High-Resolution Imagery:
Helping City Managers Better Serve Their Communities

INDUSTRY PERSPECTIVE

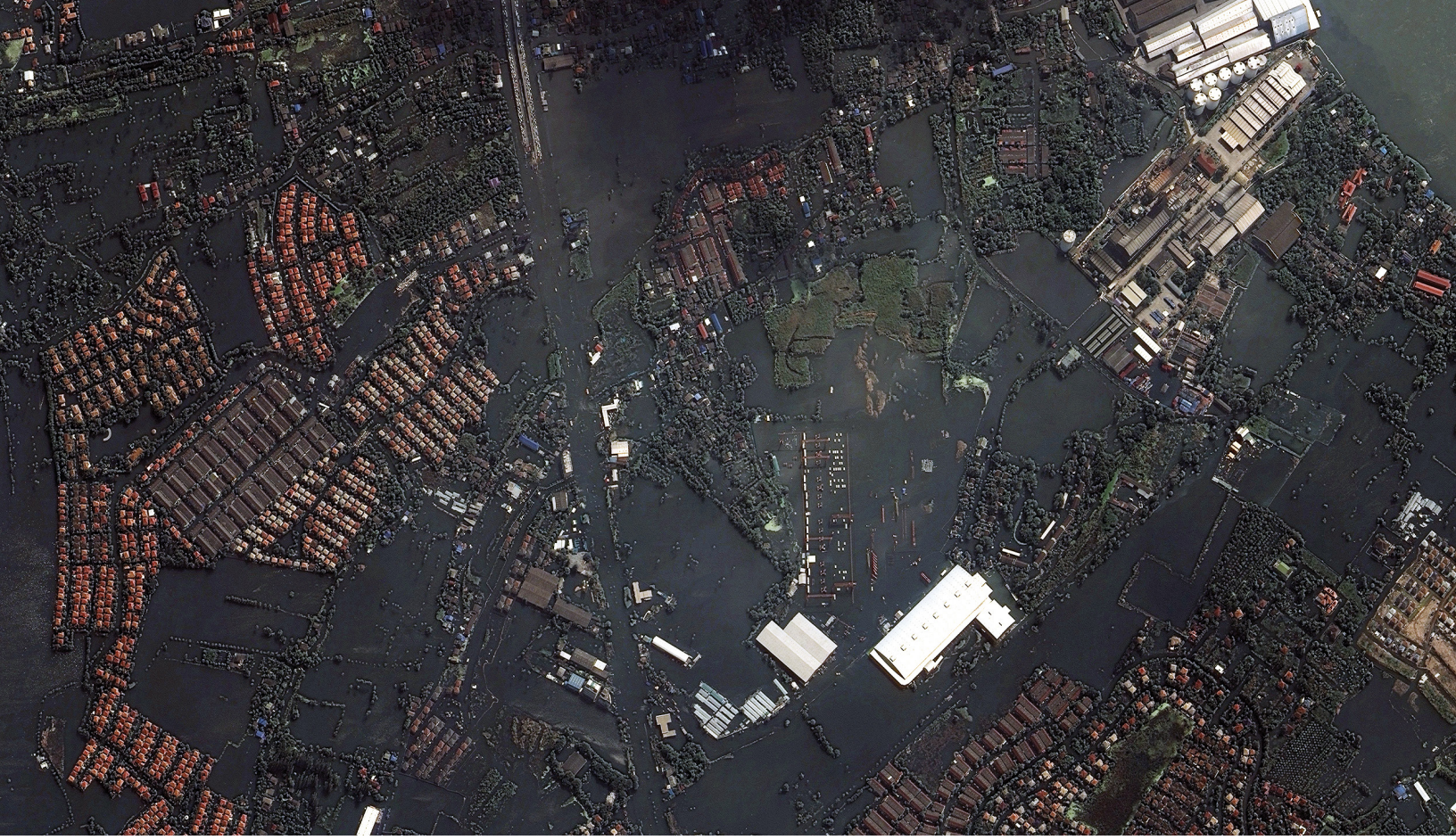
DigitalGlobe

A city manager's job is continuous and complex. Whether it's zoning, new construction, taxation or disaster planning, citizens depend on their city manager to understand their community, past and present, in great detail to prepare for future needs. In an environment of decreasing budgets and limited resources, geospatial technologies are an invaluable resource for better understanding and anticipating a community's needs.

