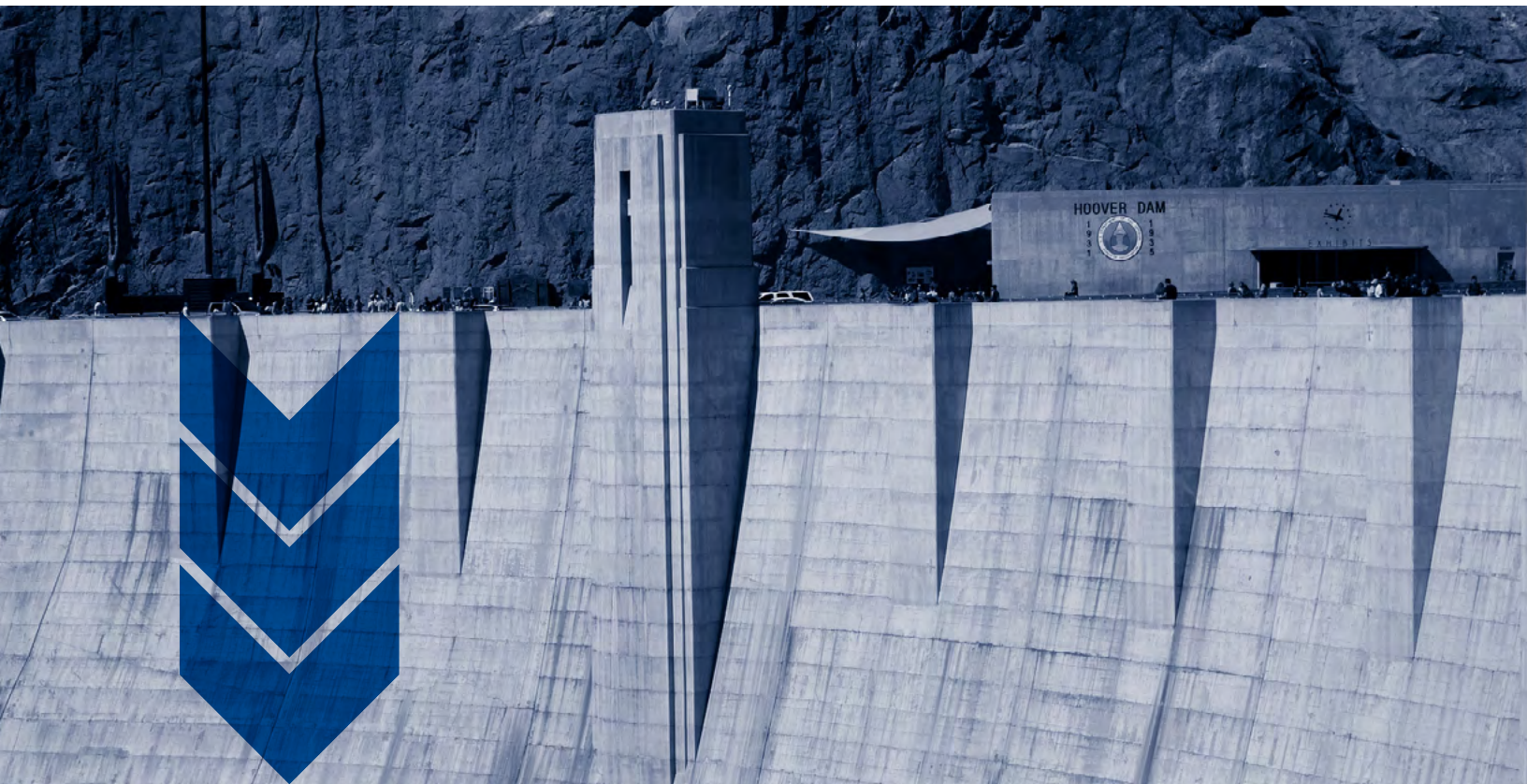


CHANGING THE INFRASTRUCTURE EQUATION: Using Asset Management to Optimize Investments





Background

Throughout the 19th and 20th centuries, infrastructure investments grew the nation’s economy and improved the quality of life for many Americans. These investments produced transformational projects such as the Erie Canal, the transcontinental railroad, the Hoover Dam and the Interstate Highway System. Accordingly, a sizeable portion of the nation’s GDP in 1930 (4.2%) was allocated to infrastructure projects, a level of investment which has significantly dwindled by 2016 (2.5%). Moreover, U.S. public spending on infrastructure fell by 8% between 2003 and 2017 according to the Congressional Budget Office. Not surprisingly, the American Society of Civil Engineers (ASCE) has identified these trends as contributing to the nation’s infrastructure funding gap that exceeds \$2 trillion over the next 10 years.

