

ArcNews

Esri | Fall 2013 | Vol. 35, No. 3

India: A Vision for National GIS



India has long adopted modern remote-sensing and GIS technologies for various development projects. Today, it recognizes that empowering its citizens and modernizing governance are urgently needed for future nation building. In support of this national goal, India is set to establish a next-generation GIS—a National GIS—that empowers its citizens, enhances efficiency in governance, and supports an inclusive social and economic order. Dovetailed into this larger vision of National GIS, the state of Karnataka has envisioned its statewide GIS subplatform. India is looking at innovative GI policies by which such authoritative and updated GIS data and a wide range of applications would become possible. (See pages 16 through 21 for a preview of the future.)

GIS: Transforming Our World

By Jack Dangermond

To everyone who attended the 2013 Esri International User Conference, I want to thank you for helping to make this year's conference such a great success. For those who could not attend, let me take a few minutes to give you an overview of the opening remarks from Monday morning. Also, if you would like to view the Monday Plenary Session, it is available at esri.com/uc.

The theme of this year's conference was "GIS: Transforming Our World." The word *transformation* can refer to two types of change: physical change, as well as change in how we perceive things. GIS is relevant to both.



Our world is facing serious challenges.

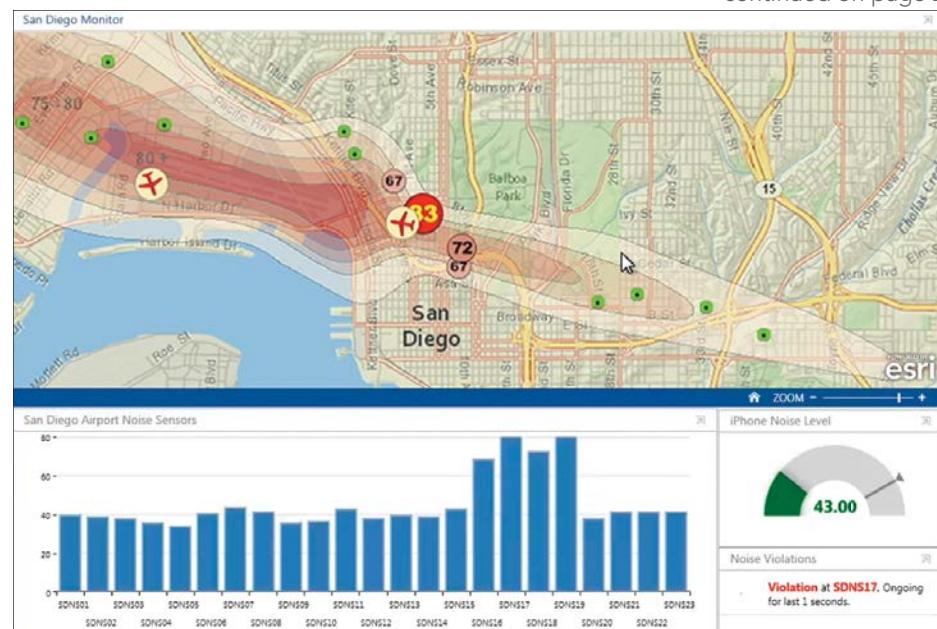
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Completely Integrating ArcGIS for Server, Portal for ArcGIS, and ArcGIS Online

Implementing Web GIS

Web GIS is a new pattern for delivering GIS capabilities and is at the center of Esri's strategic direction for implementing GIS as a platform. Maps on the web provide a new paradigm for how people everywhere access and use geographic information. They use GIS maps on their desktops, the web,

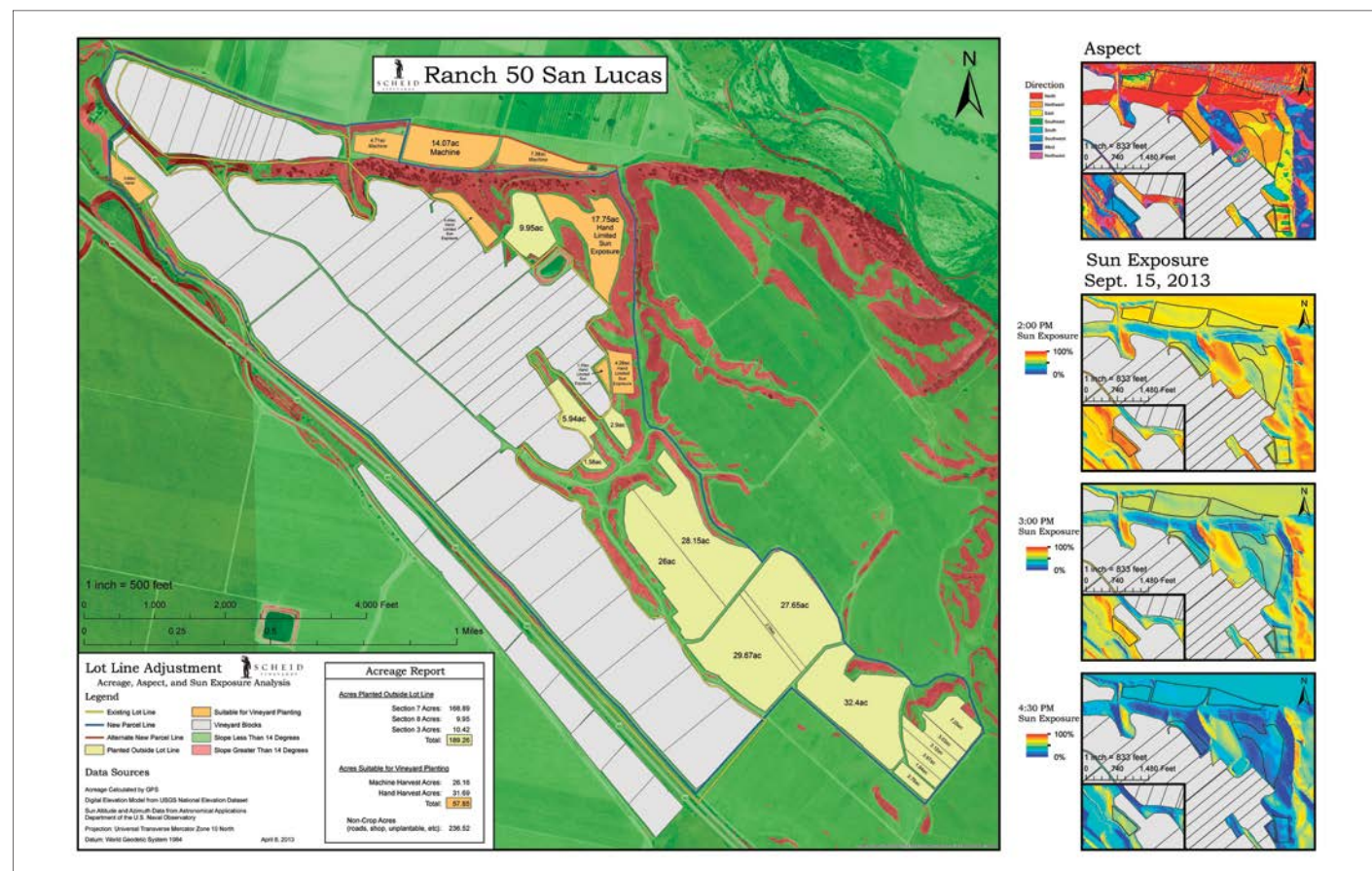
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Web GIS supports real-time visualization and analysis. It also provides a flexible and agile framework for implementing GIS as a platform.

Scheid Is at the Cutting Edge of Geospatial Agricultural Management

World-Class Vineyard Uses GIS to Fine-Tune All Its Operations



Scheid Vineyards (originally known as the Monterey Farming Corporation) was founded in 1972 in Monterey County, California. The business has progressively grown, and today it farms approximately 4,200 acres of varietal wine grapes, making it one of the leading independent producers in the United States.

