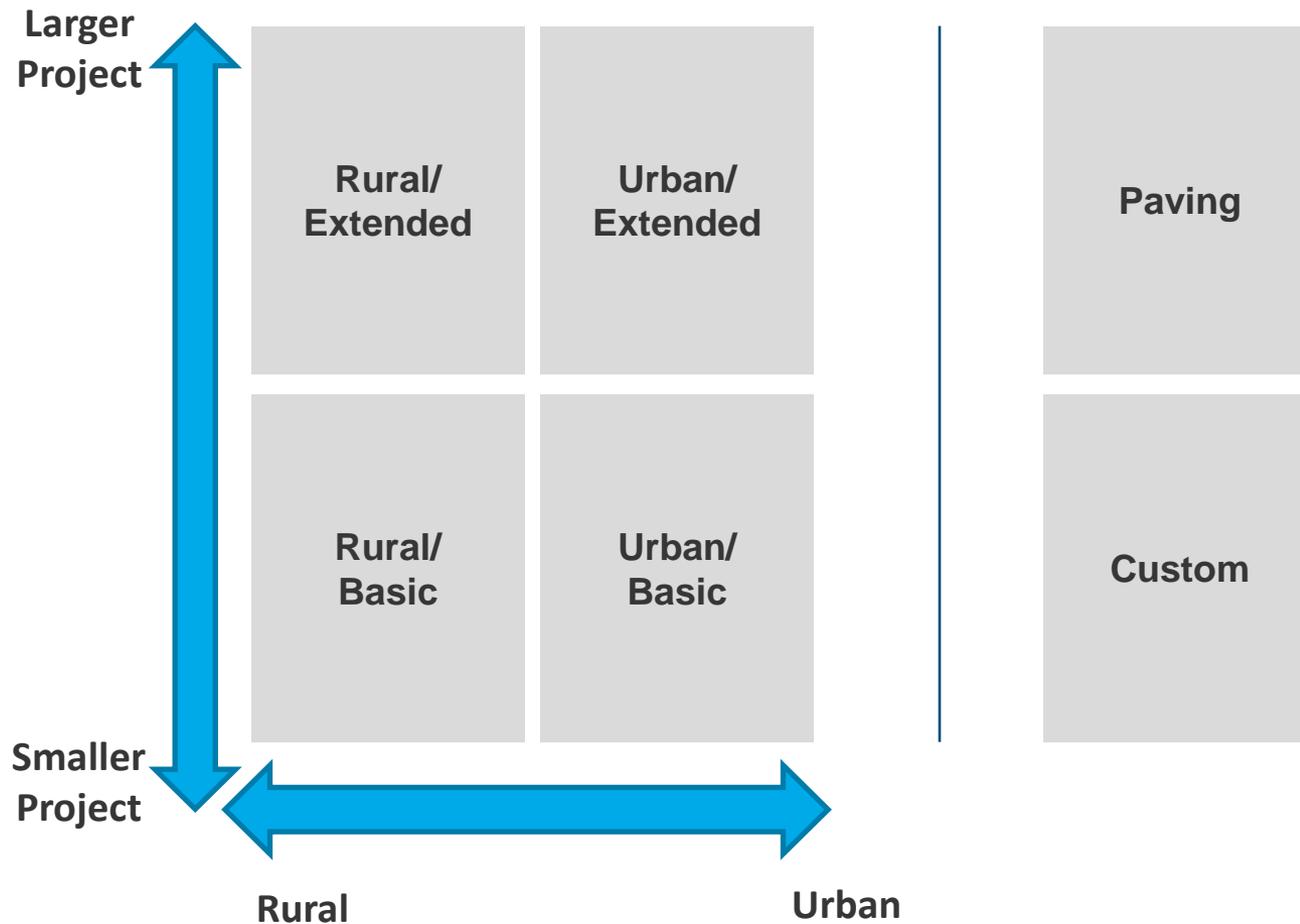
|      |                                       |       |   |
|------|---------------------------------------|-------|---|
| PD-1 | Economic Analyses                     | PD-10 | Pedestrian Access                                     |
| PD-2 | Lifecycle Cost Analysis               | PD-11 | Bicycle Access  |
| PD-3 | Context Sensitive Project Development | PD-12 | Transit & HOV Access                                  |
| PD-4 | Highway and Traffic Safety            | PD-13 | Freight Mobility                                      |
| PD-5 | Educational Outreach                  | PD-14 | ITS for System Operations                             |
| PD-6 | Tracking Environmental Commitments    | PD-15 | Historical, Archaeological, and Cultural Preservation |
| PD-7 | Habitat Restoration                   | PD-16 | Scenic, Natural, or Recreational Qualities            |
| PD-8 | Stormwater                            | PD-17 | Energy Efficiency                                     |
| PD-9 | Ecological Connectivity               | PD-18 | Site Vegetation                                       |

