

THE GOVLOOP GUIDE

The background of the cover is an aerial photograph of a city or town, showing a grid of streets and various buildings. Overlaid on this is a large, semi-transparent yellow circle that is centered in the middle of the page. The circle has a slight gradient and is partially obscured by the text at the bottom.

THE MAPPING REVOLUTION: INCORPORATING GEOGRAPHIC INFORMATION SYSTEMS IN GOVERNMENT

TABLE OF CONTENTS

EXECUTIVE SUMMARY - - - - - 3

HOW GIS CAN TRANSFORM YOUR AGENCY - - - - - 6

 Case Study: U.S Census Bureau - - - - - 7

 GIS as a Platform - - - - - 8

GIS FOR FACILITIES MANAGEMENT - - - - - 13

5 WAYS TO BUILD YOUR GIS BUSINESS CASE - - - - - 14


HOW GIS CAN CREATE AN OPEN AND TRANSPARENT GOVERNMENT - 16

 Increasing Collaboration: The Geoplatform.gov Story - - - - - 18

7 WAYS GIS IS POWERING CIVIC ENGAGEMENT INITIATIVES - - - - - 22

GUIDE SYNOPSIS AND GIS RESOURCES	25
YOUR GIS CHEAT SHEET	25
GIS Glossary	26
Next Steps and Conversation Starters	27
Happy Hour Small Talk Bullet Points	27
GIS 30 Second elevator pitch to your boss or peers	27
ABOUT GOVLOOP	28
ACKNOWLEDGEMENTS	30

EXECUTIVE SUMMARY

A large, stylized orange map of the United States is positioned in the background, spanning across the top and sides of the page. The map is composed of various shades of orange and yellow, with some areas appearing more solid and others more like a network of lines, possibly representing infrastructure or data connections.

Since the beginning of civilization, humans have used images as a means to tell stories. We have used images to educate, entertain or to build a just and moral society. Our ancient ancestors would use images to remember stories and archive information for future generations. Similar to our ancient ancestors, we use images today to convey meaning, understand complex relationships and improve communication.

The use of mapping and geospatial technology is at the heart of storytelling and improved communications. As the challenges of the public sector continue to grow in complexity, efficient and effective communication tools are essential. Today, government is more intercon-

nected than ever before, and the complexity has led to increased integration between state, local and federal officials. At all levels of government, agencies are looking for solutions to find value and improve public sector decision-making through data.

Geographic information systems (GIS) are one tool that agencies have implemented to work towards improved communications and decision-making. GIS presents the ability to show information visually and to help the public or key decision-makers spot new trends, patterns and relationships. By leveraging GIS technology, government agencies are preparing for the future style of governance, which will rely

on real-time insights, data-driven decisions and using maps as a means of improved communications and information sharing with constituents.

Esri has sponsored this report, *The Mapping Revolution: Incorporating Geographic Information Systems in Government*. [According to Esri](#), “GIS integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. GIS allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts.”

With GIS, agencies can gather new perspectives on organizational changes to improve mission needs. GIS provides the opportunities for agencies to map quantities and densities, and manage facilities and change. With GIS, anything can be mapped, providing easy to use and visually compelling maps.

In this report, GovLoop outlines the impact of GIS on the public sector by exploring:

- ◆ **Case studies and applications of GIS in the public sector**
- ◆ **Lessons learned and best practices for GIS adoption**
- ◆ **Examples where GIS is creating an open and transparent government**
- ◆ **Ways GIS is powering civic engagement initiatives**
- ◆ **Thoughts from Esri President, Jack Dangermond**

Additionally, this report includes case studies from federal agencies, such as the U.S. Census Bureau, Geoplatform.gov and U.S. Department of Agriculture.

GIS truly represents the ability to integrate, collaborate, and communicate more efficiently across an agency. With a GIS platform, operations and services can be scaled across the agency, and facilitate more comprehensive and direct communication with core stakeholders.





"We are seeing a lot of interest in Congress, for example, by staffers who are introducing maps and geographic analysis into their policy discussions. For the traditional GIS professionals, the platform is providing a new and open platform for sharing their geo database investments as easy to use services. The ability to integrate multi-agency information also promises to help facilitate better collaboration across agencies,"

Jack Dangermond, Esri President

HOW GIS CAN TRANSFORM YOUR AGENCY



Today, many different kinds of users can benefit from GIS. Nearly every federal government agency uses GIS as a means to work towards their missions. GIS is used to visualize the volumes of data that government collects, helping decision makers find new associations, improve communications with the public, increase operational efficiency, and understand the impacts from policy. Some examples of the applications of GIS in the federal government include:

- ◆ **Department of Housing and Urban Development:** The US Department of Housing and Urban Development uses GIS to assist grantees and map federal housing projects.
- ◆ **Department of Agriculture:** USDA's Risk Management Agency uses actuarial maps for more equitable premium pricing to insure America's farmland.
- ◆ **Department of Defense:** An Esri report highlights several ways the Department of Defense leverages GIS. One example is from the Naval Oceanographic Office, which launched an enterprise geospatial data service.
- ◆ **National Oceanic and Atmospheric Administration (NOAA):** NOAA uses a geographic data portal platform to share datasets that serve as a data repository from thousands of organizations.
- ◆ **International Boundary Commission:** Using GIS, the International Boundary Commission maintains boundaries and resources along the Canada-U.S. border.

These five examples only begin to show the depth and breadth of GIS use in government. The examples also show that GIS applications are not just reserved for traditional GIS users. The applications bring in new users who can benefit from leveraging GIS technology.

In order for GIS to continue to evolve, GIS experts will still play an essential role within the agency to serve as an authoritative source for GIS initiatives, manage GIS infrastructure and implement the technical components for GIS. Esri President Jack Dangermond recently spoke with GovLoop on the changing role of GIS within government, Dangermond said, “The technology is getting easier, and the user community is growing very rapidly, but you still need to have GIS

professionals that know how to stand up and manage GIS systems.”

CASE STUDY: U.S. CENSUS BUREAU

Location is important for most agency analytics, but it is a central component to the efforts of the U.S. Census Bureau. The Census Bureau is responsible for collecting data on communities and analyzing it in order to allocate funds and plan programs and projects. To accomplish this, the agency needs to have accurate lists of current addresses, road networks and boundaries, which are collected through GIS technology and partnerships with federal, local, state, and tribal governments. “This initiative is helping us assure that we col-

lect this information and maintain it and use it as part of this geospatial fabric and geospatial network,” said Tim Trainer, Chief of Geography Division of the U.S. Census Bureau, in a interview with [GovLoop](#).

To ensure accurate and up-to-date data, the agency uses databases and systems that are interconnected to share information. Specifically, the U.S. Census Bureau uses the Master Address File Topologically Integrated Geographic Encoding and Referencing program (MAF TIGER). “We have now those TIGER line files that actually linked the spatial data to our statistical data, so as people use the Esri products in their environment they no longer have to do that join process,” says Trainer. The two sources, MAF TIGER and Esri,



This [GIS] initiative is helping us assure that we collect this information and maintain it and use it as part of this geospatial fabric and geospatial network,” said Tim Trainer, Chief of Geography Division of the U.S. Census Bureau

are seamlessly integrated to provide widely available and accurate data that is extremely valuable to a myriad of people, organizations, and government agencies.

