

Esri News

for State & Local Government

Winter 2016/2017

Ensuring a Better Future

Do you know what kind of future you are planning?

Is it a future that preserves the quality of air, water, and land systems for our descendants? Because a sustainable future does not happen by default or by accident, Esri launched the Green Infrastructure initiative to help you and decision-makers—both within and outside of government—plan a better future for the United States using GIS.

There is a pressing need to ensure that the nation's valuable landscapes are not sacrificed as a result of development that is haphazard or poorly conceived. Unlike the gray infrastructure of bridges, roads, dams, and other structures, this green infrastructure is precious and cannot be rebuilt once it is lost.

Green infrastructure is actually an old idea that has new vitality, thanks to GIS technology. Frederick Law Olmsted, the acknowledged founder of American landscape architecture, recognized the value of setting aside tracts of land and preserving natural scenery for the enjoyment of everyone, not just the wealthy. Olmsted was a board member of the commission appointed to oversee the first national park, Yosemite. In his 1865 report, Olmsted noted that the preservation of the area's scenic beauty would generate not only economic returns from tourism but also tremendous benefit to the physical and spiritual well-being of the nation's inhabitants. The objective of the Green Infrastructure initiative is a systematic, information-based method for transforming



communities in the United States into sustainable centers by identifying and preserving an interconnected system of landscapes at regional, local, and urban scales. This means addressing green infrastructure proactively at the beginning of the planning process, rather than reactively at the end.

A green infrastructure approach to development identifies critical landscapes of ecological, scenic, and cultural value and preserves them. Ecologically valuable landscapes contain features that benefit all living organisms in an area,

not just people. Scenic and culturally valuable landscapes are characterized by recreational areas, viewsheds, and similar features that increase property values and promote tourism.

To be effectively safeguarded, these areas must be considered on multiple scales—regional, local, and urban. At each scale, maintaining the connectivity of open spaces, habitats, and parks is important because connectivity provides a resilience to the components of these

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landscapes that helps them survive challenges, such as climate change, better than isolated areas.

Previously, environmental concerns were set aside in favor of what was perceived as economic necessity based on the belief that these were competing rather than complementary aspects of a truly sustainable future. Green infrastructure makes solid economic contributions. Preserving watersheds protects the water supply and safeguards the health of human populations that use that water as well as the vegetation and wildlife that depend on it. Keeping coastal areas intact mitigates the effects of storm events and limits damage to buildings and other structures. Unmarred scenic views are valued and enhance property values.

Currently the majority of local government entities that regulate the use of the land base in the United States do so in isolation from each other and often without tools to effectively assess existing conditions or model the effects of proposed policy changes.

The time for implementing green infrastructure is now because GIS provides the tools needed to integrate, analyze, visualize, collaborate, and communicate this new vision for the nation.

GIS is essential to a green infrastructure approach to planning because it reverses the prevailing paradigm of developing first and relegating any leftover areas to green space afterward. Green infrastructure planning is fundamentally a spatial problem. With GIS, data about the natural world and built environment—from many sources, in a variety of formats and range of scales—can be combined and modeled to uncover patterns and perceive relationships.

Although GIS makes planning with accountability and metrics possible, a national dataset identifying intact, natural areas was needed. To enable a GIS-enabled approach to green infrastructure planning, Esri created a dataset using National Land Cover Database



2011 for the initiation definition of these “cores,” or intact areas. The result was the National Intact Habitat Cores Database.

Using this dataset, Esri compiled the first national green infrastructure map depicting every intact natural area larger than 100 acres in the United States regardless of ownership or preservation status. This map shows areas of ecological, cultural, and scenic importance. Local and regional data can be combined with this national map to evaluate the current state and probable future of an area given planning policies. This lets decision makers determine what action will be required to preserve these valuable landscapes.

A suite of green infrastructure planning tools is available across the ArcGIS platform as online tools and desktop toolsets for use with the National Intact Habitat Cores Database. A simple online tool that lets anyone assess the current state of green infrastructure in their area is available at esri.com/green-infrastructure on the Current tab. At the same site, on the Future tab, tools for modeling scenarios based on filtering and weighting the core data to reflect community values can be used to generate layers that can be viewed or used with GeoPlanner for ArcGIS.

GeoPlanner for ArcGIS is a web application for planning professionals that is integrated with ArcGIS Online and runs in desktop and tablet web browsers. A premium app offered in the ArcGIS Marketplace, it provides tools that support every step in an end-to-end, geoenabled planning and design workflow.

Esri also provides toolsets for ArcGIS for Desktop and ArcGIS Pro that are available at no charge from ArcGIS Online.

Planners, elected officials, researchers, businesses, and the public can find out the status of the green infrastructure in a community now and extrapolate the effects of current planning on the landscape. Local and regional data can be combined with the national map to evaluate the current state and probable future given current planning to see what action is required to preserve these valuable landscapes.

Communities can preserve natural habitats, protect biodiversity, promote healthier lifestyles, and improve quality of life by supporting intelligent and balanced growth. This approach to planning evaluates likely results against values.

Applying a green infrastructure approach to a community encompasses these four steps:

1. Critically evaluate the community's land development policies.
 2. Compare benchmarks for the community to other communities.
 3. Include a green infrastructure element in the community's comprehensive land-use plan.
 4. Use GIS analysis and tools to ensure that the community stays on track to preserve its green infrastructure.
- You can take the first step toward a more sustainable future by finding out the green infrastructure score of your community and entering your location.

