Sustainability best management practices can help State and local public agencies improve use of their economic, social, and environmental resources. However, integrating sustainability best practices into State departments of transportation procedures can be daunting. Traditional design and construction dynamics—where a given discipline focuses solely on its own area of expertise—is not always conducive to adopting the enduring and collaborative process that is embodied in sustainability practices. The largest hurdle is recognizing that sustainability, in practical application to State DOT activities, is ill defined. In addition, the sustainability concept of the interrelatedness of all aspects of a project does not necessarily fit the conventional DOT project delivery process of plan, design, bid, build, and maintain.

To strengthen the Arizona Department of Transportation’s (ADOT) continuous improvement culture, it evaluated tools and strategies for integrating sustainability best practices into life cycle asset management. Staff developed a Sustainable Transportation Program and conducted trials of the
Federal Highway Administration’s Infrastructure Voluntary Evaluation Sustainability Tool (INVEST). INVEST is a Web-based tool that employs numerous multidisciplinary criteria to evaluate sustainability practices.

A major cornerstone during ADOT’s development of sustainable best practices was the agency’s participation in INVEST pilot testing and implementation phases between 2011 and 2015. As a result of this involvement, ADOT is changing how it approaches sustainability by integrating INVEST as a tool to perpetuate change within the agency.

**Sustainable Transportation in Arizona**

Arizona’s transportation infrastructure is spread over 114,000 square miles (295,260 square kilometers), operates from sea level to 6,000 feet (1,830 meters) above sea level, and withstands temperatures that range from below 0°F (-17.8°C) to more than 120°F (48.9°C). Maintaining the optimum condition and performance of this diverse infrastructure is essential to Arizona’s economic vitality, quality of life, and natural and built environments. ADOT recognizes the critical need to plan and prioritize resources more efficiently to maintain and operate a robust, economically beneficial transportation network.

According to *The Collaborative Benefits of Using FHWA’s INVEST – Arizona Department of Transportation Sustainability Implementation Final Report*, published in April 2015, “Through continuous improvement practices, ADOT strives to strategically invest resources to achieve the highest possible return. ADOT also recognizes, in relation to investment and return dynamics, the importance of delivering transportation solutions in a more sustainable manner to achieve [the State’s] economic, social, and environmental goals.”

ADOT recently moved from the early stages of identifying sustainable strategies to implementing and operating a Sustainable Transportation Program within its core administrative, planning, design, construction, operations, and maintenance activities.

**The Triple Bottom Line**

The three primary principles of sustainability revolve around achieving an efficient, well-balanced use of economic, social, and environmental resources—commonly known as the triple bottom line. In theory, this approach facilitates proper use of funding while realizing all potential project goals. A sustainable highway, for example, not only incorporates the need for mobility and transportation alternatives but also considers safety, accessibility, livability, asset management, and environmental protection.

The window of opportunity to meet such needs before a project’s completion requires extensive coordination within the core group of individuals who are delivering the project and also with stakeholders during the development of the project. Multiple driving forces and fiscal responsibility influence all transportation projects. The goal of sustainability best management practices is to address every essential aspect within the context of the project, and the job of the INVEST tool is to frame those facets.

As the National Cooperative Highway Research Program’s Report 708: *A Guidebook for Sustainability Performance Measurement for Transportation Agencies* states, “Often, a goal will support more than one principle. Yet no one goal in itself is sufficient to achieve sustainability—it takes multiple goals, pursued in concert, to promote sustainability.” The report continues, “When a final set of goals is defined, it’s important to cross-check the package of goals to ensure that all of the principles are well addresses. In doing so, take care not to force-fit the goals to make them map to the principles. A balanced goal set... achieves comprehensive coverage of the basic principles of sustainability.”

**An Overview of INVEST**

INVEST is a Web-based tool that enables users to evaluate the performance of projects and programs against sustainability best practices, called criteria. The criteria cover the full life cycle of transportation services, including system planning, project planning, design, and construction, and continuing through operations and maintenance. FHWA developed INVEST for voluntary use by transportation agencies to assess and enhance the sustainability of their projects and programs. Expanding the use of INVEST throughout the State DOT process aligned with ADOT’s Strategic Focus Areas and one of the national performance objectives in the FHWA Strategic Implementation Plan for performance year 2015: SP3 – Enhance environment, foster livable communities, and promote sustainable practices.

INVEST has the capacity to facilitate a collaborative process by ensuring those involved in a project have a format to assess and consider a host of cross-cutting sustainability concepts outside of their immediate

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Even before its Sustainable Transportation Program, ADOT was using sustainable approaches to winter storm management. For example, ADOT is testing the latest snowplow GPS and sensor technologies, which help the agency be more sustainable in types of materials spread, fuel usage, and route efficiencies.
discipline. This tool promotes an internal thought process that would otherwise go unexploited.

