Sustainability in Federal Lands Highway Projects

December 8, 2014
Today’s Webinar

• Introduction
• What is sustainability and why it is important?
• How to integrate sustainability in transportation projects?
• How to measure sustainability in transportation projects?
• Ohio DOT Case Study – Dave Lastovka, ODOT
• How was INVEST successfully used by FLH on FLMA projects?
• How are we currently using INVEST in FLH?
• Discussion
What is Sustainability?

The Sustainability Triple Bottom Line

- Environmental
- Economic
- Social
Sustainability

- The **Social** principle: Meeting basic human needs fairly and efficiently, which includes considering issues like human health, safety, access, mobility, mode choice, cultural resources, archeological resources, aesthetics, and recreation.
The **Environmental** principle: Following three natural laws (Robért, 2000):

- Do not extract substances from the Earth faster than they can be regenerated,
- Do not produce waste faster or at a greater amount than it can decompose and reintegrate into an ecosystem, and
- Do not damage or disrupt natural processes or ecosystems with human activities. Often the easiest of the three principles to understand, the environmental principle considers solutions based on factors such as habitat, ecology, stormwater runoff and quality, air quality, recycling and reuse, energy efficiency, and noise management.
• The **Economic** principle: Efficiently and/or productively using public capital, avoiding deterioration of capital assets. This principle considers solutions based on factors such as financial durability, reliability, responsibility, lifecycle costs, benefit-cost-driven decisions, and the use of natural resources.
How to integrate sustainability into transportation projects?
Progress of Sustainable Technologies

As time passes, technologies that were emerging evolve from available to adopted. The pool of emerging technologies is continually replenished as technology advances.

- **Emerging Technologies**: are in the process of development or being tested.
- **Available Technologies**: are accepted and proven technologies that are available, but are not yet commonplace.
- **Adopted Technologies**: are commonly used and may not be considered to promote the practice of sustainability in the future.
From here to there....

Present  

Future
Present to Predict Future
Future to Define Present
Integrated Approach for Sustainable Roads

- Provide a **process** for integrating sustainability into the planning, design and construction of roadway projects.
- Intended to fit within the existing design process.
- Assumes system-level planning efforts are complete and specific project identified.
- Flexible and applicable to different project types and sizes.
Sustainability and Context Sensitive Solutions (CSS)

- Close relationship with each other
- Projects need to:
  - “Be in harmony with the community and preserve the environmental, scenic, aesthetic, historic and natural resource values of the area”
  - Be safe for all users
  - Solve problems agreed upon by full range of stakeholders
  - Meet or exceed expectations of designers and stakeholders
  - Demonstrate effective and efficient use of resources among all parties

Integrated Approach for Sustainable Roads

- Owner’s staff, public officials, planners, engineers, designers, construction oversight

- **Interdisciplinary team** led by a sustainability manager. **Sustainability Manager:**
  - Could be the same person or could transition through project phases
  - Needs to guide the team, assign responsibility, ensure coordination, track progress and conduct quality control
Six-Step Approach

- Step 1: Develop a Sustainability Vision
- Step 2: Identify Project Context
- Step 3: Define Sustainability Goals
- Step 4: Identify Sustainable Solutions
- Step 5: Assess and Select Sustainable Solutions
- Step 6: Incorporate Solutions

A sustainable solution is a specific project activity, feature or process that promotes sustainability. Some examples:

Activity:
• Recycling existing pavement materials in place

Feature:
• Installing bicycle lanes

Process:
• Analyzing lifecycle costs.
Aligning Project Steps with Each Phase

Steps 1, 2, 3: Vision/Context/Goals
Steps 4, 5: Identify/Assess/Select Solutions
Step 6: Incorporate Solutions

Tracking Progress

LEGEND
- Optimal timing for steps
- Acceptable window for steps
Integration at Each Project Phase

• Planning:
  › Develop a sustainability vision, understand project context, define sustainability goals

• Design:
  › Identify, assess and select sustainable solutions and incorporate into construction contract documents

• Construction:
  › Communicate goals and intents from earlier phases with contract manager and monitor sustainability integration
1 Develop a Sustainability Vision

• Brief, well crafted statement that aligns the project team to a desired sustainability outcome
• Intended to start the conversation and shape the goals.
• Needs to be developed early on

Example Project Step 1: Create a Sustainability Vision

Basic Information
This project will widen a 15 mile corridor of a two-lane scenic byway through rolling mountains to meet current safety standards. There is an existing retaining wall along northern edge and stream along the southern row boundary. Existing ACP needs rehabilitation to depth of at least 4 inches. The project will add trailhead access points and parking in two locations. Scenic byway crosses a wildlife migration route and an historic trail.