You can learn more from Tim Trainor in our [full video interview](#) with him.

HOW CLOUD COMPUTING HAS IMPACTED GIS

One of the reasons GIS has extended to new users and communities across government is due to the boom in cloud computing and the ease of creating simple, web-based maps. Dangermond states, “GIS is becoming much easier with the web services and web apps. As a result, knowledge workers across the enterprise, including the executive suite and policy makers, are saying ‘I want to have access to that.’ Now that it’s easy to use, they don’t have to go down the hall and get a GIS expert to make a map. They can actually do it online on their own device.”

Cloud computing has changed the way government functions, and the way agencies collaborate and share resources. “The cloud has revolutionized the way in which the public sector delivers services. Likewise, cloud technology has transformed how GIS technology functions within an agency. With cloud comput-

ing, increased activity is taking place on agency networks as more services are moved online,” states Dangermond.

Additionally, the cloud software delivery model has impacted GIS users. The traditional delivery of GIS entailed loading computers with various software applications and managing it on individual computers. Now, software can be hosted in the cloud and accessed remotely across many different devices on a network. Dangermond explains how the changes in software delivery have impacted GIS and the new way GIS software is delivered to users: “A modern approach is to host the software virtually in the cloud in order to save agencies space, costs, and responsibility by not requiring them to download software onto their computers or server. This is particularly important with GIS, as agencies can now leverage GIS technology across the agency, leverage data across the agency, and capitalize on current investments.”

Clearly, the cloud has transformed many practices within the public sector. The cloud has revolutionized how agencies , connect workers in the field and/or remote locations, contractors, and citizens to improve the quality and depth of analysis that is required in public sector decision-making.

For those looking towards GIS as a profession, this is truly an expanding market and opportunities exist for individuals who are interested in data science, data management and analytics. As Dangermond notes, “The world also needs mission focused geographic information knowledge makers who understand the science and engineering required to build and support successful applications systems.”

GIS AS A PLATFORM

ArcGIS is Esri’s mapping software platform. ArcGIS has dozens of applications, serving four main purposes:

- ◉ **Planning and Analysis**
- ◉ **Asset/Data Management**
- ◉ **Operational Awareness**
- ◉ **Field Workforce**

With these applications of GIS laid out, three kinds of users can benefit from the ArcGIS platform: developers, organizations and location services. ArcGIS provides an infrastructure for map making and allows organizations to compile geographic information to share and visualize spatial data. Since ArcGIS Online has been built on a cloud and device architecture, GIS professionals can easily manage their organization’s geospatial content using cloud-based

mapping tools and infrastructure. With the use of the cloud, agencies can quickly collaborate, share maps, and bring data to life with mapping. As Jack Dangermond stated in a recent interview with GovLoop, “What we see happening is a huge technology shift. The cloud is creating a new modality for the usage of GIS information.”

With the latest release of ArcGIS Online, users can access geospatial functions on any device, anywhere and at any time. ArcGIS Online also includes a library of applications and templates for users to share and create customized maps, which are all accessible on mobile devices, tablets and desktops. ArcGIS features include:

- **Supports real-time data server networks and all geospatial data types**
- **Simple access through a Software-as-a-Service (SaaS) model**
- **Integration with business intelligence (BI) tools**
- **An easy and ready to use service that includes: Self-service mapping, applications across all the devices and browsers, and geoprocessing**
- **Improved features for developers**
- **Hosting and sharing applications and content**
- **Cloud infrastructure that creates a dynamic and scalable GIS infrastructure**
- **Built on open standards**

“The enterprise approach has improved efficiency by integrating and leveraging our existing plant health IT systems and isolated GIS programs, reducing redundancy throughout our network,” said Todd Shroeder, Director of Business Systems Management, USDA. “As a vital part of IPHIS, GIS has helped USDA achieve its goals by improving standardization, accuracy, consistency, and data exchange. In addition, it allows decision makers and scientists to manage current USDA activities and develop and implement long-range plans.”

Government agencies are motivated now more than ever to be efficient and productive. The United States Department of Agriculture’s (USDA) Animal and Plant Inspection Service (APHIS) is one such agency that is utilizing ArcGIS Online in order to streamline processes and provide data in a timely manner to a myriad of audiences.

Shroede stated that before using ArcGIS Online, USDA APHIS

had “great data, but you just couldn’t visualize the information.” GIS became the solution to visualizing the data and creating easily readable and malleable maps. Online services provided a space where information could be stored and then analyzed. By storing information in a single location, analysts and employees can understand “new connections and new relationships across these data sets,” said Shroeder, relationships that may not have been seen before since the data was located in separate reports.

APHIS also utilized GIS to share information with other agencies and their efforts, creating the Integrated Plant Health Information System (IPHIS). “IPHIS has improved communication and transparency by sharing information between other programs and allows access to cooperating entities, such as diagnostic laboratories at state, local, academic, and industry sites,” according to a report by Esri. The information is stored in the cloud, in addition to the software. The benefits of the cloud-hosted software include the ability for multiple agencies, corporations, and programs to have access to not only the raw data, but also the analyzed data presented as easily readable maps. By sharing these maps, APHIS is supporting nation-wide efforts for sustainable agriculture.

Developers play an essential role in building applications and extending tools for GIS and non-GIS users.



ARCGIS FOR DEVELOPERS

In addition to educating government on the various applications for GIS, another important area that is bringing GIS to new users is leveraging an energetic and passionate GIS developer community. Developers play an essential role in building applications and extending tools for GIS and non-GIS users. One example comes from a Hackathon event in San Francisco. Esri partnered with the City of San Francisco's Mayor's Office of Innovation and non-profit Grey Area Foundation for the Arts (GAFFTA) to bring together developers, hackers, entrepreneurs and designers to leverage the Esri API and geospatial data to create meaningful maps and new ways to find information for citizens.

At the end of the hackathon, 12 projects were submitted, and the grand prize, Most In-

novative Use of Esri Technology Award was given to a team that created a simple website to explain what POPOS (privately owned public spaces) were and to showcase the application. The team leveraged the ArcGIS GeoTriggers API with a live iOS mobile application. Esri states, the application automatically detected when you were within a certain proximity of a POPOS and the trigger would automatically send you a text message notification. The winning team was awarded co-office space to help further develop their idea, \$1,000 in Amazon Web Service credits, and \$2,000 plus \$250 in ArcGIS Online Credits. (You can learn more [here](#).)

In a recent [Industry Perspective](#) by GovLoop, Dangermond stated, "We are opening up ArcGIS Online with a series of development code and documentation, to allow everyone

from simple startups to enterprise developers to have access to online maps and geoservices." Esri has provided the development community with a robust set of tools and services to facilitate increased adoption and support of the developer community.