# Project Development Criteria (cont.)



- |       |  |       |                                   |
|-------|--|-------|-----------------------------------|
| PD-19 | Reduce and Reuse Materials                         | PD-27 | Construction Noise Mitigation     |
| PD-20 | Recycle Materials                                  | PD-28 | Construction Quality Control Plan |
| PD-21 | Earthwork Balance                                  | PD-29 | Construction Waste Management     |
| PD-22 | Long-Life Pavement Design                          |       |                                   |
| PD-23 | Reduced Energy and Emissions in Pavement Materials |       |                                   |
| PD-24 | Contractor Warranty                                |       |                                   |
| PD-25 | Construction Environmental Training                |       |                                   |
| PD-26 | Construction Equipment Emission Reduction          |       |                                   |

# Multiple Scorecards to Fit Your Project



# Operations & Maintenance Criteria



OM-1 Internal Sustainability Plan

OM-2 Electrical Energy Efficiency and Use

OM-3 Vehicle Fuel Efficiency and Use

OM-4 Reuse and Recycle

OM-5 Safety Management

OM-6 Environmental Commitments Tracking System

OM-7 Pavement Management System

OM-8 Bridge Management System

OM-9 Maintenance Management System

OM-10 Highway Infrastructure Preservation and Maintenance

OM-11 Traffic Control Infrastructure Maintenance

OM-12 Road Weather Management Program

OM-13 Transportation Management and Operations

OM-14 Work Zone Traffic Control



# Video



# Ohio Department of Transportation (ODOT)



[Watch Video Case Study Here](#)

## Complex, Urban Project

### *INVEST Role: Project Development*

- Largest project in ODOT history – replace bridge spans / expand lanes
- Involves coast-to-coast Interstate
- Affects historic district and high-traffic sports complex
- Targeted major savings in diesel fuel, steel, water and landfill
- Used INVEST to validate those savings assumptions





# INVEST Demo



# INVEST User Workspace



My Workspace Logged in as FHWA Demos

**Logout**  
Version 1.0

**INVEST**  
ECONOMIC • SOCIAL • ENVIRONMENTAL

Home Learn Browse **Score** Home > My Workspace

search

## My Workspace

Scoring Tutorial

Start a new Project or Program

Continue Working on an Existing Project or Program:

### System Planning and Processes

|                        |                      |                           |                            |                       |                        |                             |
|------------------------|----------------------|---------------------------|----------------------------|-----------------------|------------------------|-----------------------------|
| <a href="#">Test 1</a> | <a href="#">Edit</a> | <a href="#">Duplicate</a> | <a href="#">Print-View</a> | <a href="#">Score</a> | <a href="#">Delete</a> | <a href="#">Collaborate</a> |
|------------------------|----------------------|---------------------------|----------------------------|-----------------------|------------------------|-----------------------------|

### Project Development

|                        |                      |                           |                            |                       |                        |                             |
|------------------------|----------------------|---------------------------|----------------------------|-----------------------|------------------------|-----------------------------|
| <a href="#">Test 2</a> | <a href="#">Edit</a> | <a href="#">Duplicate</a> | <a href="#">Print-View</a> | <a href="#">Score</a> | <a href="#">Delete</a> | <a href="#">Collaborate</a> |
|------------------------|----------------------|---------------------------|----------------------------|-----------------------|------------------------|-----------------------------|

### Operations and Maintenance

|                        |                      |                           |                            |                       |                        |                             |
|------------------------|----------------------|---------------------------|----------------------------|-----------------------|------------------------|-----------------------------|
| <a href="#">Test 3</a> | <a href="#">Edit</a> | <a href="#">Duplicate</a> | <a href="#">Print-View</a> | <a href="#">Score</a> | <a href="#">Delete</a> | <a href="#">Collaborate</a> |
|------------------------|----------------------|---------------------------|----------------------------|-----------------------|------------------------|-----------------------------|

