


Smart Communities Turn to GIS to Improve Operational Efficiency



An aerial photograph of the Las Vegas McCarran International Airport, showing the tarmac with several aircraft, terminal buildings, and surrounding infrastructure. In the background, a range of mountains is visible under a blue sky with scattered white clouds. The image is overlaid with a semi-transparent blue filter.

*“With GIS, you can eliminate duplication of data; many people can use the same dataset, many times. To put it simply: **With GIS you can do business better, faster and with less cost.**”*

- **Majed Khater**, GIS Program Manager,
Las Vegas McCarran International Airport

Introduction

When talking about smart communities, it's important to distinguish between the end and the means.

The goal of a smart community is to improve the lives of residents by making a community more livable, sustainable, resilient, well-run, healthy, safe and prosperous. In short, the point is to help civic leaders address whatever challenges their communities might be facing and better plan for the future.

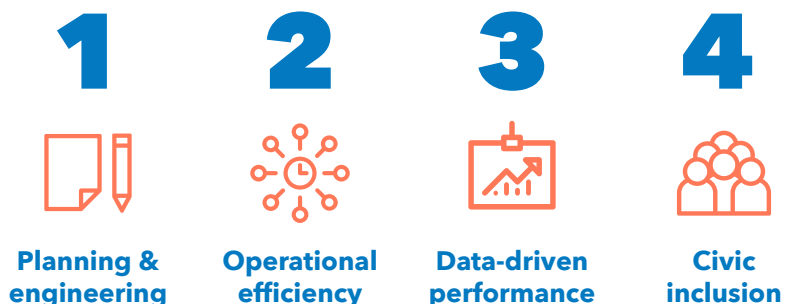
The means of creating a smart community include a wide range of technologies, such as internet of things (IoT) connected sensors, drones, performance dashboards, mobile devices and apps, imagery, geographic information systems (GIS) and GIS-based visualization and analysis tools. A smart community initiative succeeds when civic leaders begin with a clear goal and apply technology to achieve it.

Operational efficiency is one of the four technology tenets of a smart community. Nearly every community faces difficult questions about how they leverage their staff and budget to achieve their goals. Improved operational efficiency enables them to reduce the cost and time of their operations and services - and to make smarter decisions about how they allocate resources to the best locations that benefit the most people.

Improved operational efficiency also strengthens the other tenets: planning and engineering, data-driven performance and civic inclusion. And GIS is the foundation, as it provides communities with a platform for gathering, visualizing, analyzing and sharing data.

GovLoop partnered with Esri, whose ArcGIS platform is a leader in GIS, to explore the different ways in which communities can gain operational efficiencies, with a look at the role of people, processes and technologies. The report also highlights success stories from Detroit, Las Vegas, Crawford County, Pennsylvania and Johns Creek, Georgia.

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



Why Operational Efficiency Is Key to Smart Communities

Operational efficiency takes many forms, but it essentially involves developing new ways of working that enable agencies to optimize the management and performance of internal operations and constituent services. New workflows can reduce the cost of and time it takes to deliver existing services and make new services possible.

Location data is critical to managing the delivery of services. Agencies gain efficiency when they improve how they collect, share and analyze location-based data and integrate it with other data.

Smart communities and smart cities can improve operational efficiency when they embrace GIS technology that:

Streamlines workflows and business processes

Legacy workflows and processes are often cumbersome, with no cohesive process for collecting, analyzing and sharing data. GIS provides a platform for managing services from beginning to end, with everyone working off one authoritative source of data.

Improves field data collection and mobility

Governments have the opportunity to reshape their approach to collecting information from the field. Data can be derived from information collected in the field through mobile devices, drones, crowd sourced data from apps, and sensors connected through IoT. These modern methods improve the timeliness of data and improves accuracy.

Analyzes data quickly to change the pace of government operations

Reducing the time it takes to collect, analyze and share data – and improving the government staff confidence that data is both up to date and accurate – makes it possible to accelerate the workflows and business processes that drive daily operations.