Sustainability Vision
The agency is committed to the sustainable development of Scenic Byway X. To achieve this the agency envisions minimizing disruptions to wildlife and to public enjoyment of the historic trail during construction, preserving and/or enhancing the wildlife habitat and the historic nature of the trail, conserving resources and exercising responsibility in a fiscally constrained environment while upgrading the roadway corridor for the safety of the traveling public.

This example does not represent an actual project and is intended to be illustrative of the proposed approach rather than comprehensive.
Understand Project Context

- Focused on the unique attributes of the project and project area
- Helps shape goals
- Evolves as the project progresses

**Example Project Step 2: Understand Project Context**

**Noteworthy Context Observations**

**Physical**
Rolling hills, retaining walls on northern edge of existing roadway, existing pavement needs rehabilitation, significant elk migration route, good soils, native vegetation unique to area — varies depending on slope/sun exposure/and water accessibility, stream along southern edge of roadway, 150 mi. from existing gravel source and 180 mi. from ACP plant

**Social**
Significant scenic byway, crosses historic trail, existing shoulder parking dangerous, most users recreational, seasonal residents from nearby cabin community, bikes not allowed on trails - rare on roadway (undesirable)

**Economic**
Project funds limited, need to spend construction $ in FY 1&2, park has potential to raise revenues currently limited due to congestion (can be applied to maintenance, but not design/construction)

**Regulatory**
Design and construction per FLH PDDM & Construction Manual, likely CE, NPDES permit required

*This example does not represent an actual project and is intended to be illustrative of the proposed approach rather than comprehensive.*
3 Define Sustainability Goals

- Succinct, well defined
- Keep brief (5 to 7 goals at most)
- Keep consistent with the vision
- Use to identify solutions

Example Project Step 3: Define Project-level Sustainability Goals

Project-Level Sustainability Goals
1. Reduce raw material usage and recycle or reuse 75% of existing structural and pavement materials
2. Reduce water usage during construction and throughout lifetime of the project
3. Preserve and enhance the elk habitat and migration route
4. Provide safe access to the historic trail while enhancing scenic and recreational opportunities
5. Minimize construction impacts to public and wildlife

This example does not represent an actual project and is intended to be illustrative of the proposed approach rather than comprehensive.
Identify Sustainable Solutions

- Big picture brainstorming exercise
- Reach high; push the envelope
- Identify early in the design phase

Example Project Step 4: Identify Sustainable Solutions

| Goal 1: Reduce raw material usage and recycle or reuse 75% of existing structural and pavement materials |
|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| **Drainage & Landscaping**                      | **Geometric & Pavement**                        | **Structural & Geotechnical**                   | **Construction Processes**                       |
| • Leverage LID to reduce piping and structure needs | • Cold-in-place recycling of ex. ACP            | • Relocate and reuse retaining wall materials   | • Construction waste management plan             |
| • Reuse existing native plantings               | • Hot-in-place recycling of ex. ACP             | • Use stabilizing techniques to preserve existing structural backfill |
| • Use RAP as pipe bedding material              | • Mill top 4” of ACP                            |                                                 |                                                 |
|                                                 | • Use RAP as new shoulder base                  |                                                 |                                                 |
|                                                 | • Balance cut & fill                            |                                                 |                                                 |
Assess and Select Sustainable Solutions

Does the solution….

• Fit the context?
• Fulfill one or more sustainability goals?
• Require trade-offs?
  › Conflict with other solutions?
• Offer feasibility and cost effectiveness?
• Bring value long term?
• Fit within an identified project phase?

Example Project Step 5 (1 of 2): Assess Sustainable Solutions

Goal 1: Reduce raw material usage and recycle or reuse 75% of existing structural and pavement materials

Drainage & Landscaping
- Leverage LID to reduce piping and structure needs
- Reuse existing native plantings
- Use RAP as pipe bedding material

Geometric & Pavement
- Cold-in-place recycling of ex. ACP
- Hot-in-place recycling of ex. ACP
- Mill top 4” of ACP
- Use RAP as new shoulder base
- Balance cut & fill

Structural & Geotechnical
- Relocate and reuse retaining wall materials
- Use stabilizing techniques to preserve existing structural backfill

Construction Processes
- Construction waste management plan

Limited ability to do this and maintain existing geometrics

CIR, HIR and milling are mutually exclusive. Milling ACP and using RAP is preferred technique given existing pavement condition.