Monterey County is known for having the longest growing season in the state due to the maritime influence of Monterey Bay and the unique geography of the Salinas Valley. This longer "hang time" (the time the fruit spends on the vine) allows the grapes to ripen slowly and evenly and achieve peak flavor development. Scheid Vineyards, with 10 estate vineyards located along a 70-mile spread, is able to grow 29 different varieties in a spectrum of styles.

The first implementation of GIS on the vineyard started in 1998, when Tyler Scheid surveyed all the vineyard properties in submeter

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Land suitable for planting a vineyard to be machine harvested needs a slope of less than 14 degrees for the harvester, good sun exposure in September to ripen the fruit, and to be southern facing. This map shows all three factors and identifies the best places to plant. The map was made using a digital elevation model and ArcGIS for Desktop.

Implementing Web GIS

continued from cover

Deployment Options

- Cloud only
- On-premises only
- Cloud and on-premises hybrid

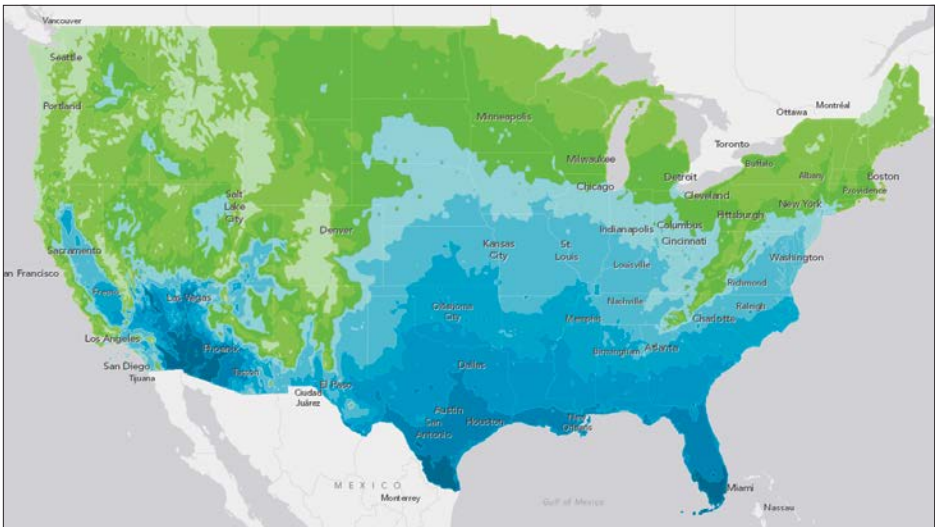
tablets, and smartphones for a sophisticated range of activities to apply advanced geographic information.

Web GIS is a transformation of GIS that brings analytics to spatial data in a way that wasn't possible before. Previously, spatial data had to be processed, modified, and extracted to answer a predetermined set of questions. Now, the data is transformed into web maps or services that are mashed up with different layers into a web GIS, which provides the flexibility to answer any possible question. The data is ready and waiting to dynamically answer questions. It

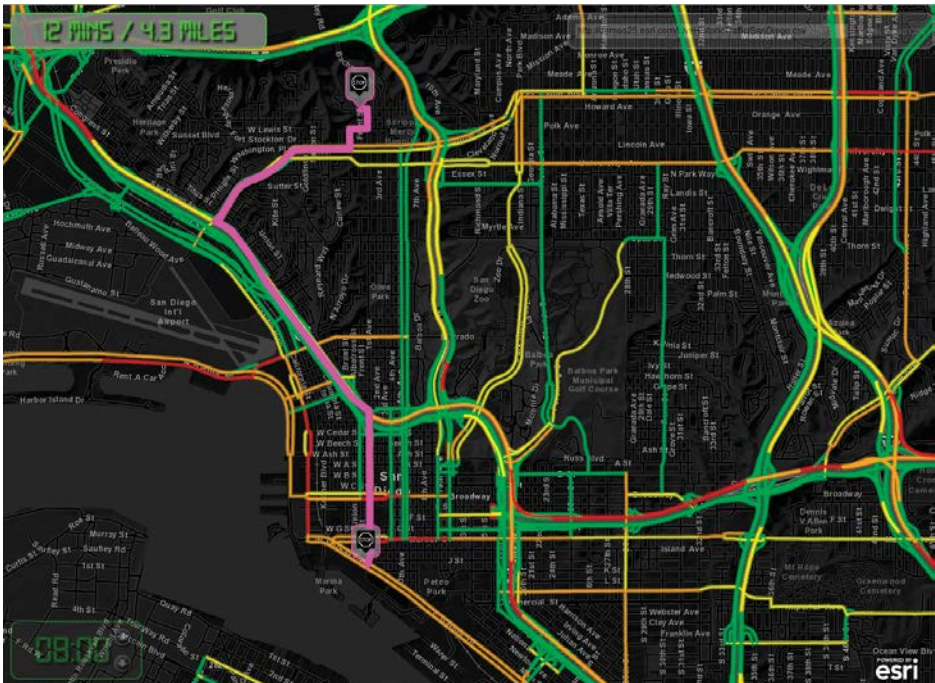
no longer needs to be processed for each individual question. Web GIS is a much more flexible and agile workflow.

Web GIS brings GIS into the hands of the people. It reduces the need to create custom applications, provides a platform for integrating GIS with other business systems, and enables cross-organizational collaboration. Web GIS allows organizations to properly manage all their geographic knowledge. At the heart of web GIS is a mapcentric content management system.

How does one go about implementing web GIS? One of the strengths of the ArcGIS platform is its flexibility to support the web GIS implementation method that best fits an organization. It can run completely in the cloud, completely within an organization's own infrastructure, or in a hybrid pattern.



Web GIS makes any data, such as the current weather conditions, ready and waiting to dynamically answer any possible question.



Integrating real-time information, such as traffic data, into ArcGIS maps and apps is critical for workers in the field.

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ArcNews (ISSN 1064-6108) is published quarterly by Esri at 380 New York Street, Redlands, CA 92373-8100, USA. ArcNews is written for the Esri user community as well as others interested in mapping and geographic information system (GIS) technology. It contains material of interest to planners, foresters, scientists, cartographers, geographers, engineers, business professionals, and others who use spatial information.

Cloud-Only Deployment

The cloud-only deployment pattern is ArcGIS without the box; everything runs in the cloud using ArcGIS Online. ArcGIS Online provides a mapcentric content management system that stores the data, delivers GIS services and content as software as a service, and manages user access and security. ArcGIS Online also provides ready-to-use content from datasets to basemaps and on-demand services that supplement an organization's own geospatial data. It is an excellent entry point to ArcGIS because it provides simple mapping tools that can be accessed from web browsers, tablets, and mobile devices and because setup and maintenance of the GIS infrastructure are securely handled by Esri.

On-Premises-Only Deployment

However, some organizations cannot utilize a cloud-based implementation. They may not have an Internet connection or their connection is unreliable. In many cases, government or industry regulations prevent them from using cloud services or storage. An on-premises-only deployment is ideal for these situations. Everything runs on the organization's own internal IT infrastructure using ArcGIS for Server with the Portal for ArcGIS extension.

ArcGIS for Server transforms data, whether it's a file, a database, or a real-time data stream, into services that people can access over the web. It enables GIS capabilities in the organization's infrastructure so they can be accessed anywhere and at any time. The Portal for ArcGIS extension provides the mapcentric content management system and collaboration tools that connect GIS data and services with people

through apps. This implementation can be supplemented with Data Appliance for ArcGIS, which provides local instances of ready-to-use services from ArcGIS Online.

Cloud and On-Premises Hybrid Deployment

Combining the cloud and on-premises deployment methods into a hybrid deployment can provide the best of both worlds. ArcGIS for Server provides the behind-the-firewall data storage, sharing, and processing, while ArcGIS Online provides cloud-based sharing, dissemination, and collaboration. This implementation also allows organizations to integrate the ready-to-use content from ArcGIS Online with the data and services hosted on their internal infrastructure. This method allows organizations to take full advantage of the advanced capabilities of ArcGIS for Server while taking full advantage of the cloud GIS platform provided by ArcGIS Online.

The hybrid deployment method also provides the most flexibility to adapt a GIS infrastructure to meet an organization's changing needs.