Uses operational dashboards to improve responsiveness

Dashboards present location-based analytics in an intuitive and interactive format. They make it easy to monitor performance metrics in real time and visualize trends in a way that is immediately accessible to people who are not experts in either data or GIS, whether they are internal stakeholders or constituents.

Uses data and analytics to improve decision-making and service delivery

Each of the above efficiencies helps to create a culture rooted in evidence-based decision-making. Civic leaders can make decisions about policies, operations and services based on the latest data, and they can monitor the impact of those decisions – and change course, if necessary – as new data comes in.

Provides meaningful information products to the public

Transparency is a critical piece of community engagement. Civic leaders can leverage their existing GIS data and systems to create a platform that enables constituents and other external stakeholders to track progress on key initiatives and gain new insights into the community.

The goal is not to be smart for smart's sake, but to be smart with intent; this means looking for ways to improve operational efficiency that serve a broader goal of the community.



Operational Efficiency in Action



Las Vegas McCarran International Brings Order to Airport Management

The Challenge

An airport is a large and complex organization with multiple business units involved in managing its operations, such as finance, security, maintenance and engineering. That's a challenge when an airport relies on paper maps, blueprints and facility drawings, as McCarran International Airport in Las Vegas did for many years.

At McCarran, which has two terminals and five concourses with a total of 92 gates, each unit worked with its own copies, customizing them with information relevant to their function. Over time, these copies became busy, cluttered and fragile, and were generally accessible only to people within that unit. But when running a highly efficient organization like an airport, every bit of information can be critical, and that information must always be up to date and readily accessible.

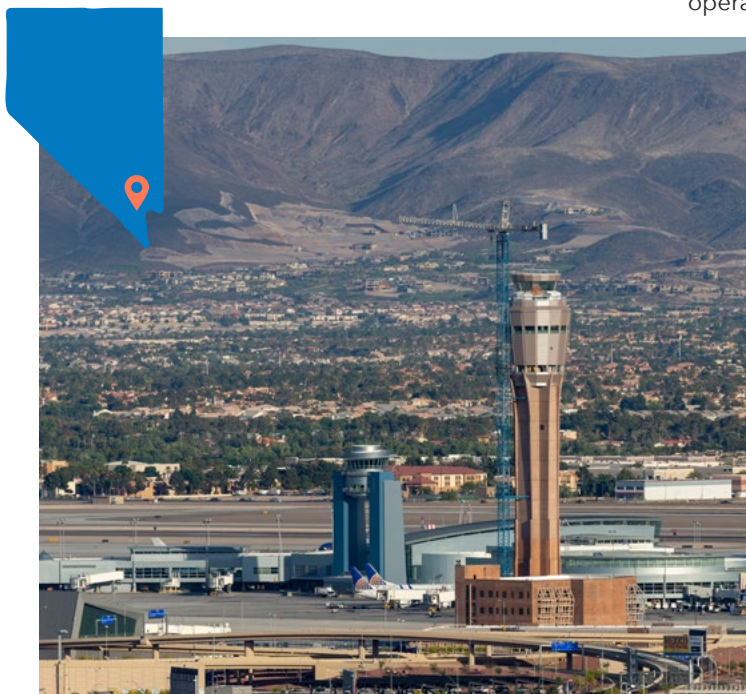
For example, let's say a construction project causes a water main break. Who has access to the drawing showing the location of the shutoff valve, which had been relocated several years earlier? In such a situation, the time spent tracking someone down who can locate and interpret the map could prove costly.

The Solution

McCarran began investing in GIS in 1995, with a handful of projects focused on supporting external airport management activities such as land-use planning and noise impact analysis. It was an easy place to begin, because Clark County already had very good GIS base maps of the areas around the airport, with information on parcels, streets, land use, zoning and aerial images.

