

Advanced Asset Management

The pressure on utilities to perform is intensified by deteriorating infrastructure and limited funding. Achieving your goals means reimagining how you manage your assets from the pipes to people and everything in between. Water utilities face mounting challenges: aging infrastructure, rising costs, limited funding, changing workforce, and the increasing frequency of extreme weather events. Traditional approaches to asset management are no longer sufficient to address these pressures. Instead, utilities must embrace a paradigm shift to advanced asset management.

Advanced asset management is focused on all the assets a utility manages, including people. It leverages the power of advanced technology and brings real-time data together to optimize asset operations, maintenance, and investment decisions. This enhanced approach to asset management prioritizes resilience, leverages advanced digital tools and focuses on total expenditure (TOTEX) rather than just upfront capital expenses (CAPEX). By embracing innovations like artificial intelligence (AI), and predictive analytics and advanced decision support tools, utilities can better manage their assets, make proactive decisions and build a more sustainable future.

Let's explore how this paradigm shift is transforming the water sector and shaping the future of asset management.



Current Landscape & Trends

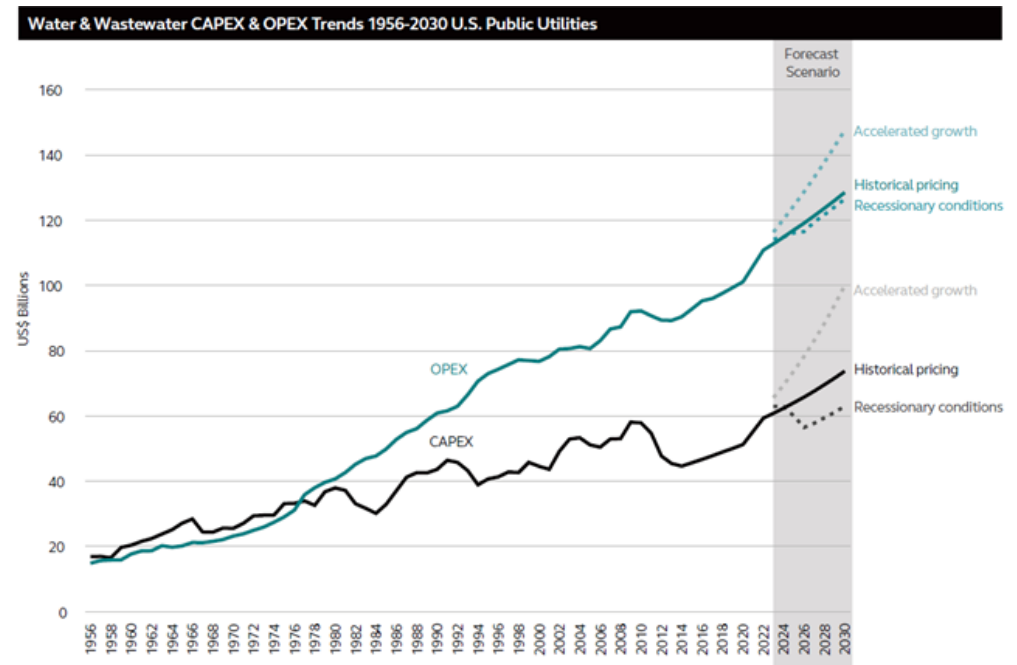
Water utilities in the United States are grappling with an array of challenges that demand immediate attention:

Increasing gap between OPEX and CAPEX: Operational expenditure (OPEX) continues to climb as utilities face rising costs for maintenance, energy and staffing. Simultaneously, capital expenditure (CAPEX) funding for infrastructure renewal remains limited. This growing gap hampers utilities' ability to make long-term investments, forcing many to rely on reactive maintenance instead of proactive asset renewal. Only 20% of utilities stated they were fully able to cover costs of service in the future, according to a recent AWWA survey¹.

Aging infrastructure: U.S. utilities experience 237,000 water line breaks annually, costing ratepayers \$2 billion each year. In the 2025 Report Card for America's Infrastructure issued by the American Society of Civil Engineers (ASCE), water infrastructure received a C- and wastewater infrastructure a D+. Learn more about what this grading means and how strategies like reliability-centered maintenance, asset management program implementation and digital tools for proactive renewal planning can help raise these grades².

Soaring investment needs: The cost of buried infrastructure investment has increased by 32%³, including the need for lead service line replacements, making traditional approaches to funding and maintenance unsustainable.