Conclusion

The ArcGIS platform flexibility allows organizations to choose the best implementation method for them, whether that's cloud, on premises, or a hybrid. The determination of which implementation method an organization should use should be based completely on which one works best with its needs and existing IT infrastructure.

For more information about ArcGIS Online, visit esri.com/agol. For more information about ArcGIS for Server, visit esri.com/server.

World-Class Vineyard Uses GIS to Fine-Tune All Its Operations

continued from cover

Highlights

- GIS is used to manage data, such as ground moisture content, the presence of harmful insects and mildew, and the status of specially cultivated rows.
- ArcGIS aids harvest analysis, the selection of prospective planting sites, in-field data collection, and determining irrigation requirements.
- Broad access to the GIS platform ensures that everyone in the organization is on the same page.

GPS, including a detailed irrigation system and frost zone mapping at the Hames Valley vineyard. ArcView then allowed him to do some basic analysis, such as generating soil series acreages relative to vineyard blocks and verifying vine count for each block compared to geographic acreages.

Gregory Gonzalez joined the company in 2009 as an intern after graduating from nearby California State University, Monterey Bay, with a degree in GIS, and has since brought the GIS program at Scheid to new levels of sophistication. Today, Gonzalez is a ranch supervisor and GIS technologist at the vineyard. Other GIS/vineyard technology team members include Jonathan Vevoda, a GIS specialist, and Scheid, technology coordinator. Together they have implemented an enterprise-wide precision farming system with the ArcGIS platform at its core. The GIS is used for data management, harvest analysis, selection of prospective planting sites, in-field data collection, and determining irrigation requirements and as a company-wide information portal.

"A GIS is the backbone of any precision farming operation," says Vevoda. "It is the spatial data reservoir from which you can draw in order to make informed decisions in a timely and efficient manner. Using a GIS as the information hub in an agricultural operation ensures that everyone within the company is looking at the same data and the entire operation is aware of what is going on in the individual departments and can react accordingly."

Complementary Operations

In addition to ArcGIS, Scheid Vineyards uses complementary geospatial software in its operations. Equipment tracking via Global Positioning System/code division multiple access at one-minute reporting intervals is provided by Geoforce of Coppell, Texas. It was

integrated with ArcGIS so that it could feed ArcGIS for Server at 15-minute intervals with its postprocessed tracking data. In addition, geofences were established based on the vineyard's infrastructure features so that equipment usage can be tracked to the block level with the GIS. (A geofence is a virtual perimeter that encloses a specified area. When used with a location-based service, an automatic notification is generated and sent to the server whenever the geofence is entered or exited.)

For personnel and production management, the vineyard has partnered with AgCode of Glenwood, Minnesota, a production/payroll company that helps track costs and production to ranch, section, and block levels. It also has the ability to track these variables by crew or individual. By using AgCode, the vineyard was able to eliminate paper-based production records and capture field-level production data directly into the database, which then feeds ArcGIS. This gives it the capability to catch inefficiencies in near real time and then investigate and make adjustments when needed.

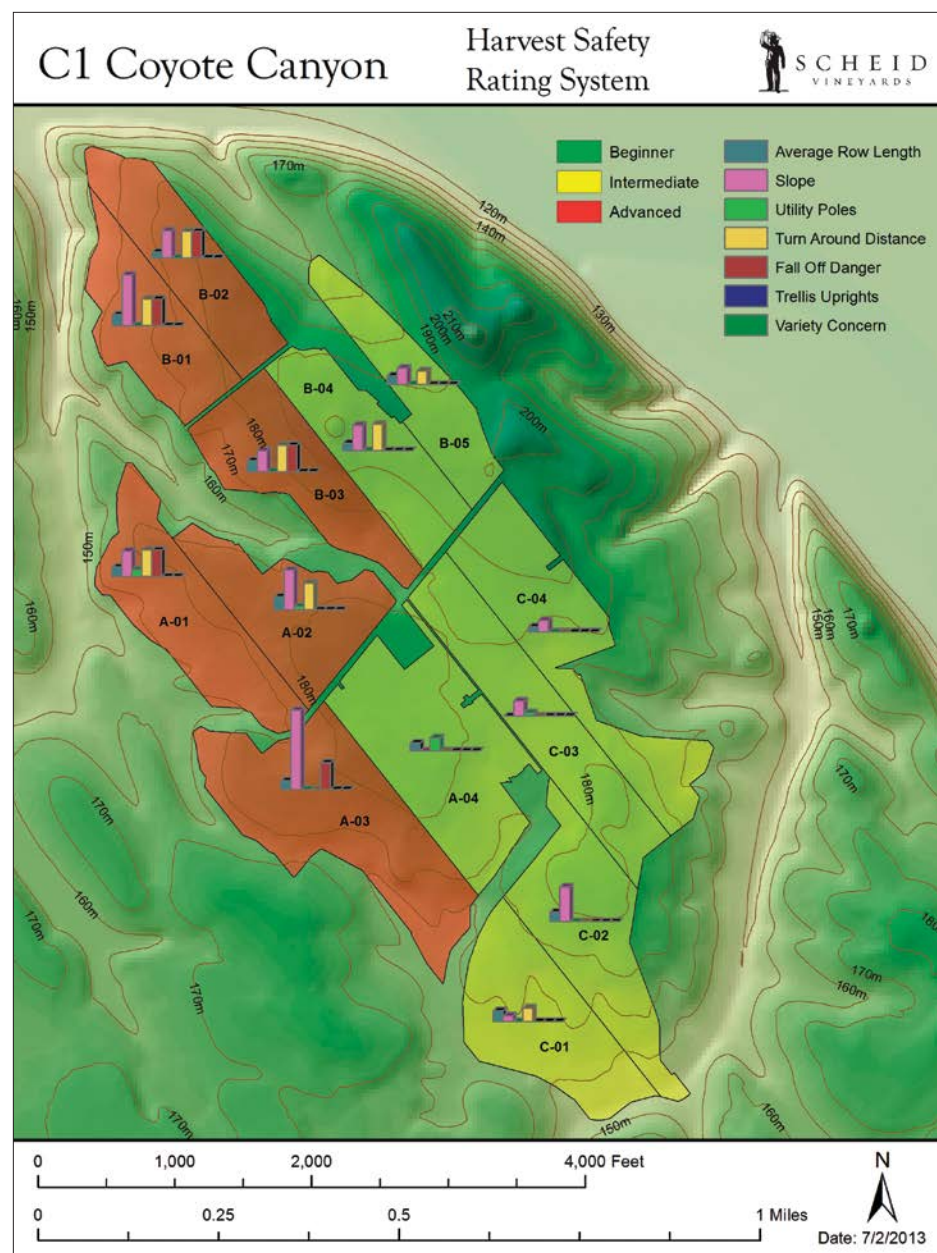
The vineyard also uses the Web Soil Survey, a US soils database produced by the National Cooperative Soil Survey and maintained by the US Department of Agriculture Natural Resources Conservation Service. This service provides information on soil types and crop suitability for specified areas. The site is regularly updated and is the single authoritative source of soil survey information in the United States. Scheid Vineyards uses the soils map layers for site evaluation for prospective plantings. It helps determine the most suitable vine rootstock and clone combinations in the areas selected for cultivation.

Scheid's Innovative Approach to Precision Agriculture

Neutron probes have been installed throughout Scheid Vineyards to monitor the amount of moisture in the ground in a specified area. The information collected from each probe is added to the GIS so that all the data can be interpolated to create a raster map that represents soil moisture levels across the entire operation. This soil moisture map then becomes another layer in the vineyard's enterprise GIS. The map will be used as part of the vineyard's irrigation geographic infrastructure, which is currently under development. The GIS/vineyard technology team is planning to integrate weather station and irrigation data with the soil moisture map and remote-sensing data so that it can become



Premium Monterey County wine grapes from Scheid Vineyards. (Photo Credit: Heidi Scheid.)



The Harvest Safety Rating System matches the experience level of Scheid workers with individual vineyard blocks as beginner, intermediate, and advanced. This greatly decreased Scheid's accident rate and increased production efficiency.

more dynamic and precise in the application and monitoring of its irrigation processes.