The next task was to bring GIS to the airport interiors. It conducted an airport-wide GIS needs assessment, identifying relevant datasets for each business unit and how GIS could be used to improve day-to-day operations. Over time, the county began focusing on data layers that could be utilized across multiple business units, such as terminal floor plan data.

Today, using ArcGIS, management has a centralized and scalable GIS framework to manage all the airport information. This system combines data such as facilities, work orders, passenger counts and finances locked in various stand-alone systems into a common operating picture. Having an accessible system opening to the entire operation makes it more efficient to manage, share and secure the data and analysis. Now everyone can incorporate the data into their operational workflows.



The holistic view of the airport also makes it easier to perform high-level strategic planning. Key activity areas include planning (land use, property management, lease/concessions management), airport operations (airfield/terminal inspections for regulatory compliance, emerging/security management) and maintenance and assets management.

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Crawford County, Pa., Makes Quicker Work of Property Assessments

The Challenge

Assessing property values in Crawford County, in rural northwestern Pennsylvania, is always a challenge, with only three assessors on staff to cover 51 municipalities. The Assessment Office is charged with valuing more than 57,000 land parcels and the structures on them for the purpose of real estate taxation. Whenever changes are made, such as a new building goes up or an existing one is altered or torn down, assessors need to visit.

Traditionally, it was a laborious process. A week prior to going into the field, an assessor would alert the office staff, who would collect new building permits for the area, pull the property cards that list key information and download any relevant information from the computer-aided mass appraisal (CAMA) system. The assessor would take all that into the field, along with a copy of a three-by-four-foot wall map, a pen, tablet and a digital camera.

After arriving at a site, the assessor would pull out the property card and map and verify they were at the right location, make notes and sketches, take photos and annotate the photos with the property number and head to the next site. Once back in the office, the assessor would sort through the paperwork and update the files.

“Our assessors still have to visit all 51 municipalities each year. But because of GIS, they can do it faster and more efficiently, which means less time in the field - which means they can get more work done back in the office.”

- Phil Baranyai, GIS Manager, Crawford County Government

The Solution

That process began to change when the GIS manager with the county offered to ride along on site visits. Once the manager saw how assessors work, he knew that he could make their lives easier.

Based on input from the assessors, the GIS office developed an app with Collector for ArcGIS. They loaded up the app on rugged Android tablets, along with web maps for each municipality in an assessor's territory. Now, clerical staff no longer need to gather information for each visit; instead, as building permits and other documents come in, they enter the information into the CAMA system, and the Assessors enter a point location in GIS with a unique identifier to the CAMA system – that generates the full record of information associated with that parcel. The GIS office also created a Survey123 for ArcGIS digital form that the public can use to submit requests for assessments, which automatically gets entered into the system. These requests, as well as new 911 address requests are also available via the Collector App.

On the day of a site visit, rather than pack up property cards, paper maps and other supplies, the assessor grabs the tablet and heads into the field. Arriving at a site, the assessor drops a point on the Collector app and adds a field visit point with a status of the work completed thus far. The tablet also has a geotag digital camera and a sketch app and digital pen. Once back in the office, or on a Wi-Fi connection, the data automatically updates back into the county's GIS server.





Detroit Maps Out Highways in the Sky

The Challenge

For major airports, the ability to effectively handle high-value cargo is essential to remaining competitive. They need transportation distribution and logistics operations that can unload cargo from airplanes and move it quickly to regional warehouses and distribution centers, which typically are located three to five miles outside the airport.

Over time, Detroit has been feeling competitive pressure from Chicago and Toronto, whose airports had a growing volume of cargo business because of their good ground handling facilities.

The Detroit Region Aerotropolis Development Corporation, which facilitates economic development in the area, decided that rather than simply try to keep pace with the capabilities of other airports, Detroit should leapfrog them. The idea was to build “highways in the sky,” using commercial drone services to move cargo, bypassing traffic jams and other hazards that can slow the movement of cargo.

