

National Geospatial Advisory Committee

Geospatial Technology and Information Use Case:

ROAD MAINTENANCE

Introduction

Public infrastructure is often taken for granted. Whether it is drinking from the faucet or driving on the road – citizens are constantly interacting with public infrastructure whether they realize it or not.

The condition of our infrastructure is certainly noticeable, and crumbling roads are what people seem to notice most. The American Society of Civil Engineer's gave America's roads a grade of D in the 2017 Infrastructure Report Card. Addressing road conditions, with both short and long term objectives, is a challenge many states, counties, and municipalities are currently facing. Many of the nation's roadways have multiple designations including state and county highways and local arterials. Most roadways do not end at jurisdictional boundaries. An accurate inventory of roadway assets across jurisdictional boundaries is essential for developing a Pavement Management Plan (PMP) and establishing appropriate criteria for cost-share activities.

A Pavement Management Program (PMP) is a geospatial asset management process used to effectively allocate resources to maximize the service life of paved roads. This program includes a systematic process for inspection, evaluation, project planning, and maintenance of the entire street pavement network. The information collected is used to identify appropriate maintenance strategies for each street segment based on the condition, expected service life, and volume of traffic.

Benefits of Geospatial Data

Geospatial technologies and analytics are integral tools for a successful asset management program. More importantly, geospatial technologies can quickly create a simple narrative for a complex process. Other benefits include:

- Coordination and Collaboration
 - Allows multiple jurisdictions to manage the same asset and the asset's lifecycle;
- Visualization and Analysis:
 - The road network as a system, rather than individual puzzle pieces;
 - Related assets, including utilities, and their relationship with the pavement program;
 - Investment strategies along with their impact on treatment strategies, and ultimately the overall condition of the system;
- Communication:
 - A complex process in a simple manner;
 - A clear representation of options allowing decision makers to confidently set a strategy; and,
- Education:
 - Policy makers and citizens on the benefits of an asset management program to ensure effective use of limited resources.

Description

In 2006, the City of Topeka, Kansas performed a condition inventory on their roadways. The overall condition of the City's streets was found to be "fair". The Governing Body sought to improve the condition, and in 2009 issued a ballot initiative for a ½-cent retailer's sales tax, expected to bring in \$14 million annually for 10 years.

The ballot question laid out restrictions, including that revenue could only be spent on existing streets and related infrastructure and could not be spent on building new roads.

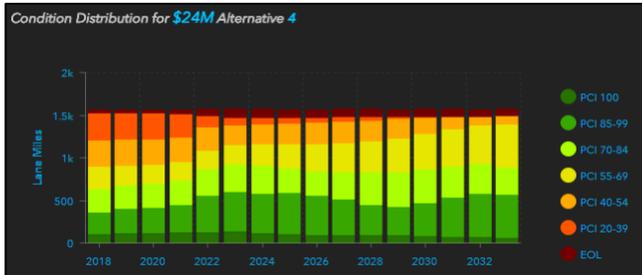


Figure 1. Condition distribution of streets over time.

The assessment showed that arterials remained in “fair” condition, but the overall pavement condition dropped to “poor” due to the lack of investment in preventive maintenance and rehabilitation on collector and local streets, which constituted over 2/3 of the City’s inventory. Also, Topeka lacked project coordination to reduce water main breaks occurring under newly laid pavement, or alignment with other infrastructure projects. Without a systematic approach, little to no street repairs and resurfacing occurred in neighborhoods. These decisions led to a growing backlog of streets needing more costly repairs and a pothole epidemic.

The facts presented through the 2016 analysis demonstrated that a new pavement management approach was necessary. The Topeka Governing Body set a goal to increase the overall pavement condition index to “fair” within 10 years. With the sales tax scheduled to sunset in 2019, which accounted for 52% of the annual program budget, the Topeka Public Works Department embarked on a sophisticated geospatial analysis to achieve 3 objectives: 1) to educate the citizens and Governing Body on the decision process for immediate and long term needs; 2) to cultivate a culture where pavement management is programmatic and not project based; and 3) to optimize treatment strategies to reach the Governing Body’s goal. The Public Works Department performed extensive geospatial and asset management analysis to develop an approach to their objectives. The analysis assumed the sales tax would be extended.

The result was a well-distributed and programmatic system for treatment strategies that optimizes tax dollars and met the condition goal (Figures 1-2).

Treatment strategies were identified for all 1,600 lane miles, including a timeline of when treatments should occur. The analysis estimated less than 5% of roads would be at the end of their service life in 15 years. Understanding what treatment would occur when provided the City with another advantage. Neighboring or overlapping projects could be coordinated together, whether it was with the County, the State, or utilities, and the City could take advantage of economies of scale and collaborative funding scenarios.



Figure 2. Maps of current (L) and projected (R) pavement condition.

Challenges

The [US NSDI](#) emphasizes a key to its implementation and success is collaborative partnerships, noting “building an effective NSDI will require a well-coordinated effort among federal, tribal, state, local government, and academic institutions...”. Pavement management has the potential to be a flagship representation of the need for the NSDI. The challenge is having an accurate inventory and condition assessment that stakeholders can agree on. An additional challenge is aligning funding solutions among stakeholders and coordinating related underground infrastructure to capitalize on economies of scale.