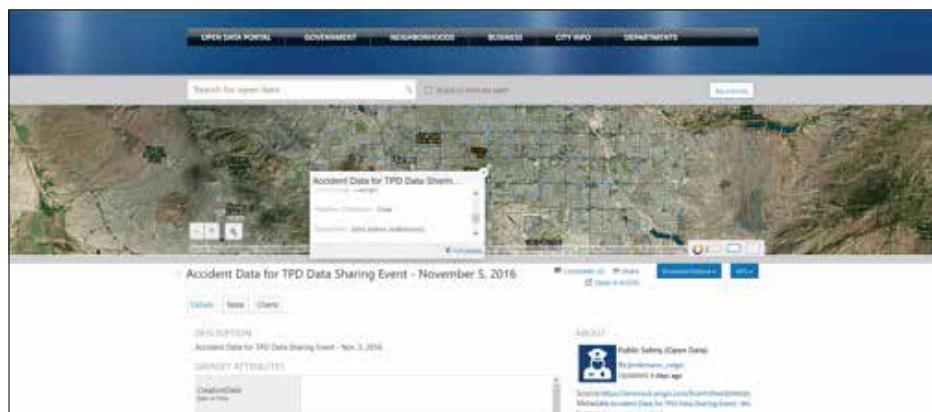
City of Tucson Police Department Supports the White House Police Data Initiative

by Jeremiah Lindemann

The Tucson Police Department hosted its inaugural Data Sharing Event in early November in support of the Department's commitment to the White House Police Data Initiative. The event provided a collaborative, innovative, and fun approach to gathering and analyzing data from bicycle and pedestrian collisions, and it generated a robust discussion about distracted behavior. Members from the Tucson Department of Transportation, various Bicycle and Pedestrian Programs, the University of Arizona, civic and social organizations, and other volunteers all participated.

Participants gathered in groups and analyzed redacted reports on the collisions that were in paper format. Esri's geoform application was used to capture the paper information and map it quickly. Attributes identified by reviewing the reports, injuries, and citations were all collected.

In real time, the data was displayed in Operations Dashboard which was projected overhead for all participants to see. Charts interactively changed to show the attributes that were collected. Peter Johnson, the GIS Supervisor at the City of Tucson was excellent in supporting the Police Department to the event and sees the event having longer term improvement stating "The GIS Unit at the City of Tucson's Information Technology Department is a partner with the Tucson Police Department in helping them turn



↑ (Information gathered at the Tucson Data Sharing Event was immediately shared on Tucson's Open Data Portal)



↑ Operations Dashboard shows information in real-time

their wealth of data into a wealth of information. We do this through improved data visualizations, analysis, access and automation. All of which will lead to improved planning, operational awareness, policing strategies and coordination of enforcement activities for the Police Department."

The Tucson Police Department had a goal of making processes better. With key stakeholders in the room, they quickly assembled a survey using Survey123 to poll all participants about what data is most important to them and what data could be collected better in the future.

Data that was collected was immediately shared to Tucson's Open Data site

utilizing ArcGIS Open Data, making it available for all and supporting the White House Police Data initiative. Students from the University of Arizona have some great plans in taking this data and doing further analysis on it to help make a more livable community.

Sergeant Matthew Faulk who helped organize the event sees "... from our perspective one of the most important elements is the Police Department to having a 360 dialogue with the community. This allows us to be much more proactive with a discussion together with people rather than being reactive with stagnate data."

↑ Geoform used to capture information from collision reports.



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Preparing Your Stormwater System for Historic Rainfall and Flooding

Dan Hartman, Public Works Director, City of Golden, Colorado

It's a familiar concern for stormwater professionals: Is my system prepared to handle the next storm? What if it's a 100-year flood? A 1,000-year rainstorm?

Reason for such concern hit Colorado in September 2013, wreaking havoc across 2,000 square miles of the Front Range of the Rocky Mountains. Torrential rains, far exceeding previous records, caused widespread flash flooding that damaged or destroyed about 20,000 homes and commercial buildings, 485 miles of roads, and 50 bridges, according to the National Oceanic and Atmospheric Administration.

The 17 affected counties included Jefferson County, home of the city of Golden. While not in one of the hardest-hit areas, Golden experienced a year's worth of precipitation in less than a week. Nonetheless, "the amount of damage we incurred was very minor," says public works director Dan Hartman, who attributes the damage control—at least in part—to the effectiveness of the city's Cartegraph Operations Management System (OMS), integrated with Esri's ArcGIS platform.



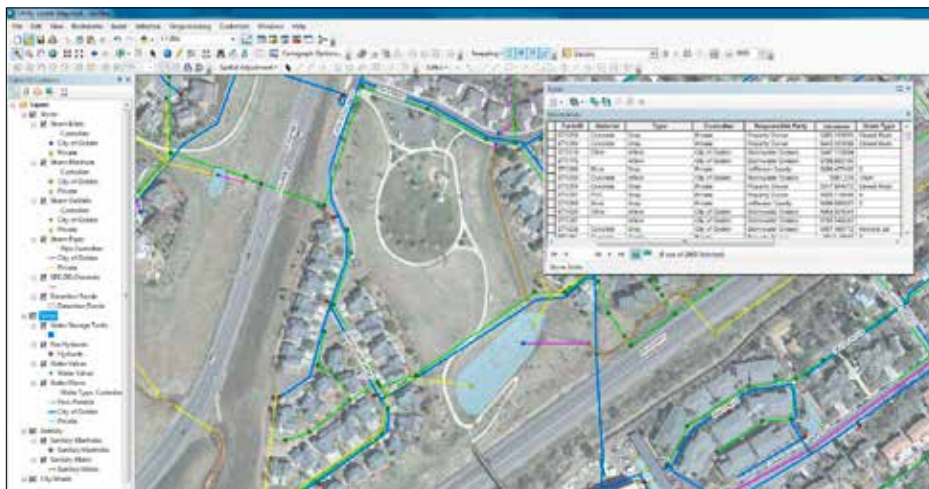
↑ The 7th Place Bridge over Tucker Gulch after the September 2013 flood.

Challenge

That level of preparedness was not always in place. According to Hartman, when he took his position in 1988, Golden was "a wait-for-a-break-and-respond organization." Assets were not

quantified, and there was no ongoing reinvestment program. This situation made it difficult to maintain stormwater and other types of systems at the operating level for which they were designed. Setting his sights on developing an investment plan, Hartman began to implement a rudimentary asset management system.