- Home
- Learn
- Browse
- Score
- Glossary
- FAQ
- Case Studies
- FHWA's Sustainable Highways Initiative
- Provide Comments
- Register
- Privacy

# Scoring in INVEST

## System Planning Criteria by Sustainability Principle

| Criterion Number and Title                                   |
|--|
| SP-1: Integrated Planning: Economic Development and Land Use |
| SP-2: Integrated Planning: Natural Environment               |
| SP-3: Integrated Planning: Social                            |
| SP-4: Integrated Planning: Bonus                             |
| SP-5: Access & Affordability                                 |
| SP-6: Safety Planning  |
| SP-7: Multimodal Transportation and Public Health            |
| SP-8: Freight and Goods Movement                             |
| SP-9: Travel Demand Management                               |
| SP-10: Air Quality   |
| SP-11: Energy and Fuels                                      |
| SP-12: Financial Sustainability                              |
| SP-13: Analysis Methods                                      |
| SP-14: Transportation Systems Management & Operations        |
| SP-15: Linking Asset Management and Planning                 |
| SP-16: Infrastructure Resiliency                             |
| SP-17: Linking Planning and NEPA                             |

My Workspace
Logged In as FHWA Demos

[Logout](#)  
Version 1.0



[Home](#)
[Learn](#)
[Browse](#)
[Score](#)

[Home > Score > Scorecard > View Criterion](#)

### Criterion Details

#### SP-1 Integrated Planning: Economic Development and Land Use

[Download as pdf](#)

#### Goal

Integrate statewide and metropolitan Long Range Transportation Plans (LRTP) with statewide, regional, and/or local land use plans and economic development forecasts and goals. Proactively encourage and facilitate sustainability through the coordination of transportation, land use, and economic development planning.

#### Sustainability Linkage

Integrating transportation planning with economic development and land use supports the economic triple bottom line principle by creating opportunities to improve access and mobility, and increase the social, environmental, and economic returns on both public and private investments in transportation projects and programs.



#### Scoring Requirements

**Background**

This criterion recognizes that each state and MPO has different land use and economic development regulatory, policy, and institutional frameworks, plans, and goals, and allows for flexibility in the activities and types of plans agencies use to measure integration. The intent of this criterion is to encourage agencies to integrate sustainability into transportation, land use, and economic development planning.

### Criterion Scoring

#### Test 1

**Has the agency developed goals and objectives for the integration of metropolitan and/or statewide transportation planning with economic development and land use planning above and beyond current requirements?**

Yes (1 point)

No

**Are the goals and objectives consistent with applicable economic development and land use plans above and beyond current requirements?**

Yes (1 point)

No

**Does the agency regularly engage land use and economic development agencies in its jurisdiction throughout the transportation planning process?**

Yes (2 points)

No

- [Home](#)
- [Learn](#)
- [Browse](#)
- [Score](#)
- [Glossary](#)
- [FAQ](#)
- [Case Studies](#)
- [FHWA's Sustainable Highways Initiative](#)
- [Provide Comments](#)
- [Register](#)
- [Privacy](#)

# How INVEST Measures Sustainability



My Workspace Logged In as FHWA Demos

Logout  
Version 1.0

Home Learn Browse Score Home > Score > Scorecard

search go

## System Planning Scorecard

Program or Process: Test 1 [edit](#)

[View full scorecard](#) to save or print from your browser.

| Criteria  | Points |
|---|--------|
| <b>SP-01 <a href="#">Integrated Planning: Economic Development and Land Use</a></b> 15/15<br>Integrate statewide and metropolitan Long Range Transportation Plans (LRTP) with statewide, regional, and/or local land use plans and economic development forecasts and goals. Proactively encourage... |        |
| <b>SP-02 <a href="#">Integrated Planning: Natural Environment</a></b> 15/15<br>Integrate ecological considerations into the transportation planning process, including the development of the long range transportation plan (LRTP) and TIP/STIP. Proactively support and enhance...                  |        |
| <b>SP-03 <a href="#">Integrated Planning: Social</a></b> 15/15<br>The agency's Long Range Transportation Plan (LRTP) is consistent with and supportive of the community's vision and goals. When considered in an integrated fashion, these plans, goals and visions...                               |        |

Download

- [Compendium - Web Version](#)
- [Compendium - Print Version](#)
- [Scorecard](#)

