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How Data-Driven Performance Powers Smart Communities

INDUSTRY PERSPECTIVE

Data-driven performance

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Introduction

Smart communities across the nation are embracing the power of data in new ways. They're realizing what's possible if they do, and what's at stake if they don't.

These communities understand data's critical role in staying competitive, wooing new businesses and attracting residents, and advancing their decision-making capabilities. They also use that information to shape different scenarios of what the future could look like for residents and to forge a strategic path forward.

Simply put, smart communities make the lives of their citizens better through technology. Those interrelated technologies often include Internet of Things (IoT) connected sensors, artificial intelligence and particularly geographic information systems (GIS).

Organizations culminate these technologies in dashboards that elevate real-time awareness and decisions: They analyze new and legacy data together to demonstrate the cost of operations, they monitor performance in the context of community needs and they provide opportunities for improvement and feedback.

Smart communities use these collective investments to plan and engineer cities, counties and states that adapt to change. The goal is to make smarter decisions about how they allocate resources to the best locations that benefit the most people, all while ensuring they're achieving equity for their residents.

To balance and proactively respond to these critical issues requires real-time insights about the management and health of a community.

That's where data-driven performance comes in.

It's one of the four technology tenets of a smart community, and it's usually the one that comes to mind when people hear the word smart. Although data-driven performance isn't an entirely new concept, what's different now is the varying types of data that leaders have access to for decision-making, and their ability to connect and compare data in new ways that were not previously possible.

As elected officials, department heads and line managers collaborate with frontline employees to respond to their community's needs, they're relying on place-based decision-making to holistically track, measure and address issues that matter most to residents.

Data-driven performance enables communities to tap into the power of real-time dashboards and metrics to track resources, validate whether their efforts are working, determine who is impacted and make timely decisions. Communities are applying this data-driven approach to a range of activities, including tracking hotspots of disease outbreaks, monitoring vehicles and crews in real time, analyzing decades of budgets and projects to determine equity across neighborhoods and driving economic restoration.

To explore this topic further, GovLoop partnered with Esri, a leader in GIS, to delve into the specifics of data-driven performance, why it's especially critical at this time and how it fuels smart community investments that will impact current and future generations. The report also highlights success stories from Philadelphia, Pennsylvania, and Texas State Parks.

Esri's Smart Community Information System establishes four technology tenets governments need to deliver smart communities. They are:

1

Planning & engineering

2

Operational efficiency

3

Data-driven performance

4

Civic inclusion

Why Data-Driven Performance Is Key to Smart Communities

High-performing organizations are using location as the standard approach to achieve new insights.

We see this playing out in Baton Rouge, Louisiana, to conduct crime analysis, in Iowa's Department of Transportation to monitor snowplow operations in real time, in Tempe, Arizona, to track opioid abuse via emergency calls and the wastewater system, and in many more communities across the nation.

Increasingly, smart devices, IoT and cloud computing are working in unison to feed civic engagement and field mobility data into dashboards. Decision-makers rely on those dashboards for insights about the locations of people, nature, vehicles and infrastructure. By geo-enabling the data, governments are enhancing business intelligence, establishing more efficient workflows, improving communication and tackling issues in their entirety as opposed to siloed, individual parts.

The desire to make life better for residents can put communities in a continuous state of building, developing and collecting data. But in the midst of those efforts, there must also be iterative reviews of what's being done, how it's being done and the impact on the community. Data-driven performance provides the needed context around a particular decision and why it's being made, whether that's planning an urban mobility project, deciding how best to dispatch medical staff or advocating for more service in a neighborhood.

But how do communities know if these efforts are adding value?

When data-driven performance is at the forefront, communities always consider these questions:

- How can we continuously validate the efficacy of our smart investments — technologies that improve the lives of citizens — in real time?

- How can we use those insights to refine our work where needed and make the necessary adjustments to better serve all of our citizens?

To be clear, data-driven performance does not begin and end with a dashboard. Smart communities take the concept of data-driven performance and operationalize it by connecting data across their enterprise with other sources, while engaging the public and doing so with a sense of urgency.