The team is currently testing various pest scouting data collection methods for use with its ArcGIS for Mobile platform. Throughout the growing season, the vineyard is constantly monitoring the vines for the presence of harmful insects, diseases, and mildew. Recording pest sightings and their locations in the field and then directly transmitting that information to the GIS for analysis allows ranch managers to take immediate action to combat a disease or insect invasion and minimize the damage to the vines.

GIS is also used to track the special treatment of some vines for Scheid's Estate Row program. This program involves the careful monitoring of specific rows of vines within the vineyard that are cultivated differently than the others, depending on the winemaker's needs. The treatment of these rows varies from year to year, and the winemakers carefully evaluate the quality of the wine produced after each harvest. The goal is to replicate an especially good wine by following the same procedures and treatments previously performed on a particular row. The collected data for the Estate Row program is maintained in the GIS so that it is accessible throughout the entire company for review.

"By developing an operations central GIS, we can integrate essential data from a variety of sources and eliminate a large portion of the tedious, time-consuming processes that previously made a major impact on our operational

efficiency," Gonzalez says. "Broad access to the GIS platform ensures that everyone in our organization is on the same page, which allows us to do more with less: less paperwork, less double data entry, less driving, less fuel, less confusion, less contradiction, and so on. In turn, we are creating more time for mission-critical tasks, such as evaluating production quality and characteristics relative to targets set in our wine programs. We can spend more time with the vines and, by doing so, increase our understanding and knowledge so that we can continue to push the envelope on the quality of our wines."

Down the Road

With Esri's announcement of ArcGIS GeoEvent Processor for Server, the vineyard hopes to take advantage of its real-time data streaming capabilities. "This will be a good product for our asset management program as we continue to build our geoinfrastructure," says Scheid. "It will allow us to not only track equipment movement but also the critical hours of usage, which will help us evaluate service schedules and overall equipment use. We also plan to use the ArcGIS Tracking Analyst and Network Analyst extensions to ensure the maximum efficiency and profitability from our equipment fleet."

For more information, contact Tyler Scheid, technology coordinator, Scheid Vineyards (e-mail: tyler@scheidvineyards.com).

GIS: Transforming Our World

continued from cover

The work of GIS professionals is creating many information products that are directly changing our physical world. Their work also changes how we see, understand, and interact with our world.

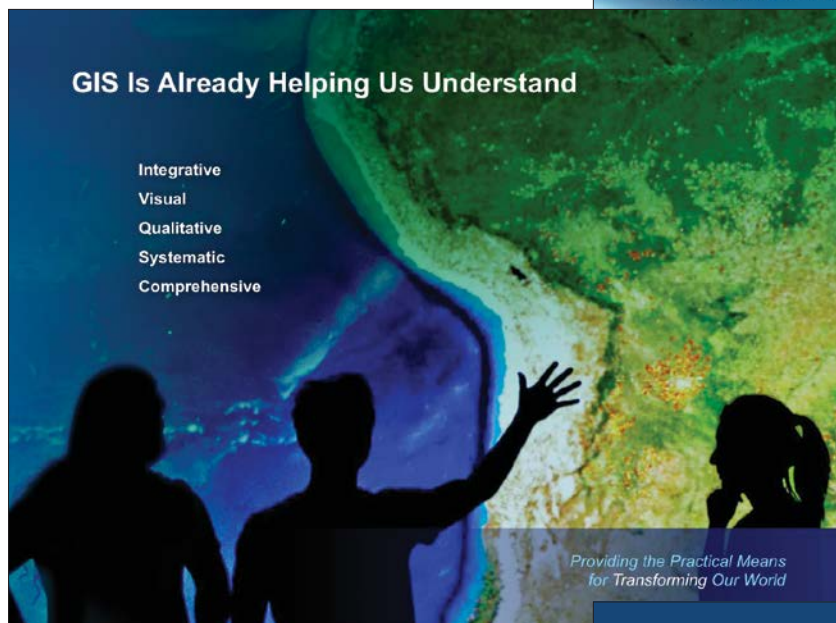
Today, our world is facing serious challenges on many fronts. It's becoming clear that we need to collectively work to create a better future. This means leveraging our very best design talent, as well as our best technology and science, to create a more sustainable future. GIS provides the platform for doing this.

The Power of GIS

GIS is already changing how we think and how we act. It is built on the science of geography and, as such, it provides an integrative and comprehensive framework that cuts across many disciplines and organizations. GIS also has the power of qualitative analytics blended with easy-to-comprehend geospatial visualization.

By integrating geographic science into everything we do, GIS is improving how we measure and analyze things, as well as how we predict the future. It is also providing better ways to plan, design, and make decisions. The success of the GIS community is creating tens of thousands of important systems around the world and providing evidence of the huge contributions our field is making.

For all these reasons, GIS is a promising technology for addressing issues at a larger scale—a global scale—in the world. To do this, we clearly need to also dramatically scale up its application and make it pervasive.



Scaling Up

By scaling up, I mean that we need to dramatically grow the application of GIS, leveraging the current community of users. We need to make it pervasive throughout organizations and across society.

Is this possible? My sense, as well as personal experience with other pervasive technologies such as the Internet and GPS, is that this scaling up is both possible and in some ways inevitable. GPS, for example, has been radically simplified, and this in turn has rapidly transformed human beings' sense of place. Together with consumer web mapping, we can now see both our whole planet and where we are at any time.

GIS will become pervasive in the same way, leveraging the connectivity of the web and cloud computing. The result will be better decisions that reflect better understanding and ultimately a more sustainable future.

GIS Changes How We Think and Act

Integrating Geographic Science into What We Do



Web GIS Can Represent All Data Types

As Web Maps and Web Services



Providing a New Medium for GIS

GIS Is Being Transformed

Into a Web GIS



GIS → Web GIS

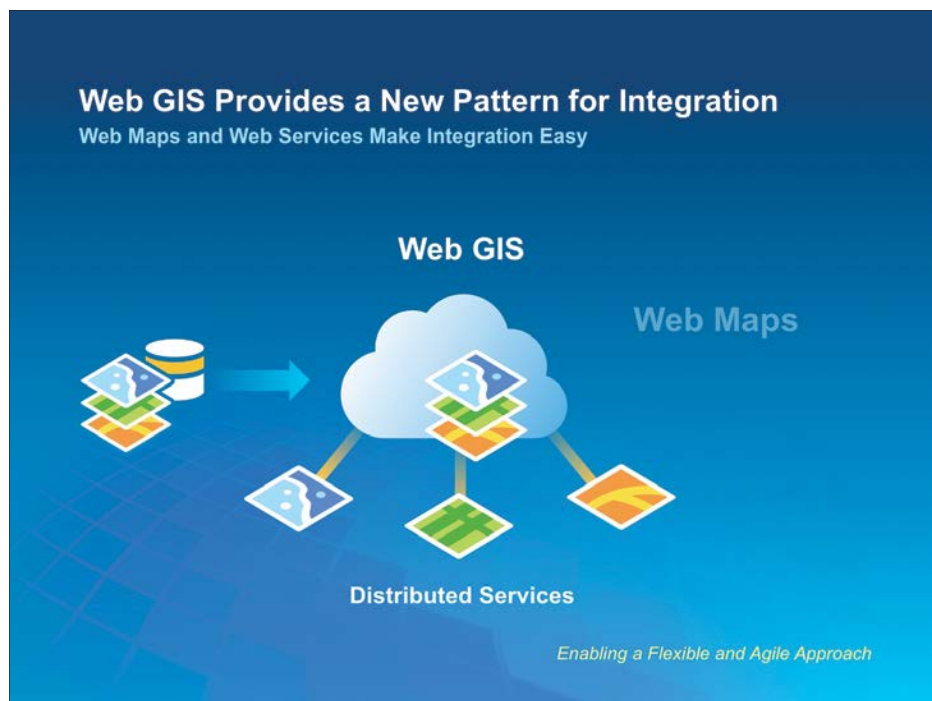
This next step in the evolution of GIS involves a new technology pattern—web GIS. With release 10.2 of ArcGIS is a complete web GIS, not just mapping. It integrates Esri's and other geospatial technology (i.e., using strong engineering and open standards). This platform takes advantage of the latest trends, including web and cloud technologies, big data, faster machines, and pervasive devices. Web GIS also directly models and integrates all the geospatial data types—remote sensing, GPS, the sensor web, 3D data, crowdsourcing data, real-time data, and pervasive web content.