America's investment gap threatens a broad array of infrastructure. Each day there are 850 water main breaks in North America, a number that has increased by 27% over the past six years. According to TRIP, a national transportation research group, 44% of America's major roads are in poor or mediocre condition costing U.S. drivers nearly \$129 billion a year in extra vehicle repairs and operating costs. Furthermore, the 2018 National Bridge Inventory data indicates that 38% of U.S. bridges need repair, replacement or significant rehabilitation.

As the United States works to meet its infrastructure needs, the impacts of a changing climate are making the challenges more dynamic; such was the case when Hurricane Harvey made landfall in southeastern Texas and subsequent flooding overwhelmed existing infrastructure. In some regions, climate change will increase the frequency and severity of extreme weather, whereas other areas may experience prolonged droughts and devastating wildfires. The expected impacts to infrastructure are causing a heightened focus on resilience rather than status quo maintenance.

However, state and city governments that are preparing for future needs are doing so amid competing priorities such as large pension and retiree health care liabilities, education, debt servicing, and resource needs for first responders. Consequently, infrastructure investment has not kept pace with current demands, let alone the dynamic future ahead. Even though life cycle costs analyses show that it is more cost-effective to engage in preventative maintenance, rehabilitation, and timely replacement, the chronic underinvestment in infrastructure continues to result in deteriorating conditions that impact reliability, public safety, and the ability to bounce back from costly disasters.

With inadequate and dwindling funding resources, infrastructure asset owners need a better way to prioritize their investment decisions and pinpoint repairs. While some, particularly in the private sector, have used asset management planning for years, others at the state and local levels are increasingly exploring this approach to optimize infrastructure investments.



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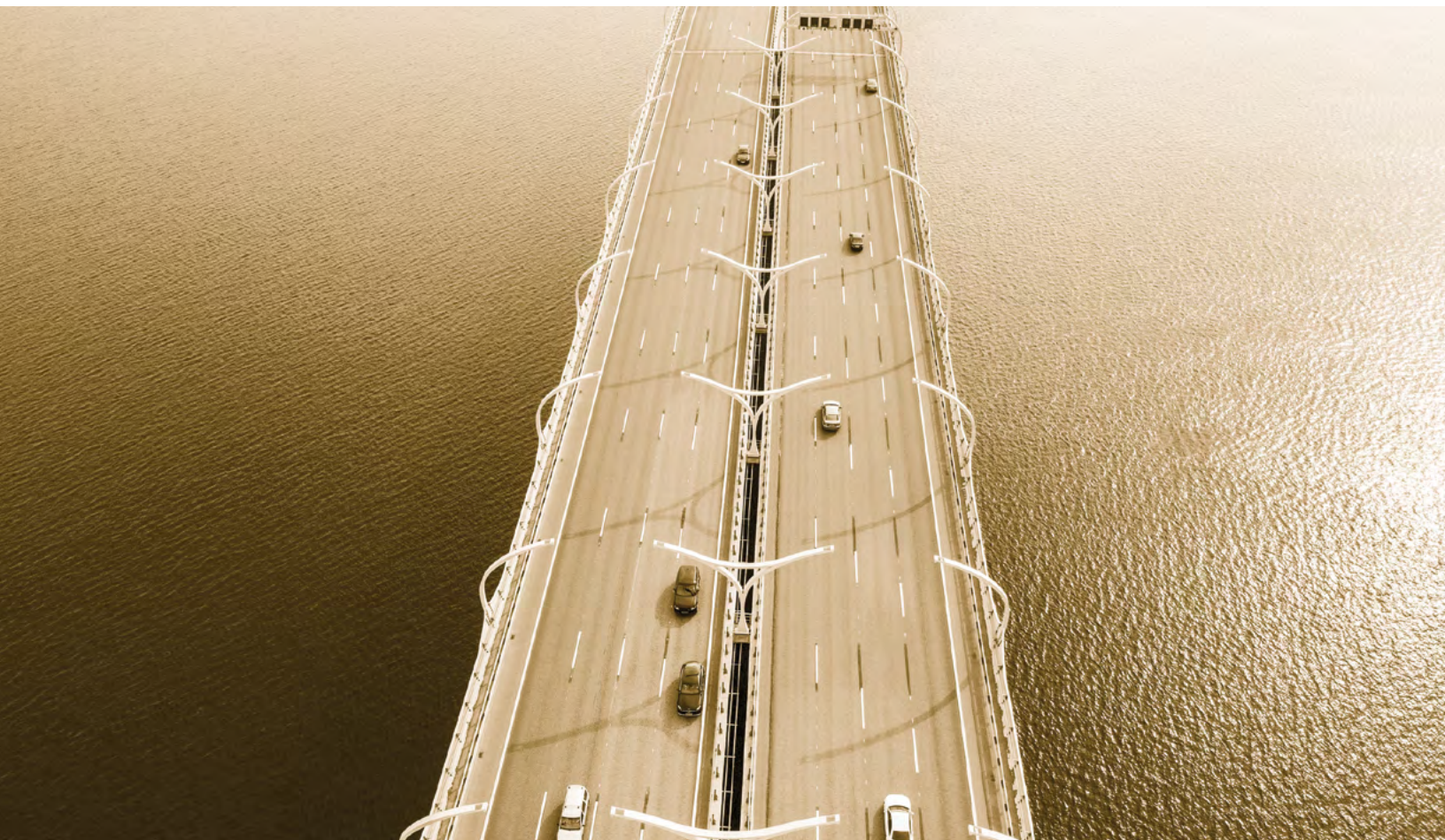
Why Asset Management