What's at stake?

Public safety, education, budgets, jobs and service levels are critical issues in any community. The ability to understand the health of your community in these and other areas through data-driven performance is vital. Data-driven decision-making saves lives and keeps you relevant. It makes your community an attractive place to live, work and play; and keeps you on top of evolving issues at the onset. In other words, you can respond to economic, social, environmental and technological changes proactively rather than reactively.

The ability to make data-driven decisions is a foundational capability that will carry you through crisis — both now and in the future. In 2020, communities responded to multiple crises, including COVID-19, budget shortfalls and racial injustice. Location-based data has been at the heart of those response efforts, helping communities understand and address coronavirus outbreaks, racial disparities in health care and criminal justice, and how best to allocate scarce resources and make course corrections.

GIS technology provides a starting point to help you identify gaps in your performance and create a tactical plan for moving the needle in the right direction. That's true whether you're redesigning a city to take advantage of driverless vehicles or to be sustainable and resilient for decades to come.

How GIS Shapes and Elevates Data-Driven Performance

GIS has been acknowledged as a foundational platform in building smart community strategies worldwide.

In the context of data-driven performance, GIS enables governments to collect and organize vast amounts and types of data, analyze it quickly and empower agencies to move from static to real-time decision-making. They can see who is impacted and who has not received the same levels of service.

To identify trends and outliers, communities are investing in GIS technology to integrate artificial intelligence and machine learning, which helps them see correlations and patterns in new ways.

Smart communities can achieve data-driven performance by embracing GIS technology that:

Analyzes and migrates data quickly to change the pace of government services.

Today's advanced technological capabilities make it possible for agencies to operate in seconds rather than minutes or hours. Sensors collecting data from buildings, vehicles and even the environment can provide real-time feedback about what is happening in the field.

Responsiveness is a game-changer and a differentiator when comparing how various communities tackle similar issues and deliver services to residents. Examples include efficient traffic management and snow removal services that prioritize historical data, real-time conditions, community needs and at-risk populations.

Improves urban mobility through intelligent infrastructure.

Communities are improving the way that people, goods and services can freely move about, and they're doing that through intelligent infrastructure. That means cars, buses and local transit stations aren't the only sensor-enabled objects on street corners or operating underground.

When urban mobility is prioritized, vehicles across various modes of transportation, streetlights, buildings and other objects can communicate with one another. The ultimate goal is to facilitate safe and smooth mobility for all, including drivers, walkers, bikers, transit riders and those using scooters and other forms of micro-mobility.

Leverages artificial intelligence and machine learning to better understand patterns and reduce impacts.

An increasing number of communities are using machine learning and artificial intelligence in a range of disciplines, such as forecasting unemployment by sector, housing affordability, homelessness and asset management.

Using data-driven algorithms and techniques, employees can automate the prediction, classification and clustering of data.

Organizations are also using these capabilities to identify and understand other patterns that affect the health and vibrancy of a community. Take blight, for example. Tracking vacant lots, abandoned houses and other deteriorating properties has traditionally been a very manual process for government employees and residents.

But using artificial intelligence and machine learning, communities can train computers and algorithms on what blight is and what it looks like. This enables them to better identify where it's creeping up, how it has evolved over time and how to allocate resources to combat it.
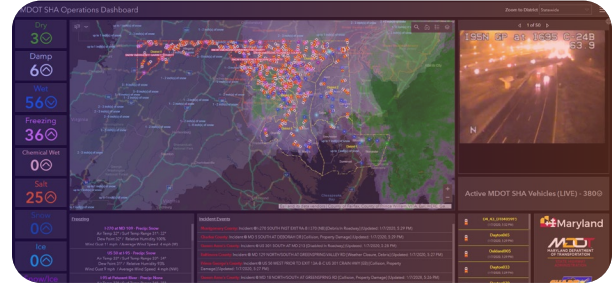
Integrates autonomous vehicle information, sensors and devices in the urban landscape.

Internet-connected cars talking to one another used to be a futuristic vision. But it's becoming more commonplace as communities make plans to embrace autonomous vehicles on their roadways.