This example does not represent an actual project and is intended to be illustrative of the proposed approach rather than comprehensive.
6. **Incorporate Solutions**

- Integrate solutions into project by the final design phase
- Include solutions in the plans and specifications
- Assign responsibility for implementation to a team member
- Track solutions over time

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### Example Project Step 6: Incorporate Solutions

<table>
<thead>
<tr>
<th>Responsible Person</th>
<th>Sustainable Solution</th>
<th>When Incorporated</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leverage LID to reduce piping and structure needs</td>
<td>Intermediate Design</td>
<td>Complete</td>
</tr>
<tr>
<td></td>
<td>Reuse existing native plantings</td>
<td>Final Design</td>
<td>In Process</td>
</tr>
<tr>
<td></td>
<td>Use RAP as pipe bedding material</td>
<td>Intermediate Design</td>
<td>Complete</td>
</tr>
<tr>
<td></td>
<td>Use RAP as new shoulder base</td>
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<td></td>
<td>Balance cut and fill</td>
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<td></td>
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<td></td>
<td>Use stabilizing techniques to preserve existing structural backfill</td>
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<tr>
<td></td>
<td>Construction Waste Management Plan</td>
<td>Specifications</td>
<td>In Process</td>
</tr>
<tr>
<td></td>
<td>Use LID techniques to capture grey water</td>
<td>Intermediate Design</td>
<td>In Process</td>
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<tr>
<td></td>
<td>Gray water irrigation</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Low and no-water plantings</td>
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<td></td>
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<tr>
<td></td>
<td>Plant native species</td>
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<td></td>
<td>Closed loop wheel wash</td>
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<td></td>
<td>Monitor water use</td>
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<td></td>
<td>Leverage settling tanks in TESC and reuse grey water for dust control</td>
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<td></td>
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</tbody>
</table>

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How to measure sustainability in transportation projects?
INVEST 1.0 – FHWA’s Sustainability Tool

Welcome to INVEST Version 1.0!

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 solidation.

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-

What do you want to do?

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.

• Web-based self-assessment tool
• Connects sustainability principles with action
• Measures sustainability specifically for transportation
• Helps stakeholders go above and beyond
• Voluntary
• Free, easy to use
• Practical
• Flexible
Supporting the Entire Life Cycle

- System Planning
- Project Development
- Operations & Maintenance
## INVEST’s Niche among Sustainability Tools

### Transportation System Life Cycle

<table>
<thead>
<tr>
<th>Evaluation Tool</th>
<th>Type of Tool</th>
<th>Required Criteria</th>
<th>System Planning &amp; Programming</th>
<th>Project Development</th>
<th>Operations &amp; Maintenance</th>
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</thead>
<tbody>
<tr>
<td>Envision™</td>
<td>Voluntary 3rd Party Certification</td>
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<td>STARS</td>
<td>Voluntary 3rd Party Certification</td>
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</tbody>
</table>

- **Tool Specifically Targeted at Roadway Projects**
- **Tool Targeted at General Infrastructure**

Credit for graphic: Lisa Reid, Anneke Davis, Tim Bevan, CH2MHiIl
Multiple Scorecards to Fit Your Project

Larger Project

Rural/Extended

Urban/Extended

Rural/Basic

Urban/Basic

Smaller Project

Rural

Urban

Paving

Custom
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

INVEST
ECONOMIC • SOCIAL • ENVIRONMENTAL

INVEST
Criteria Details
SP-1 Integrated Planning: Economic Development and Land Use

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.
How INVEST Measures Sustainability

System Planning Scorecard

Program or Process: Test 1  edit

View full scorecard to save or print from your browser.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>SP-01 Integrated Planning: Economic Development and Land Use</td>
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<tr>
<td>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...</td>
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<tr>
<td>SP-02 Integrated Planning: Natural Environment</td>
<td>15/15</td>
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<tr>
<td>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...</td>
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<td>SP-03 Integrated Planning: Social</td>
<td>15/15</td>
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<tr>
<td>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...</td>
<td></td>
</tr>
</tbody>
</table>

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
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
INVEST Pilot Sites

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

Puget Sound Regional Council
Oregon DOT
Western Federal Lands
Montana DOT (4 projects)
Western Federal Lands
Washoe County, NV
Central Federal Lands
Monterey County, CA
Nevada DOT
Utah DOT
City of Peoria, AZ
Arizona DOT
North Central Texas Council of Governments
Ohio DOT
Pioneer Valley Planning Commission
Maryland DOT
D.C. DOT
North Carolina DOT
Nashville Area MPO
Georgia DOT
INVEST Implementation Sites