Affordable service challenges: Affordability is an ongoing challenge for the water sector, with rising rates disproportionately affecting underserved communities. Approximately 10% of consumers in major cities struggle with unaffordable water service, reflecting poverty rates challenges.



Source: Congressional Budget Office, Bluefield Research

U.S. public utilities continue to navigate rising costs, with strong CAPEX investment driving infrastructure renewal while OPEX trends reflect ongoing operational and regulatory pressures shaping the water sector's future.

¹ AWWA State of Water Industry (SOTWI), 2026

² 2025 Infrastructure Report Card | ASCE

³ EPA Drinking Water Infrastructure Needs Survey and Assessment

Current Landscape & Trends

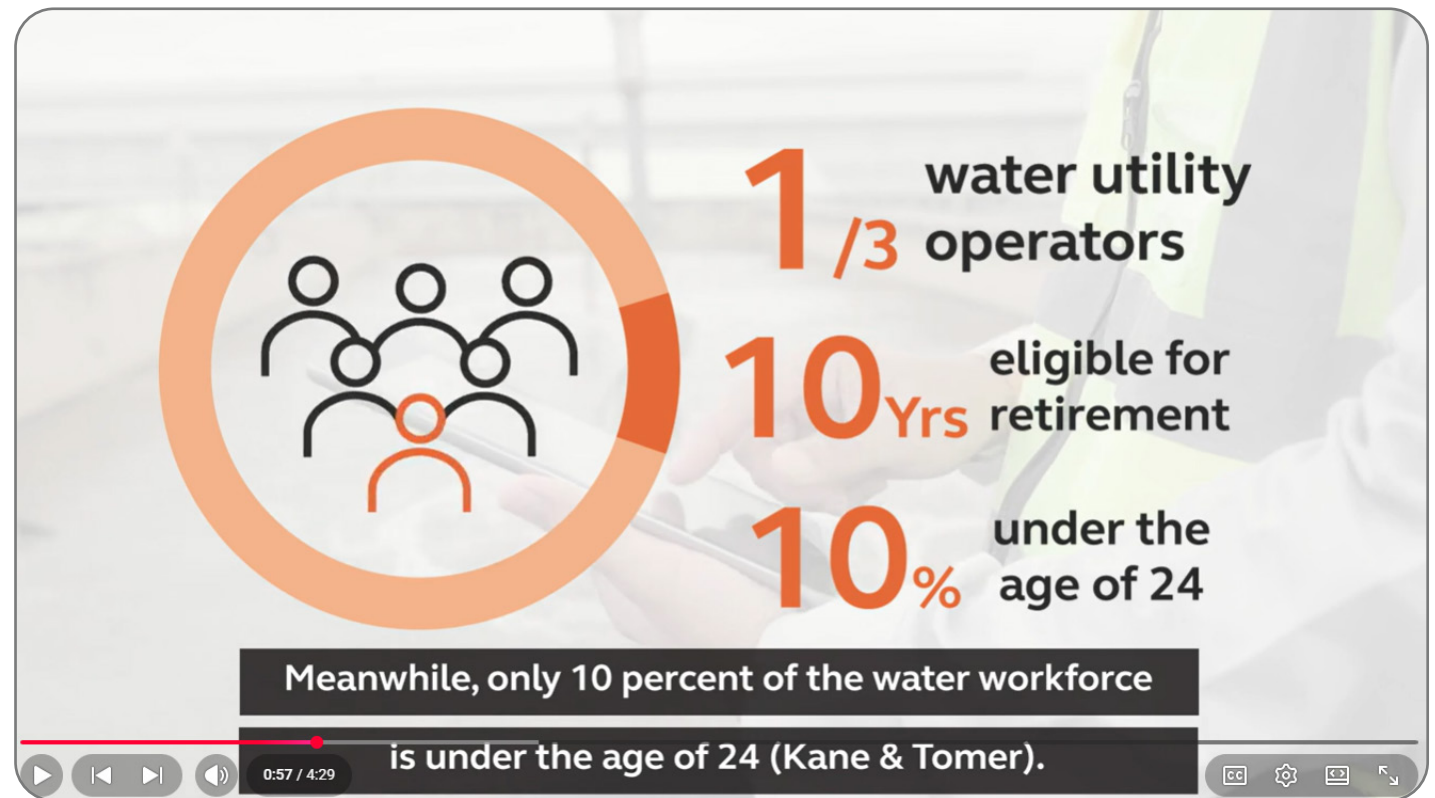
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Silver tsunami: The water sector is experiencing a long-anticipated wave of retirements, known as the “silver tsunami.” During the pandemic, retirement rates accelerated, and many utilities lacked programs to retain institutional knowledge. This wealth of knowledge can be captured through data and in systems, before these employees leave the organization. This loss of expertise, combined with increasing turnover driven by demand for higher wages, created chronic vacancies. Advanced asset management tools that emphasize automation and standardization are critical to addressing workforce gaps. These issues and solutions are discussed in this episode of [Current Briefs](#).



