WHITE PAPER

Transforming cities and infrastructure for a sustainable future

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Executive summary:

Rapid urban growth is forcing cities to confront the parallel challenges of the climate crisis, aging infrastructure, and disrupted labor forces all with ever-diminishing budgets. As city leaders grapple with these challenges, digital transformation is proving the solution. This paper discusses how the right combination of digital tools is helping cities move from a reactive response to delivering a more sustainable future while saving costs and connecting the workforce to trusted data. These tools enable them to transform work, achieve operational agility, resiliency, and efficiency, while delivering asset reliability and safety, and meet sustainability and net zero commitments.

Introduction

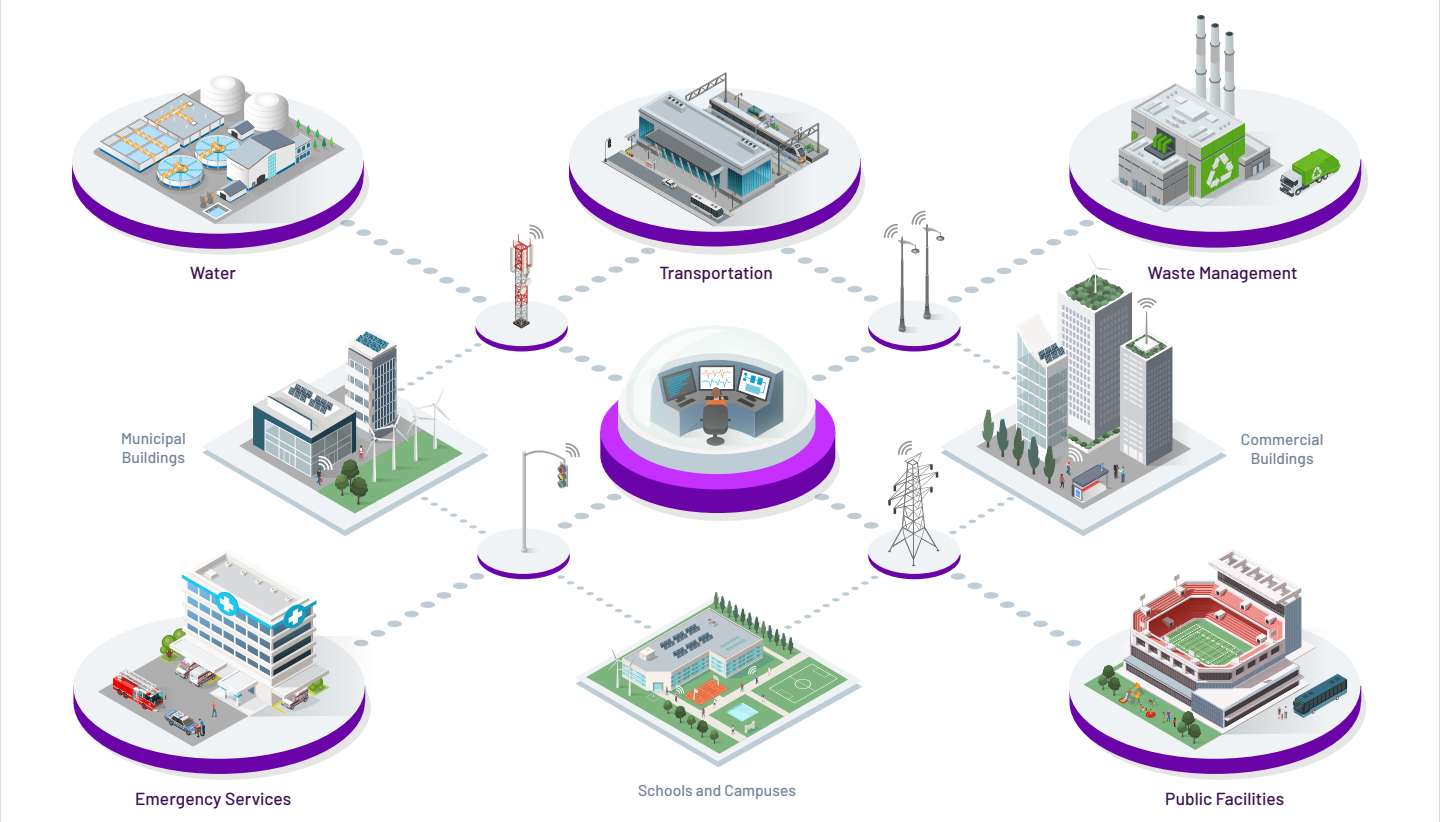
According to the World Economic Forum, more than half the global population lives in cities–a figure that's expected to rise to 80% by 2050[1]. With nearly seven billion people projected to be living in urban areas in little more than a generation and, with global energy consumption on the rise, against a backdrop of more extreme weather events driven by climate change, it's imperative for cities to invest in more sustainable infrastructure and resources.