Asset management is the practice of managing infrastructure capital assets to minimize the total cost of owning and operating them, while delivering the service levels customers desire.

The concept of asset management requires a balance between infrastructure's benefits (e.g., financial, technical, environmental, and social), costs, and varying levels of risk. Striking this balance requires the infrastructure "owner" to translate its institutional goals into technical and financial plans – an asset management strategy. This high-level strategy can be adapted over time based upon input from stakeholder groups, evolving regulatory

standards, or unreliable infrastructure performance due to climate change.

Furthermore, an asset management strategy is an effective tool across various levels of government, geographic contexts, and types of infrastructure when operated in a dynamic, data-rich environment – an asset management system.



According to the International Organization for Standardization, key components of an asset management plan include:

- The iterative process of negotiation between the technical needs (existing and future planning) and financial resources for ensuring quality performance of an organization's infrastructure assets.
- An inventory of the organization's infrastructure that can be managed individually, as groups, or by thematic portfolios.
- A comprehensive database of the costs, benefits, and risks associated with the infrastructure's expected performance.
 - *life cycle cost – assessing capital costs, operation and maintenance (O&M) costs, replacement costs, and associated frequencies across the lifetime of an asset)*
 - *lifetime of an asset – the time it takes for infrastructure to reach a pre-determined performance threshold, not often the actual end of the asset's life*
- A timeframe scheduling the infrastructure's O&M, replacement, and/or expansion as guided by the asset management strategy.

As greater awareness and utilization of asset management practices grew over the years, the methodologies used became more sophisticated. In the early days, information collected about assets was generally a time-consuming, labor-intensive and paper-based endeavor. And in some cases the institutional knowledge resided with a handful of senior individuals who often did not document the data to ensure its accurate and complete transition to junior staff coming up through the ranks. Over the years, however, significant advancements in technology - such as the use of sensors on bridges to better detect cracking, GPS and GIS systems, drones to provide data condition of rail tracks, acoustic imaging systems to gather data from underwater structures and the development of specialized software have now made it possible to collect vast amounts of data that can be consolidated into one central data repository.

Once a comprehensive infrastructure inventory is in place, it is continuously updated as the condition of assets change and more data becomes available. With an up-to-date inventory, policymakers and asset owners can begin to better understand and prioritize essential repairs and replacement projects, and plan a long-term capital budget.

There are a growing number of examples at the state and local levels of government and within the private sector that are demonstrating the tremendous advantages to employing sophisticated asset management practices.