The first step was to update the existing meticulous, hand-drawn maps of city systems. Those maps showed 32 miles of water distribution lines and 38 miles of sewer lines but included no record of the stormwater system. Hartman commissioned aerial surveys, which revealed that the systems were nearly twice as large as what the hand-drawn maps showed: 79 miles of water lines and 72 miles of sewer lines. Also identified were 66 miles of storm pipes and 11 miles of storm channels. City staff then utilized Esri's ArcGIS software to digitize the location

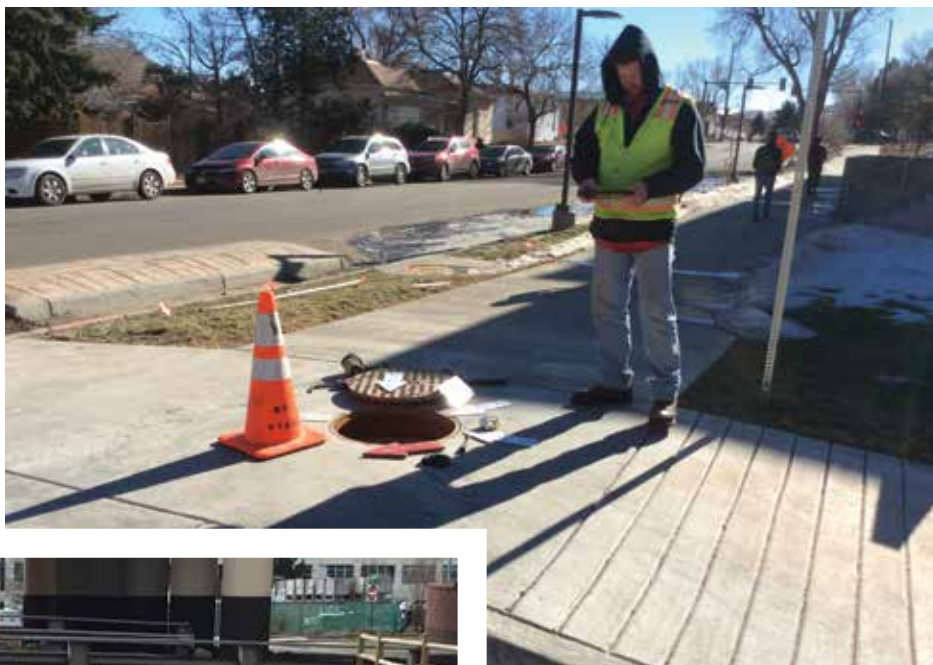


← Cartegraph's new platform—Operations Management System (OMS)—integrates with ArcGIS, bringing mapping, asset management, and work management tools to the field, which streamlines workflow and data entry.

of these assets. These new digital maps allowed the public works team to start capturing and storing critical asset data.

Solution

In 1999, Golden transferred that data into the Cartegraph system and, for the first time, was able to integrate geographic information system (GIS) technology with asset and work management systems. All of the city's assets were recorded in what then became a robust database, says Hartman. "We used basically every module—water, wastewater, stormwater, streets, trees, signs, etc." With a clear



↑ Field staff use Cartegraph on their mobile devices to conduct detailed inspections of the city's storm inlets, manholes, outfalls, detention ponds, pipes, and channels.



↑ The 7th Place Bridge over Tucker Gulch prior to the September 2013 flood.

picture of the location, dollar value, condition, and life expectancy of every asset, Hartman could more easily make realistic projections for the annual investment required to maintain the system.

The stormwater team now conducts detailed annual inspections of the city's thousands of storm inlets, manholes, outfalls, detention ponds, pipes, and channels. In addition, drive-by inspections are made after storms in order to discover any resultant stoppages. These regular inspections keep the system prepared for whatever Mother Nature throws its way.

Golden recently transitioned to Cartegraph's new platform, OMS, a web-based application that integrates with ArcGIS through editable feature services

published using ArcGIS for Server. This mobile-friendly technology brings mapping, asset management, and work management tools to the field, which streamlines workflows and data entry.

When performing inspections of the stormwater system, workers now use iPads to navigate to the inspection site, go through a detailed checklist, make necessary notes, attach photos, and document that the inspection has been completed. If staff discover an asset that's not up to par, they schedule the needed repairs by creating a task, on the spot. When clearing channels, rebuilding detention ponds, fixing inlets, and performing other maintenance, workers log their data while in the field, providing a real-time record of the work completed,

who performed it, how much time it took, and materials that were used.

"For stormwater, the key benefit of operations management is that it provides us with an organized approach to inspect, maintain, and repair our system," says Hartman. "It allows us to document that our system is functioning [at] the highest level it can."

Results

The record flooding of 2013 put Golden's stormwater system to the test. "The system performed well. The inlets were open and the detention ponds were clear, so they could do their jobs," says Hartman. "You can't start fixing those things when the rain starts."

As a result, Golden can be confident that the stormwater system can handle the maximum level for which the system was designed. "To the extent our system could protect us from damage, it did," says Hartman. "That is due in part to our regular inspections and the technology that helps us track the condition of the assets in the system."

ArcGIS Is a Complete Platform for Open Data

Esri Users Take on Responsibility for Open Data Sharing in Their Agencies

Agencies and organizations at all levels of government are increasingly conscious that being transparent and open will make them more effective and efficient. To expand the number of smart communities in the United States and around the world, the White House and other national governments are calling for government agencies to share more information. Open data fosters trust by promoting constituent engagement and provides validation that equitable and appropriate development is being done.

As agencies start down the path of creating an open data strategy, they typically realize that the GIS department is the most mature, experienced, and prepared team to build powerful information services and make data accessible to different communities. Tens of thousands of government-based GIS teams

use ArcGIS as their system of record, so the platform is already integrated with agencies' enterprise and operations systems. This is beneficial, since ArcGIS is a complete open data solution as well.