With geospatial information, such as satellite imagery, city managers can monitor and foresee where the bulk of problems, such as disaster response coordination or infrastructure issues, might occur. Geospatial technologies provide an important foundation for enabling efficient disaster recovery and continuity of operations. They also play a crucial role in everyday city operations, such as transportation, infrastructure inspection, wastewater management, utilities and zoning efforts.

City managers are under constant pressure to address various shocks and stressors, both manmade and natural. Geospatial technologies provide insight into what is happening in communities and enable managers to allocate resources efficiently. That could mean the number of people they decide to send into the field or the amount of money they allocate to maintain roads and other infrastructure.

This industry perspective explores how city managers can use imagery and geospatial technologies to make their communities more resilient, so that day-to-day operations minimize the inevitable costs of disaster response and recovery. Through geospatial technologies, cities can move past just responding to shocks to appropriately adapt and make long-term, sustainable progress.



What 'geospatial' looks like today: location, time, & context

Everything happens in a certain place at a certain time, and city managers must continuously assess and understand what is going on around their cities to be prepared to react and respond to future needs. A leap in the type and amount of geospatial technologies available to city managers has changed the paradigm from data scarcity a decade ago to data abundance—especially imagery—today. This paradigm shift calls for new organizational principles around location, time and context to better portray what is happening in a community.

Location refers to a given place and can be described at various levels. For example, it could refer to city-level information for Rome or the Shanghai Metropolitan area, or it could be much more specific, such as the latitude/longitude coordinates of a manhole or a traffic signal. Today, satellite imagery provides this high-detail location information everywhere across the globe.

The second principle of modern geospatial technology is the **time** associated with imagery for a given location. This detail provides a historical perspective and adds continuity to information about a location going forward. Monitoring changes over time is critical to understand a community's dynamics and needs.

The final principle is **context**. Context describes information about a given location and the impact of events on that location. That context can be at a micro scale (e.g., a gas pipeline rupture affecting a few city blocks), a city scale (e.g., a bridge collapse jamming traffic), or a global scale (e.g., flooding in Bangkok, Thailand, interrupting the computer hardware supply chain in the U.S. computer industry). For city managers, satellite imagery can provide contextual information that helps manage city sprawl with proper zoning, capture accurate land taxation of newly built parcels, monitor construction to ensure appropriate permits, react to and recover from disasters, and monitor and maintain infrastructure including roads, airports, electricity and water.

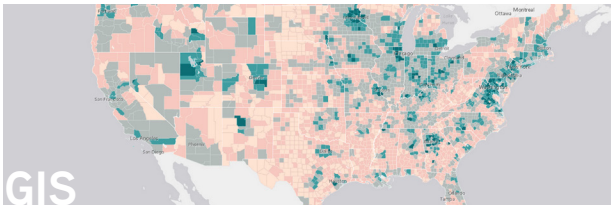
Additionally, an abundance of data available through satellite imagery enables ongoing monitoring projects and the ability to scale across geographies. The same monitoring system for one city can be consistently applied to all major cities in a given country. Thus, city managers can collaborate to form strategies for resiliency based on a common understanding. Rather than spending precious time gathering intelligence, they can focus on more productive analysis and decision-making phases.

What imagery and geospatial technologies are available to help city managers?

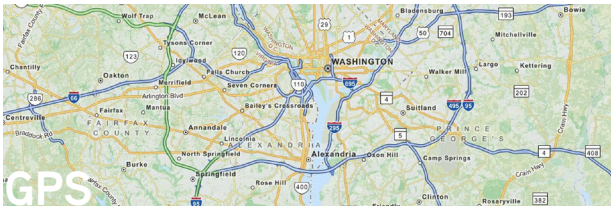
Technologies that power city managers with information about location, time, and context include:

Global satellite imagery that provides fine details of a city. For example, 30 cm spatial resolution shows objects as small as a manhole cover or markings on a parking lot. This imagery is being refreshed frequently across many cities to provide detailed and accurate location and context information over time.

Desktop or cloud-based **Geographic Information Systems** (GIS) that offer efficient means for city managers to seamlessly integrate imagery into their workflows and use it to drive decisions.