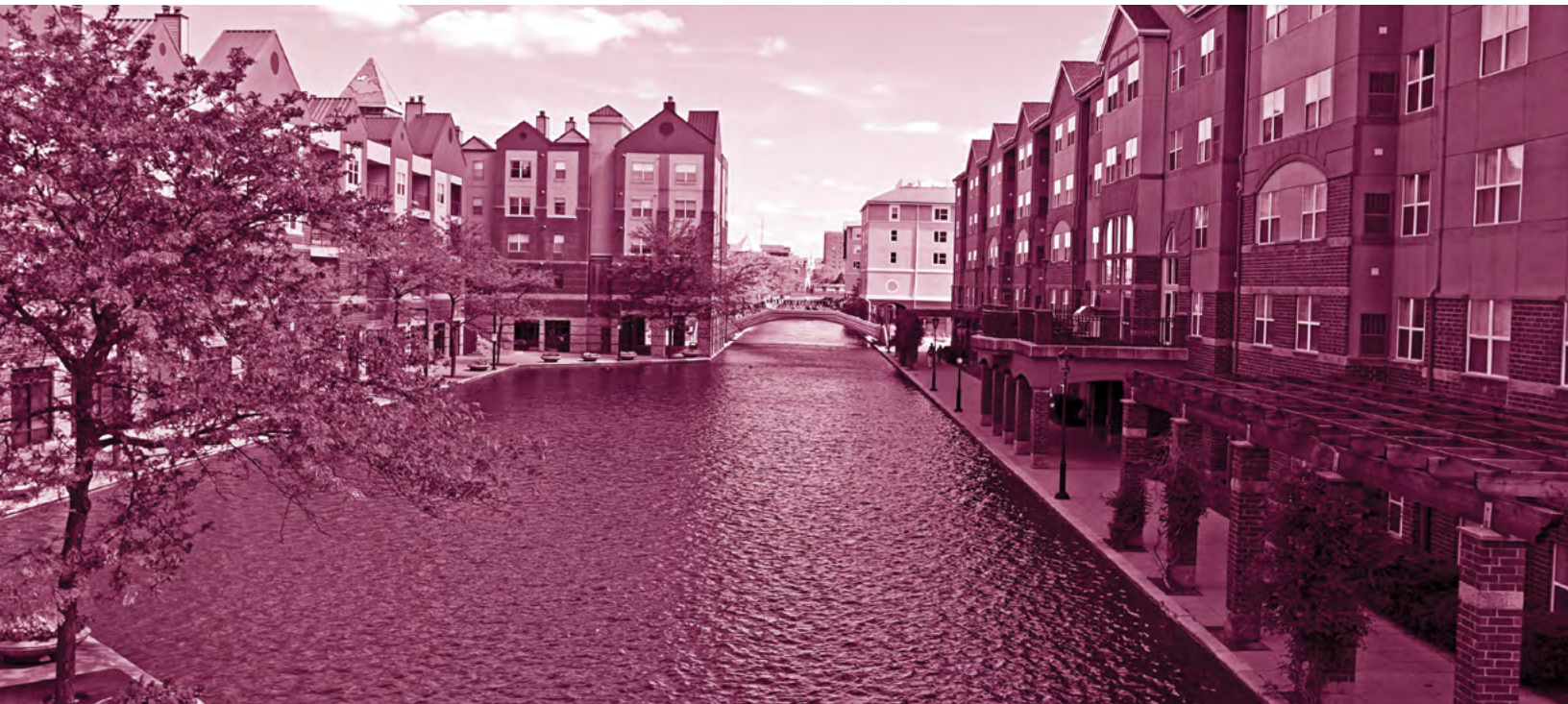
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Incentives and Regulations at the Federal and State Levels

In many cases, asset management plans are voluntary and not required by the federal government. The exception has been in the transportation sector where the federal government has required the development and implementation of asset management programs in order for recipients to be eligible for funding. In 2016, the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) finalized rules calling for asset management planning as required by the Moving Ahead for Progress in the 21st Century (MAP-21) and The Fixing America's Surface Transportation (FAST) Act. Failure to comply by any state could result in a 65% loss in the maximum federal share on National Highway Performance Program projects.