Smart communities are preparing for this future by supporting pilot programs and asking the right questions. Those questions include: Is my community designed and optimized to support autonomous vehicles? What's the impact of not embracing this change? How might the integration of autonomous vehicle information, sensors and other devices help create a safer and more livable community?
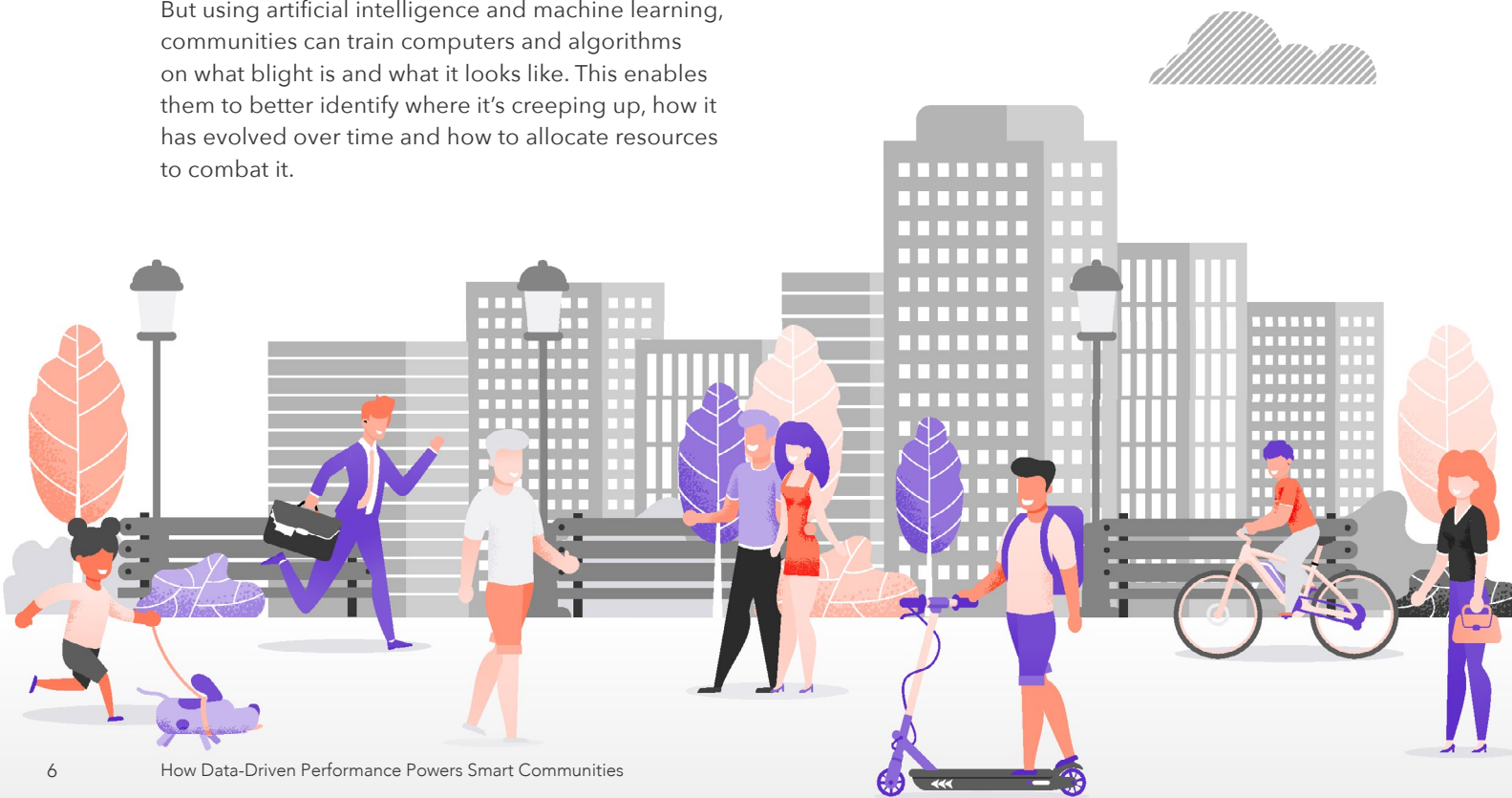
Data-Driven Performance Success Stories

Philadelphia Utilizes Place-Based Budgeting for Social Justice

Challenge: The city of Philadelphia, Pennsylvania, like many other local governments, has been dependent on spreadsheets for decades when preparing its annual capital budget. Meaningful analysis of available data is difficult when it arrives in a format of several thousand spreadsheets.