The emerging platform is easy to use, more open, accessible, and collaborative. It uses focused apps for making maps, doing analytics, and accessing a rich, living library of shared maps and geographic data.

Web GIS Integrates Any Data

One of the key concepts of web GIS is how it organizes content. Web GIS models all types of information as web maps and web services. These web maps can represent typical geospatial data types—maps and imagery, as well as tabular data, such as geodatabases, spreadsheets, and enterprise databases. It also integrates social media and sensor networks with real-time information and the whole world of big data.

GIS is all about integration of data. Web GIS also provides new patterns for involving information sharing and collaboration, web maps and services, and visually and analytically combining geospatial data.



Another intriguing aspect of web GIS is that it can help break down the fundamental barriers that separate organizations. Whether the silos are professional or organizational, the ability of the web GIS environment to fluidly integrate different disciplines and activities gives us a new framework for collaboration.

Web GIS has one other interesting ingredient: it can help us easily organize our work. It provides content management capabilities for all your maps, apps, and models and also simplifies

sharing these within a group or across departments and organizations.

Driving the Transformation

While web GIS is just starting, it is already proving to be an attractive platform that is helping us to scale up and leverage the work and knowledge of GIS professionals.

For GIS professionals, understanding this pattern and its underlying technology is important. Embracing these patterns will both leverage



existing investments and drive geospatial adoption across organizations. Ultimately, this pattern promises to make huge contributions to our understanding of the world around us.

When you put all this together, you begin to realize that we have a huge opportunity to amplify the power of GIS. GIS professionals are essential to making this happen. In my mind, there has never been a more exciting time to be a GIS professional.

Thank you again for making the 2013 User Conference an amazing experience. As Esri continues to grow and evolve, you constantly remind us to stay focused on what is important: our mission of advancing GIS and supporting our users. Your efforts are having a large impact on our world. Thank you for letting us help you make a difference.

Attendees Inspired as will.i.am Discussed Growing Up, Geospatial Technology will.i.am Embraces GIS

At the 2013 Esri International User Conference (Esri UC) in San Diego, California, innovator and seven-time Grammy Award winner will.i.am inspired a packed room of 13,500 geospatial professionals by extemporaneously speaking of his conviction that maps and GIS can be stepping stones that help advance K-12 education—a view that is a natural adjunct to his philanthropic i.am.angel Foundation that supports science, technology, engineering, and mathematics (STEM) education in the classroom.

Jack Dangermond spoke one-on-one with will.i.am, born William James Adams, at the Esri UC Plenary Session about his passion for helping young people get a strong STEM education, including learning to use GIS. Their 30-minute conversation followed a demonstration of mapping projects by four 11th graders from Roosevelt High School in the Boyle Heights neighborhood of Los Angeles, California. will.i.am grew up there and now supports the community and the students through the i.am.angel Foundation. He helped arrange for the students to use ArcGIS for their school projects after meeting Dangermond and seeing the technology in action.

The foundation chief of staff, Enrique Legaspi, said GIS is an innovative tool for kids to better understand the challenges in their neighborhoods.

“GIS maps are part of a new feature of education—getting students to think critically, collaborate meaningfully, and ask the right questions to design real solutions using GIS technology,” Legaspi said after the students finished their presentation.

will.i.am followed up on that theme. “The maps are really like a filter. They filter



Jack Dangermond and will.i.am talk about technology education and inner city programs.

information for you to make better decisions on where you are going and what to do. I want to thank the GIS community for opening the doors and transforming these kids’ lives with these tools.” He also challenged GIS professionals to get involved with both his efforts and their own schools to improve the skills that only GIS can deliver.

will.i.am, who said he plans to study computer science starting in the fall, emphasized that in a world that now uses technology so much to communicate, it’s important to be tech savvy and computer literate. “Most people don’t read or write code, but we all use technology to communicate,” he said.

Gini Connolly, the GIS manager from the City of Hurst, Texas, took will.i.am’s message of

promoting a STEM education to heart. “will.i.am was pretty neat with what he’s doing,” Connolly said during a visit to the i.am.angel Foundation exhibit, where maps from the students’ projects were displayed. “He’s a change agent.”

She was touched by his story about growing up in Boyle Heights, a predominantly Latino working-class neighborhood in East Los Angeles, and his desire to help the youth pursue their education and dreams. “He’s humble,” said Connolly. “Our eyes kind of welled up.”

For more information, visit the i.am.angel Foundation at iamangelfoundation.org.

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Overview of the 2013 Esri International User Conference Witnessing Our World in Transformation

"GIS leverages our best science and technology," said Esri president Jack Dangermond in his opening address at the 2013 Esri International User Conference (Esri UC). Speaking to the audience of 13,500 GIS users, he said, "Building on existing work, you will transform our world." (See cover article).

The Esri UC was held in San Diego, California, July 8–12. Attendees came from around the world to see geospatial directions and innovations by Esri and consider technology strategies that will help their businesses and organizations. They also connected with technical and topic experts, met their peers, and shared best practices.

Transformational Web GIS

At the heart of Esri's 2013 innovation is web GIS that puts GIS into the hands of many people. On the first day, Esri and a number of users presented strides made in GIS services, content, analytics, and enterprise platforms. These innovations were prominently demonstrated on different devices connected to web GIS platforms.

"Web GIS enables you to easily build maps that work everywhere," said Dangermond. "It opens the door for creating a participatory environment in which GIS tools are made more accessible and flexible."

Dangermond announced that the ArcGIS license will now include a subscription to ArcGIS Online, which literally makes a world of content accessible from within the ArcGIS environment.

Esri's content is organic in nature—the collection is continually growing with data contributions from thousands of organizations. Presenters highlighted newly added content, including new basemaps and authoritative datasets. Using web GIS technology, they showed ways to access vast collections of ready-to-use maps and applications available on ArcGIS Online.

Content products now include extensive 30 cm imagery for the entire United States in both remote and populated areas. Moreover, Esri added 30 cm imagery for many European countries and thousands of cities around the world. Also added were imagery basemaps, soils, geology, and living elements of the world, such as species, vegetation, and habitat. More demographic products are available, such as the US per capita income dataset.

In 2013, Esri launched Premium Image Service, which streams highly accurate and current imagery data. This ArcGIS Online service includes premium imagery data from RapidEye, DigitalGlobe, and AccuWeather on one platform. The imagery data is streamed directly into ArcGIS. Users access the multispectral service to use tools to change band combinations on the fly and select predefined imagery content, such as vegetation.

The Esri team announced new analytic capabilities in ArcGIS, such as the land modeler web application. One Esri presenter used a cell phone to select multiple data layers and variables and to assign weighted values to these variables. He then ran the analysis on his phone.

People can use Microsoft Office to access landscape data in ArcGIS Online from the spreadsheet to enrich their analysis and create maps. Another tool that makes analytics easier is Operations Dashboard for ArcGIS, which

monitors, tracks, and reports sensor data. To demonstrate this tool in real time, a presenter tracked an airplane's location and measured jet noise levels detected by audio sensors. Using a smartphone, he drew a virtual fence around an area on the map and set the application to respond when a sensor within the virtual fence had been triggered by sending alerts to other mobile devices.

Solution templates provide location analytic themes and applications. Due to integration with Microsoft Windows and IBM Cognos, location analytic processes are easier. Using these common business tools, a presenter showed how people can visualize data and also use it for analysis. Whether connected to or disconnected from the organization's platform, anyone can use GIS for analysis.

Another presenter demonstrated the elegance of Esri's analytical tools by creating a statistical hot spot on the map. Geoprocessing tools automated the geostatistical hot spot processes, allowing her to calculate cluster distances and create visualizations.