While several states have asset management requirements for water and wastewater systems, there is no such federal law for drinking water and wastewater systems or for other infrastructure asset classes. And where there are such requirements at the state or local level, oversight of completed plans to ensure they achieve stated goals and can be implemented is frequently lacking. However, the U.S. Environmental Protection Agency (EPA) has used administrative orders

on some states to require asset management practices. Some examples of states with asset management requirements are New Jersey, which requires plans for water and wastewater systems and Florida, which gives priority for State Revolving Fund (SRF) loans to water projects having an asset management plan. The U.S. EPA published "State Asset Management Initiatives," a report in February 2019 that details the actions being undertaken by other states.



The Hoosier State Doubles Down on Asset Management

The Indiana Department of Transportation has employed asset management plans for well over a decade, and Indiana's state-owned transportation assets have improved as a result. A contrast began to develop between the condition of the state-owned network and infrastructure owned by localities. To address these discrepancies, the Indiana Legislature moved to support the development of asset management plans (AMPs) at the local level by providing expertise and incentivizing their use.

First, the Indiana legislature created the Major Moves program, initially funded with \$2.6 billion in revenue from the Indiana Toll Road and \$71 million from federal funding. The goal of the program is to foster a culture of data-driven decision making by building local capacity and increasing the utilization of AMPs at the local and regional level through free technical training. The Indiana legislature further stipulated that communities must develop AMPs to qualify for the more than \$200 million in funding from the state each year. Communities were skeptical of AMPs when the program started, but concern has waned, and program capacity has grown each year.

To further assist MPOs across the state, the state legislature created the Indiana Local Technical Assistance Program (LTAP) to help with the development and review of AMPs. The LTAP provides technical expertise and resources, checks for compliance with the Indiana Department of Transportation's asset management template, and, where necessary, offers advice about areas that lack information.

The Indiana LTAP, in partnership with Purdue University, has developed and maintains the LTAP Data Management System (LDMS), a secure, state-wide repository for local asset management data. The LDMS houses information regarding trans-

portation assets, including data on more than 400,000 local and county roads and bridges. Within this system, transportation agencies have access to a storehouse of digital information to better understand, plan, and forecast the condition and maintenance of their assets.

Moving forward, Indiana lawmakers are also incorporating AMPs into water infrastructure projects. The fragmentation of the water sector – there are nearly 550 water providers throughout the state – presents a unique challenge. As such, lawmakers have incentivized water utilities to collaborate regionally to leverage technical support, share data and resources, and holistically consider future needs and solutions. When MPOs demonstrate this type of local collaboration on an infrastructure project, it increases the points their team is awarded during the grant review process. Lawmakers have also set aside resources and adjusted financing expectations for smaller communities; these communities only need to provide a 20% match compared to 50% match provided by larger communities.

As a whole, infrastructure agencies of all sizes in Indiana are capitalizing on the AMP trainings, LTAP resources, and regional partnerships to assess their infrastructure, prioritize maintenance needs, and expand strategically.



Private Sector Engagement

Another benefit of a comprehensive asset management plan for a government is that it provides a clear picture of the value of assets and which ones might be best suited for a funding/financing partnership with the private sector. Investors with significant financial resources are actively looking for infrastructure investment opportunities across the asset classes. The private sector may also be motivated to share valuable institutional knowledge and best practices with the public sector regarding successful asset management strategies because of the inherent financial incentive to have a clear and current picture of the condition of infrastructure assets.

Access to a current infrastructure asset inventory can also assist in identifying potential projects that are ripe for a public-private partnership, or P3. This is an option for a growing number of states. In 2010 there were 21 states that had passed legislation authorizing the use of P3s. That num-

ber has grown to 36 as of 2018. Public-private partnerships don't make sense for every infrastructure project, but for the ones where it does, this can be a game changer for a government.

Asset Management Plans Illuminate Investment Opportunities in Canada

As cities and states in the United States move forward with their own asset management programs, there is much to be learned from America's neighbor to the north. At the federal level, the government of Canada has made infrastructure investment a priority. In 2002 it established *Infrastructure Canada* – a governmental department that operates several programs to assist localities and states with all facets of infrastructure planning, building, and financing. The department is also the lead governmental entity tasked with developing and overseeing infrastructure policy. Among the infrastructure policy initiatives at the department is a robust municipal asset management program (MAMP). Under a five-year, \$50 million program, the MAMP has been delegated to the Federation of Canadian Municipalities (FCM) in 2017. The MAMP serves as a one-stop shop for training and best practices

for localities to learn about, create, and implement asset management plans.