Such a program faced several challenges, however. First, the program would need to connect seamlessly with the Federal Aviation Administration’s (FAA) Low Altitude Authorization and Notification Capability (LAANC), which provides drone pilots with access to controlled airspace.

The program also needed to ensure that drones steer clear of hospitals, helipads, electrical substations, schools and other sensitive areas. Finally, it needed to be sensitive to residents’ concerns about drones flying over their private property.

The Solution

The “highway in the sky” goal sought to map out routes that deliver cargo efficiently while also avoiding private property, critical infrastructure and other restricted areas.

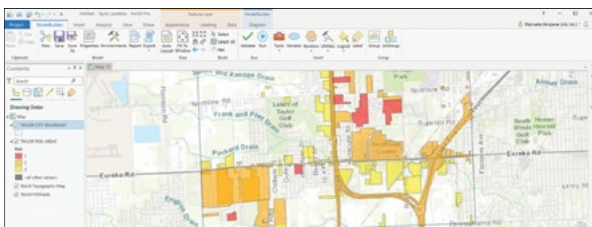
As part of a six-month, \$60,000 grant from the Michigan Economic Development Corporation’s PlanetM (mobility) initiative, the Detroit Region Aerotropolis worked with Airspace Link, which provides a GIS-enabled platform for planning drone flights. The platform integrates FAA air data with ground data from state and local agencies to develop flight plans that comply with local regulations and ordinances and reduces flight risks and then submits the plans to the LAANC.

ArcGIS is critical to the program because it serves as common ground between the various data sources. Without it, the program would have gotten bogged down with interoperability issues that would have delayed it considerably.

This pilot project could be a game-changer for the commercial drone world. Current regulations do not allow drones to fly out of the operator’s sight because of safety concerns. The “highway in the sky” might be a model that makes it possible to lift those restrictions.

“GIS created a standard. If we had to create crosswalks or interoperability between multiple data platforms, I think this project would have been a two- to five-year product.”

- **Christopher Girdwood**, Executive Director, Detroit Region Aerotropolis Development Corporation



Augmented Reality Aids River Rescues in Johns Creek, Ga.

The Challenge

The 14-mile stretch of the Chattahoochee River that borders Johns Creek, Georgia, is a popular destination for nature lovers, with opportunities to go fishing, kayaking or rafting. While the waters are generally calm, several hazards can catch people off guard and end up leading to rescue operations. Unfortunately, those same hazards have created problems for first responders as well.

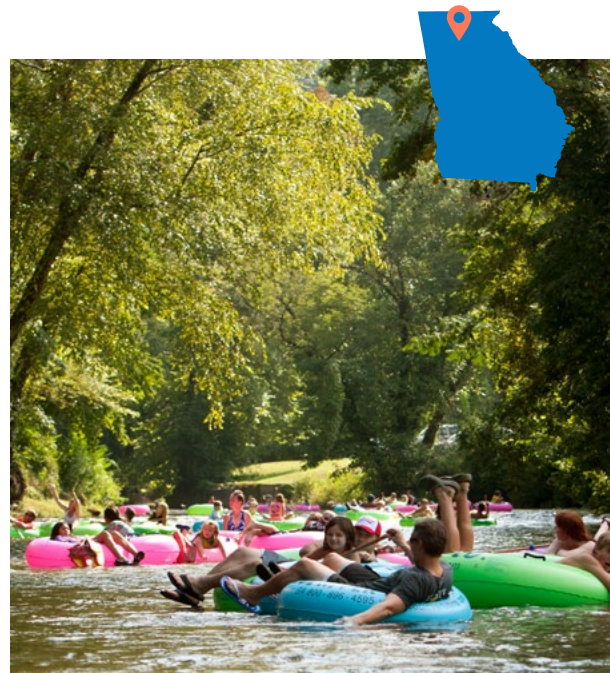
Each day water is released upstream at the Buford Dam, which causes rapids to form where the water is normally calm, and raises the surface level by as much as 11 feet. Although the release schedule is published online, many people do not check and can find themselves suddenly in unfamiliar territory.