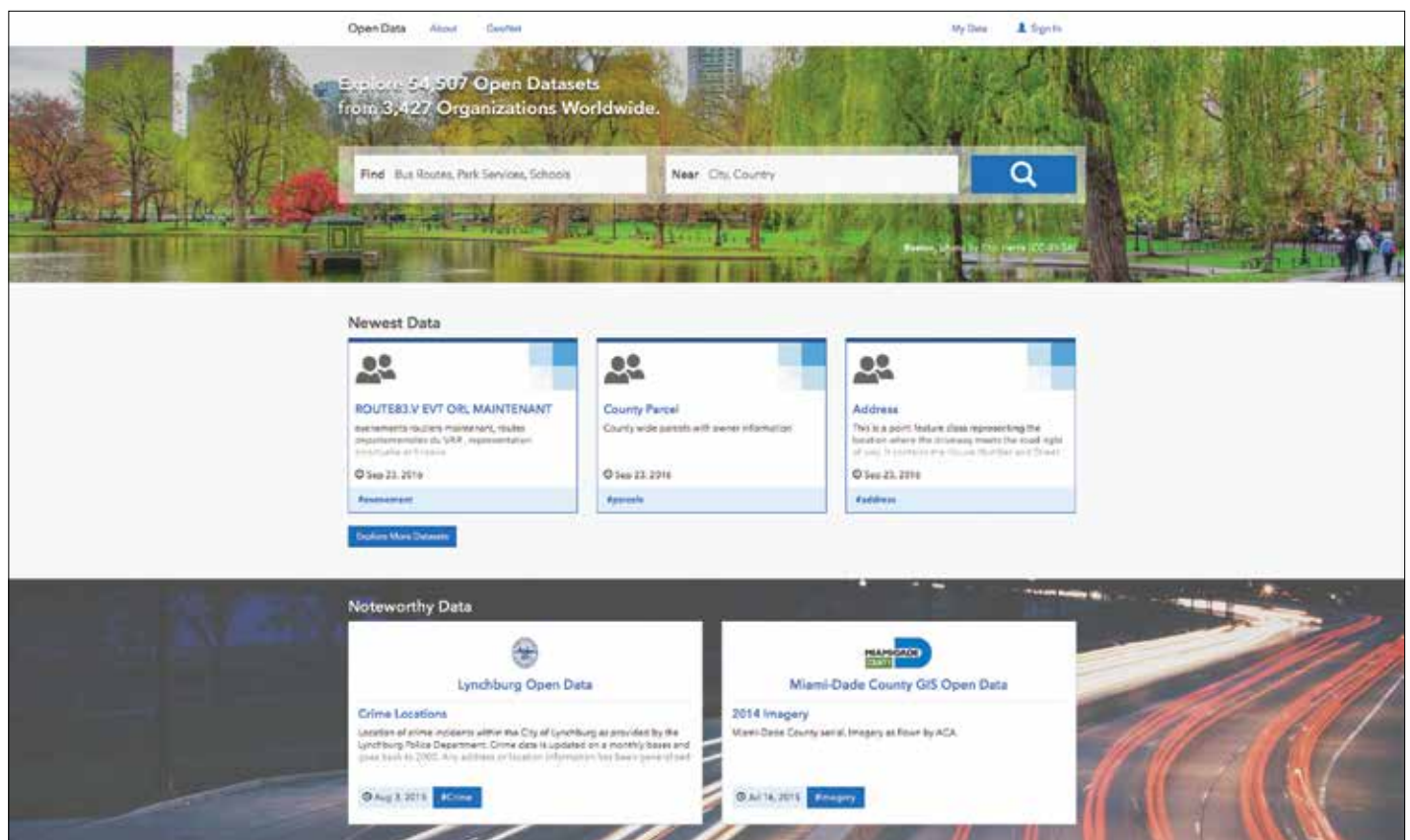
Open Data at No Extra Cost

Too often, it is assumed that making data open and available to the public is expensive, complicated, and not very advantageous. Executives deem that forming and executing an open



↑ Andrew Turner, director and chief technology officer of the Esri R&D Center in Washington, D.C.

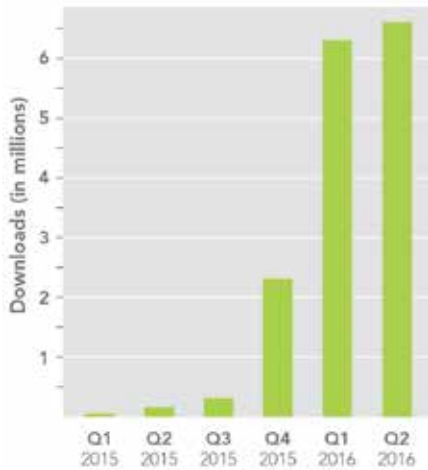
data strategy involves a long process of acquisition, installation, and operational work that burdens already busy IT groups



↑ It takes only a few minutes on ArcGIS Open Data to enable, build, and publish a site.

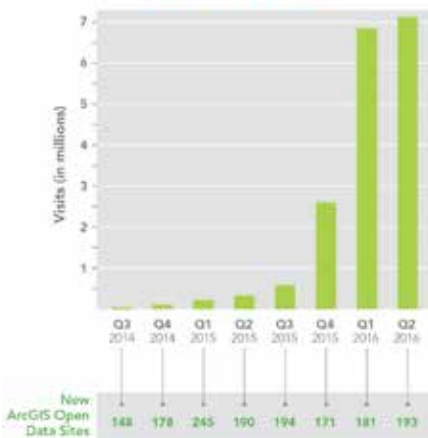
Dataset Downloads from ArcGIS Open Data Sites

Total: 15,572,393



Visits to ArcGIS Open Data Sites

Total: 17,727,465



that are just striving to get through their day-to-day work and respond rapidly to unexpected occurrences.

However, many organizations are realizing that ArcGIS is an exhaustive solution for open data. When combined with the rest of Esri's mapping platform, it can be used to support business development, collaborate with other governments, and tell stories that really engage citizens. The data services already available in ArcGIS can be reused to share integrated, sustainable, and effective data with the public.

ArcGIS Open Data is included with ArcGIS Online at no extra cost. It requires only a few minutes to enable, build, and publish an open data site. Organizations

can create as many open data sites as they need, as well as configure and design them. For example, an organization can have a main ArcGIS Open Data site along with other open data sites for individual agencies, specific initiatives and events, or even local neighborhoods.

The software can be configured to use existing, on-premises layers in ArcGIS for Server. Alternatively, organizations can publish their data in cloud services. ArcGIS Open Data sites include unlimited bandwidth, and members of the public can download as much data as they want. Citizens can also create public accounts where they can save data, share it, and tell their own stories using an organization's open data. What's more, ArcGIS Open Data provides performance dashboards so that agency employees and even the public can monitor and evaluate key initiatives like affordable housing, reducing traffic congestion, and keeping pedestrians safe.

Available to All Governments, Organizations

About 3,500 organizations all over the world already use ArcGIS Open Data. The US Department of Transportation recently launched its National Transit Map, which has reportedly collected 400,000 transit stops and 10,000 routes from 270 agencies and uses ArcGIS Open Data to share the information. In February, the US Department of Homeland Security introduced HIFLD Open from the Homeland Infrastructure Foundation—Level Data subcommittee, which makes national infrastructure data available to support community safety, disaster resilience, and economic development. The US Department of Education and the US Department of Housing and Urban Development have ArcGIS Open Data sites, as do the United Kingdom's Office for National Statistics and Australia's Commission on Safety and Quality in Health Care for its Australian Atlas of Health Care.