The groundwork for developing asset management plans began in 2007 when the FCM issued a report indicating a \$123 billion infrastructure deficit encompassing all three levels of government. Soon after, Canada's Public Sector Accounting Board (PSAB) issued regulation 3150 in 2009 that required local governments to include their tangible capital assets on their annual financial statements. In order to comply with this new regulation, localities needed to know the value of their tangible capital assets across all infrastructure classes throughout their life cycles. With this knowledge, a local government is then able to identify its overall infrastructure funding deficit and create a plan for managing its assets



in a long-term plan. The foundation for an asset management plan was in place.

A significant service provided by MAMP is raising awareness about asset management. During its first year of operation MAMP funded over 20 proposals from partner, private sector and stakeholder organizations to provide workshops and other informational sessions to local governments throughout Canada. These sessions have helped to educate local government staff about the benefits of asset management plans and how to develop them. MAMP also provides technical assistance to help with the development of asset management plans. Additionally, MAMP takes a broad view of the many asset management activities that are eligible for funding in an effort to tap into the varying needs of local governments across the country.

The FCM has reported that local governments have not taken a standardized approach to developing their asset management plans. This is chiefly due to varying requirements in each governmental jurisdiction and other additional factors. In order to gather information about the varying practices, MAMP maintains close relationships with the jurisdictions and their stakeholder communities. These different approaches are included in a central knowledge base of best practices maintained by MAMP.

With each passing year, MAMP continues to expand its online library of resources that contain useful information for those communities that are only just beginning to understand the value of creating their own asset management plan.



The Next Step Forward in Asset Management: Citywide or Statewide Planning

Perhaps the greatest opportunity to maximize value of infrastructure investments may come from governments that can evaluate their infrastructure assets across sectors to prioritize funding and schedule projects efficiently. Public infrastructure assets have mostly been managed individually by sector. And while this practice has been beneficial and should continue, this approach does not provide the comprehensive overview that government asset owners and policymakers need when prioritizing all of their funding decisions. Moreover, because they do not have a full understanding of the condition of their assets, asset owners they are at a disadvantage when developing long-term capital budgets.

Michigan's Infrastructure Database Provides A Roadmap for Smarter Investments


Like many states, Michigan was struggling to maintain and modernize its aging infrastructure in the face of mounting funding and financing challenges. Seasonal temperature variations coupled with decades of underfunded maintenance had taken a toll on the condition of many of its assets and backlogs of projects in need of repair or replacement continued to grow. In other cases, the existing infrastructure was not adequate to meet current and future demands. Understanding that something had to be done to turn the situation around, then Governor Rick Snyder called for the creation of the 21st Century Infrastructure Commission in his 2016 State of the State Address.

The Commission was charged with developing recommendations to improve the state's infrastructure for the next 30 to 50 years, including transportation, drinking water, waste water, storm water, energy and broadband. The challenge seemed daunting as the state has 3,350 separate asset owners that spanned multiple infrastructure sectors: road agencies, transit agencies, wastewa-

ter systems, drinking water systems, natural gas utilities, electric utilities, broadband providers, and drainage commissioners. There are almost 1,400 drinking water systems alone in Michigan.

Yet, over the course of seven months, the Commission crafted a series of recommendations that was essentially a roadmap of how Michigan can bring its infrastructure into the 21st century. The comprehensive recommendations spanned infrastructure sectors but the centerpiece would be establishing a statewide infrastructure database and asset management plan. Prior to establishing the database, the Commission recommended a smaller scale pilot program to "identify existing infrastructure data and gaps, determine an appropriate comprehensive database system to house the data, and begin to coordinate amongst the asset management data and planning sectors across the state."

In April 2017, the Michigan Infrastructure Asset Management Pilot got underway with the participation of two noncontiguous regions in the state



Creating a dynamic inventory across infrastructure sectors such as bridges, roads, water pipes, and schools can be daunting to many governments as the siloed nature and sheer volume of assets can be overwhelming. It is possible with the strong support of the political leadership, a small dedicated team, and the use of asset management software to make this effort more manageable.