Score 79  
Your Rating: Bronze

96 points needed for Silver  
120 points needed for Gold  
144 points needed for Platinum

- Home
- Learn
- Browse
- Score
- Glossary
- FAQ
- Case Studies
- FHWA's Sustainable Highways Initiative
- Provide Comments
- Register
- Privacy



# Criteria in Action

SP-1 Integrated Planning: Economic Development and Land Use

PD-8 Stormwater

OM-12 Road Weather Management Program





# PD-29 Construction Waste Management

*Western Federal Lands Highway Division*



- **Goal:** To utilize a management plan for road construction waste materials to minimize the amount of construction-related waste destined for landfill.
- Maximum number of points: 3



*Owner requires the contractor to maintain a formal Construction Demolition Waste Management Plan (CWMP)*  
(1 point)

- **SCORE: 1 point**

*Owner demonstrates that a certain percentage of the construction waste has been diverted from landfills (1 point for at least 50% diversion, 2 points for at least 75% diversion)*

- **SCORE: 0 points**

## *Western Federal Lands Plan for Improvement*

- Scored 19 projects
- Identified 11 criteria where projects score well and 9 criteria where projects do not score well.
- Looking across a set of projects to make adjustments programmatically to overall processes is a great way to use INVEST and maximize sustainability improvements.
- Identified PD-29 as one where they could improve.
- Developing requirements for contractor to report on waste destinations.
- Enables them to document practices in use that reduce construction waste, such as current practice of reusing old paving material as base for road construction.
- Enables them to track progress and make further improvements.



# PD-8 Stormwater

## *Cleveland Innerbelt Bridge*



- **Goal:** to improve stormwater quality from the impacts of the project and control flow to minimize pollution adverse effects on receiving water bodies and related water resources, using management methods and practices that reduce the impacts associated with development and redevelopment.
- Maximum number of points: 9

## Water Quality (3 points)

| Amount of Runoff Treated<br>[% of Annual Volume] | Target Pollutant                              | Target Imp. Surface Area<br>[& of Added] <sup>1</sup> | Points |
|--|---|---|--------|
| 80% – 89%  | Sediment                                      | 101% – 125%   | 0      |
|  |   | >125%   | 1      |
|  | Sediment, and Metals<br>or Other <sup>2</sup> | 101% – 125%   | 1      |
|  |   | >125%   | 2      |
| 90% +  | Sediment                                      | 101% – 125%   | 1      |
|  |   | >125%   | 2      |
|  | Sediment, and Metals<br>or Other <sup>2</sup> | 101% – 125%   | 2      |
|  |   | >125%   | 3      |

Column 3 – For retrofit projects, see Table 2 for equivalent percentages to use.  
 [<sup>1</sup>] – %of Added = Treated Impervious Surface Area / Added Impervious Surface Area  
 [<sup>2</sup>] – Other basin-specific pollutant of concern is targeted

## Flow Control (3 points)

| Amount of Runoff Managed<br>[% of Annual Volume] | Flow Control Standard Used | Target Imp. Surface Area<br>[& of Added] <sup>1</sup> | Points |
|--|----------------------------|---|--------|
| 80% – 89%  | Peak Rate                  | 101% – 125%   | 0      |
|  |                            | >125%   | 1      |
|  | Flow Durations             | 101% – 125%   | 1      |
|  |                            | >125%   | 2      |
| 90% +  | Peak Rate                  | 101% – 125%   | 1      |
|  |                            | >125%   | 2      |
|  | Flow Durations             | 101% – 125%   | 2      |
|  |                            | >125%   | 3      |

— ODOT scored 3 points.

## *Low Impact Development / Effective Best Management Practices (3 points)*

- 100 percent of impervious surface area is treated using best management practices
- **SCORE: 3 points**





# PD-20 Recycle Materials

## *Cleveland Innerbelt Bridge*



# PD-20 Recycle Materials



- **Goal:** to reduce lifecycle impacts from extraction, production, and transportation of virgin materials by recycling materials.
- Maximum number of points: 12

