

Criterion Example:

**Utah Department of Transportation Statewide
Highway System**

Utah

Module: Operations & Maintenance (INVEST Version 1.0)

Criterion: [OM-07 Pavement Management System](#) (1-15 points)

Lead Agency: Utah Department of Transportation (UDOT)

Link: www.udot.utah.gov

Sources: To review the sources for criterion examples, including Case Studies, please refer to the Resources tab of www.sustainablehighways.org.

Description: Using the pilot version of INVEST in winter 2011-2012, UDOT developed specific recommendations for sustainability improvements to its operations and maintenance program. UDOT then performed a new self-evaluation in the summer of 2014 using INVEST 1.0 to measure progress and identify room for improvement. UDOT found that it had made sustainability progress in a number of areas, including OM-07. UDOT scored well on this criterion, as it has a mature pavement management system (PMS) in place, but also found through the INVEST self-evaluation process that UDOT could further improve its PMS by integrating LIDAR data into the system to enhance the quality of the data.

Scoring Details:

Develop a Pavement Management System and Collect Data (1/1)

UDOT received one point in this area as it has a PMS that includes an inventory, a condition assessment, a determination of needs, a prioritization of projects needing maintenance and rehabilitation, a method to determine the impact of funding decisions, and a feedback process.

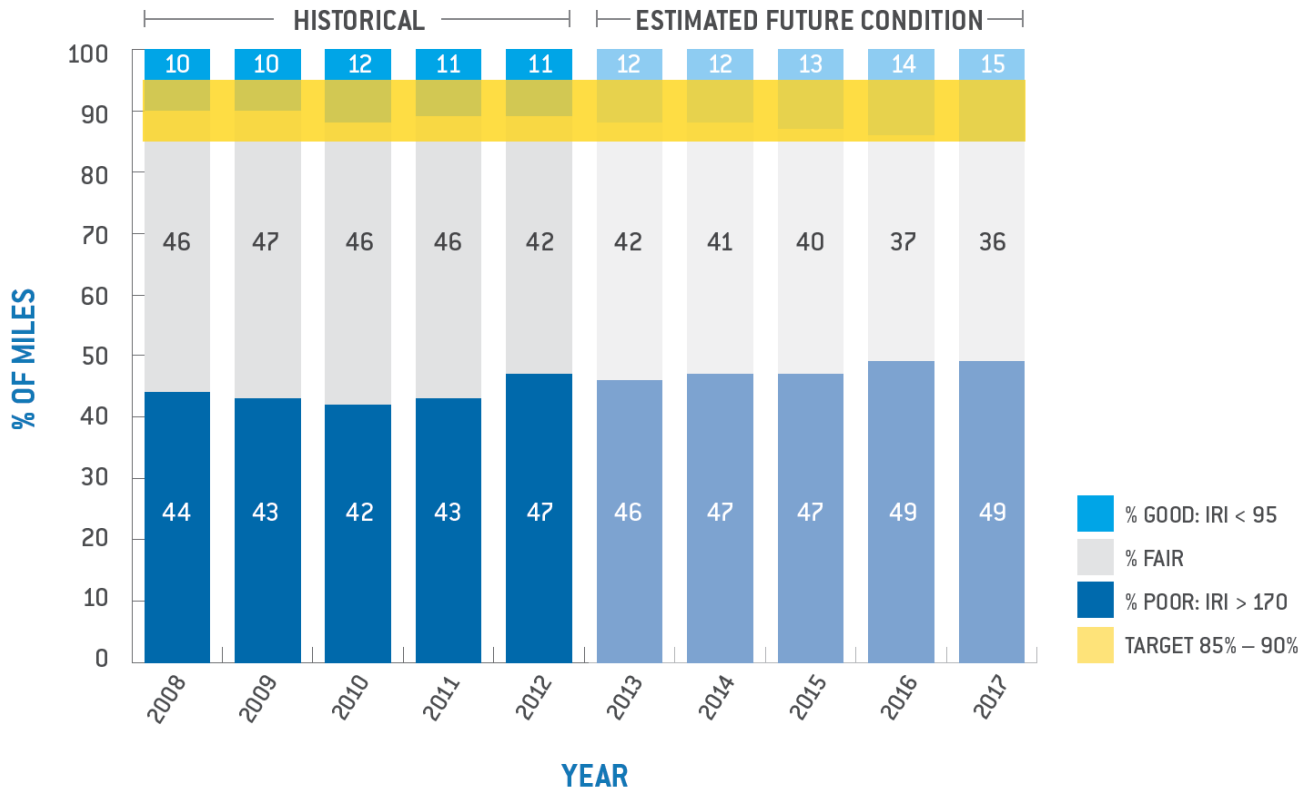
Track Pavement Network Performance (3/3)

UDOT received three points in this area because it tracks performance using metrics for roughness, cracking, rutting, and faulting and has measures related to project timeliness. The graph on the next page for instance shows past performance and projected future performance on pavement roughness, using the International Roughness Index (IRI).