Buildings account for 30% of global energy consumption and 28% of energy-related carbon emissions. Against a backdrop of a global pandemic, climate crisis, economic uncertainty, and budget constraints, city leaders must act with urgency to make urban infrastructure more resilient. Markets are increasingly pressuring cities to reduce carbon emissions, respond to extreme weather events, reduce waste, and preserve natural resources while still providing critical infrastructure and resources–and citizens expect this as well, increasingly demanding greater transparency.

[1]World Economic Forum, 2022: www.weforum.org/communities/biodivercities-by-2030

Digital technologies are key enablers for cities and public facilities seeking to transform into more sustainable operations while continuing to ensure functionality, comfort, safety, and efficiency. There are five trends underpinning the need for digital transformation, each of which can be met with a sustainable solution that can generate significant savings on time and cost, improve the reliability of core assets, and reduce response times and energy use:

1. The increasing complexity of service networks can be addressed with greater operational agility and resiliency
2. Budget constraints can be overcome with improved operational efficiency
3. Labor disruption can be met with a digitally connected workforce
4. Aging infrastructure can be met with tools to improve asset reliability and safety
5. Increasing pressure over climate change can be met with sustainability solutions, making net zero emissions more achievable



Operational agility and resiliency

Cities are in continuous operation, providing the critical infrastructure and services their citizens need. Similar to industries, they are exposed to and must adapt to market conditions, forces of nature, and limited funds. They must also do as much as they can to ensure their communities are healthy and safe. A major trend affecting how cities operate is the increasing complexity of service networks. Cities are expected to prepare for the next unknown event using systems that mitigate or positively respond to chronic or acute stresses: global pandemics, flooding and hurricanes, wildfires, disruptions to essential services, and more.

Many cities aren't capable of adapting to such crises as quickly as their citizens need them to, and are being pressured to reduce response times. This can be accomplished through sharing critical data across different service lines such as city management, emergency services, utilities, and even residents using industrial information management. Strengthening operational agility and resiliency also stems from enabling remote situational awareness, monitoring, and control in city hubs like emergency operations centers; enabling city works to respond fast in the face of service disruptions or crisis situations; and protecting critical data through backup.

The Nava Raipur Smart City located in central India was designed with operational agility and resiliency in mind. This "new" Raipur has its locus in an integrated command control center (ICCC). Its first development phase included integrating six city systems into the ICCC: rapid public transit, CCTV systems, SCADA systems, and actuated valves and pumps to improve water and sewage systems, a smart grid for distributing and managing power, and building management solutions to streamline operations while monitoring energy consumption. Nava Raipur runs more safely and efficiently thanks to real-time insight into its critical infrastructure, and has reduced its emergency response time by 60%.

Click here to learn how Nava Raipur has embraced smart growth

Operational efficiency

Every city, big and small, faces budget constraints. In the face of rapid urbanization, many citizens are demanding more livable, sustainable cities and infrastructure. This could mean more green spaces, better walkability or public transit, energy-efficient buildings, and an investment in more sustainable energy sources. At a time when many cities lack budgets for these types of initiatives and may even be cutting back services to their communities, the need to digitally transform is more pressing than ever.

Operational efficiency means optimizing operations and assets so that cities can reduce energy and operational costs while delivering reliable, safe, efficient services to their residents. This could include initiatives like delivering safe, clean drinking water by optimizing chemical dosing or improving water reclamation, or even making city buildings more comfortable and energy-efficient through air exchange and temperature control.

The City of Bremen, Germany, wanted to modernize heating systems in several municipal buildings, but it saw a larger-scale opportunity. It integrated 1,200 buildings and 1.8 million square feet into a single building management system (BMS) and consolidated six regional control stations under a single operator interface. The new heating systems use less energy to operate, and the city was able to reduce energy consumption by 15% to 18% without investing in new buildings–a savings of approximately €30,000 per year.