Developers explained the extensive performance capabilities of Esri's latest release, ArcGIS 10.2, for managing large datasets and running visualization and analysis tools. ArcGIS takes advantage of a computer's CPU for parallel processing, which boosts response. Performance enhancements have improved geoprocessing and analytical tools, such as those used to perform a feature-weighted analysis. Developers can now manage and share code on the popular GitHub that allows them to check out code, make modifications, check it back in, and share it so others can merge it into their projects. Geoprocessing tools automate the import and export processes for JSON and Microsoft Office.

Transformational Users

Esri's mission for the User Conference has always been to create a venue for people to come together, share ideas, and learn from each other. During this conference, attendees shared their GIS stories, applications, and best practices. Users presented hundreds of papers about their work in agriculture, defense and intelligence, forestry, retail, transportation, and many other industries. They described real-world applications from data management, analysis, and imagery to mapping, platforms, and web GIS. A few of these stories were shared during the Plenary Session.

From Roosevelt High School, Los Angeles, California, a team of 11th grade students demonstrated their class projects that uncovered environmental injustices in their low-income

community. Sponsored by renowned musician will.i.am, the i.am.angel Foundation is helping underprivileged inner-city kids set a course for professional careers. Dangermond sat with will.i.am on stage and talked about the science, technology, engineering, and mathematics program; value of education; and the need for professional mentors (see the article on page 5).

CenterPoint Energy's Cindi Salas shared the benefits of its implementation of the new Esri Portal for ArcGIS. It is similar to ArcGIS Online; however, the company hosts the platform on-site behind its own firewall. Staff uses the company's operational data, as well as outside content. The team demonstrated how Portal for ArcGIS is more secure, has more applications, and employs multiple datasets. This has transformed many of CenterPoint's business processes, as staff is moving from static maps to dynamic GIS maps.

Christian Simbeck, the Bavarian State Forest Administration geographic information officer (GIO), described the German organization's enterprise GIS and talked about the application his team built for disconnected editing in the forest.

Tim Oliver, the GIO from Horry County, South Carolina, described how the county's enterprise GIS extends to county staff members who access it on their mobile devices. The county requires that GIS be part of every significant project. The GIO demonstrated the value of the enterprise system for hurricane disasters, tax assessments, and crime management.

India has made a vast commitment to modernize its infrastructure. Sam Pitroda, adviser to the prime minister of India on public information infrastructure and innovations, described how the country's National GIS is essential to its development plans and implementation (see the article on page 9 and the special section on pages 16 to 21).

The Urban Observatory is a program inspired by Richard Saul Wurman, the founder of TED. The project geographically compares demographic, land-use, and other data provided by participating cities. The project could provide valuable insight for city planners, anthropologists, sociologists, engineers, and urban scientists (see the article on page 8).

National correspondent for *The Atlantic* journalist James Fallows shared the importance of GIS technology for informing the public of news events.

Esri specifically acknowledged the work of three organizations. It's Enterprise GIS Award was given to the Lands Department of the Government of the Hong Kong Special Administrative Region and accepted by Mr. Siu Wai Ching, Dominic, JP, deputy director of survey



GIS professionals from around the world come to the Esri International User Conference.

and mapping. The Making a Difference Award honored the work of John E. Wennberg for the *Dartmouth Atlas of Health Care*. Dangermond presented his President's Award to Direct Relief, a nonprofit organization that provides medical assistance to people around the world who have been affected by poverty, natural disasters, and civil unrest. The award was accepted by Dorothy Largay, board member, and Andrew Schroeder, director of research and analysis. In addition, Esri extended special consideration to hundreds of exceptional organizations by recognizing their GIS work with the Esri Special Achievement in GIS Awards.

Users shared their GIS projects by participating in the Map Gallery. More than 700 posters and displays showed applications and analyses that have made a difference in communities and the environment. Users also participated in the Lightning Talks forum, in which they described projects, applications, tools, and tips. Among these five-minute vignettes were applications for mapping paintable surfaces using lidar and 360-degree photography; for parental intelligence using real-time information, geofences, and location tracking; and for locating water features in the desert by using an iPhone.

Transformational Learning

The Esri UC was the place to be for getting a crash course in all things GIS. Thousands of users honed their GIS skills at workshops for 3D imagery, ArcGIS Online, ArcGIS tools, scripting and coding tips, and more. At the Hackers Sandbox, developers tried ArcGIS and its APIs and software developer kit applications, developer services, and more. Attendees needing data assistance met with Esri's data experts who ran diagnostics on their data. Attendees brought their maps to the Map Critique Station to receive one-on-one advice from a professional cartographer. At the Technical Support Island, anyone could ask questions, get tips, and talk through solutions for making the most of their GIS.

The ongoing GIS Managers Open Summit provided an open forum for decision makers to talk with peers about GIS approaches, management strategies, and technology values. From cloud deployment to lessons learned, senior executive teams shared their challenges and compared platform business values.

Perhaps the most popular area of the Esri UC was the GIS Solutions EXPO, where more than 300 exhibitors demonstrated their solutions, applications, and gadgets. These Esri Partners are at the forefront of geospatial technology. In addition, Esri industry islands, staffed by topic experts, allowed anyone to meet and talk about anything.

Many Esri Partners helped support the conference with sponsorships. Platinum sponsors, the highest level of sponsorship, were Amazon Web Services, DigitalGlobe, and Trimble. Esri thanks all Esri UC sponsors for their work in making the conference a success.

Esri International User Conference proceedings are online at esri.com/uc.

Nadika Senadheera Makes a Serious Difference

GIS Hero



Nadika Senadheera

Nadika Senadheera's job as a GIS consultant takes her to places where death may be only a doorstep or two away.

That became a tragic reality in May 2013 when she was on assignment in Kabul, Afghanistan, for her employer, United

Nations' World Food Programme (WFP). One of her good friends, a woman from Italy who worked for the International Organization for Migration (IOM), suffered severe burns when suicide bombers set off an explosion outside a compound that housed IOM in Kabul.

During that attack, Senadheera hid in a bunker nearby as Taliban attackers detonated bombs, lobbed grenades, and fired at Afghani police and NATO forces.

"Even one of our guesthouses was completely gone. Bullet holes were everywhere," Senadheera said during an interview at the 2013 Esri International User Conference (Esri UC), almost six weeks after her 14-month assignment in Afghanistan ended.

Though she got out unscathed, the experience was frightening and heartbreaking. "Our good friend, we lost her because the Taliban attacked. She didn't survive," said Senadheera, pausing to wipe away tears. "She was 80 percent burned. I apparently had the last picture of her. We had a sushi night in one of our guesthouses, and she came over. I had to share that picture with her parents."

Danger comes with the territory for aid workers, even GIS professionals like Senadheera who was in Kabul to help organize and manage WFP's geographic information system and infrastructure and train its staff to use GIS. Though they often work indoors on computers, standardizing and analyzing data or training colleagues how to use geospatial technology, they are sometimes called upon to work in the field in less than hospitable conditions. Even inside compounds protected by security details, there's no such thing as absolute security.

Though she resisted the idea for a long time, Senadheera finally agreed in 2012 to work in Afghanistan to help the Vulnerability Analysis and Mapping (VAM) analysts properly organize spatial data for WFP (such as the location of helipads and airfields for the aircraft delivering food) and transfer the data into a working geodatabase. GIS will help WFP identify the neediest people there and safely deliver the food.

One night in May 2012, Senadheera huddled in a guesthouse in Kabul for more than six hours, listening to gunfire and bombing outside. "Eight suicide bombers were there shooting and blowing themselves up. I was so scared, and I was under the bed wondering, when would this be over?"

For her GIS work for WFP under such dangerous conditions, Esri president Jack Dangermond called Senadheera a "real hero" and presented her with a Making a Difference Award at the 2013 Esri UC.

Senadheera, who grew up in Sri Lanka, accepts the risks inherent in her assignments for WFP, a nongovernmental organization where she has worked for the better part of the last 13 years. There's passion in her voice when she talks about the value geospatial technology brings to the mission of feeding people mired in



poverty or displaced by a natural disaster or a conflict.