Additionally, planning efforts can be coordinated across asset sectors and between public and private asset owners to make repairs and improvements more cost-efficient and less disruptive to the local community. For example, planned work on an underground water main or other utilities beneath a street can be combined so that the asphalt does not need to be repaved more than once.

working together with the appropriate state agencies with jurisdiction over drinking water, stormwater, wastewater, transportation, and private utilities. The 158 pilot communities involved in the effort were able to catalog an impressive amount of information using data-sharing agreements, including over 13,500 miles of wastewater pipe data and over 4,800 bridges. A key goal was to develop consistency across asset owners in standards and management practices, and to create mechanisms for coordinate planning and communications. The thought was that evaluating assets in one database using condition data and expected useful life could illuminate opportunities for coordinated investment. One year later, the work done by the Pilot exceeded expectations and indicated that it was possible to move forward with such a database to encompass varied infrastructure sectors and across the state.

Soon after the Pilot submitted its report and recommendations, Governor Snyder signed legislation creating two new councils geared towards infrastructure management. The Michigan Infra-

structure Council was charged with expanding the regional database into one that encompassed statewide assets and then develop a long-term plan and strategy that included the condition, needs and priorities of both public and private infrastructure assets.

As the Transportation Asset Management Council has done since 2002 with regard to transportation infrastructure, the Water Asset Management Council was created to assist Michigan's communities in developing water asset management programs and issuing an annual report on their condition. A significant part of this effort has been providing grant funding to assist water utilities in developing asset management programs.

While work is ongoing in creating the comprehensive database and evaluating this first phase of work, these ambitious efforts have made Michigan a national leader in statewide infrastructure asset management.



District of Columbia Identifies and Funds Unmet Capital Needs in 10 Years

The District of Columbia, like many other cities, had a problem. Home to the federal government, a thriving business community, and a growing population, the District was staring down a mounting infrastructure investment gap. This was not just about potholes in the roads – although those were an issue – but also about the condition of schools, sidewalks, municipal buildings, the city’s fleets of vehicles, and every piece of equipment owned by the city.


Caught in a cycle of responding to crises and not being able to plot an appropriate repair and replacement schedule or plan for future needs, the District was in search of a better way to address these challenges. Enter the District’s Chief Financial Officer (CFO) Jeff DeWitt who directed his office to undertake a comprehensive review and inventory across all asset classes and agencies. Soon thereafter, the Council of the District of Columbia passed legislation to mandate such an effort and charged the CFO’s office with determining the costs of maintaining or replacing the assets. The Office was to produce an annual report on a maintenance and replacement schedule for capital assets that would assist in the creation of a long range capital financial plan.

Instead of being overwhelmed by the scale of such a directive, the CFO’s office rolled up its sleeves and got to work. It organized a capital budget committee comprised of appropriate staff from the affected agencies to survey best practices in asset management plans else-

where and then craft a phased approach to a capital asset replacement schedule. By devising a limited proof of concept (i.e. a pilot), the committee set out to test the feasibility of developing an enterprise-wide, centralized asset registry and employed specialized software to create the Capital Asset Replacement Scheduling System or CARSS. This system was designed to answer four key questions:

1. What assets does the District own?
2. What is the condition of those assets?
3. How should the District prioritize its capital needs?
4. How much funding is available to address those needs?

As part of this process the committee began to score, rank and prioritize all the identified capital needs according to specific criteria developed in conjunction with the Mayor’s Office and enter that data into CARSS. The pilot was successfully implemented in mid 2015 and over the next few years the inventory grew to where 100% of the District’s assets have now been incorporated into CARSS. Not only does CARSS act as a centralized asset data base, it is updated on a weekly basis so that it is always providing the most up-to-date information on asset conditions and any changes in value. For example, the system can provide information on any vehicle owned by the city including its current mileage and most recent maintenance records.