Through ArcGIS, Esri has provided developers with access to a suite of ArcGIS Runtime Software Developer Kits (SDKs), which can be used to create custom GIS business applications for mobile devices and tablets, to run on any operating system and be deployed in the Apple App Store, or the Android and Microsoft Marketplace.

In addition to SDKs, developers have access to ArcGIS APIs to help aid in development. ArcGIS Runtime allows developers to create applications for desktop and cloud users with small runtimes and light-

weight deployment features. Dangermond provided further insights on how Esri supports developers, “Last year, we decided to re-engineer and open up our platform to be a powerful and friendly environment for developers. Our focus is on developers who want to support applications that embed mapping from real spatial analysis from the cloud. Esri now supports developer friendly content, services, APIs, and run time tools for building simple as well as complex apps.”

The developer community has capitalized on many of the developer features supported by Esri. Dangermond noted that they now have thousands of developers who are embracing the services and building applications, as “programmers both in the public and private sectors are taking advantage of this new resource together

with open government data and services to build apps.”

ARCGIS FOR ORGANIZATIONS

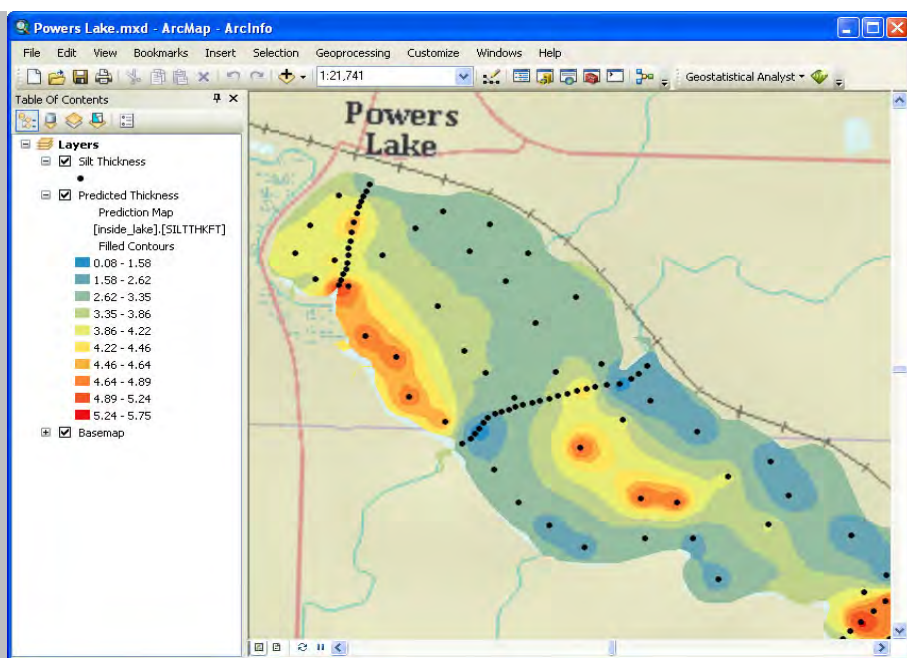
As the public sector is tasked to increase collaboration efforts, ArcGIS Online is transforming collaboration practices within an agency. Through ArcGIS, users can access thousands of maps and resources made by the GIS community. By creating a common GIS environment, agencies can improve collaboration practices through spatial data and fully leverage GIS investments agencies have made. “The creation of new web apps that are associated with the cloud supports very simple mapping and very simple use of geographic data in such a way that many more people are learning how to make maps, on top of the base maps and infrastructure

maps that our traditional users are making,” stated Dangermond.

With ArcGIS, Esri has led the charge in how GIS can be leveraged by organizations. ArcGIS now provides organizations the ability to more broadly adopt GIS and integrate with cloud, mobile, and web applications.

One example comes from King County in Washington State. King County recognized the importance of GIS and created a GIS Center to track and analyze the use of GIS technology and its return of investment. After extensive analysis, the GIS Center determined that GIS was an efficient and extremely beneficial program for county projects and agencies. The Center’s [Return of Investment Report](#) from March 2012 stated that “An analysis of the survey responses indicate that overall the use of GIS—compared to not having the GIS technology— had a net benefit of approximately \$180 million for the year 2010 alone.” However, financial benefits are not the only advantage to using GIS technology.

In King County, as many as 1,000 out of the 14,000 county employees use GIS data and applications in their daily work. The GIS Center was set up to help county agencies organize and understand the datasets “make better use of them for mapping, applica-



By creating a common GIS environment, agencies can improve collaboration practices through spatial data and fully leverage GIS investments agencies have made.

tions, and analysis,” said Greg Babinski, Finance and Marketing Manager and GIS Technology at the GIS Data Center. The data is shared and easy to find, making it possible for employees to use the data in every advantageous way possible. One of the primary advantages is the ease of readability of the data when it is put into Esri programs. Agencies can then “see their data differently, which allows them to use it more productively,” says Babinski in [Esri’s Winter 2012/2013 newsletter](#).

ARCGIS FOR LOCATION

An emerging trend in the geospatial community is the use of location analytics and integration with business intelligence (BI), enterprise resource planning (ERP) and customer relationship management (CRM) software. Traditionally, BI, ERP, and CRM analytics have not

been defined spatially, either because the data could not be accessed within the organization, or the need to spatially portray data had not been expressed.

Organizations typically use BI to make charts, graphs, and tables, but have yet to leverage the power of spatial data. With ArcGIS, paired with an organization’s BI, ERP, and CRM data, organizations can identify new insights and find new relationships to improve business workflows, operations, and improve how services are delivered to customers. ArcGIS and location analytics seeks to support and connect business intelligence platforms to GIS, to develop geographic analysis of the rich and complex analytical BI data collected by organizations.

For organizations, BI and GIS integration is a promising development. By mapping BI

