

Transportation Asset Management Case Studies

Presented by



U.S. Department
of Transportation
**Federal Highway
Administration**

HIGHWAY ECONOMIC REQUIREMENTS SYSTEM-STATE

The Indiana Experience





Aerial view of the I-65/I-75 split in Indianapolis.
Photo by James Kinder.

FRONT COVER PHOTO:

View of downtown Indianapolis from White River Park.
Photo by Roy Nunnally.

Note From the Director

With factors such as an aging national infrastructure, increasing congestion and limited funds weighing heavily on transportation agencies, State departments of transportation (DOTs) are looking for innovative ways to manage their transportation dollars.

One tool that is providing great benefits is Transportation Asset Management (TAM), a strategic approach that strives to provide the best return for each dollar invested by maximizing system performance, improving customer satisfaction and minimizing life-cycle costs.

TAM endeavors vary from State to State and include efforts in the areas of data integration, economics in asset management, the utilization of Highway Economic Requirements System – State Version (HERS-ST), life-cycle cost analysis (LCCA), system preservation, and pavement and bridge management, among others.

Because each State's experience is unique – and because FHWA believes that transportation agencies work more efficiently when information on one another's successes is shared – the Office of Asset Management is continuing its series of TAM case study reports begun in 2002.

On behalf of the Office of Asset Management, I am pleased to add this case study on HERS-ST to the series. I believe that each of the five case studies generated this year (one on LCCA, two on HERS-ST and two on comprehensive TAM efforts) will help transportation agencies meet the increasingly complex challenges facing them today.



David R. Geiger
Director, Office of Asset Management
October 2006

Note to the Reader

The TAM case study series is the result of partnering between State departments of transportation and the Federal Highway Administration's (FHWA's) Office of Asset Management. FHWA provides the forum, and the States furnish the details of their experiences with asset management.

For each case study, FHWA representatives interview State transportation staff and compile the information, and the State approves the resulting material. Thus, the case study reports rely on the agencies' own assessment of their experience. Readers should note that the reported results may not be reproducible in other organizations. ■



Work on the Ohio River Bridge on US 231.
Photo courtesy of INDOT Bridge Section.

Executive Summary

Indiana is within a day's drive of 80 percent of the United States population. Known as the "Crossroads of America," the State has several major lake and river ports, rail lines, airports and a comprehensive highway network. Because the Indiana Department of Transportation (INDOT) focuses the bulk of its Federal funds on enhancing the movement of people and goods versus providing access to land, its planning process has a slightly different focus than that of some other DOTs: roadways are evaluated in terms of statewide significance, mobility and connection between major activity centers in order to support the State economy.

Given this, it is not surprising that INDOT began investigating the use of needs analysis models for statewide planning applications in the late 1980s. When the agency's first endeavors fell short of the desired goal due to data sampling issues, the DOT began looking at other options.

The program that held the most promise proved to be HERS, a new investment/performance model that had just been introduced by the U.S. Department of Transportation (USDOT) for use at the Federal level. Initially, the software was not available for State use, but Indiana obtained a copy from the software consultant and then worked with that contractor to develop a customized version known as HERS-IN.

Since that time, Indiana has utilized HERS-IN, along with a suite of tools it has developed, to build a comprehensive asset management program. One tangible outcome is the May 2006 release of the first fully funded 10-year production/construction plan in the agency's history. As of the fall of 2006, Indiana is upgrading to the standard HERS-ST 4.0 software, as the latest release includes the features that were previously exclusive to HERS-IN.



A country road.
Photo courtesy of the Indiana Office of Tourism Development.

AGENCY FACTS

The Indiana State Highway Commission (ISHC) was formed in 1919 as part of a nationwide effort to improve the country's roadways. ISHC's task was to create a highway network that would connect every county seat and every town with a population of over 5,000. The State Highway Commission served Indiana until 1981, when it became the Indiana Department of Highways (IDOH). Eight years later, the Department of Highways underwent another change, combining with the Transportation Planning Office to become the agency we know today – the Indiana Department of Transportation (INDOT).

INDOT has defined its vision as *Driving Indiana's Economic Growth*. It furthers this vision through its commitment to “build, maintain and operate a superior transportation system enhancing safety, mobility and economic growth.” That mission becomes reality through the application of core values such as customer focus, integrity, people, agility, continuous improvement and safety.

INDOT is one of the largest agencies in the State, with over 4,700 short- and long-term employees. These employees work in Headquarters, seven district offices and 142 maintenance facilities located within 38 sub-districts statewide.



INDOT Headquarters is one of many State facilities located along the historic Central Canal in downtown Indianapolis.
Photo courtesy of Roy Nunnally.

Interestingly, Indiana code limits the total of State jurisdictional facilities to 12,000 centerline miles. The intent is to manage INDOT's responsibility in terms of facility maintenance and required funding. As a result, INDOT has jurisdiction over approximately 11,187 of the State's 95,576 centerline miles. In addition, if a new road or bypass is planned, an agreement must be signed to transfer the existing route to a local municipality prior to INDOT constructing the new facility.