When the city appointed its new budget director, Marisa Waxman, she came with a vision of doing away with spreadsheets and hoped to create a new system that would make data open and transparent for citizens. The public wanted to see where investments were being made in different locations around the city and identify neighborhoods that needed greater support.

Also at play were growing calls for social justice and the need to take steps to provide greater justice for all. In Philadelphia, city leaders decided to use a lens of equity when examining annual budgets and where city dollars have been allocated.

Solution: The arrival of Waxman provided Philadelphia an important opportunity to innovate and try out new protocols as a first step in moving to place-based budgeting. Waxman saw the value of the proposed change early on, which made programming for social justice possible. Ultimately, the city's Department of Parks and Recreation agreed to participate in a pilot program before converting to a full place-based budgeting protocol.

The city introduced CityGeo as its first open data program. CityGeo collects, maintains and shares data and information – geographic data, program and financial data – with residents and other stakeholders in the city. The city has over 300 datasets and intends to make the data open and transparent for everyone. The pilot has evolved into a spatial model that is very dynamic and can be adapted for multiple purposes.

The city has three main goals for the pilot: 1) determine where money and resources have been spent in the city, 2) compare CityGeo data with other demographic and economic data over time to identify neighborhoods in need of assistance, 3) prove that the city could take one program area like parks and recreation and use that data to go back 20 years or more to determine where capital investment dollars have been made over time.

The city had several challenges and milestones to address before launching the app. They included verifying the data was clean and ready for analysis, responding to the needs of stakeholders and being very conscience of avoiding scope creep.

Most services offered by cities and counties are location-based, such as where an accident occurred or a city tree was taken down by a storm. The visual representation of what's being spent and where it has been spent offers a new level of understanding where needs are greatest within the community.
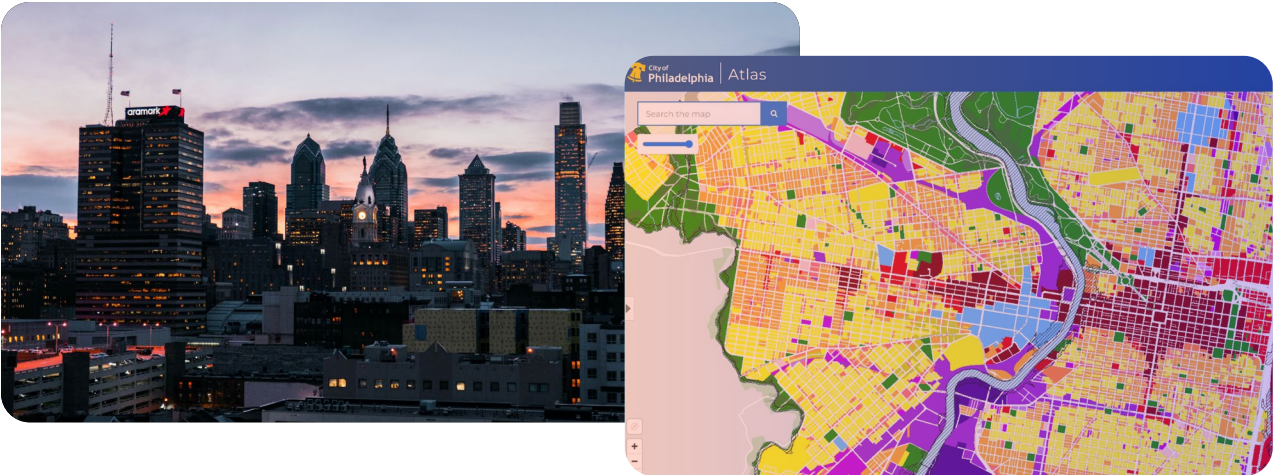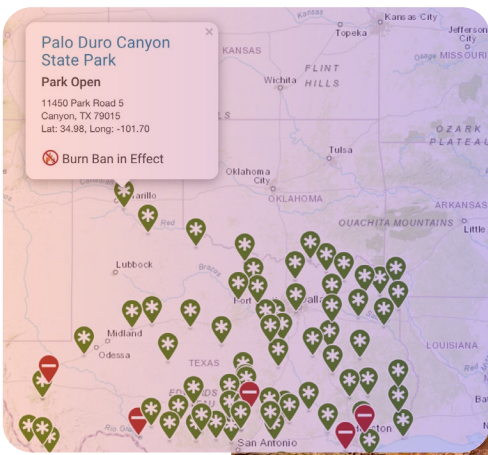
GIS Dashboard Reengineers Planning at Texas State Parks