## *Recycled Asphalt Pavement or Recycled Concrete Aggregate (5 points)*

- **SCORE: 2 points**

| Mix Type                         | % Recycled Asphalt Mix | Estimated cubic yards of asphalt | Estimated cubic yards of recycled asphalt mix<br>(column 2 multiplied by column 3) |
|----------------------------------|------------------------|----------------------------------|--|
| 446-1H Asphalt Warm Mix          | 15%                    | 4247.21                          | 637.08   |
| 446-2 Intermediate Asphalt       | 35%                    | 6143                             | 2150.05  |
| 448.1 Intermediate Asphalt       | 35%                    | 770                              | 269.5  |
| 12.55MM Asphalt Warm Mix         | 15%                    | 9386.25                          | 1407.94  |
| 19.0MM Asphalt Warm Mix          | 30%                    | 10744                            | 3233.2   |
| Total                            |                        | 31290.46                         | 7687.77  |
| <b>Total % Recycled Material</b> |                        |                                  | <b>25% [7687.77/31,290.46]</b>   |

| Recycling Method Used  | Points Earned |     |     |     |             |
|--|---------------|-----|-----|-----|-------------|
|  | 1             | 2   | 3   | 4   | 5           |
| Percent average recycled material (ARC) required for recycling in pavements              | 10%           | 20% | 30% | 40% | 50% or more |
| Percent average recycled material (ARC) required for granular base course or embankments | 20%           | 30% | 40% | 50% | 60% or more |

*In-place Pavement Recycling (6 points)*

- **SCORE: 0 points**

*Recycling Minor Structural Elements (1 point)*

- **SCORE: 0 points**



# OM-12 Road Weather Management System

*Utah Department of Transportation*



# OM-12 Road Weather Management System

## Implement the Standards of Practice or Standard Operating Procedure (SOP) for Snow and Ice Control (2 points)

- › Salt reduction
- › Anti-icing program
- › Chemical storage BMPs
- › Equipment calibration
- › Fuel efficiency through planning and route optimization



### • **SCORE: 2 points**

#### **Utah Snow SOP highlights all 3 areas of sustainability:**

- › Saves \$124,000 per year compared to standard practice (economic)
- › Reduces the amount of salt used by 30 percent (environmental)
- › Improves road safety and accessibility (social)

# OM-12 Road Weather Management System

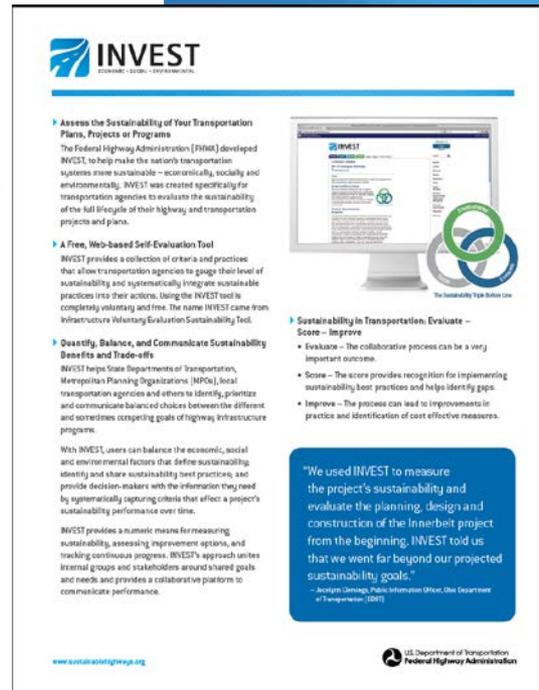


## *Utah DOT's Plan for Improvement*

- UDOT developed a prioritized set of recommendations for improved sustainability
- Included a recommendation to produce a snow removal decision support system, which would formalize the agency's current process.

# Resources Available

- INVEST Toolkit
  - › Fact sheet
  - › Presentation Slides
  - › User Guide
- Full day, in-person INVEST training
- Funding for using INVEST and developing case studies



- How might INVEST help you in your work?



Try INVEST at:  
[www.sustainablehighways.org](http://www.sustainablehighways.org)

## Contact:

Mike Culp ([michael.culp@dot.gov](mailto:michael.culp@dot.gov))  
Connie Hill Galloway ([connie.hill@dot.gov](mailto:connie.hill@dot.gov))  
Tina Hodges ([tina.hodges@dot.gov](mailto:tina.hodges@dot.gov))  
Heather Holsinger ([heather.holsinger@dot.gov](mailto:heather.holsinger@dot.gov))  
Rob Hyman ([robert.hyman@dot.gov](mailto:robert.hyman@dot.gov)), or  
Diane Turchetta ([diane.turchetta@dot.gov](mailto:diane.turchetta@dot.gov))