To make matters worse, the river banks are heavily wooded. Once the water rises and submerges the river's natural nooks and crannies and rocks, people can have a difficult time finding landmarks to use as navigation. And the dam water from Lake Lanier is cold, so when it mixes with the river's natural warm water, heavy fog often forms, making it even more difficult to navigate.

Finally, the amount of water released varies day to day, so the environment never looks the same. Even first responders who are Chattahoochee River veterans can have trouble finding familiar landmarks they can use to navigate. When responding to someone in distress, even small delays can make a big difference.

“The solution is really a continual work in progress since we’ll update it as technology changes and improves. The goal is to give the swiftwater team a tool that they can deploy quickly and with a minimum amount of setup time.”

- Nick O’Day, Chief Data Officer, Johns Creek, Georgia



The Solution

To overcome the challenges of this environment, the Johns Creek Fire Department, which typically responds to distress calls, needed to provide its responders with two fundamental capabilities – navigation and sight – seamlessly integrated in one solution. The city of Johns Creek developed a solution based on AuGeo, an augmented reality application developed by Esri.

The software is loaded on an iPad, which is mounted to a rescue boat at eye level so firefighters can view it without looking down and taking their eyes off the river. As they travel along the river, the system will use its camera to display the real-world river but overlay key points of interest that might not be visible to the human eye. Those points of interest help the firefighters keep track of where they are.

They incorporated a night-vision sensor fitted over the camera lens to solve the visibility problem. The night-vision attachment can cut through both darkness and fog, helping the firefighters navigate safely around rocks, branches and other obstructions.

The solution both reduces the risks involved in these rescue efforts and gets the first responders to the scene more quickly and efficiently.

The Smart Community Information System That Scales to Meet Your Challenges

Operational efficiency is achieved when organizations move from project-based thinking to a smart community information system approach that sets a foundation for the entire enterprise. Esri's ArcGIS provides for a platform that grows with your needs.

Governments will always achieve more when their efforts aim to increase access to information, improve workflows, create data-driven decision tools and follow a purpose-driven plan. Developing a geospatial strategy to maximize your impacts can benefit from the Esri Method, a process that is designed to help you meet your challenges head on. This methodology seeks to walk governments through a process that meets a community's individual needs by working to:

- **Understand** - Business needs and challenges that GIS can support
- **Plan** - For staffing, process and technology solutions
- **Act** - Initiate methods for implementation and success

Esri's ArcGIS provides a foundation, enabling agencies to manage the collection, visualization, analysis and sharing of data on a single platform.

Here are some of the solutions that state and local agencies commonly use to improve the efficiency of their operations and deliver better services to constituents:

- Create, analyze and extend spatial data
- Improve field data collection and mobility
- Collect and analyze data derived from IoT connected sensors, drones and citizens
- Use operation dashboards to improve performance
- Involve the public through meaningful opportunities for input and understanding



Conclusion

Operational efficiency is integral to the development of a smart community. By streamlining their business processes and workflows, agencies can improve both the performance and cost effectiveness of their operations and deliver better service to their constituents.

Location data provides the essential ingredient: operational intelligence. With GIS, agencies can collect data on operations in real time, analyze it and feed it back into performance dashboards, where it can be used to enhance responsiveness and to support data-driven decision-making.

As always, the goal of smart communities is to improve the lives of residents. Ultimately, improving operational efficiency is not just about re-engineering processes and workflows but about providing services that make a community a better place to live.

go.esri.com/improve-op-efficiency



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.



GovLoop's mission is to inspire public sector professionals by serving as the knowledge network for government. GovLoop connects more than 300,000 members, fostering cross-government collaboration, solving common problems and advancing government careers. GovLoop is headquartered in Washington, D.C., with a team of dedicated professionals who share a commitment to the public sector.

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