Complex regulatory drivers: Utilities must navigate an increasingly complex regulatory landscape. Environmental regulations, compliance standards and consent decrees add pressure to already stretched resources. In some states, asset management plans are required to be eligible for state revolving funds or for permit renewals. Without proactive planning, the risk of non-compliance can lead to penalties, public health risks, and reputational damage.

Extreme weather events: Flooding, droughts, and storms are more frequent events, threatening the resilience of water systems. These major weather events uncover assets’ major vulnerabilities.

The challenges in funding, aging infrastructure and workforce, regulatory changes, and extreme weather events are compounding and forcing utilities to operate in reactive mode, putting out fires and fixing what is needed to keep operations running. The Asset Management Paradigm Shift offers a framework to break this cycle and move from a reactive approach to a proactive one.

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The Asset Management Paradigm Shift

Utilities are moving away from outdated, reactive approaches and adopting new strategies to meet the demands of today's environment. Here's how the paradigm is changing:

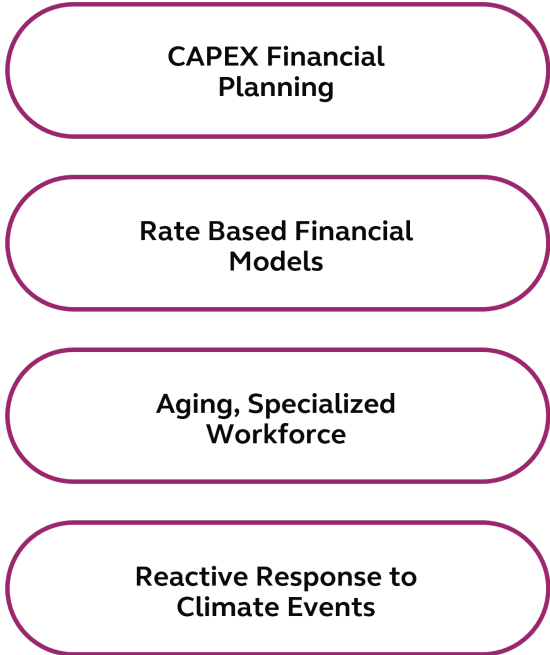
From CAPEX to TOTEX Planning

- Instead of focusing solely on upfront CAPEX, utilities are now considering the total cost of ownership over an asset's lifecycle, known as TOTEX
- This comprehensive approach helps utilities balance maintenance, operations and capital investments, optimizing long-term financial planning.

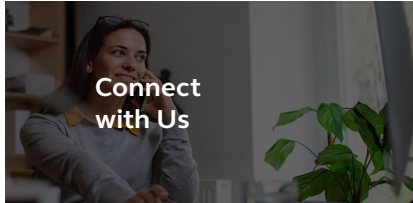
From Traditional to Alternative Finance Models

- Programs like the Water Infrastructure Finance and Innovation Act (WIFIA) provide new sources of funding for capital projects. These programs allow utilities to increase revenue without raising customer rates.
- Utilities are exploring both traditional and innovative funding mechanisms like state revolving funds and public-private partnerships to meet growing financial needs.

Conventional Asset Management



Advanced Asset Management



Embracing Digital Tools and Technologies for Optimized Decision Making

- As the water industry faces financial challenges to pay for the backlog of aging infrastructure advanced decision support tools evaluate multiple risk reduction alternatives and funding scenarios to make the most of limited funds.
- Arcadis' Enterprise Decision Analytics (EDA) provides powerful optimization of capital investment plans against customizable constraints and goals. EDA has been an effective tool in helping utilities see the impact of performing or deferring capital projects on level of service goals.



[Watch here](#) how performance, cost, timing, and risk are brought into one tool and turn complex data into clear, actionable decisions insights.

From Specialized Workforces to Flexible Staffing with Digital Skillsets

- As the water industry faces labor shortages, utilities are embracing flexible staffing models that integrate advanced digital tools.
- This shift reduces reliance on aging, specialized workforces with traditional engineering, finance and operations skillsets.