Challenge: In the Texas Department of Parks and Wildlife, regional directors and park managers have long been proponents of using data to guide their decisions. But data has not always been easy to use.

Each month, the department would send out an email with a financials spreadsheet, sharing data for the most recent month as well as for the same month the previous year. That spreadsheet provided a valuable snapshot, but until recently, any deeper analysis had to be done manually – e.g., copying and pasting data from previous spreadsheets.

Such manual analysis might be feasible when looking at historical trends, but it was often too time-consuming when it came to dynamic decision-making.

For example, a park manager trying to decide the best allocation of limited maintenance funds would want to know which camping loops or facilities serve the most visitors – and are tied to the most revenue. In such a case, a park manager likely would have been forced to review old spreadsheets and make a rough estimate.

Also, such spreadsheets tended to become data silos. With different people using their own copies of the spreadsheet to do their own analysis, they often ended up looking at very different data. There was no single source of information.

Solution: The Texas State Park Insights Viewer now serves as that single source of information. It brings together revenue, visitation and capital construction data into an intuitive dashboard that enables regional directors, park managers and other employees to conduct the kind of detailed analysis that just wasn't practical before.

The idea for the dashboard came about when the department's infrastructure division asked for a tool that would enable it to calculate how much revenue would be lost if a certain campground or camping loop were shut down for construction.

For example, the division might have three construction projects on tap for the fiscal year. The challenge is to figure out when to schedule each project in a way that minimizes the potential loss of revenue. Such analysis, which would entail running multiple scenarios, would have been arduous to the point of impractical without the dashboard.

The dashboard also makes analysis more intuitive by presenting data on a map. While engineers might use a spreadsheet to determine the cost of a new facility, seeing the location of that facility on a map would help them understand the potential impact of construction.

"Bottom line, the useful information provided in Park Insights Viewer has allowed us to make informed decisions quicker than ever before," said Reagan Faught, State Parks Region 2 Director for the Texas Parks and Wildlife Department.

Empowering Your Organization With the Right Tools

Communities can't afford to make decisions in siloes or without the proper context. They must be able to explain, for example, why one neighborhood is getting certain resources and another is not. Or why a transit station is being built in a particular location versus somewhere else.

There must be clarity around what's being done to make life better for residents, why it's being done and how those efforts are playing out over time. Jurisdictions like the ones mentioned in this piece are taking that purposeful approach to delivering a smart community, and they're using the following tools to prioritize data-driven performance:

- **ArcGIS GeoEvent Server** is part of the Esri Geospatial Cloud and allows you to track moving assets, monitor stationary sensors, follow social media feeds and send alerts to stakeholders when thresholds are met. You can boost real-time awareness and response rates.

- **ArcGIS Velocity** brings the real-time and big data capability into ArcGIS Online, enabling users to ingest, visualize and analyze spatial real-time and big data to gain new insights.

- **ArcGIS Dashboard** enables users to convey information by presenting location-based analytics using intuitive and interactive data visualizations on a single screen. Every organization using the ArcGIS platform can take advantage of ArcGIS Dashboards.