FHWA divided the INVEST criteria into four modules: System Planning for States, System Planning for Regions, Project Development, and Operations and Maintenance. Each module works independently from the others, and therefore an agency can use them separately to evaluate programs or specific projects. The System Planning for States, System Planning for Regions, and Operations and Maintenance modules facilitate evaluation of an agency’s programs, and the Project Development module facilitates evaluation of projects from early planning through construction. Each module has a scorecard (Project Development has multiple) designed to recognize the varying scope, scale, and context of projects or programs. For more information, visit www.sustainablehighways.org.

System Planning for States. This module provides criteria for users to self-evaluate system-level planning and programming policies, processes, procedures, and practices. This module is geared toward States, tollways, and local agencies that perform landscape-scale and corridorwide planning and that typically own infrastructure.

System Planning for Regions. Like the first module, the System Planning for Regions module provides criteria for users to self-evaluate system-level planning and programming policies, processes, procedures, and practices. However, this module is geared toward metropolitan planning organizations, councils of governments, or other planning organizations that perform landscape-scale planning for a regional area, but do not typically own infrastructure.

Project Development. Project development is the second step in the life cycle of a transportation project. During this step, specific projects that were conceptualized and programmed in the system planning processes are planned, designed, and constructed. The Project Development module includes criteria that span the entire project development process from early planning, analysis of alternatives, environmental documentation, preliminary and final design, and construction.

Operations and Maintenance. This third step in the life cycle of a transportation project involves operating and maintaining infrastructure that was planned, designed, and constructed in prior steps, and this step results in needs for data collection and new project identification. Agencies then pass this information back to the systems planning step to complete the life cycle of projects. This module

As part of its sustainability approach, ADOT regularly operates temporary nurseries for native plants, like this one for saguaro cactuses.

ADOT instituted a progressive policy to limit idling of heavy equipment, such as this crane waiting to place culverts. Anti-idling policies help reduce fuel use and vehicle emissions.
focuses on the performance of system-level operations and maintenance activities in a manner that contributes to the overall sustainability of the highway network.

**Step 1: System Planning**
ADOT’s use of INVEST dates back to the 2011 pilot testing for FHWA, which focused specifically on user interface. ADOT has come a long way since that initial effort. In 2015, for example, ADOT became one of the first State DOTs to link the INVEST tool and the requirements of the National Environmental Policy Act (NEPA) for federally funded transportation projects. This application of sustainable systems planning is illustrated in an environmental study of a new major interstate.

In 2012, Congress had recognized the importance of the corridor between Phoenix, AZ, and Las Vegas, NV, and designated it as future I-11 in the Moving Ahead for Progress in the 21st Century Act. In summer 2014, the Arizona and Nevada DOTs completed a 2-year I-11 and Intermountain West Corridor Study, which included detailed corridor planning for the potential interstate link between the two cities. The study also included high-level visioning for extending the corridor south to Mexico and potentially north to Canada. The Fixing America’s Surface Transportation (FAST) Act of 2015 extended the Arizona portion of the corridor to the border of Mexico through its statutory listing of high-priority corridors.

The I-11 and Intermountain West Corridor Study pointed to the need for a new multimodal freight corridor and a manufacturing belt that will drive trade, commerce, job growth, and economic development for the two States, as well as facilitate strong connections to other major regional markets.

In early 2015, ADOT advertised for proposals to complete a federally funded $15 million tier 1 environmental impact study (EIS) for the proposed expanded portions of the I-11 and Intermountain West Corridor. ADOT will begin the tier 1 EIS in 2016, and it will take approximately 3 years to complete. In meeting with the FHWA Arizona Division on the scope of work for the project, ADOT decided to use INVEST as part of the alternatives screening for the study. ADOT will consider advancing innovative scope-of-work objectives in connection with environmental activities as an additional format for stakeholder participation and project acceptance.

In addition, ADOT’s Multimodal Planning Division used its experience with INVEST to develop a comprehensive sustainability work plan for the division to facilitate balanced decisionmaking among environmental, economic, and social values.

**Step 2: Project Development**
The INVEST Project Development module was a key driver in moving ADOT’s Sustainable Transportation Program from the development phase to the implementation phase. ADOT’s adoption of the INVEST Project Development module was rooted in the introduction of a systematic process during the early stages of the program. The systematic process materialized through development of a milestones framework, which consists of 13 milestones. The framework aided in building a process for implementing sustainable transportation and drove the introduction of sustainability practices inside the State DOT.

ADOT developed the milestones framework through extensive discussion of how to prioritize and weight different sustainable transportation variables, and what should constitute reasonableness when applying those variables. A rollout of INVEST Project Development was one of the identified milestones. ADOT introduced the concepts and began implementation of the milestones framework in January 2013. The department completed the milestones in June 2015.

Internal training and project scoring sessions to familiarize staff...
roundabouts installed under variable conditions; and (2) the relative efficiencies of hosting the INVEST platform within different ADOT programs.