From Reactive to Proactive Climate Resilience, using Dynamic Information

- Extreme weather events are forcing utilities to shift from responding to climate impacts to actively preparing for them
- Advanced asset management incorporates vulnerability assessments, flood evaluations and predictive analytics to design more resilient infrastructure

- Leveraging real-time, dynamic data to adapt to rapidly changing conditions. Digital tools such as digital twins, advanced decision support systems and IoT sensors provide actionable insights, enabling smarter decision-making for both capital and maintenance needs.

By adopting these strategies, utilities can better address long-term challenges, make optimized capital investment decisions, improve operational efficiency, enhance resiliency, and satisfy their customers.

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Implementation Strategies

How can Utilities Successfully Deploy Advanced Asset Management Practices?

Strategic Planning: Effective asset management begins with understanding where utilities currently stand and defining clear goals for the future. Developing a formalized Strategic Asset Management Plan ensures alignment between the asset management program and the larger utility strategy and stakeholder's desired level of service. As shown in the graphic, line of sight from organizational strategy through asset management strategy and planning helps ensure alignment of daily work activities with organizational vision, goals, and objectives.

Moving from capital project prioritization to optimization: A transparent, data-driven framework for prioritizing capital projects ensures resources are allocated to the areas of greatest need. Once an organization decides on its prioritization framework, it needs a powerful analytics tool to optimize and enable enhanced decision making. EDA from Arcadis helps visualize asset data, understand and recognize insights, test investment scenarios and optimize around asset performance.



Line of Sight from Organizational Strategy to Operational Activities

Current Landscape & Trends

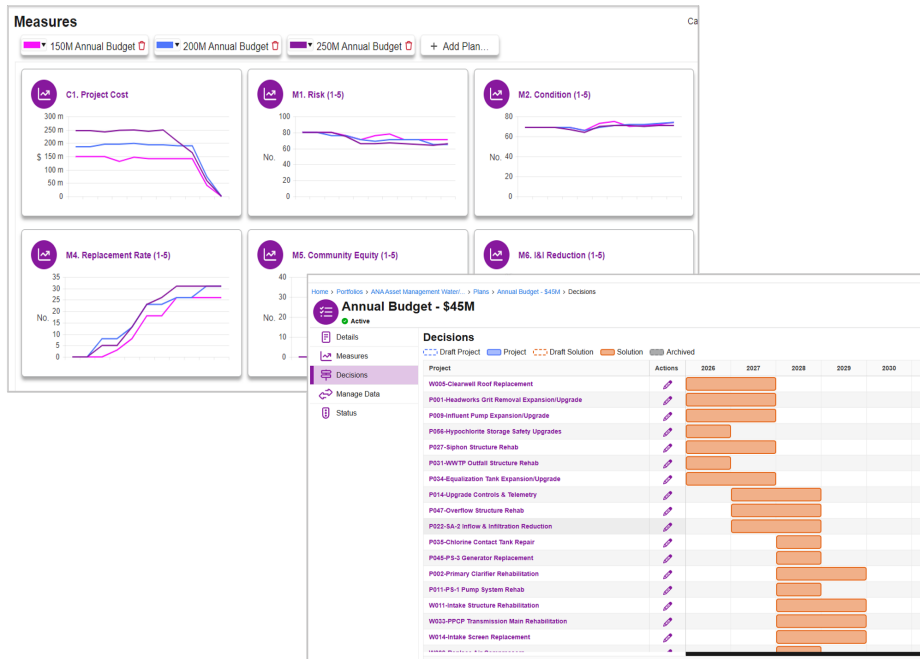
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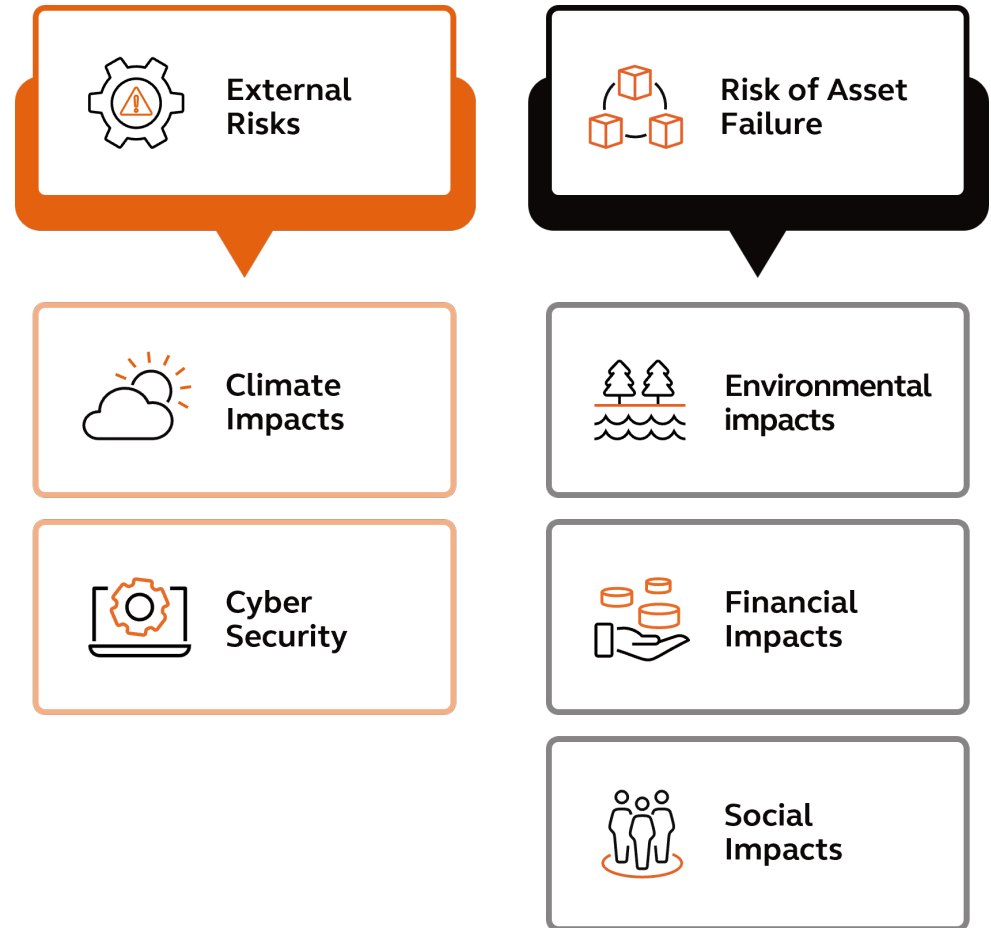
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The EDA solution is a decision support platform that empowers asset-intensive organizations to better understand their asset portfolios and enable optimal, data-driven decisions that balance and prioritize complex factors for an optimal asset investment plan. The graphics below illustrate some outputs from EDA Portfolio which allows multiple projects and portfolios across the business to be compared against one another for prioritization, by analyzing and comparing project outcomes within a common reporting framework. EDA Portfolio is designed to develop, prioritize, and optimize asset investment decisions for short-term or long-term programs, OPEX, CAPEX, or TOTEX.