The agency also has jurisdiction over 5,571 structures greater than 20 feet in length. Indiana's county transportation departments maintain approximately 18,453 bridges.

SETTING THE STAGE

What Did Indiana Have?

Prior to the implementation of HERS-IN, the agency used a spreadsheet-type approach to identify system deficiencies. The data sheet included average annual daily traffic (AADT) data from a three-year count cycle and other road inventory characteristics, in combination with a simplified 24-hour capacity estimate, to produce volume-to-capacity maps. Traffic forecasts were based upon historical trends by functional classification. The planning process was based on a timeframe of about six to seven years and was documented in the Highway Improvement Program.

When INDOT established its long-range planning section in the 1980s, the agency began investigating highway needs analysis options. One approach of particular interest was the Idaho Transportation Department's Highway Needs Analysis Reports, which incorporated the tabular output of the FHWA/Wilbur Smith Needs Model (HWYNEEDS) with a system of highway system maps using a cut-and-paste approach. This method provided both a systems-level analysis and the identification of project-specific highway improvements.

"We saw what Idaho had done," says Steve Smith, manager for the Long Range Planning Section of the Office of Urban and Corridor Planning. "It looked like an interesting way to approach needs analysis." Based on that, INDOT chose to implement a systems analysis program utilizing the Highway Performance Monitoring System (HPMS).

What Did Indiana Want?

The drawback with HPMS was that it only used sample data and the results weren't always applicable to the State's jurisdictional roadways. "We were able to come up with a functional classification but couldn't separate the State jurisdictional system," says Smith. INDOT's planning division was looking for a needs analysis model that would identify specific deficiency locations and evaluate alternative highway investment levels, and it appeared that a customized version of the HERS national software might be the answer.

Customizing the software would require some major changes, as the national model was based on a sampling system that estimated the number of miles of highway improvements needed but not the locations. Indiana wanted to be able to do both. The ability to analyze potential capacity expansion projects was also high on INDOT's wish list.

HOW DID INDIANA GET THERE?

After months of work with the systems consultant, Indiana finalized the HERS-IN software in 1998. The customized version was congestion-based and included a process to convert the State's road inventory database to HPMS for HERS-IN. The result? Indiana finally had a 100 percent database for the 12,000 miles of the State jurisdictional system and didn't have to rely on sample data when evaluating the State's long-range needs.

The customized software contained several other special features, including an override element that allowed software-generated improvements to be replaced with analyst-specified improvements; the ability to produce maps; and the capability to evaluate capacity expansion projects and estimate the impact of each capacity improvement on traffic system-wide.

With HERS-IN in place, INDOT began looking at the larger picture – developing systems analysis programs that would generate a project-specific long-range plan. The State quickly discovered that it needed a suite of tools to make that goal a reality. Those tools include the following:

- ◆ Indiana Statewide Travel Demand Model (ISTDM). INDOT's ISTDM is the cornerstone for the State's various systems planning tools, including HERS-IN. The model is used to provide the analytical framework for assessing transportation system performance and deficiency analysis, long-range plan development and systems-level project analysis, as well as the spatial analytical framework for many of the DOT's management systems.
- ◆ Traffic Forecasting Tool (TFT). First developed in 1998, the TFT provides link-based travel forecasts for Indiana's State jurisdictional system. Link-based information is then displayed on a graph showing forecasted volume, available capacity and level of service (LOS).
- ◆ Major Corridor Investment Benefit Analysis System (MCIBAS). Initiated in 1995, MCIBAS offers benefit-cost analysis of system alternatives in INDOT's ISTDM, including evaluation of corridor-level economic development benefits. The MCIBAS process uses the ISTDM to measure the direct impact of a major highway improvement on existing and future traffic volumes, speeds and distances. MCIBAS also includes a post processor that converts the travel demand impacts into dollar values for travel time, travel cost and safety benefits.

“You can do a full needs analysis in HERS-ST,” Smith states, “but you still need to use all your tools.”



The I-70 ramp west of Indianapolis, a Fast Track project.
Photo courtesy of INDOT.

WHERE IS INDIANA TODAY?

INDOT still uses its customized version of the software, HERS-IN, but is moving toward use of the standard HERS-ST software. The agency has been totally re-engineered, creating a dedicated staff of technicians who will be trained in the use of HERS-ST.

Overall, Indiana has made great strides in developing its asset management program since the inception of HERS-IN in 1998. The following are some of the highlights:

- ◆ **Fiscally-Constrained Long-Range Transportation Plan (LRTP).** The plan provides a footprint for highway capacity improvements and the distribution of Federal and State funds over the next 25 years.
- ◆ **Route Concept Reports.** These urban Interstate reports help determine when major reconstruction projects will be needed and how adding travel lanes will reduce disruptions to motorists. Route concept reports build upon the HERS-IN analysis by providing additional details such as route characteristics, data from original construction and subsequent projects, additional pavement history data, socio-economic data, field check findings, a listing of existing projects/scheduled improvements, and estimated project costs.
- ◆ **Planning Studies.** INDOT is conducting a series of planning studies that have system-wide impacts to various highway facilities. They include an access management study and a statewide interchange planning study.