- **ArcGIS Online** is the foundational cloud-based mapping and analysis solution. Use it to make maps, analyze data and to share and collaborate.

- **Insights for ArcGIS** is analysis software that fuses location analytics with open data science and business intelligence workflows. Answer questions you didn't know to ask, analyze data completely and unlock new insights.

- **ArcGIS Solutions** is a collection of applications and tools that support common government workflows and challenges. From managing election activities, addressing homelessness, monitoring performance of operations or responding to civic concerns, these applications help you deploy solutions in days, not months.

- **ArcGIS Network Analyst** provides network-based spatial analysis tools for solving complex routing problems. You can plan routes for an entire fleet, calculate drive times, locate facilities and solve other network-related problems.
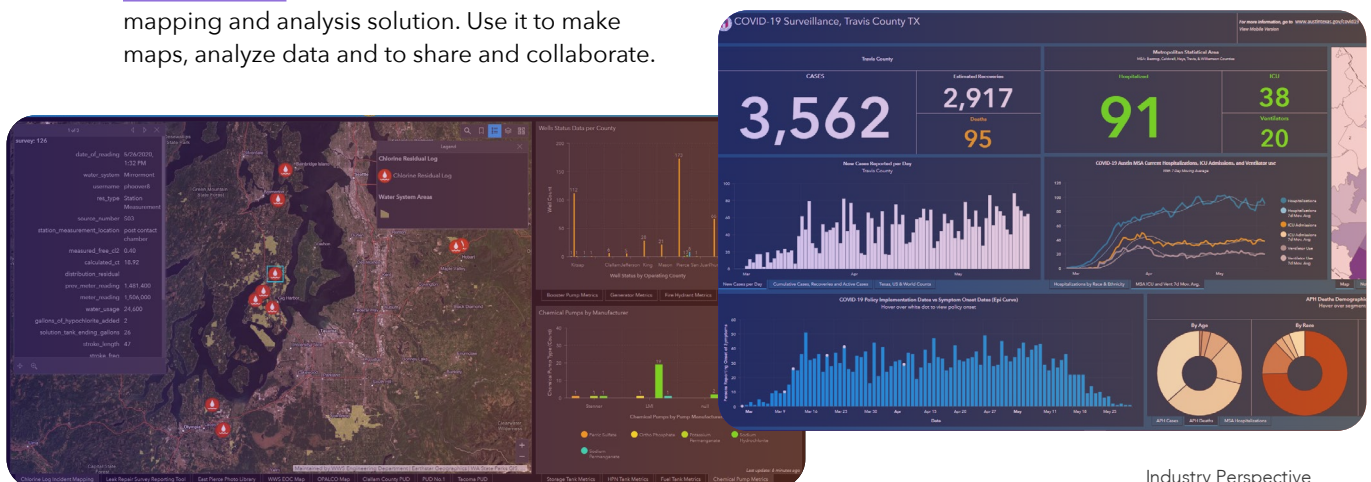
Conclusion

Data is a powerful tool for helping smart communities better understand how they're performing today, what's possible in the future and how to strategically bridge the gap between those two places.

By prioritizing data-driven performance, communities ensure that they're not taking a broad-brush approach to address unique challenges and provide government services.

Using location-based data as a foundation, they can understand issues at a neighborhood level and provide context to residents about what they're doing and why they are doing it.

Ultimately, they aren't relying on a single tool, technology, planning document or survey. These communities are using GIS data as a guiding light to ensure they are efficiently designing and managing communities that are equitable for all.

Learn more: go.esri.com/power-data-driven

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When Esri was founded in 1969, we realized even then that geographic information system (GIS) technology could make a difference in society. Working with others who shared this passion, we were encouraged by the vast possibilities of GIS.

Today our confidence in GIS is built on the belief that geography matters - it connects our many cultures and societies and influences our way of life. GIS leverage geographic insight to ensure better communication and collaboration.

Explore our website to discover how our customers have obtained the geographic advantage by using Esri software to address social, economic, business, and environmental concerns at local, regional, national, and global scales. We hope you will be inspired to join the Esri community in using GIS to create a better world.

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