With a complete asset inventory, CARSS has been instrumental in providing detailed data used to develop the District's most recent six-year Capital Improvement Plan (CIP). According to its 2018 Long-Range Capital Financial Plan Report, the District identified approximately \$11.5 billion in total capital needs during its CIP period. During this six-year capital planning period, the District plans to fund more than \$8.2 billion in capital projects, with approximately \$5.3 billion of that amount funded from selling municipal bonds. However, the District's overall need for new or replacement infrastructure and maintenance of existing capital assets far exceeds this funding level by about \$3.3 billion. Through extensive financial analysis, the District was able to determine that through a combination of maximizing its borrowing up to its statutory debt limits, coupled with an aggressive program to refinance its existing debt and dedicate the savings to capital, maximize federal grants, and most importantly increase the amount of 'pay as you go' (or paygo) funding, the District could address those identified but unfunded capital needs in a reasonable amount of time. After extensive consultation with the Executive Office of the Mayor and the District Council, in FY 2017 legislation was adopted that, starting in FY 2020, gradually increases the amount of annual paygo funding for capital needs until it reaches an amount that is equal to annual depreciation of the District's assets, and then remains at that level of funding into the future. As a result of this action, the District

will now be able to fund all its unmet capital needs by FY 2028, assuming no new capital projects are added to the CIP.

Having the data provided by CARSS readily available to policymakers has helped shape important funding decisions and clearly shows the consequences of each decision. Should an official look to fund a project that is not currently in the six-year CIP, (1) either additional funding must be secured, or (2) funding from an existing project in the CIP must be cut. As the District's Senior Financial Policy Advisor, Darryl Street, noted "for the first time, we can more precisely quantify the costs of these decisions."

The District's innovative approach to asset management has added to the city's strong financial management that has resulted in upgrades to its General Obligation bond ratings by each of the three major credit rating agencies, including to Aaa by Moody's Investors Service (Moody's), and to AA+ by both Standard & Poor's (S&P) and Fitch Ratings. As stated in its 2018 Long-Range Capital Financial Plan Report, "Arguably, CARSS is the most comprehensive and detailed capital asset management system of any city or state government in the country."

Lessons Learned for Infrastructure Agencies/Owners

Each of the case studies profiled revealed ‘lessons learned’ that can be valuable to asset owners and policymakers alike. Several common themes emerged:

- **Political buy-in and direction from elected officials is paramount.** Data collection and cooperation among asset owners and managers is key and political direction can make that happen.
- **The benefit of early and frequent communication among affected agencies and/or asset owners cannot be overstated.**
- **Don't be overwhelmed by the enormity of the task. Start small with a proof of concept to test out the data collected.** In other words, start small and take note of what needs to be tweaked and then gradually move on to other asset classes.
- **The designation of a centralized office to collect data across asset classes is optimal.**
- **Asset owners working with constrained resources need not worry as your team can be comprised of just a handful of specialized staff with a infrastructure knowledge, financial background, IT knowledge and a data collection capabilities.** Each agency should have a small team that can work with the centralized team.
- **The Internet has brought data collection and analysis into the digital age and as such, collected data should be safeguarded with strict cybersecurity protocols and stored in a secure central data base.**
- **It is critical that policymakers have a long-term view of addressing their infrastructure investment gap.** The problem didn't develop overnight and won't be solved in the short term.
- **The bottom line is that engaging in asset management practices across infrastructure sectors can be a game-changing tool for infrastructure asset owners.** It provides the opportunity to take a proactive approach to assessing the condition of their assets and the data needed to make appropriate long-term funding decisions.



Policy Recommendations

There are several levers that can be deployed to encourage greater adoption of best-practice asset management strategies:

- States, counties (or similar jurisdictions) and cities should create an infrastructure commission or team to oversee the consolidation of their infrastructure data across asset classes. This infrastructure commission should manage the one-stop shop for a centralized data base. This responsibility could be given to the chief financial officer of the state or city.
- Consolidate best practice standards that are currently developed for different infrastructure assets across agencies into one center for best practices. This can be modeled after the Canadian example. Such a center will include access to grants and low-interest loans similar to what is being done at the United States Department of Transportation (USDOT).
- Create a new grant or low interest loan program at the federal and/or state levels whereby localities or states can apply to get assistance with setting up a comprehensive asset management inventory as well as education and training programs.
- Require continuous oversight and accountability for completed plans to ensure that they meet stated goals and can be implemented.
- Require state and local governments to create comprehensive asset management plans and issue annual reports as a condition to receiving federal funding (already a transportation requirement but could be applied to water systems). States should have a similar requirement of their localities as a condition of receiving state funding.

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