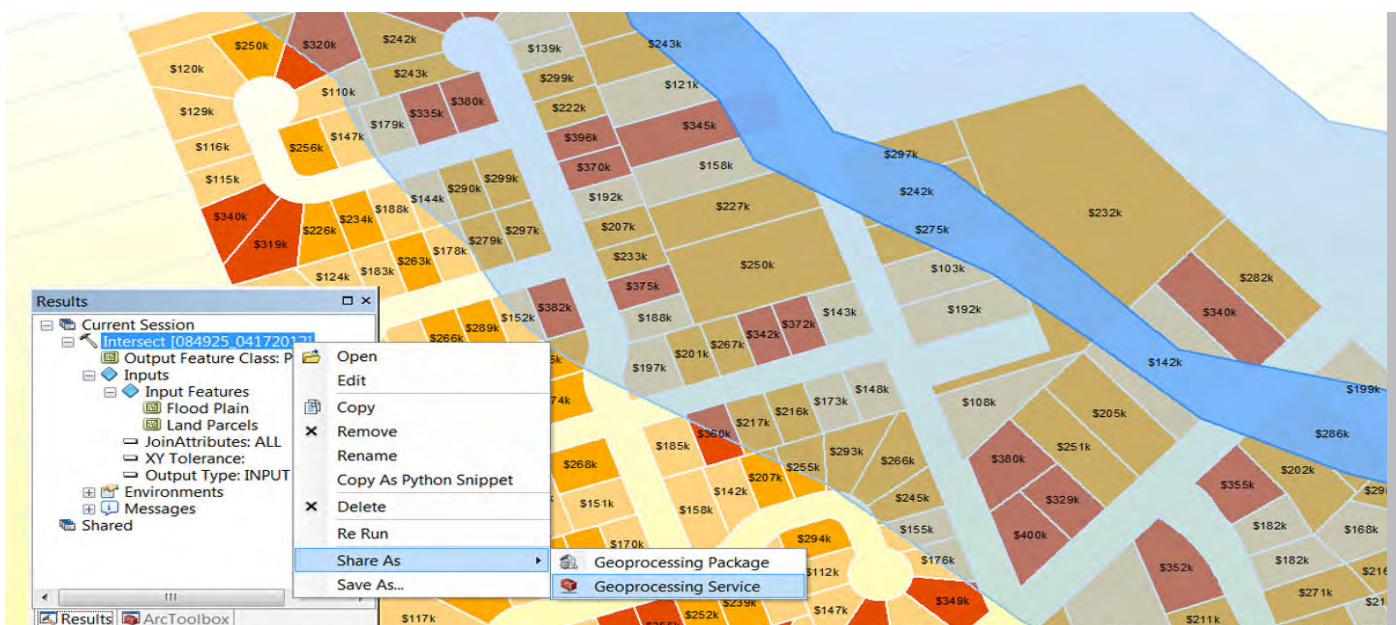
information, agencies can unlock new insights that would traditionally not be known or understood. The ArcGIS platform easily integrates with BI information. Dangermond states, “Our partners are really excited because in a non-disruptive way, all of a sudden, fantastic maps can be made from BI information.”

GIS for location analytics is providing the public sector with new insights to improve decision-making. Organizations will utilize business intelligence and GIS in a variety of different ways. Yet, there are some common themes that all agencies can benefit from.

THREE BENEFITS ARE:

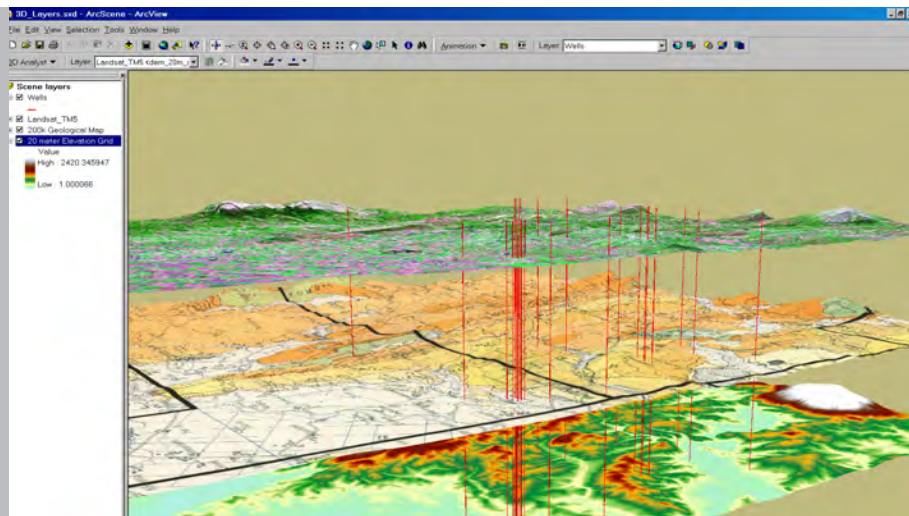
1. Highlights Relationships Otherwise Never Known

By leveraging both BI and GIS, agencies developed an en-



With ArcGIS, paired with an organization’s BI, ERP, and CRM data, organizations can identify new insights and find new relationships to improve business workflows, operations, and improve how services are delivered to customers.

GIS spatially shows patterns, trends, and utilizes data to improve decision-making.



hanced ability to analyze and understand performance of a variety of objectives through maps. With the ability to instantly develop maps, agencies can spot and identify new trends visually.

2. Shows Spatially Patterns, Trends, and Utilizes Data to Improve Decision-Making

One of the challenges with data continues to be identifying high value analytics and using data to drive improved insights. A recent Esri report does a great job explaining this trend, stating, “High-value analytics—with the ability to visualize and interact with data in new ways, users can recognize patterns and connections that may not be revealed with only charts and graphs. For example, two locations may be operating at less than 50 percent capacity. If these locations were exposed only through a list, it may not be apparent that they are in close geographic proximity

and potentially cannibalizing each other.” For CIOs, the use of BI and GIS can be a quick win, delivering a business advantage, and leveraging two highly complementary technologies. Additionally, it’s clear that with both technologies, agencies can take a more holistic view of their data and customers and easily visually spot trends to improve service delivery.

3. Facilitates Non-Disruptive Technology Adoption

With location analytics, adoption of the technology is largely non-disruptive. Agencies are able to use ArcGIS to run on top of existing technology, not impeding workflows or disrupting processes within organizations. GIS is certainly in a transition phase, and through the ArcGIS platform, the public sector can leverage complementary technologies like BI, enterprise resource planning (ERP) and customer relationship management (CRM) software.

GIS FOR FACILITIES MANAGEMENT

A recent [GovLoop and Esri event](#) featured Stu Rich, Chief Technology Officer, of PenBay Solutions, who described how government agencies leverage GIS for facilities management.

Traditionally, GIS was used to measure the environmental impact of a facility within the community. Now, with advancements to GIS technology, and the integration of many other kinds of data, GIS for facilities is helping managers think through the entire lifecycle of a building. Managers are using GIS to conduct an environmental analysis while making site location decisions, planning landscapes, making security decisions, and selecting materials for construction. GIS also has applications for inside buildings, as GIS has been used for space utilization, emergency management, and compliance with state, local, or federal mandates.

In order to effectively manage facilities, organizations need to understand important data points around where offices, vehicles, property, people, pipelines, desks, computers and even power outlets. This information can lead to improved decision-making and allow the public sector to make smarter data-driven decisions.

Rich suggested that facilities are a huge investment, and that we spend 85% of our time in an indoor environment. “Facilities information systems need to understand your entire portfolio because that’s the scale of the business problem you’re operating in,” Rich stated. Rich believes that GIS should be a cornerstone of facilities information strategy.

A second presentation was by Thom Oaks, Solutions Engineer, Esri, titled, “Tools for a Better Understanding: Metrics About Your Facilities.” This presentation provided insights on how GIS users can gain insights on issues, such as space availability, energy use and other key performance indicators. The use of 3D GIS allows decision makers to highlight new insights and improve decision-making.

There are dozens of applications demonstrating how GIS can be used to improve the public sector, everything from improving service delivery, gaining efficiency, and monitoring and assessing government programs. Public sector organizations operate and maintain facilities. With GIS, facility managers can gain new insights throughout the entire lifecycle of a facility. With GIS managers can make smart decisions on site selections, space optimization and business continuity.