Working on the I-70 Hyper Fix Project (I-65 / I-70) in Indianapolis.
Photo courtesy of Heather Miller.

The biggest accomplishment, though, says Roy Nunnally, manager of the Modeling and Forecasting Section, is finalization of the 10-year production/construction plan known as Major Moves. Introduced in May 2006, this subset of the INDOT L RTP is the first completely funded 10-year plan in INDOT's history.

The Major Moves plan was developed using INDOT's May 2005 initiative for prioritizing highway construction projects. The rating system is based on 11 critical criteria, including a project's potential for contributing to economic growth. HERS-IN was utilized to rank the Major Moves projects.

Major Moves Criteria for Highway Projects

1. Cost Effectiveness Index
2. Corridor Completion
3. Road Classification
4. Mobility
5. Intergovernmental Agreements
6. Safety Criteria
7. Economic Development Criteria
8. Customer Input Criteria
9. External Funding of Projects (Earmarks)
10. Bypass Project Selection Criteria
11. Urban Revitalization



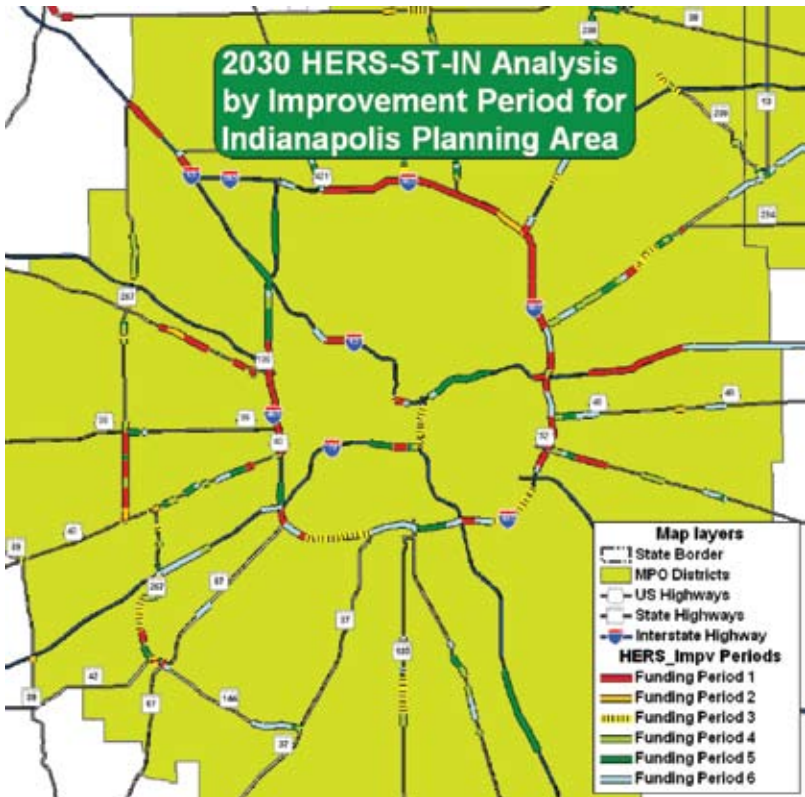
WHAT HAS INDIANA LEARNED?

INDOT has garnered a few simple but vital lessons with regard to HERS and asset management.

First, as indicated earlier, a State needs to utilize a series of planning tools to provide a thorough systems-level analysis. No tool can do it alone.

Second, a key component of the planning process is gathering input from district, metropolitan planning organization (MPO) and regional planning organization (RPO) staff. While one of the benefits of HERS-ST is that it provides a recommended timeframe for a project based on the benefit-cost analysis, local insight has proven crucial to moving a project forward. “We need that ‘ground truth’ kind of feedback,” says Smith.

Finally, INDOT has learned that, even though the agency has been using a customized version of HERS, its relationship with FHWA is symbiotic. Specifically, INDOT had been using what it calls the intermediate-year feature, which allows the State to add “what if” scenarios for new corridors. It spoke with FHWA about adding that feature to HERS-ST, and FHWA made the change. “We had a need that the software did not address, and FHWA responded,” Smith states. The new version of HERS-ST, 4.0, contains that feature.



Map showing a HERS-IN analysis by funding period for the period ending 2030.
Snapshot courtesy of INDOT's Planning Division.

WHAT'S NEXT?

INDOT's goal is to gravitate towards HERS-ST and fully utilize the standardized software. This includes participation in the developers group, which Nunnally views as key to the future of HERS-ST.

In addition, Indiana wants to increase interest in HERS-ST, not only at the State level but at the local level as well. Already, one MPO which had developed its own benefit-cost analysis tool has asked for training and a copy of the HERS-ST software.



GIS MAP

Statewide mobility corridor maps are just one of the many graphic outputs HERS offers.
Snapshot courtesy of INDOT's Planning Section.

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