By the Numbers

58 INVEST implementation projects
In 26 states and DC
By 31 agencies, including:
• 11 state DOTs
• 14 MPOs
• Federal Lands Highway Divisions (all 3 divisions)
• 5 other transportation agencies

State DOT
MPO
Federal Lands Highway
Other
Illinois Tollway

- Illinois Tollway **mainstreamed** INVEST into its standard procedures. Developed agency-specific INVEST Manual with responsible parties, actions, timelines.
- **Customized** INVEST with supplemental text and added criteria from I-LAST to meet its unique needs
- Used SP & OM modules to score 4 most recent funding programs. Found upward trend. Identified SP-11, SP-17, OM-1, OM-6, & OM-8 for improvement.
- Scored 35 projects with PD to provide baseline. Next will score and improve in-progress projects that are part of $12 billion capital program.
- Will score, improve, and track progress at 30%, 60%, and 95% design; pre-construction; substantially complete.
TriMet

- Used INVEST on light rail project
- Saw INVEST as opportunity to use federally-tested set of metrics to assess effectiveness of TriMet sustainability strategies and their integration into the project.
- PD custom scorecard – achieved Gold
- Selected 7 of 14 OM criteria as applicable to transit project. Scored Bronze.
- TriMet recommendations resulting from INVEST:
  - Embed RFP process with sustainability language and expectations to ensure data collected and goals met
  - Use INVEST in synergy with other sustainability evaluation tools
Arizona Department of Transportation

• Scope:
  › Evaluated 20 planned or under-construction roundabout projects
  › Held training INVEST workshops with local governments

• Key Outcomes:
  › Integration into ADOT decision-making of a comprehensive platform for assessing programs and practices using a holistic sustainability lens.
  › Plans to improve management of waste streams from pavement preservation projects.
  › Improved freight mobility.
  › Integration of key ADOT partners into the transportation sustainability conversation.

Freight Considerations - State Route 89 and Perkinsville Road, Chino Valley, AZ
PD-13: Freight Mobility Score – 7/7
• 2 Points – Safety improvements specific to freight
• 2 Points – Design and construction adjustments specific to freight
• 3 Points – Construct dedicated truck delivery ingress and egress

Overall, the project scored 41 points in INVEST, giving it a Silver rating.
Washington State Department of Transportation

- Scored 3 corridor planning studies with INVEST SP module.
- Developed recommendations for making corridor planning at the agency more sustainable based on INVEST scoring.
- Integrated these recommendations into WSDOT’s updated Practical Planning Guidelines.
- Will have positive impact on all future corridor studies.
- Used PD module to evaluate part of SR 520 Bridge Replacement and HOV program.
OM-12 Road Weather Management: Implement Standard Operating Procedure for Snow and Ice Control (2 points)

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

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)

As part of the INVEST evaluation, 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.
How Office of Federal Lands Highway is Using INVEST
The Halstead Meadow Bridge is located in Sequoia and Kings Canyon National Parks, approximately 30 miles north of Three Rivers, CA, and 70 miles east of Fresno, CA. This project involved the replacement of roadway fill with a new bridge. The roadway fill was restricting flow and drainage across the Halstead Meadow and causing severe erosion issues.
Halstead Meadow Project

- PD-6 Tracking Environmental Commitments- Utilized a comprehensive environmental compliance tracking system to ensure environmental commitments were identified, tracked, fulfilled, and verified.
- PD-7 Habitat Restoration- Installation of the bridge restored the ecology of the surrounding meadow by allowing natural water flow to resume.
- PD-9 Ecological Connectivity- Connectivity of habitats was re-established with the construction of the new bridge. Wildlife can now safely pass underneath the bridge.
System Planning Module for LRTP

- FLH is using SP module for evaluating the sustainability integration in recently developed Alaska Federal Lands Long Range Transportation Plan. This plan was jointly developed by all Federal Land management agencies, Alaska DOT&PF, and FLH.
- Results suggested that while the agencies considered sustainability, they did not integrate it as a requirement in the plan.
- Lessons learned from this study are being used to develop the Northwest Collaborative Long Range Transportation Plan.
The Pacific Northwest Collaborative Long Range Transportation Plan (CLRTP) is being jointly developed by all federal Lands Management Agencies, State DOTs, and FLH in Oregon and Washington.