5 WAYS TO BUILD YOUR GIS BUSINESS CASE

Now that you have set a foundation for GIS and its potential applications, here are five benefits you can use to start building your business case for GIS.

Improved decision-making by government officials

1. GIS ALLOWS GOVERNMENT OFFICIALS

To detect patterns, trends, and new relationships otherwise not known. Through spatial analysis, government leaders can take a holistic view of a policy, program, or process to understand how to improve their decisions based on a multitude of factors. To make a proper decision, agencies must look at a variety of regulations, existing programs, and policies in order to make a decision. In many cases, this information is difficult to understand in isolation, and the data needs to be looked at through a variety of factors. GIS can simplify complex data, integrate a variety of sources of information, and summarize complex information when viewed spatially.

2. INSTANTANEOUS COLLABORATION THROUGH THE CLOUD

Through the cloud, organizations can share maps, data and pertinent information to improve collaboration efforts. In today’s world, collaboration and capitalizing on resources is essential to improving how the public sector delivers services.

3. IMPROVED TRANSPARENCY FOR CITIZEN ENGAGEMENT

GIS provides increased transparency and accountability for citizens. With the combination of the cloud, sharing of data, maps, and pertinent information, GIS is allowing increased engagement with citizens and more succinctly showing trends in the community visually, which enables a more constructive conversation for government employees.

4. IMPROVED ALLOCATION OF RESOURCES AND PLANNING

By viewing data spatially, government agencies can easily track and view underserved communities and use this information to allocate resources more efficiently, reform policies, or spot distressing trends about communities and offer remediation strategies.

5. IMPROVED COMMUNICATIONS DURING A CRISIS

GIS can help communities plan and respond to a crisis. With GIS, communities can define emergency routes, know location and status of critical buildings during a crisis, and allocate the proper resources for response. With GIS, organizations can prepare, respond and recover from crisis more efficiently than ever before.



HOW GIS CAN CREATE AN OPEN AND TRANSPARENT GOVERNMENT

GIS is helping to facilitate an open government in many ways. Undeniably, the way that government interacts with citizens is changing. Through emerging technology, government agencies are looking to increase two-way discussions with citizens and make government more responsive to citizen needs.

IMPROVING COMMUNICATIONS

GIS facilitates a more open, transparent and collaborative government, as Dangermond said, “Fundamentally, maps are a language. They can

help communicate about government activities better than anything else. By connecting key datasets to maps that tell stories, government can more effectively communicate to citizens and let them know what is going on.”

Dangermond continued to explain the work done by Allen Carroll, Esri Program Manager, who has been leading a project called, “Story Maps.” Carroll and his colleagues have created maps telling the stories of many events, such as walking on the National Mall in Washington, DC, visiting a Smithsonian museum, depicting

the Civil War, and the sinking of the Titanic. Each map has photos attached; they are interactive, and lead people to deeper understanding about an event or location. One great example is the map titled, [“Where Are the Centers for Education Innovation?”](#), which takes a look at a state-by-state comparison of where STEM and charter schools can be found around the country.

The Story Maps website (<http://storymaps.esri.com/home/>) states “[Story Maps] combine intelligent web maps with web applications and templates that incorporate text, multimedia, and interactive functions. Story maps inform, educate, entertain, and inspire people about a wide variety of topics.”

With Story Maps, anyone can build, create, or modify a map to tell a compelling story.

Story Maps is an excellent way to improve communications for government. Dangermond said, “Carroll and his team are inventing a kind of pattern for geographic information communication and that requires web services about geography, design, and clear story telling. These kinds of mapping apps can leverage the geospatial platform and help open up government and enable lots of stories to be told.”

Carroll recently spoke at a Gov-Loop and Esri event, saying, “What’s exciting to see, is how Story Maps has taken off in the last few months. Every day we

see new uses and applications from our stories that we could never have imagined telling.”

The use of Story Maps is changing the way people view and think about GIS, providing applications that extend well beyond the traditional GIS user. Lee Bock of Esri said, “Traditionally when people do GIS on the web they put a table of contents, and the approach has been ‘here is our data, explore it and good luck!’” This works well for an advanced audience – but Story Maps tries to take an approach for a simple user experience, sometimes removing complicated features and functionality to maintain an easy user experience.



“[STORY MAPS] COMBINE INTELLIGENT WEB MAPS WITH WEB APPLICATIONS AND TEMPLATES THAT INCORPORATE TEXT, MULTIMEDIA, AND INTERACTIVE FUNCTIONS. STORY MAPS INFORM, EDUCATE, ENTERTAIN, AND INSPIRE PEOPLE ABOUT A WIDE VARIETY OF TOPICS.”

Story Maps leverage many different kinds of technology, and the developer community to create simple and informative maps. Bock stated, “There is no one true story map technology – you can program in Java, or with crayons and paper.” Esri also uses the developer community GitHub to store and host code. Sylvia shared some of the applications of leveraging GitHub; “You can search and find all story maps by searching on GitHub. It lets you see the full code resources and see what changes have been made in the past, you can request to see latest changes to receive updates.”

Bock also provided an overview of some of the templates available for users, he said, “These templates are for peo-

ple who want to publish a story but do not have the time to write their own application.”

With Story Maps, there are many different options to leverage. Bock said, “If you want a way to publish this to the world – there are a lot of different options.” Generally speaking, we are working to move our templates into a hosted environment with arcgis.com, for the time being you would download and host them yourself.”

“Our citizens and Congress want to see stories about what is going on—with climate change, voter attitudes and Medicaid expenditures, for example. Where are we spending more or less on issues they care about? Story Maps are an

example of consumer-focused web apps that will open up and leverage federal government’s geospatial information to reach citizens in new ways,” said Jack Dangermond, Esri President.

INCREASING COLLABORATION: THE GEOPLATFORM.GOV STORY

Through emerging technology, agencies are looking for new ways to collaborate, share resources and leverage existing investments within an agency. Additionally, many of the resources and data that agencies collect have applications across departments or agencies. For instance, data that is collected by the Department of Education may provide valuable insights to



“STORY MAPS ARE AN EXAMPLE OF CONSUMER-FOCUSED WEB APPS THAT WILL OPEN UP AND LEVERAGE FEDERAL GOVERNMENT’S GEOSPATIAL INFORMATION TO REACH CITIZENS IN NEW WAYS,”

the Department of Transportation or other agencies. Agencies are increasingly looking at ways to develop shared infrastructures to shared resources. That's why a group of agencies teamed up to create Geoplatform.gov.

Harvey Simon, Geographic Information Officer at the Environmental Protection Agency, recently spoke with GovLoop about Geoplatform.gov. Simon provided expert insights into Geoplatform.gov, which is a national effort to improve the way geospatial data is shared, making information easier to catalogue, search and find. "Part of what we are doing with Geoplatform is trying to find out how to get the good data to go to the top and be shown as a trusted resource," said Simon.