How the World Food Programme Uses GIS

WFP uses GIS in several ways, including for food security analysis—identifying who does not have access to enough nutritious food and the underlying causes of hunger in a region. The organization's VAM unit does this work.

Part of Senadheera's job involves training WFP's national staff to use GIS. She also helps to standardize available spatial data and analyzes and maps the information using Esri ArcGIS. The mapping technology helps WFP identify who needs food assistance (such as malnourished children or disaster victims), where they live, how to safely route the food to the people, and what areas of the country are vulnerable to natural disasters or conflicts. WFP often steps in to help during a crisis and needs to know, quickly, what areas will likely be the hardest hit.

When floods ravaged Pakistan in 2010, Senadheera flew in a United Nations Humanitarian Air Service helicopter piloted by Russians, hovering low over hard-hit Sindh province to drop food to hungry people.

While the crew dispensed the biscuits, Senadheera used a GPS to get the exact locations of where the food was dropped and marked those locations on a basemap. She also kept track of how many cases of biscuits were left at a given location and took an estimated head count of how many people picked up the food. By figuring in the average family size for each person who carried away a box of biscuits and village population data, she could calculate whether the helicopter needed to return to that area and drop off more food. She also used ArcGIS to create maps that showed where WFP had distributed food and where the helicopters still needed to go to distribute more biscuits.

Like Father, Like Daughter

Senadheera said her father instilled a love of maps and travel in her when she was only five. Hema Senadheera served as a radio officer aboard cargo ships from 1975 to 1995, and the stories he told during his brief trips back home were the stuff of legend for the young girl.

"Whenever he came home, he took the globe and he started [to show us] his route—I went to this country, I boarded the ship, and this is the route I took and these are the people that I met, and these are the countries that I passed," she recalled. "And he was showing us his passport and the coins, which fascinated me most."

A seed was planted. "I thought, this is something cool! Why can't I follow in my Daddy's footsteps?"

She started to draw and color maps. Then she studied history of the countries on the maps. By

the time she headed off to college, Senadheera knew geography was for her.

She graduated with a bachelor's degree in geography from the University of Colombo in Sri Lanka in 1995 and soon went to work for the Esri distributor in Sri Lanka. After working briefly for the Asian Development Bank, she received a 15-day contract with WFP in 2000 to analyze World Health Organization data and map where malnourished people, especially children, were living in Sri Lanka. She used Esri software to analyze the data and create the maps, which helped WFP deliver food to the neediest people in the country.

Senadheera received a Fulbright Scholarship to attend State University of New York (SUNY), Albany, from 2004 to 2006. She earned her



Left and above: When floods ravaged Pakistan in 2010, Senadheera and colleagues flew in a United Nations Humanitarian Air Service helicopter hovering low over hard-hit Sindh province to drop food to hungry people.

master's degree in geography and spatial sciences from SUNY. She later interned at Esri in Redlands, California, before returning to the WFP and her life on the road.

Though her 14 months in Afghanistan were marked by violence, Senadheera feels a sense of accomplishment, having led the effort to build WFP's geospatial enterprise system for the country and trained close to 120 people—all men—in how to use GIS.

For more information, contact Nadika Senadheera, GIS officer, WFP Country Office (e-mail: Nadika.Senadheera@wfp.org).

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Anyone Can Experience the World-Class Event as if They Were There

WWW Conference Comes to Life with iPad App

In September 2012, Esri hosted the WWW Conference, a world-class event featuring artists, entertainers, scientists, and visionary thinkers coming together to reinvent “the art of conversation.” It was a hot-ticket item with a select audience fortunate enough to attend. Now the experience has been made accessible to all.

Esri has provided Esri International User Conference (Esri UC) attendees with free access to the more than 30 pairings of brilliant minds from the conference through the WWW Conference app for iPad and iPad Mini. People can easily revisit the extraordinary conversations and—moreover—exclusive material, such as new videos of Pritzker Prize-winning architect Frank Gehry and hand-edited drafts from Pulitzer Prize-winning poet C. K. Williams. A treasure trove of illustrations, cartographic images, and bibliographic references is available for anyone to delve deep into the resonating ideas and personal histories of WWW conference participants.

Richard Saul Wurman—architect, cartographer, and founder of the renowned Technology/Entertainment/Design (TED) conferences—developed the WWW Conference to give attendees riveting, uncut, and unrehearsed discussions that “seduce and inspire,” according to the former Esri UC keynote speaker and author of more than 80 books.

“In its great leap backwards, starting with Plato, Socrates, and Aristotle, all of whom were involved in the celebration of conversation

2,500 years ago, the conference engaged in the intimacy a single conversation can offer,” says Wurman, who created the forum as the anticonference to engage improvised conversation—intellectual jazz.

Indeed, the conference was lauded for its natural, organic staging and passionate exchanges.

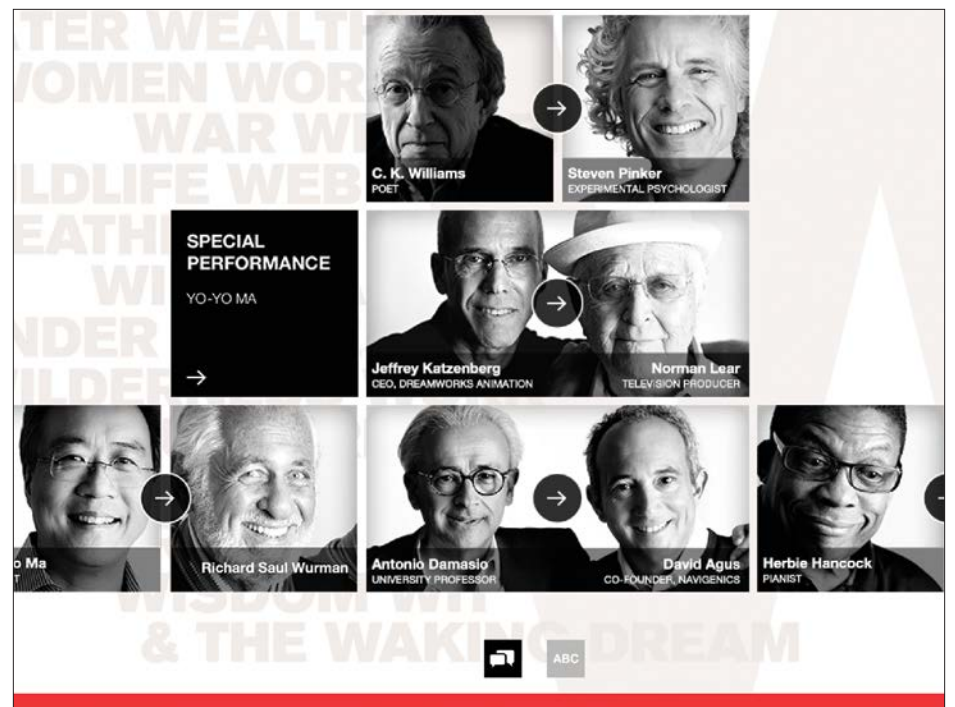
Forbes contributor Dan Munro wrote, “Much of the real creativity for the conference was in the format itself. . . . An intimate venue, a single host, two people and one audience.”

Thomas Fisher, dean of the College of Design at the University of Minnesota, wrote in the *Huffington Post*, “All of [the speakers] seemed to share one trait; the relentless pursuit of a big idea or passion, regardless of what their colleagues or critics thought.”

The WWW app showcases the intimacy of the individual and the power of the idea through its elegant filming and presentation style. Choose a conversation, speaker details, or supplemental material—it’s all available in an intuitive mobile environment.

Now available in iTunes, the app is free for Esri UC attendees or can be purchased for US\$3.99. Selecting the first letter of a speaker’s first or last name in the interactive alphabet allows you to begin learning about those that participated in the conference.

In the final quarter of 2013, the app will undergo a massive update. More material will be added to enhance the depth of the



More than 30 pairings of brilliant minds from the WWW Conference can be viewed through the WWW Conference app for iPad and iPad Mini, now available in iTunes. The app is free for Esri UC attendees or can be purchased for US\$3.99. (Image courtesy of Wurman Inc.; Photos by Jon Kamen.)

unique experience and will only be accessible through the app. As the year progresses, more

speaker contributions will be included in a major update.