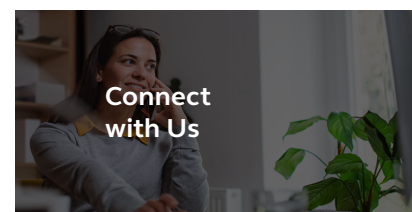
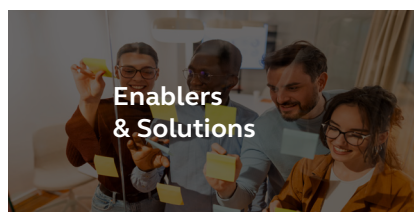


Arcadis' EDA solution optimizes capital plans based on user-defined constraints and enables more informed decision making.

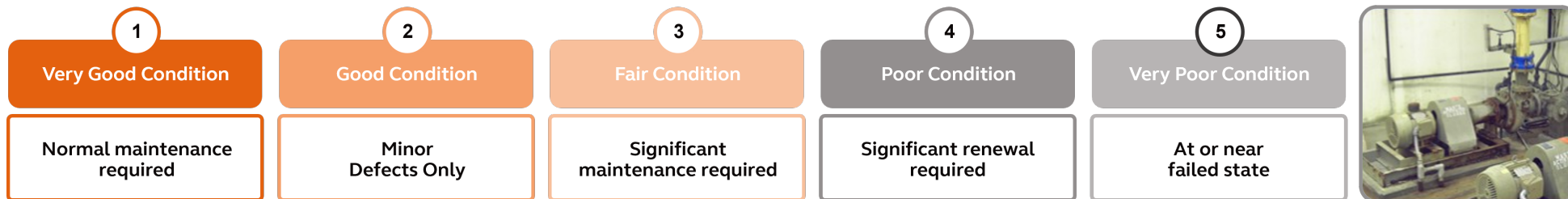
Comprehensive approach to risk: Utilities must move beyond traditional risk management to adopt a holistic view that integrates operational, financial, environmental, as well as external risk factors such as extreme weather and external threat risks. By leveraging vulnerability assessments and predictive analytics, utilities can proactively identify and mitigate risks before they escalate, improving service reliability and resilience.