Simon's expertise on GIS comes from a career in the geospatial community, working for over 25 years on a variety of different GIS initiatives at the EPA. Simon was heavily involved in emergency response initiatives at the World Trade Center, Hurricane Katrina, and Deep Water Horizon.

Prior to Geoplatform.gov, spatial data was very difficult to sort through and use due to the inability to lay it on a map. "Geoplatform mixes hosting environment and a way to integrate different data sources and the way you socialize around maps and it's also

where the government hopes to put trusted data in a way that's easy to find so that one of the early problems we've had with geospatial searches in the past."

With Geoplatform.gov, the EPA is looking at ways in which they can share high value data. "We're looking at [Geoplatform.gov] as a place where we can put high demand data, like our facility information for our environmentally regulated facilities for public use and it's also where we hope to find data that EPA needs," said Simon.

Simon indicated that Geoplatform.gov and the EPA are working to create a single repository for geospatial information. As the EPA deals with many kinds of environmental issues, geospatial data is often located in disparate systems, making it difficult for administrators to get a full picture of complex issues. Simon said, "Geoplatform.gov is where we will get those services directly from the a central infrastructure and we won't have to reproduce data locally."

Esri President Dangermond has indicated that there is an important difference between Data.gov and Geoplatform.gov: "Data.gov is a separate portal that focuses on data and data downloads of government data. These systems are being linked, but their purpose is different: data.gov

is about open data access to government data. Geoplatform supports online interactions with mapping and geographic information services. Users can directly use services in application and to combine (mashed up) and embedded these services in apps across federal agencies and beyond."

The vision of Geoplatform.gov is to make mapping and geographic information widely available to extend applications to knowledge workers. As Dangermond states, "This will support not only geospatial professionals, but the whole class of knowledge workers and policy makers who are finding mapping and location analytics valuable."

Dangermond said that agencies are currently leveraging Geoplatform.gov in impressive ways, such as standing up the A16 authoritative geographic data layers to be used as foundational base layers, which are then available as "shared services." These layers include common base maps, geocoded services, and many other kinds of data collected by the agency. Dangermond said, "People can discuss and use them [A16 geographic data layers] as map services, feature services and integrate them with their own data. Mash ups can also be persisted and shared. All of these services are available as web maps and can be used in apps available in the systems."

Dangermond believes that Geoplatform.gov will accomplish three things:

- 1 Expand and leverage the federal government's investments in authoritative source geospatial information
- 2 Enable the easy sharing of apps
- 3 Minimize redundant data storage by setting up common services available for all agencies

Another impact from Geoplatform.gov is that the service will improve the way geospatial analysis is used across government. Dangermond said the impact is comparable to the way Apple introduced iTunes. Apple used a cloud/device pattern, which was a game changer for the music industry. Dangermond believes that now a similar pattern is transforming GIS, as GIS is now cloud-based and geo services can be delivered on any kind of device. Dangermond stated, "The Geo Platform is an example of this [cloud/device deployment]. Unlike Apple's platform, however, Geoplatform.gov is open and will provide a new pattern for GIS across government."

Dangermond also provided insights on how geoplatform.gov will impact government:

- Government users will be able to connect their spreadsheet software to the Geoplatform and make maps of their data using the platform's web services such as geocoding and base mapping.
- Users will also be able to "geo-enrich" their spreadsheet data by overlaying different map layers behind the data their geo-referenced spreadsheet data and extend the attribution in their tables using data from the overlay maps.
- The impact of extending GIS to new users will empower agencies to leverage different kinds of technology with GIS, this could be enterprise systems such as IBM Cognos, SAP business tables, SharePoint or geo-encoded social media.

GIS has increased the ability of government agencies to collaborate, share resources, and work towards their most important mission objectives. By sharing data, resources and information, agencies can work to remove siloes and use the right data to make improved decisions. One great example comes from the Geoplatform.gov case study.

"The Geo Platform will facilitate the realization of GIS across government as shared infrastructure. While we don't know entirely all the applica-

tions that it will support. My sense is that it will follow the same pattern as GIS within departments or within organizations. It will be embraced increasingly effectively and integrated as it demonstrates clear value in helping government save money, communicate and help make better decisions."

"Emerging capabilities will leverage the investments in geographic information across enterprise computing platforms providing a much richer way using geography as the common integration platform. The transformational changes that are happening with geospatial technology are rapidly expanding both the number and types of GIS users across the enterprise,"

Jack Dangermond, Esri President



7 WAYS GIS IS POWERING CIVIC ENGAGEMENT INITIATIVES

Mobile programs connect dynamic working environments and increase efficiency by providing real-time information to entire agencies. However, mobile is not just useful inside of an agency, but it is also beneficial for connecting government agencies with citizens.

Monica Pratt, Editor of ArcUser magazine, explained that two types of civic engagement apps are emerging: "The first type complements existing government services and makes them more accessible. The second, more intriguing type encourages people to work closely with government to do things no one had thought of doing before, like rounding up volunteers to clean beaches after a holiday weekend."

Rather than replacing the work of traditional GIS, these apps make the maps and data produced by GIS departments more useful and accessible to more people both inside and outside government. These apps also elevate the value of the authoritative data produced by government GIS departments as people become dependent on current, accurate data. Pratt described that civic engagement apps fall into seven categories: public information, public reporting, solicited comments, unsolicited comments, citizen as sensor, volunteerism, and citizen as scientist. Each are highlighted below:

1 Capturing Public Information

These kinds of apps are used to improve complex data and information to citizens through a map, which cannot be easily understood otherwise. Pratt highlighted that these apps are “effective at addressing transparency concerns, provide a channel for feedback, and communicate both where and why government money is being spent.” One example that Pratt highlighted is Recovery.org, which shows stimulus spending from the American Recovery and Reinvestment Act economic stimulus spending.

With the Recovery Accountability and Transparency Board App, users can check project information from the exact location of the project using