The SP module is being used to evaluate the CLRTP at each stage. The first evaluation was performed after goals and objectives were developed for this plan. Two subsequent evaluations will be performed at draft and final stages of this plan.
Located in Fairfax County, Virginia, these projects involve creating two new four-lane divided roadways to provide vital east-west links between Richmond Highway (U.S. Route 1) and Telegraph Road (VA Route 611). In addition to constructing a roadway and median on a new alignment, these projects also include building multiple bridges and large culverts to make the roadway corridor more transparent, promote wildlife passage, remove existing roads through wildlife corridors, and develop a shared-use path for pedestrians and bicyclists. The Fairfax County Parkway project also includes construction of a commuter parking and transit interface within an interchange.
Mulligan Road/Fairfax County Parkway

Landscaping and noise barriers along Fairfax County Parkway, one of the EFL projects evaluated using INVEST. (Courtesy of EFL)

Wildlife underpass on Mulligan Road (Courtesy of EFL)
• These projects excelled in the criteria related to
  › context sensitivity,
  › pedestrian and bicycle access,
  › ecological connectivity,
  › long-life pavement,
  › environmental training, and
  › construction quality control.

• Other criteria identified as potential areas for improvement, with relatively low additional effort, included site vegetation, reducing and reusing materials, and construction waste management.
Ongoing Projects

- FLH continues evaluation of a number of projects in each division using INVEST Project Development Module.
• The EFLHD – FWS 2015 INVEST Cooperative Research project will provide a report documenting sustainability lessons learned, improvements identified and implemented, analysis of costs and benefits of implementing particular sustainability best practices, recommendations for future action and recommendations on improving INVEST as well as adding to the state of the practice. The final report will also include a two page summary case study.
Denali National Park is developing a new Long Range Transportation Plan. FLH is assessing the current operations and maintenance practices on the park using M&O module of INVEST.

Results of this study will improve sustainability in operations and maintenance of Denali National Park.
Try INVEST at:
www.sustainablehighways.org

Contact:
Amit Armstrong (amit.armstrong@dot.gov, 360-619-7668)
Tina Hodges (tina.hodges@dot.gov, 202-366-4287)
Jack Van Dop (jack.vandop@dot.gov, 703-404-7282)
Questions and Discussion
Appendix: 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
Appendix: Project Development Criteria

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

PD-19  Reduce and Reuse Materials
PD-20  Recycle Materials
PD-21  Earthwork Balance
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
PD-27  Construction Noise Mitigation
PD-28  Construction Quality Control Plan
PD-29  Construction Waste Management
## Appendix: Operations & Maintenance Criteria

<table>
<thead>
<tr>
<th>OM-1</th>
<th>Internal Sustainability Plan</th>
<th>OM-8</th>
<th>Bridge Management System</th>
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<tbody>
<tr>
<td>OM-2</td>
<td>Electrical Energy Efficiency and Use</td>
<td>OM-9</td>
<td>Maintenance Management System</td>
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<tr>
<td>OM-3</td>
<td>Vehicle Fuel Efficiency and Use</td>
<td>OM-10</td>
<td>Highway Infrastructure Preservation and Maintenance</td>
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<td>Reuse and Recycle</td>
<td>OM-11</td>
<td>Traffic Control Infrastructure Maintenance</td>
</tr>
<tr>
<td>OM-5</td>
<td>Safety Management</td>
<td>OM-12</td>
<td>Road Weather Management Program</td>
</tr>
<tr>
<td>OM-6</td>
<td>Environmental Commitments Tracking System</td>
<td>OM-13</td>
<td>Transportation Management and Operations</td>
</tr>
<tr>
<td>OM-7</td>
<td>Pavement Management System</td>
<td>OM-14</td>
<td>Work Zone Traffic Control</td>
</tr>
</tbody>
</table>
Large Multi-Modal Transportation Plan

**INVEST Role: System Planning**

- Rapid regional growth: 6.5M to 10M
- Projected funding shortfall of $45B
- Need to increase mobility, cut some improvements & reprioritize others
- Influence travel behavior & demand, improve transportation / land use links
- Extend life of existing assets, increase spending on O&M
- Used INVEST to validate assumptions, ID improvements in asset management and infrastructure resiliency

[Watch Video Case Study Here]
North Central Texas Council of Governments (NCTCOG)

• NCTCOG is now taking action in 3 areas identified by INVEST:
  • SP17: conducting infrastructure climate vulnerability assessment
  • SP15: analyzing asset data to screen project alternatives and planning scenarios
  • Multiple criteria: developing sustainability related performance measures