Global Positioning System (GPS) tools, such as those enabled on smartphones, tablets and handheld GPS devices, can readily ingest imagery, which city workers can then take into the field. Imagery and derived 3D models allow city managers to adopt the evolving smart city models and create and maintain accurate 3D representations of their cities. Such models fit into the evolving Building Information Modeling technology that allows city managers to integrate outdoor and indoor information to create a comprehensive view of city infrastructure for emergency management. For example, this technology can equip firefighters with detailed information about buildings.



Importance of a current view of a city

To make informed decisions confidently, city managers need the full picture. This means access to highly detailed, highly accurate and frequently updated imagery.

Space technologies can map an entire metropolitan city and keep the information up-to-date. During a disaster, this can mean providing daily updates to accelerate emergency response and track recovery. For day-to-day city maintenance operations, highly accurate satellite imagery and derived information on a manager's desktop means greater efficiency in the field. For example, it helps determine the best manhole for their field workers to use when accessing a sewer in need of repair to speed the identification and repair process.

Historically, obtaining recent imagery of a city has been a challenge. For a large metropolitan area such as Shanghai, it could take weeks to collect data and another month or two to produce usable, actionable datasets. Further, to obtain this imagery, city managers would have had to issue a tender, or request for proposals, while often spending $30,000 to $40,000 of taxpayer money to prepare it. Satellite imagery can collect the same type of information much faster and provide the data within days. Additionally, because these products can now be ordered off the shelf, city managers avoid an expensive procurement procedure.

Removing barriers to entry

Traditionally, cities have faced four main obstacles to obtaining high-quality geospatial imagery: licensing, acquisition, ease of use and the need for a specially trained workforce. New approaches and technology, however, are making it easier for cities to modernize their systems.

BARRIER 1:
LICENSING

Many cities have limited access to imagery and rely on Google Earth or other photographs that are often outdated but freely available online. But these photos have traditionally had a licensing model that was built for specific applications and had restrictions on use that prevented city managers from customizing the data for their particular needs.

Now, however, getting access or upgrading to high-quality imagery is becoming easier—and cheaper—thanks to faster processing and automated analytics. The licensing models are evolving to include lower cost barriers and fewer usage restrictions. Leveraging these technologies helps city managers solve many problems that require a reliable, detailed view of the ground. For example, they can settle disputes over boundary lines or ensure appropriate property taxation.

BARRIER 2:
ACQUISITION AND SPEED

In the past, cities used a model of service-level agreements in which they had to secure a set of bids for imagery over a set period of time. Managers overseeing a 10,000-square-mile metropolitan area would split the region into quadrants and collect imagery information on one quadrant per year to stay on budget.

Now, city managers have affordable options for accessing imagery and gaining a better understanding of change on a frequent basis. Current and historical geospatial information is available through online subscription models that are more economical than the tender, or bidding, process. Subscription models also give cities the flexibility to periodically refresh that information.

The speed at which data is available has increased, which makes it not only more useful, but also more accessible. It used to take months for an imagery provider to deliver data to end users; it now takes minutes. With new technologies, city managers can have a complete assessment of damages within hours of a disaster, so they can appropriately assign resources and better serve citizens in need.

BARRIER 3:
EASE OF USE

Imagery datasets are typically very large, making them potentially cumbersome to download and use. In the past, cities had to invest in resources for ingesting, accessing and storing all of that data. Now, options such as hosting the imagery online allow city managers to spend less time and money gathering, manipulating and storing data, and more time using it to solve real-world problems.

Imagery is typically served in open standard formats, which allows for integration into a city's GIS and public websites for sharing with citizens. Today's data analytics quickly process and share the information online, which eliminates the need for state and local information technology teams to invest in so much equipment. It also means that governments are not receiving large amounts of data that someone must manipulate before it is useful. Shapefiles—an easily sharable data format for GIS software—and maps show all the detail city managers want and need.

BARRIER 4:
WORKFORCE

Historically, cities needed specially trained individuals to analyze geospatial data. As recently as five years ago, cities required several resources, including GIS software, robust IT infrastructure and a tech-savvy workforce, to manage the geospatial technology required to work with this heavy data.