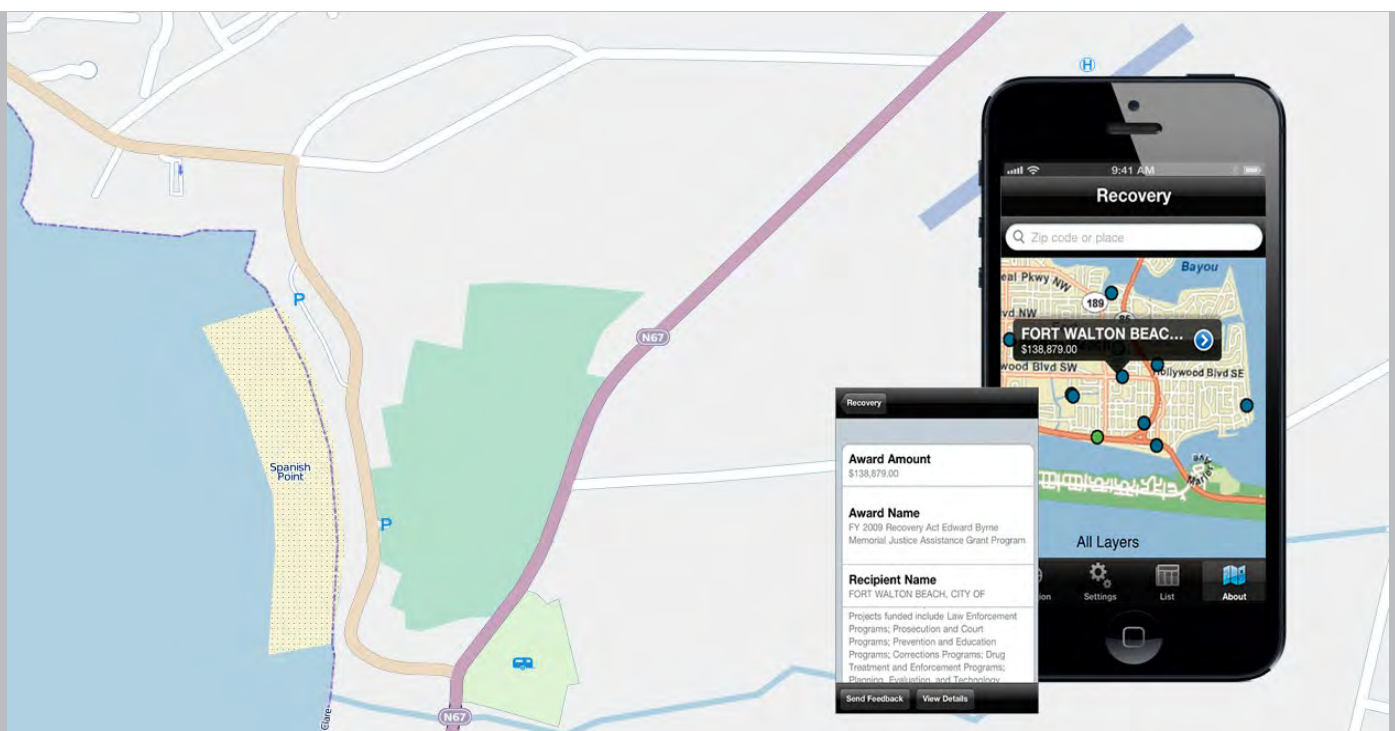
GPS, or search other projects and their information such as contracts, grants, loans and specific project details laid out in the form of a GIS map. The engagement aspect of the app encourages users to supply feedback in the form of text and/or image, as well as report fraud.

The ultimate goal of the app is to “ensure transparency and accountability,” according to a quote by Edward Pound in an article detailing the app titled, “Mobile Application Illustrates US Recovery Projects.” In order to accomplish the goals of the board, Pound suggested that “we have to stay current and keep up with the ways people are accessing information and communicating.” In today’s fast-paced environment, both employees and constituents are able to digest and absorb

information in a fast and easy way, making long, text-based reports something of the past. Mobile GIS applications share information in a visual format that allows for simple comprehension in the form of maps.

2 Facilitating Public Reporting

The second kind of app that Pratt identified is mobile apps for public reporting. Pratt said, “Federal Communications Commission (FCC) tapped into the power of crowdsourced information through the FCC Speed Test, an iPhone app that measures the quality and speed of a consumer’s broadband connection. During the first six months it was available from the App Store, 1.2 million people downloaded the app and reported back information that helped the agency plan in-



frastructure expansion and determine policy. The captured data is visualized as a mapped surface that can be explored." The FCC is a great example of how to leverage GIS mobile to transform citizen engagement.

3 Soliciting Public Comments

In this instance, Pratt explains that apps do not always have to be a permanent fixture for citizen engagement programs. Apps can be developed around a certain cause or community initiative with the intent to gather feedback and information, and then removed once the needed data has been collected from citizens.

4 Identifying Unsolicited Public Comments

Social media maps can provide insights and analysis to how citizens feel or are reacting to a certain event or policy. Pratt said, "Social media maps on events such as the Gulf of Mexico oil spill aggregated and shared comments, photos, and videos that greatly enhanced the information available on conditions."

5 Making Citizens a Sensor

A citizen as sensors apps allows citizens to report crimes, potholes or incidents to improve their communities and

act as on the ground resource to improve their community.

6 Promoting Volunteerism

In this case, Pratt highlighted The Lifesaving App for the Android and iPhone, developed for the San Ramon Valley Fire Protection District. Pratt stated, "In instances of cardiac arrest, time is vital. The Lifesaving App lets smartphone users volunteer to be notified if someone nearby needs CPR. When a 911 call is received, the nearest CPR volunteer, who is in the best position to respond in timely fashion, receives information on the incident."

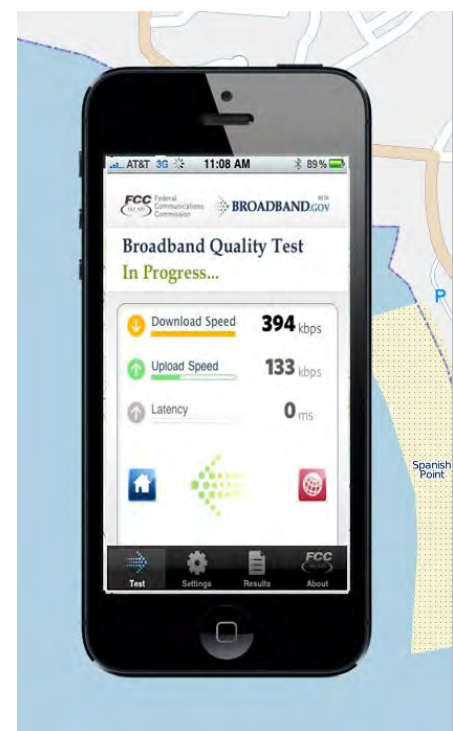
7 Leveraging Citizen Science

Civic engagement apps allow people who traditionally do not participate in government functions to become involved and contribute positively to their community. Citizens collect large volumes of data that can be beneficial to government agencies. Apps can allow citizens to contribute collective knowledge and assist with monitoring migration patterns or track-endangered species. In this instance, Pratt is highlighting how mobility facilitates citizen science.

Through mobility, citizens can share pertinent information and become sensors for communities. One example of citizen science is the free

Mojave Desert Tortoise app, which "lets users take a photo, find out more about this endangered species, and note location and other information about an individual tortoise," Pratt stated.

The ultimate goal of mobile GIS applications is to connect users to government information in order to encourage citizen engagement and government transparency. With GIS available on mobile devices, government employees and citizens can provide and share information in an easily readable format, creating an open and dynamic government environment.



GIS CHEAT SHEET

This report provided you with many lessons learned, case studies, and expert insights from thought leaders in industry and government who are leveraging GIS to transform the public sector through GIS. The following sections provide you with our GIS cheat sheet, a brief summary of the report and resources for you to find more information. GIS is changing the way government operates and communicates with citizens; the sections below will give you the need to know information and access to build your knowledge of GIS.

This sheet will give you the need to know information on GIS and help you get smart quick on the topic. We wrap up the guide with some ways to re-think how you are currently using GIS.