• Will incorporate above improvements in next LRTP
Complex, Urban Project

*INVEST Role: Project Development*

- Largest project in ODOT history – replace bridge spans / expand lanes of Cleveland Innerbelt / Voinovich Bridge
- 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
- ODOT included requirement in Phase 2 design-build RFP that contractor use INVEST, commit to sustainability level.
- Provided strong incentive for bidders to incorporate sustainability while keeping costs competitive.
- Winning contractor committed to INVEST-Platinum; bid $19 million below ODOT estimate.
- Eco-charrette in Jan 2014 with ODOT, contractor, FHWA to identify actions.
- Ex: Can use higher than the 15% recycled asphalt in ODOT standard specs.
- Will re-score with INVEST every 6 months as project decisions are made. Project tracking towards INVEST Platinum.
- Shared results with TxDOT and now TxDOT will use similar approach for $750 million Harbor Bridge replacement in Corpus Christi.
Western Federal Lands Highway

National Scenic Parkway

*INVEST Role: Project Development*

- 70 years of traffic, weather, avalanches & rockslides
- Aggressive 20-year seasonal rehab program keeps road open but work moving ahead
- Reusing all existing stonework, re-seeding disturbed roadsides
- INVEST helped validate context sensitivity but also improve their documentation & communications

[Watch Video Case Study Here]
Western Federal Lands Highway

- 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 is a great way to use INVEST and maximize sustainability improvements.
- Identified PD-29 as area to improve. Developing requirements for contractor to report on waste destinations. Enables progress tracking and further improvements.
- Currently reusing old paving material as base for road construction.
Maintaining a State-Wide Highway System

*INVEST Role: Operations & Maintenance*

- Traffic monitoring & coordination across 6K+ center-line miles of highways
- Key goals: preserve infrastructure, optimize mobility, improve safety, strengthen the economy
- Budget pressures driving need for more sustainable practices
- Used INVEST to ID inexpensive ways to promote sustainability, like better data about pavement conditions

Watch Video Case Study Here
Springfield, IL MPO

- Used INVEST PD module to develop conceptual design for Historic Route 66 corridor project showing locations for specific sustainability improvements (streetscape design, crosswalks, lighting, bus stops, public art).
- Demonstrated how the improvements would enhance the level of sustainability of the project as measured against the national benchmark of INVEST.
- Held workshop with city officials and state DOT; raised interest in implementing sustainability practices.
- Communicated INVEST criteria effectively and concisely through a visual format.
PD-15: Historical, Archaeological and Cultural Preservation

Goal: Preserve, protect or enhance cultural and historic assets, and/or feature National Byways Program (NSBP) historic, archaeological, or cultural intrinsic qualities in a roadway.

Prerequisite 2: Any portion of the project is along one of America’s Byways, a State Scenic Byway, an Indian Tribe Scenic Byway, or other route that was designated or officially recognized as such because of its significant historical, cultural and/or archaeological features.

1. Enhance features: Protect, preserve, and/or enhance historic, archaeological, or cultural resources. This could be done through the installation of informational or interpretive facilities (e.g. Viewpoint, kiosk, sign for visitors detailing historical, archaeological or cultural significance.)

1-3 points available
3 points achievable
**Goal:** Improve stormwater quality from the impacts of the project and control flow to minimize their erosive effects on receiving water bodies and related water resources, using management methods and practices that reduce the impacts associated with development and redevelopment.

**Requirements:**

1. **Water Quality:** Treating pollutants from total annual runoff volume
2. **Flow Control:** Controlling peak flows or durations from project site
3. **Effective BMPs:** Stormwater management techniques like Bioswales, biofilters, detention pond, infiltration/LID, etc.

1-9 points available
4-5 points achievable
Puget Sound Regional Council (PSRC)

- Scored update of long range transportation plan. Developed action plan for improvements.
- Focused improvements on TDM (SP-9) and asset management (SP-13)
- Developed inventory of the current TDM activities occurring across the region and framework for TDM monitoring and enhancement.
- Developed a better understanding of how peer MPOs have incorporated asset management into the regional transportation plan and how local agency asset management programs can be leveraged during the development of that approach.
INVEST: Sustainability throughout the Transportation Lifecycle
FHWA Needs Feedback to Make it Even Better

To help FHWA make the next version of INVEST even better, click on the “Provide Comments” link at:

www.sustainablehighways.org