Smaller towns, nonprofits, and community groups are creating open data

sites too. Washington, DC; Bexar County, Texas; Chesterfield County, Virginia; Waukesha County, Wisconsin; and Manlleu, Spain, are just a few places that use ArcGIS Open Data to make their government information a public service.

ArcGIS Open Data is translated into 26 languages, so governments and organizations around the world can build their own open data sites to serve local communities. The World Resources Institute, for example, created forest atlases for the Congo Basin and used ArcGIS Open Data to configure websites in English and French.

Foster Data-Driven Citizenship

A study from the Pew Research Center in April 2015 discovered that while 65 percent of Americans in the previous year had used the Internet to find data or information pertaining to the government, only 5 percent reported that federal and state governments were very effective in sharing data, while just 7 percent said that local governments shared data very effectively.

"There is a real and powerful demand for access to open information," said Andrew Turner, director and chief technology officer of the Esri R&D Center in Washington, DC. "This presents a tremendous opportunity for government agencies and organizations to meet the needs of their constituents and supporters."

Every organization with access to ArcGIS can use ArcGIS Open Data to share information. It is integrated with a host of engagement tools, such as Esri Story Maps and Web AppBuilder for ArcGIS, as well as more than 200 open-source projects from Esri and the GIS community. Additionally, app developers can use APIs and platform libraries to build new, innovative solutions that drive economic opportunity and solve important local issues.

With ArcGIS Open Data, Esri empowers any community to have data-driven citizens.

Smart GIS Enabling a Smarter World

Los Angeles, New Orleans, Other Cities Around the World Highlighted

GIS is enabling a smarter world to take shape. While advances in technology are certainly facilitating this evolution, it is the people who use GIS who are responsible for making this change take hold.

"Your work is so innovative at demonstrating the power of smart GIS," said Esri president Jack Dangermond. He told an audience of 16,000 people during the Plenary Session at the 2016 Esri User Conference, "You are working on virtually all the significant challenges and issues on the planet, from climate change to food production to humanitarian relief to making cities better."

Dangermond spotlighted scores of maps generated by users all over the world that address issues ranging from environmental monitoring, energy development, and transportation planning to building management, disaster response, health, and education.

"GIS and maps are the common language that brings us together: they help us communicate, they help us understand, and they will help us act," he said. "You are addressing so many of our planet's increasing challenges," from loss of nature and lacking biodiversity to ongoing social conflict.

"GIS—your profession, your technology—provides the framework and the process for creating...a smarter world," asserted Dangermond.

With its ability to integrate and manage data, GIS transforms abstract information into visual models—maps, charts, and 3D representations—that are increasingly informing people and organizations all over the world. The technology integrates content and provides the context for understanding why things are the way they are, allowing anyone who uses GIS to analyze the interrelationships among various phenomena. By using this technology to connect and collaborate,



people and organizations can gain a better understanding of the forces that shape the world we live in today, with the goal of discovering and designing better paths toward a more sustainable future.

GIS is undergoing a transformation as well. With the Internet of Things (IoT) promising to measure in real time virtually everything that changes or moves, a massive digital transformation is under way. Enormous amounts of data are now becoming more widely available, and maps have the ability to not only visualize this information but also integrate data from many sources and communicate this information to people and organizations.

Bringing Together Disconnected Data

"Smart GIS...is about integrating everything—connecting people and processes and things and all the data about them," noted Dangermond. "Smart GIS, for me, also means being able to engage communities."

This, in fact, is what the City of Los Angeles, California, is doing with its Los Angeles GeoHub, which brings together disparate data that, until now, has been stored in different city departments.

The online public platform encourages residents to use this data and the ready-to-use apps available at the GeoHub to improve their city.

"The citizens of Los Angeles and the employees are basically weaving together pockets of our GIS data and technology that have been hidden in the halls of our city," said Lilian P. Coral, chief data officer for the Office of Mayor Eric Garcetti in the City of Los Angeles. "What this has meant is that we've been developing applications that matter and we're putting data to work."



↑ Lilian P. Coral, the chief data officer for the City of Los Angeles, showed the audience the Los Angeles GeoHub.

For example, GeoHub is being used to inform initiatives such as Vision Zero, which aims to lower the number of deaths and serious injuries caused by traffic collisions. And the city's Street Wize app uses Web GIS to pool data onto a single map so that citizens can see in-progress or upcoming construction work on their streets. Private developers can use Street Wize to examine building opportunities as well, and the city uses the app to minimize construction conflicts and encourage coordination.

"The GeoHub dynamically integrates real-time data onto this user-focused map," added Coral. "And now we can use the same data and actually feed it into other applications—say, for emergency management."

As Los Angeles mayor Eric Garcetti specified, "[The] portal enables us to reinvent the way we're delivering services and broadens our ability to engage everyday residents and businesses."

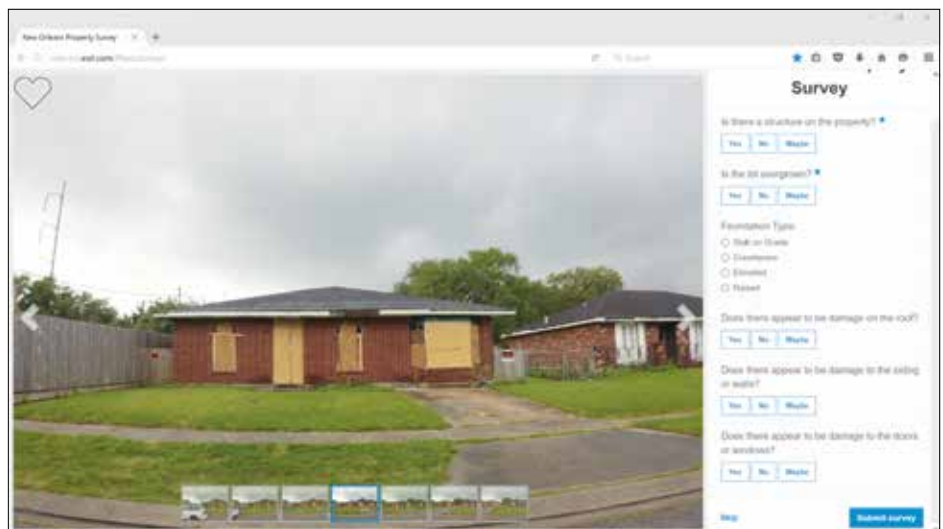
Surveying Blight in the Big Easy

The City of New Orleans, Louisiana, is conducting similarly engaging projects, though with a bit of its own flair. In an effort to be extremely thoughtful about how the water-bound city uses its land, New Orleans—together with the community—built a map that uses soil permeability, wetlands, and historical flood zones to show areas where the ground is highly absorbent and likely not ideal for development.