Why is the
move to
the cloud
important
to GIS?

Why should agencies leverage GIS?

There are dozens of benefits to leveraging GIS, but here are 5 good reasons:

- 1 Identify new insights through spatial analysis that would remain unknown
- 2 Use visualization as a key to understanding data
- 3 Improve your communications with stakeholders
- 4 Facilitate a more open, transparent and collaborative government
- 5 Improve management of resources and organization

What do I need to consider prior to adoption?

There are lots of elements you should be considering and, of course, this cheat sheet can't get to them all, but here is the need to know information to get a strategic conversation started:

- 1 Who knows (or can learn) how to leverage GIS on staff? Who are our geoscientists and how can they help us extend applications?
- 2 What's the core problem we are trying to solve and how can GIS help?
- 3 Who is already doing GIS right in our agency? How can we collaborate?
- 4 What is our experience with GIS? What would we like to do more off? Less?
- 5 What's the best way to do GIS?

Esri's GIS platform, ArcGIS, operates as a Software as a Service (SaaS) cloud model on Esri's public cloud, which provides many benefits to ArcGIS users. Three benefits of using the cloud for GIS are increased space, cost savings, and accessibility.

Increased Space



Complex and interactive software takes up valuable space on government computers. Many agencies have limited space and with the increased production of digital-born records, available space is rapidly shrinking. ArcGIS Online releases agencies from committing a large amount of space to software and having to include software on multiple computers. Instead ArcGIS runs on the public cloud and a private cloud located behind a firewall.

Cost Savings



Purchasing software requires a keen analysis by network administrators to be sure that the new software will improve performance across the agency. One advantage of ArcGIS Online is that it is charged on a pay-per-use basis, cutting down on major software investments for agencies already facing a dwindling budget and making the program a lower risk to try.

Access Anytime, Anywhere



The traditional 9-5 day is becoming less common as telework gains traction and companies operate internationally. Often, tasks need to be accomplished outside of the working hours of various programs or IT services, potentially leaving many employees unable to complete projects during non-traditional hours. ArcGIS Online is available 24/7, accommodating both local teleworkers and employees in any time zone or location.

Resources

1. GovLoop's GIS Page: <http://www.govloop.com/gis>
2. Identifying the Promise of GIS: <http://www.govloop.com/geographic-information-systems-guide>
3. ArcGIS as a Platform: An Interview with Esri President Jack Dangermond: <http://www.govloop.com/profiles/blogs/arcgis-as-a-platform-an-interview-with-esri-president-jack-danger>
4. GIS Interviews: <http://www.govloop.com/profiles/blogs/gis-interviews-geoplatform-gov-and-the-national-strategy-for-info>
5. Interactive Infographic: How GIS Influences our Daily Lives: <http://www.govloop.com/profiles/blogs/interactive-infographic-how-gis-influences-our-daily-lives>
6. [Geoplatform.gov](http://www.geoplatform.gov)
7. Esri on GitHub: <https://github.com/Esri>
8. URISA: The Association for GIS Professionals: <http://www.urisa.org/>

GIS Glossary

- GIS Wiki: wiki.gis.com
- [Dictionary of Abbreviations and Acronyms in GIS, Cartography, and Remote Sensing](#) - University of California at Berkeley
- [Esri Online GIS Dictionary](#)
- [FGDC Glossary](#) - most terms are from the Spatial Data Transfer Standard (FIPS 173)
- [Geographer's Craft Glossary](#) - University of Colorado at Boulder
- [GIS Data Depot Helpdesk Glossary](#)
- [Glossaire SIG](#) - French-language glossary from ESRI-France
- [Glossary of Cartographic Terms](#) - Perry-Castañeda Library, University of Texas at Austin

NEXT STEPS AND CONVERSATION STARTERS

This guide provided you with a lot of information on GIS, along with expert insights and government case studies. We know that you're busy – so, here's everything you need to know about this guide, based on different settings you may find yourself in.

TWITTER VERSION

Be sure to check out the @GovLoop report on GIS technology in the public sector: [\[http://bit.ly/1durvbQ\]](http://bit.ly/1durvbQ)

FACEBOOK VERSION

Check out GovLoop's report on GIS – cheat sheet on GIS, dozens of case studies – easy way to get smart on GIS. [\[http://bit.ly/1durvbQ\]](http://bit.ly/1durvbQ)

LINKEDIN VERSION

Check out GovLoop's report on GIS - studies sharing best practices and case studies to help show the value of GIS, and how GIS can be implemented in government. [\[http://bit.ly/1durvbQ\]](http://bit.ly/1durvbQ)

BULLET POINTS

- ◉ GIS is changing the way government interacts with citizens and collaborates
- ◉ We are creating more data than ever before – and need to think of new ways to visualize and process complex and multivariate information
- ◉ Through GIS we can spot new trends, relationships and associations
- ◉ There are some interesting applications of GIS, some remarkable examples come from emergency management applications
- ◉ GIS can integrate with business intelligence tools, customer relationship management database, and many business productivity tools. You can create maps directly within spreadsheets, so no need to train people on how to use new software, or switch between different programs to create maps
- ◉ Maps are a common language, allowing us all to process information in a more efficient way
- ◉ Have you heard of Story Maps? These are web maps that tell stories around everything from “Twenty Best Small Towns,” STEM Education, and March Madness Mapped.

GIS 30 SECOND ELEVATOR PITCH TO YOUR BOSS OR PEERS

Have you had a chance to take a look at GovLoop's GIS report? They have a handful of case studies and best practices, and I have some ideas on how we can start to leverage GIS. Can we spend a half hour to talk through them? I would love to float some ideas and see if they can work for our agency.

GIS has the potential to change the way we interact with citizens, the way we collaborate, make decisions, and share data internally. GIS has a lot of benefits – seeing information visually on a map makes complex information easy to digest, and is a good conversation starter. Seeing data on a map also would allow us to spot trends, red flags and see new insights that we probably could not see within our spreadsheets.

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ABOUT GOVLOOP & ESRI



GovLoop's mission is to connect government to improve government. We aim to inspire public sector professionals by acting as the knowledge network for government. The GovLoop community has over 65,000 members working to foster collaboration, solve problems and share resources across government.

The GovLoop community has been widely recognized across multiple sectors. GovLoop members come from across the public sector. Our membership includes federal, state, and local public servants, industry experts and professionals grounded in academic research. Today, GovLoop is the leading site for addressing public sector issues.

GovLoop works with top industry partners to provide resources and tools to the government community. GovLoop has developed a variety

of guides, infographics, online training and educational events, all to help public sector professionals become more efficient Civil Servants.

GovLoop's report, *The Mapping Revolution: Incorporating Geographic Information Systems in Government* is sponsored by Esri. When Esri was founded in 1969, it realized even then that geographic information system (GIS) technology could make a difference in society. GIS helps people to solve problems at local, regional, national, and global scales. Access maps and apps at ArcGIS.com. Be sure to check out all the GIS resources produced by Esri and GovLoop.

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