Now, geospatial technology providers are taking responsibility for ensuring data quality, so that city managers—rather than GIS specialists—can trust the data and start using it right away in day-to-day operations.

Geospatial technologies at work: Seeing the forest because of the trees

How the city of Dallas is using geospatial technologies to inventory trees in urban areas

Officials with the Dallas Urban Forest Advisory Committee use geospatial technology to count and identify trees to better understand, preserve and increase the city's urban forest. The global trend of urban forestry as an integral aspect of city management has several benefits. The committee has witnessed increased property values, reduced flooding dangers, cleaner air and water, lower energy bills, pollution control and even the improved health of its citizens.

DigitalGlobe's newest satellite, WorldView-3, can deliver super-spectral information—not only what we can see, but also beyond the visible spectrum. This enables cities to differentiate tree species and determine vegetation health for urban forestry. This information can also be frequently updated, which assists city managers with land zoning and managing urban sprawl while preserving urban forests. Satellite imagery serves as an economic alternative to traditional aerial hyperspectral imaging for urban forestry mapping.

Geospatial technologies at work: Addressing flood risk

How Colorado used geospatial data for flood management and recovery

In the fall of 2013, raging wildfires and heavy rain depleted forests and led to major flooding across Colorado's Front Range. The flooding took at least 10 lives and caused about $2 billion in property damage, according to news reports. Known as a 1,000-year flood, these rare events are becoming more frequent. State and local governments must find new ways to prepare and adapt.

Worldwide, an increase in paved areas that do not stop the flow of water has led to more intense flooding and resulted in a need to redefine flood classification levels established decades ago. To understand the potential impact of floods to their cities, city managers can build 3D elevation models derived from satellite data to model flood plains and better plan for severe flooding by constructing new aqueducts, reinforcing embankments, and building new culverts and water channels. Imagery and derived 3D information allows city managers to simulate various intensities of flood levels and develop resiliency programs to address the threat of flooding

Conclusion

As the Dallas and Colorado use cases illustrate, geospatial information is critical to city managers, whether they are handling day-to-day operations or addressing a disaster. Historic barriers to using these technologies have decreased, and governments can now integrate them easily and effectively. Furthermore, city managers can take advantage of these advancements to increase the quality of life and safety in their communities. Remote sensing and geospatial technologies enable efficiencies and possibilities for city management unlike ever before.

How imagery & geospatial technologies help city managers

High-resolution imagery and related geospatial technologies can make a city manager's job more efficient. Here's how:

DISASTER PLANNING

City managers can use geospatial data to develop resiliency programs to effectively prepare and react to and recover from disasters. Imagery and geospatial information allow them to map the city and create a common operating picture following a disaster to coordinate across agencies and monitor recovery efforts.

EVERYDAY OPERATIONS

City managers can leverage imagery and geospatial information to effectively allocate and mobilize resources to the right locations for field surveys. Monitoring the city landscape with imagery and information at their fingertips helps address day-to-day operations such as traffic congestion, transportation infrastructure maintenance, utilities and other services provided to the community.

COST SAVINGS

City managers can realize increased tax revenues by obtaining information on changes in construction and identifying illegal construction. Leveraging changing licensing models removes the need for costly investments in high-skilled labor and information technology, which ultimately saves cities money.

About DigitalGlobe

DigitalGlobe is a leading provider of commercial high-resolution Earth observation and advanced geospatial solutions that help governments better understand their changing environments in order to save lives, resources and time. Sourced from the world's leading satellite constellation, our imagery solutions deliver unmatched coverage and capacity to meet our customers' most demanding requirements.

Governments worldwide leverage our geospatial information to work more efficiently and better serve their citizens. A thriving metropolis monitors growth and identifies newly taxable land parcels. A developing country tackles sustainability issues as rural populations migrate to urban areas. First responders in a disaster zone track unfolding events and deploy aid faster. When it comes to real-world answers, nothing matches our geospatial information for accuracy and completeness.

Visit our website to learn how our imagery and geospatial solutions can help your citizens work, play, and live better.

About GovLoop

GovLoop's mission is to "connect government to improve govern- ment." We aim to inspire public sector professionals by serving as the knowledge network for government. GovLoop connects more than 200,000 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 connect and improve government.

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