"Using this map, we can think in completely different ways about how we build our environment and our neighborhoods," said Lamar Gardere, the city's chief information officer.

Gardere also exhibited the city's BlightStatus crowdsourcing web app, which in addition to educating residents about the blight remediation process also enlists citizens to report blight.

After collecting street-level photos of every parcel in New Orleans, the city created a six-question survey that people can use to determine blight on individual properties. Having members



↑ The City of New Orleans' BlightStatus crowdsourcing web app enlists citizens to report blight while educating them about the blight remediation process.

of the community use the photos to report whether or not there is a structure on the property; if the lot is overgrown; and if the walls, doors, or roof appear to be damaged allows the city and citizens to get a better idea of where blight is occurring around New Orleans and what needs to be done to restore these areas.

"Running frequent surveys will give us a reliable layer of vacant lots and foundation type, giving us a sense of our housing resiliency," said Gregory Hymel, the GIS director for the City of New Orleans.

As he pointed out, having a baseline on blight before hurricane season helps New Orleans tremendously with recovery efforts.

Insuring a Smarter Future

Knowing how natural disasters could affect various areas is at the core of what companies like Guy Carpenter do. One of the world's largest reinsurance brokers, Guy Carpenter helps its customers—insurance companies—manage claims and assess risk. And it uses GIS to do so.

For example, Guy Carpenter used ArcGIS to visualize which neighborhoods were impacted by a massive wildfire in Fort McMurray, Alberta, Canada, earlier this year. The fire destroyed about 2,400 homes and buildings and forced more than 80,000 people to evacuate.

"We could...pinpoint individual homes destroyed by the fire," said Shannon Peterson, a product manager for Guy Carpenter. "With this information, insurance companies can focus in on the homes that they insure, estimate their losses, prepare for expected claims, and put the resources in place to assist their policyholders."

Guy Carpenter also provides clients with a catalog of historic, mapped data that goes back 60 years and shows the relative risk of natural disasters such as tornadoes throughout the United States.

"In states where tornadoes are prevalent, insurance companies need to balance a mix of locations [for policies] they have across these high- and lower-risk areas," said Peterson.

The company also has a web-based risk management app called GC AdvantagePoint that uses ArcGIS to tackle clusters of risk.

"Bringing together the power of GIS and our industry knowledge...we help our clients manage a concentration of risk through stunning visualization and powerful analytics," said Bryan Adams, senior GIS specialist at Guy Carpenter.

Peterson added that insurance companies also use the app to evaluate locations before underwriting new policies.

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Esri Announcements

E360 Snapshot

Esri's new and improved video channel, now called E360, is live and more user-friendly. Despite the new name and improved user interface, it still has the same great content as before! You can browse E360's full library at go.esri.com/StateLocalE360. Here is a snapshot of some of our favorite videos:

ArcGIS Online Case Study: Public Utilities— Salt Lake City, Utah

See how Salt Lake City, Utah, uses ArcGIS Online to run its public utilities.

Watch this video at go.esri.com/SaltLakeCityAGOL.

ArcGIS Online Case Study: Special Events— Richmond International Raceway

See how Henrico County Division of Fire uses ArcGIS Online to manage incidents.

Watch this video at go.esri.com/HenricoCountyE360.

Interview with Richard Littlefield, City of Altamonte Springs

Richard Littlefield, Altamonte Springs GIS manager, shares why it was important to transition to an enterprise GIS. ArcGIS provides a citywide resource by pushing out GIS data to all users and allows them to create apps fast.

Watch this video at go.esri.com/AltamonteSpringsE360.

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Esri's Massive Open Online Course Program

Did you know that Esri offers free online training through our massive open online course (MOOC) program? These free online classes help you better utilize the ArcGIS platform and only require a couple of hours of study per week. The best part is that no previous GIS experience is required, and you will be given full access to the tools you need for each course free of charge!

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April 12–May 23

Going Places with Spatial Analysis

This course is for people who know something about data analysis and want to learn how the special capabilities of spatial data analysis provide deeper understanding. You'll get free access to the full analytical capabilities of ArcGIS Online, Esri's cloud-based GIS platform. Previous experience with GIS software is helpful but not necessary.

The Location Advantage

Location analytics uses the locational component of business data to improve users' understanding of their market, customers, and business processes. Organizations throughout the world use location analytics to make better decisions and gain a competitive advantage. This free, instructor-led MOOC explores the capabilities of Esri Business Analyst Online.

To learn more about Esri's MOOC program, see the 2017 course schedule, and sign up for a MOOC, visit go.esri.com/StateLocalMOOC.

"Underwriters are able to see the concentration of other homes they already write in that area," she said. "Underwriters can also evaluate hazards around the location like terrorism targets, distance to [the] coast, distance to fault lines, and other hazards as customized by the insurance company."

Insurance companies that use GC AdvantagePoint can even get live data feeds to real-time information, such as wildfire perimeters, so they can monitor situations that might affect their policyholders.