Advanced asset management balances external risks with the traditional impacts associated with risk of asset failure.



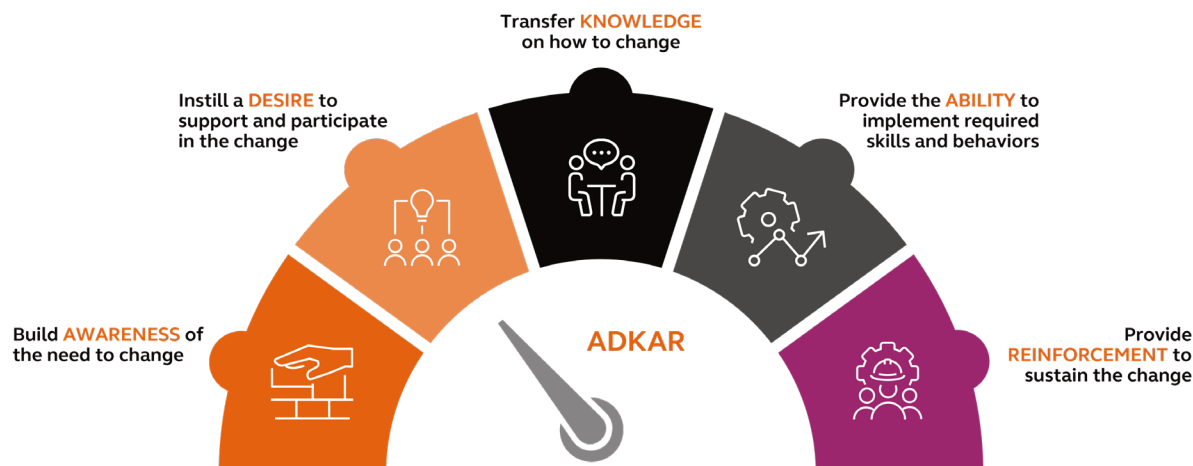
Employ digital solutions: Digital tools, such as condition-based monitoring, machine learning failure prediction models, AI for condition grading, and digital twins, empower utilities to make smarter decisions. Utilities should evaluate these tools to identify the best-fit technologies to meet their current and future goals. By transitioning to intelligent systems, utilities can optimize asset performance, reduce downtime, and improve operational efficiency. Arcadis is piloting several AI condition assessment tools to grade assets on a 1-5 scale from very good to very poor condition to determine when assets should be considered for capital investment or maintenance actions.



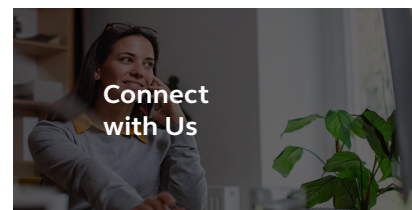
Arcadis is piloting technology that performs condition assessment scoring and collects nameplate data using AI.

Change Management: Adopting advanced asset management practices requires utilities to engage their workforce, build digital competencies and foster a culture of innovation. Change management strategies ensure that employees embrace new tools and processes, enabling a smooth transition to modern practices. At Arcadis, we embrace Prosci's approach to change management. Prosci© has researched change management best practices for more than twenty years and their data shows that integrating change management within your AM program increases the likelihood of success. Prosci leverages the ADKAR model shown in the image below to describe

everyone's change journey. ADKAR stands for Awareness, Desire, Knowledge, Ability, and Reinforcement. Supporting staff members in building awareness about asset management concepts and instilling a desire to participate in asset management practices is an important first step. Next, staff members need to be provided with the proper level of knowledge and training to be successful in using new asset management processes and tools to implement the new skills and behaviors. Lastly, reinforcement is key to help asset management changes stick and become adopted into the organizational way of working.



Arcadis leverages the Prosci ADKAR model for change management in asset management programs.




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The water industry is at a turning point. The Asset Management Paradigm Shift offers a roadmap to navigate today's challenges and position utilities for a resilient future.

At Arcadis, we help utilities harness advanced technologies like AI, predictive analytics, and digital twins to implement intelligent asset management strategies. Contact us today to learn how we can support your transformation.



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