Click here to learn how Bremen, Germany, consolidates building management and reduces energy consumption

Transformation of work

An aging and retiring workforce has been a top concern in industry for more than a decade, with many organizations scrambling to capture institutional knowledge while also trying to find ways to attract younger talent. The same is true in cities, where workforce disruption and low levels of digitalization are stunting the effectiveness of operations. New generations of workers mean changes to existing systems, saying goodbye to spreadsheets and hello to software-as-a-service (SaaS) solutions that make it easier to distribute and perform workflows.

Transforming the way cities and organizations work means building a connected workforce that enables remote operations through centralized access to data and information. In many ways, the global pandemic has forced the hands of organizations to change the way they work and begin to rely more on digital tools to keep employees connected to business-critical information and to one another. A connected workforce also means improved efficiency and skills enablement are possible through standardized, digitalized employee training. When cities digitalize their operations, it also attracts a new generation of workers to join a more sustainable effort.

The Pima County Regional Wastewater Reclamation Department in Arizona manages and maintains a sanitary sewer system that serves a population of approximately one million people, with an average daily consumption of about 60 million gallons of water. Implementing a situational awareness strategy allowed the county to reduce energy consumption and double its capacity with the same number of staff. The system also helped capture institutional knowledge, ensuring that new employees could benefit from the systematized experience of an aging workforce, even when working remotely.

Click here to learn how Pima County doubles its capacity while maintaining staff level

Asset reliability and safety

Cities dealing with aging infrastructure and greater regulation are facing significant hurdles. Add to that increasing costs and funding pressures, and it's easy to see why municipalities need a new generation of tools to solve their problems. The good news is that the right digital solutions can extend asset life and capacity, as well as address safety concerns.

Using real-time and historical data, cities can monitor assets using predictive analytics that can help them avoid downtime and anticipate maintenance needs. By recognizing patterns in asset data, cities can plan maintenance only when it's needed, and real-time data and alarm systems can alert them to upcoming needs quickly. These capabilities extend the life cycle of assets, allowing cities to do more with less.

The University of Maryland, College Park has a complex electrical distribution system whose data was contained in disparate, isolated systems. By centralizing critical data in an operations data warehouse, the university was able to respond to outages faster and significantly reduce downtime. Over time, the institution used predictive analytics to inform advanced warnings and perform preventive maintenance, generating 30% in HVAC cost savings.

Click here to learn how University of Maryland, College Park anticipates electrical outages through a centralized asset data system

Sustainability and net zero

The natural threats associated with the climate crisis have been affecting more cities in recent years, and the intensification of these disasters will likely mean no city is immune to the effects of climate change.

Markets are already pressuring cities to be better prepared for climate-related crises, and citizens are demanding more transparency around carbon emissions. Cities are beginning to make their environment, social, and government (ESG) targets bigger priorities.

This prioritization also means that as cities and facilities work toward a more sustainable future, they must also be prepared to hold themselves accountable to ESG standards and become more transparent in reporting.

Cities must be ready to show progress to state and federal governments, as well as to their own residents. Reducing waste, protecting natural resources, and optimizing energy efficiency are achievable through digital transformation and can help cities meet net zero carbon goals.

The University of California Davis (UC Davis) set an ambitious goal to achieve net zero emissions by 2025. To meet it, they implemented advanced digital tools that use real-time data to optimize the university's chilled water system, improve HVAC scheduling, and transition from steam to a low-temperature hot water heating system. Even with thousands of buildings of varying ages across campus, UC Davis reduced gas consumption by 62% and is projecting $197 million in savings through a self-subsisting budget.

Click here to learn how UC Davis is on track to achieve net-zero emissions by 2025

Conclusion

Cities, campuses, and other municipalities are caught in a position that is pressuring them to do more with less–to work toward sustainability with the expectation of transparency, to be proactive instead of reactive to crises, and to improve aging infrastructure with limited budgets. The good news for cities and infrastructure is that digital solutions can help them achieve all these goals without disrupting critical services.

Each city has different needs, so finding a technology partner with an extensive digital toolkit and proven results is essential. More than that, any provider of digital solutions must prioritize these unique needs by listening to city leaders and displaying a clear understanding of budget constraints, delivering cost-effective services that improve operational efficiency, and empowering the workforce to make fast, informed decisions based on the most accurate data.

About the author

Fiona Straton is the senior marketing lead for urban infrastructure at AVEVA. With over 16 years of industry experience, she is an advocate for digital transformation and how technology can help deliver a more sustainable quality of life for all.

To learn more about digital solutions for cities and infrastructure, visit aveva.com