Set Goals and Monitor Progress (2/2)

UDOT received two points in this area as it sets quantifiable goals relating to both condition and project timeliness and monitors progress towards goals. For instance, UDOT set a target of 85 to 95 percent of the state highway system meeting an IRI of “good” or “fair” (IRI below 170). As shown in the graph on the next page, UDOT is overachieving on the goal. Based on this information, UDOT decided to reallocate \$3 million originally slated for pavement repair to culvert rehabilitation and signage improvements.

Statewide Highway System (5,860 miles)
Ride quality – Forcasted with \$188 million/yr



Leverage Data to Demonstrate Sustainable Outcomes (7/7)

UDOT received all of the points under this area. UDOT prioritizes projects through its PMS using life-cycle cost analysis techniques. During the latest revision of the unified work plan, UDOT managers made a conscious decision to include pavement. Pavement projects in the State Transportation Improvement Program come directly from the PMS. Finally, UDOT leverages the PMS to harmonize projects that are located near one another in order to minimize traffic disruptions and improve efficiencies.

Sustainable Specifications (0/2)

UDOT did not receive points under this criterion because they use a standard specification for all of their asphalt mixes. The specification does not mandate warm mix asphalt, but allows contractors to use warm mix asphalt. Because of cost savings, contractors are choosing to use warm mix rather than hot mix. For documentation, UDOT provided its specifications for asphalt mixes (Section 02741 in its standard specifications).

Sustainability Improvements: A high priority recommendation that came out of the 2012 INVEST self-evaluation was to implement collected LIDAR data into UDOT's PMS. Even though undertaking this activity would not improve the INVEST score, the LIDAR data will give UDOT a more accurate inventory of the network. This would improve the consistency of the pavement condition data and lead to better results from the PMS. The PMS recommends the treatment, timing, location, and funding levels for pavement projects. Improvements to UDOT's already sophisticated PMS would then maximize pavement lifetimes, decrease costs, lessen the environmental impacts of construction, and reduce raw material usage.

The recommendation also supplemented an effort at the time to switch from manual pavement condition assessment to automated data collection. Prior to 2012, UDOT collected pavement condition data manually by inspecting each tenth of a mile segment every two years. Staff photographed conditions and assessed ride quality. This information was then used to populate the state's PMS.

Starting in 2012, UDOT switched from manual inspection to automated collection of state-of-the-art 3D pavement distress data. The automated collection provided detailed cracking, rut and faulting distress data that is quantified by exact length, width and depth. The Department is now able to recommend specific projects, allocate funding, and predict future pavement performance more accurately than before. UDOT has estimated an annual cost savings of \$3.4 million in improved pavement management practices and projects.

UDOT's vendor also collected system-wide LIDAR data concurrently with the pavement distress information. Using the LIDAR data presented some early challenges due to the large amounts of information contained in the point cloud. UDOT worked with the vendor and outside consultants to refine and calibrate the data to improve the accuracy to plus or minus one inch. The uses of the calibrated point cloud continue to expand. UDOT has already identified many cost savings and uses for this data, as shown in the box on the next page.

Adding up the total savings and dividing by the costs yields a benefit cost ratio of 3.5, meaning that the monetary benefits to UDOT of implementing the recommendation outweigh the costs by three and a half times.

The implementation of the automated data supports sustainability concepts on many different levels. Much of the cost savings involves reduced time spent by personnel in the field and the associated travel. The reduced travel results in fewer emissions from burning less fossil fuel. The safety of personnel is improved because of the reduction in exposure to traffic. The improved pavement distress data provides better decision making criteria in the PMS. By performing the correct treatments at the right time, paving materials will be utilized to their maximum benefit.

Collection of Mobile Automated System-wide Pavement and LIDAR Data

Savings

- \$3.4M in improved pavement management practices and projects
- \$85K saved annually in outdoor advertising inventory and measurements
- \$26K saved annually in Highway Performance Monitoring System (HPMS) field measurements
- \$90K saved annually in field measurements for smaller pavement preservation design projects
- \$125K saved annually in Maintenance Management Quality Assurance (MMQA) data collection and features inventory database
- \$39K saved annually in field investigation to prepare Concept Reports for design projects
- \$100K saved annually in surveying for applicable larger design projects
- **Total:** \$3.9M total per year, \$7.8M every 2 years

Costs

- \$2.2 million every 2 years

Benefit Cost Ratio

- 3.5