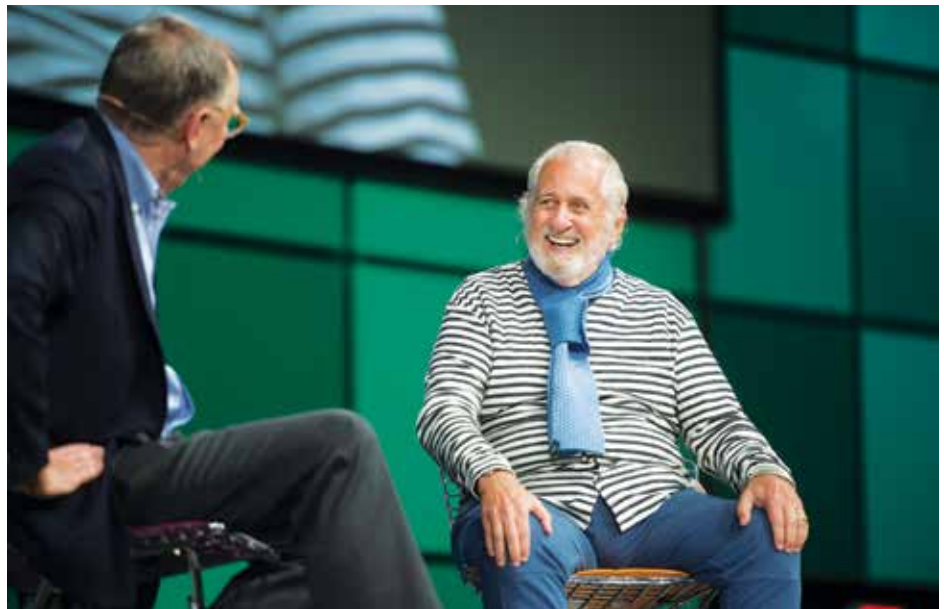
A Humboldtian View of Nature

Although nature can be vexing to insurance companies, it was what motivated and inspired Alexander von Humboldt. The Prussian scientist and naturalist spent his life in the eighteenth and nineteenth centuries studying and writing about nature. He explored South America and Russia, observing a diversity of plants, animals, and geology.

Andrea Wulf's book, *The Invention of Nature: Alexander von Humboldt's New World*, explores Humboldt's views of nature "as a web of life." She said one of his goals was to excite in people a love of nature.

Humboldt's writings—including his seminal book *Cosmos: A Sketch of the Physical Description of the Universe*—greatly influenced a number of prominent naturalists, politicians, writers, and thinkers, including Charles Darwin, Henry David Thoreau, and John Muir, Wulf said. The maps and infographics in these books, which accompany essays about science and nature, were pioneering, foreshadowing what we know today as GIS.

Wulf showed examples of Humboldt's maps, including one that focused on the transportation of precious metals around the world. Another showed the location of volcanoes and earthquakes, with green circles illustrating groups of volcanoes; green and red dots showing inactive and active volcanoes, respectively;



↑ According to Richard Saul Wurman, the only way humans can bring about a better world is to embrace the individual way everyone understands things and put together those idiosyncrasies, like GIS does. His new book, *Understanding Understanding*, will be published next year and will feature GIS and mapping as a fundamental language for understanding.

and gray shaded areas displaying where earthquakes had occurred.

"[Humboldt] was...the founder of what you are doing here today," Wulf said. "He said that with knowledge comes thought and with thought comes power. So his belief in the free exchange of information, in uniting scientists, in fostering communication across disciplines remains an important pillar of science and communities today. And this is exactly what you are doing here. You are sharing all your knowledge, all your data with your Web GIS."

Embracing Understanding

Just as Humboldt cultivated and shared his knowledge, so should GIS practitioners.

"Geography, mapping, [and] GIS have never been so important," said Dangermond. They provide "the language of understanding of our world and...a platform for creating a better future."

With GIS continually getting smarter, humans today are aware of things they couldn't have known before—things about the built environment, about nature, about the planet. That engenders

a different kind of understanding about the world—and that is just what Richard Saul Wurman, founder of TED Talks, wanted the audience to contemplate at the end of the Plenary Session.

"I'd like you to think about how you personally understand things," he prompted. "Don't measure yourself by what teachers or parents or others tell you...that this is the only way you can do things."

Instead, he urged attendees to figure out how they each go about understanding things. It will be different from person to person, he said, but he gave everyone "permission...to embrace that idiosyncratic, human way each of us understands things."

Because, just as GIS cultivates new understanding, so do different ways of understanding create a better, smarter world.

Racine County, Wisconsin, Uses Esri Technology to Quickly Serve Land Records and Open Data

Web GIS Gives People the Ability to Access Information Using Any Device

By Tyson Fettes, Racine County Register of Deeds



↑ Tyson Fettes, the county's Register of Deeds, helped spearhead efforts to share land records information using Web GIS.

When I became the recorder for Racine County, Wisconsin, in 2011, I envisioned sharing records and parcel data with the public using focused web apps. I wanted a lean, efficient government enabled by modern mobile and web technology.

I knew this would be a challenge—more than a decade had passed since the county's first GIS implementation. In the intervening years, advances in web GIS had outpaced the county's ability to keep up with changes in technology. Our GIS consisted of a legacy map viewer with multidirectional arrows that users had to click to navigate. It had too many layer options, expressed stale data, and was slow. What was a first-of-its-kind public-facing mapping system in 2006 had become a relic.

Today, the county Register of Deeds apps and an open data portal appear in a portfolio on the GIS & Maps section of the Racine County home page. Created with web GIS templates available in Esri ArcGIS Online the apps in the gallery give our community immediate access to land, property, and tax information that residents previously could only obtain by visiting or calling the Register of Deeds office. Web GIS now lets us serve essential land information to residents in the form of apps such as Racine County Mapbook, which displays parcel ID numbers, names of landowners, and current assessment



↑ Visitors can search for maps or data via a public app gallery.

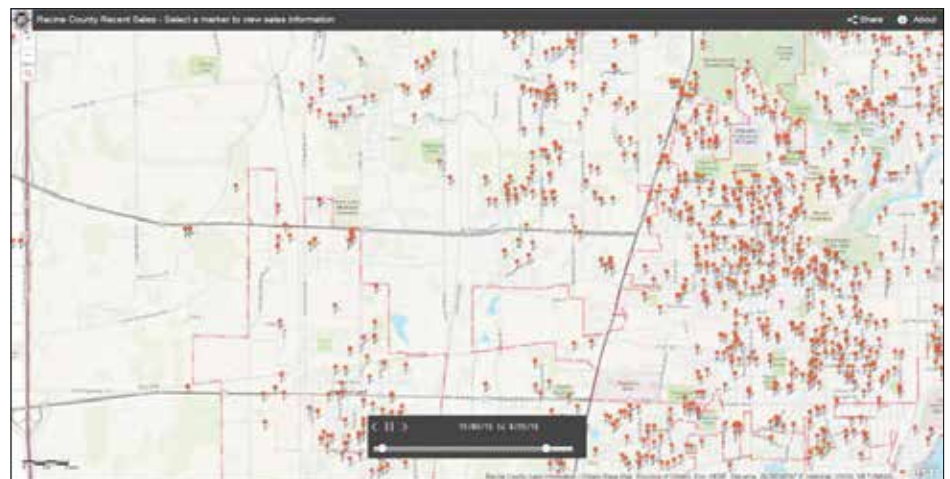
values; Racine County Recent Sales, which maps the location of property sales; and the Racine Sheriff Foreclosure App, which lists dates of sales for foreclosed properties. The portfolio page also includes a multipurpose portal that hosts a growing collection of more than 20 land-related datasets that people can download or map within the same interface.