**Step 3: Operations And Maintenance**

The INVEST Operations and Maintenance module contains 14 criteria. The criteria cover both internal operations and operations and maintenance of an agency’s roadway infrastructure.

As part of its application of the Operations and Maintenance module, ADOT conducted scoring workshops for each of the 14 sustainability criteria. For each criterion, the ADOT project team facilitated discussions with relevant ADOT subject matter experts. Generally speaking, the dozens of participants were the most senior practitioners within their respective subject areas. The discussions—most of which were held in person at ADOT headquarters in Phoenix—included up to five participants and typically required 1 hour.

ADOT issued a final report in March 2016 that summarizes the estimated scores for each criterion based on those discussions. The report also includes brief explanations of the scoring. In the end, ADOT scored 142 points out of a possible 210—sufficient to achieve platinum achievement level for Operations and Maintenance, INVEST’s highest rating. An independent third party conducted the scoring effort. The exercise further strengthened ADOT’s understanding of sustainability best practices and helped identify opportunities for improvement.

“We [were] excited that ADOT began using the INVEST Operations and Maintenance module to evaluate and improve the State’s operations and maintenance program,” says Michael Culp, team leader of the Sustainable Transport and Climate Change Team with FHWA.

“With this work, ADOT will have used all three modules of INVEST...”

<table>
<thead>
<tr>
<th>Achievement Level</th>
<th>Number of Projects</th>
<th>Percent of Projects</th>
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</thead>
<tbody>
<tr>
<td>Gold (50% of total possible points)</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>Silver (40% of total possible points)</td>
<td>9</td>
<td>18%</td>
</tr>
<tr>
<td>Bronze (30% of total possible points)</td>
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<td>40%</td>
</tr>
<tr>
<td>Not Rated</td>
<td>19</td>
<td>38%</td>
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</tbody>
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Source: ADOT.

with the Sustainable Transportation Program were central to the success of ADOT’s rollout of the Project Development module. The initial objective was to utilize the INVEST criteria to better assess projects that adhered to the traditional development process. Several training sessions called upon a range of knowledgeable professionals from engineering to technical disciplines, which facilitated a higher level of communication. This method led to a more collaborative project development process and, ultimately, a more sustainable outcome.

ADOT, always on the lookout for opportunities for improvement, tracked the development of INVEST as a large number of national practitioners vetted and beta tested it. When ADOT realized the tool’s applicability, the agency selected project scoring teams and introduced pre-scoring training, technical group project scoring, and individual scoring of key entry points to examine and connect the ADOT project development process and the INVEST Project Development criteria. This process and approach proved how easily a State DOT could adopt INVEST.

Overall, ADOT’s approach attempted to establish and understand what the project team viewed as three separate levels: standard design and project development processes, current best management practices, and current sustainable operating focus areas where efforts go “above and beyond.” This methodology created a platform for multiple users to assess their sustainability efforts under one recognized approach.

The evaluation considered the effectiveness of (1) criteria, using...
to cover the full life cycle of transportation projects and programs.”

**ADOT’s Future with Sustainable Transportation**

ADOT developed a roadmap for its 2016–2017 program development initiatives to set the entire Sustainable Transportation Program into operation. The roadmap consists of operational focus areas identifying 36 reasonable entry points. The focus areas identify candidate projects and activities that cumulatively reflect the current program goals.

ADOT chose each focus area for one or all of three reasons: (1) it addresses a true operational need, (2) it aligns with the strategic focus areas in ADOT’s mission statement, and (3) it could contribute to both Arizona’s and the national state of the practice in connection to sustainable transportation. For example, ADOT’s Sustainable Earthwork Plan, currently underway, is a case study to ensure best management practices are fulfilled and innovative techniques or considerations are applied during construction projects. It aligns with ADOT’s strategic focus areas of innovation and financial resources, as well as solidifies a documentable approach to reach a level of sustainable outcome.

ADOT has established a working group to oversee its Sustainable Transportation Program. The working group realized this effort could create new ways to gather the agency’s collective knowledge of sustainability best practices and enable ADOT to exceed original expectations in this area. With its approach to sustainability and continuous improvement, ADOT can explore ways to further analyze opportunities, develop a host of sustainable program initiatives, and meet the triple bottom line goals of advancing economic, environmental, and social aspects.

“As a pilot test agency, ADOT was one of the first departments of transportation to use INVEST,” says Culp. “ADOT contributed valuable feedback on the System Planning module that helped FHWA ground INVEST in State DOT realities and improve the tool for release as INVEST 1.0. Later, ADOT’s application of the INVEST Project Development module to score and improve the sustainability of 20 roundabout construction projects provided an excellent example—to be shared nationally—of how measuring sustainability with the INVEST criteria can help agencies improve economic, social, and environmental outcomes at both the project and programmatic levels.”

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For more information, visit www.azdot.gov/business/environmental-planning/programs/sustainable-transportation-program or contact Steven Olmsted at 602-712-6421 or solmsted@azdot.gov.