How did we get to the point where Racine County residents can now easily map open data and find many land records documents online? From 2011 and 2015, we scanned old records, updated our aging tax system software, and connected real estate data in the county to lay the foundation that would make my vision a reality. We have achieved this goal by using the ArcGIS Online Web GIS resources available through Racine County's license agreement with Esri.

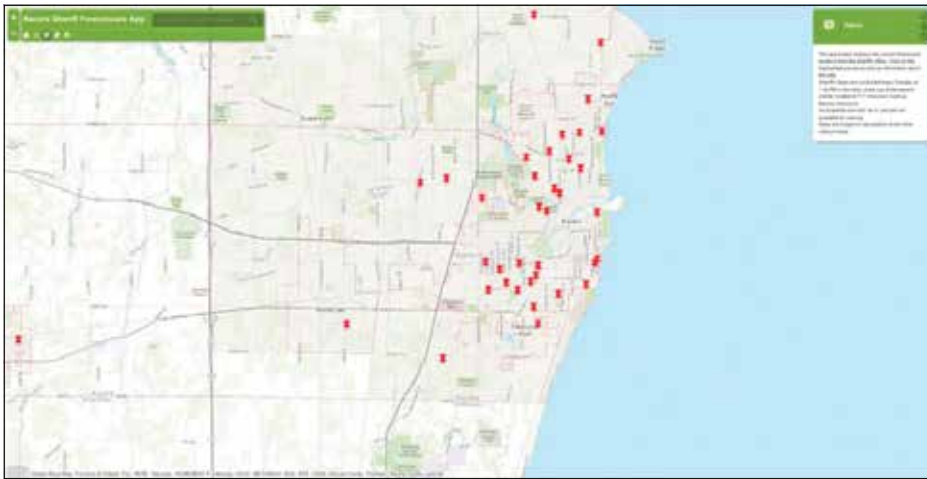
Weeks after the Register of Deeds office launched the project in 2015, the county board noticed our progress in connecting major systems and subsequently green-lighted integration for the whole enterprise.

Integrate and Deploy

Our public-facing mapping system also needed to be usable on mobile devices. If you wanted to view the maps on an iPhone or Android device back



↑ The Racine County Recent Sales map shows the locations of property sales within specific time periods. When people click on a symbol, a pop-up will appear that lists information such as the value of the property and the names of the buyer and seller.



↑ The red symbols show where foreclosed properties are for sale. Users who click on a symbol will see the address of the foreclosed property and the time and date of the upcoming sale.

in 2011, forget about it. More than half of all citizens and workers today access maps on phones and tablets—mobile capability was becoming an expected public service for the county. Without standardization and a vehicle to nimbly share county land records data, none of the office's digital assets would be in any shape for presentation in mobile browsers, much less desktop browsers.

To modernize the county's information data management and serving practices, my office collaborated with Esri partner Pro-West & Associates, which helped us define two broad objectives for the overhaul:

Integrate the processes of multiple departments.

Deploy solutions quickly that work on any mobile client.

To my surprise, I learned that the Local Government Information Model (LGIM), Esri's standard for homogenizing all local government data holdings, would help us meet the first of those objectives. LGIM essentially converted all office data into the same language so that all systems could "talk" to each other. This meant that data in the tax system could be hyperlinked to the specific item on the map and vice versa; items on the maps can be clicked, which takes the user back to the tax system and creates a continuous fact-finding experience.

To deploy solutions quickly, the county used Esri's web app templates

configured for common government tasks. Esri provides easily modifiable land record templates to serve tax parcel information and show the location of all foreclosed properties within any county. Migrating to LGIM was the first step in getting the data uniform and connecting departments, enabling us to produce public apps quickly.

A significant part of that process involves migrating parcel data to the parcel fabric—Esri's parcel editing standard and a subset of the LGIM standard that contains necessary data layers. With so many departments—including police and fire—relying on the office's parcel maps for accurate addressing, the fabric would establish a clean address database for our county as well as bring semi-automated editing to parcel work.

Pro-West helped assess our data and create an action plan that included a fundamental data cleanup. This involved using rules to move data to LGIM and prepare it for migration into the parcel fabric.

Presenting the Apps

One of the first web apps to populate the gallery was Racine Sheriff Foreclosure App. For years, the Racine County Sheriff's Department had compiled a list of foreclosed properties and posted it in public places like the library and Town Hall. To readily present that information to a wider audience, we collaborated with the department to create a map that displayed

information from the county foreclosure database. Users can click on properties and get the parcel ID and other information, such as time and date of sale.

Soon after that app went online, we launched Racine County Recent Sales. The list of weekly home sales in a county like ours usually appears in a newspaper. The app includes a time slider for users to animate the chronology of recent sale properties and see a wealth of weekly updated property sales data. Each pin links directly to the tax system and expresses the data in it. Clicking the pin opens a pop-up window that shows assessed value, tax amount, and other registry information—a huge improvement over the newspaper's static list.

The latest addition to the gallery is our new Open Data Portal. Although not specifically land records related (it includes everything from imagery to soils data), the portal will eventually be expanded and folded into our county enterprise GIS.

Follow the Model

While the gallery includes many apps, the Racine Sheriff Foreclosure and Racine County Recent Sales apps exemplify what is so appealing about LGIM. First, the model simplifies the work of homogenization by getting everything standardized and connected. That's essentially part one. The second part is apps that give all that hard-fought extraction, transformation, and loading (ETL) work—the scanning, the data scrubbing, the converting—an avenue of expression that's accessible anywhere. I also can't overemphasize how appealing it is that these apps work on all devices, given the obvious mobile nature of land records management.

Admittedly, the first step of digitizing/ETL is the biggest in terms of effort but bears the most fruit down the line. That rigorous back-end work is what ultimately removed more than 20 steps from the legacy process of getting land records and property tax data to users on the front end. Now Racine County is poised to create more apps this way for many of its offices using its Register of Deeds office as a guide.



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