Application Features Global Cities of 21st Century

Urban Observatory Opens Lens into Comparative Understanding

For the first time ever, more than half the world’s population lives in cities. By the year 2050, that figure will rise to nearly 70 percent. What does this mean for individuals living in cities? And what does this mean for the government agencies, private businesses, and community institutions serving those populations?

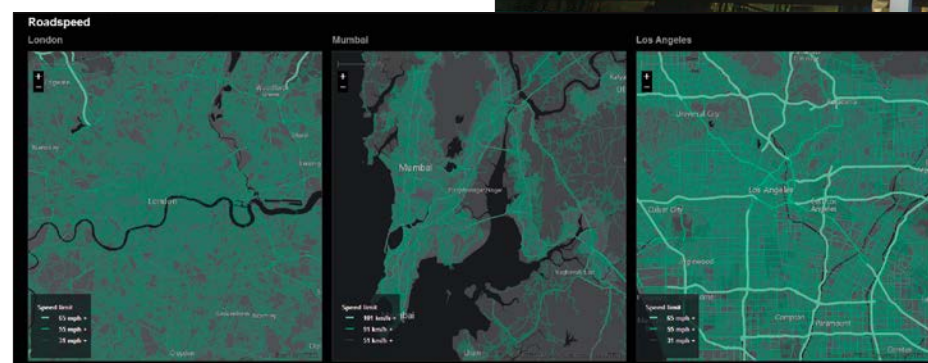
A groundbreaking, immersive exhibit and ArcGIS software-based website was launched to directly compare cities on numerous subjects, such as demographics, land use, infrastructure, and transportation. The Urban Observatory exhibit and web application seeks to provide understanding through comparison and contrast to these and other complex questions facing modern life in the 21st century. Created by Richard Saul Wurman; Jon Kamen of @radical.media; and Jack Dangermond, president of Esri, it provides visual context that gives way to meaning.

“A map is a pattern made understandable, and you must be able to compare patterns to identify and comprehend successes, failures, and opportunities cities have with each other,” says Wurman. “Urban Observatory demonstrates this new paradigm by creating comparative cartography. You only understand something relative to something you already understand.”

“The Urban Observatory tells the story of the global community through analysis of our largest, most unique cities,” says Dangermond. “Interactive maps and standardized information let you investigate every aspect of life. It establishes a common language for cities to share and learn.”

The Urban Observatory made its landmark debut at the 2013 Esri International User Conference (Esri UC). The physical exhibit and

the cloud-based web application were unveiled July 8. Attendees and online visitors explored simultaneous views of major cities located around the world. Both the exhibit and application provided dynamic, flowing content



Three cities and three different urban transportation approaches are visible on a simple map of roads depicted by their posted speed limits. Los Angeles (right) has high-speed freeways everywhere, while London (left) keeps them at the periphery, and Mumbai (center) roads address its peninsular location.

organized around the themes of work, people, places, movement, and systems.

An Idea Decades in the Making

The vision for Urban Observatory has its roots extended to decades past—in 1971 when Wurman was the guest editor and designer of the no. 80 issue of the *Walker Art Design Quarterly*. The issue was titled “Making the City Observable.” In it, Wurman makes first mention of an Urban Observatory that compares cities in 100 different ways. It then became an exhibition that traveled to 15 different cities.

Fast-forward to 2010. Wurman gave a keynote



Jack Dangermond (right) and Hugh Keegan introduce the Urban Observatory at the 2013 Esri International User Conference.

They recognized that no two cities in the world—from Asia to Africa to the Americas—collect information in the same way. Questions are not asked the same way. Maps are drawn to different scales or use different symbology. There are no consistent, shareable plans illustrating streets, electric grids, water supply, buildings, and more. Population, health care, income, cost of living, or quality of life cannot be viewed in a comparative format.

In spite of tremendous effort and success capturing data and quantifying the results, limited knowledge and understanding exist from the private citizen to the businessperson to the government official.

The Urban Observatory tackles these issues head-on by addressing the need for a systematic method of data visualization and cohesion. It empowers the individual to examine, compare, and contrast the global cities of the 21st century and thereby creates understanding for people with the use of common maps and data that speak a unifying language. According to Wurman, an overarching theme of the Urban Observatory is MAP: Mankind’s Ability to Perceive. As he explains, “Understanding

speech at the Esri UC, where he proposed studying 19 cities that will reach 20 million inhabitants in the 21st century. That idea became the seed for Wurman’s 19.20.21 project, which seeks to grow to 100 cities and 100 layers of comparative information. That project laid the foundation for what is now the Urban Observatory.

From then to today, new challenges for modern life have risen, and continuing issues have only become more complex as populations swell and resources subside. Wurman collaborated with Dangermond, each possessed by the singular idea that maps and geography provide a unifying language of understanding.

India's Platform Connects Everyone to Information

Esri UC Keynote Speaker Sam Pitroda Shares a Nation's Technology Plan

India has one of the fastest-growing economies in the world. Renowned for its IT and software development, it is an important component in the world's technological advances. The prime minister of India declared the period of 2010 to 2020 the decade of innovation.

Sam Pitroda is the technology adviser to India's prime minister and the thrust that is forwarding the implementation of a national GIS. "Technology is key for driving India's development," he said in his keynote speech at the 2013 Esri International User Conference.

As a young man, Pitroda left India for 20 years to work in the telecom business in the United States. While visiting India on a business trip, he tried to call his wife from his hotel and could not make a connection. That day he committed himself to improving India's communication system. Pitroda took up his mission in 1980, at which time the country had 2 million phones for 750 million people. Today, India has 900 million telephones for 1.3 billion people. He posed the question: what can 900 million connected people do? As the chairman of the national innovation council, his plan has been to build technological infrastructures that connect everyone to information.

India's development is challenged by disparity, demography, and the lack of infrastructure. To meet these challenges, leaders have designed

a plan for expansion, which includes building more hospitals, schools, and roads; producing quality goods and services; and making the most of its investments. The plan includes a strategy for equity. The poorest of the poor will be served. In 2010, the World Bank reported that 32.7 percent of India's population lives on less than \$1.25 a day, while 68.7 percent live on less than \$2 a day.

"We have a huge amount of young talent, and we have a moral responsibility to solve the problems of the poor," Pitroda said. "Technology, including GIS, is going to help us do this during the next two decades."

In other countries, the populations are aging and decreasing; however, in India the population is young and growing, with 550 million below age 25. Each year, 25 million young people are added to India's work force. Successful development means creating jobs for everyone.

"We have to make sure that the poorest of the poor can get the best education possible. To do this, we have decided to focus on information. We believe a lot of the poverty has to do with the poverty of information," Pitroda explained. "We have introduced the right to information as a pillar of democracy in the 21st century. We have to democratize information."

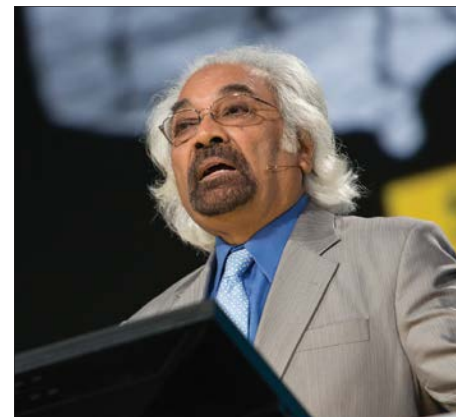
India has been ramping up its technology infrastructure with platforms that connect a large

portion of the population to information. Its platform that connects voice has already been successful. Now the country is creating a platform to connect data for police departments, intelligence agencies, and food distribution. Next, India will create an identification (ID) platform that is connected to every resident via unique ID, including facial features, fingerprints, and iris codes. People will use their unique IDs to connect to bank accounts, mobile phones, ration cards, food distribution, and employment applications.

Recently, India rolled out its Knowledge Network that connects all universities, libraries, and research and development institutions to improve collaboration and share resources. It is now designing a government network, which will tie 250,000 local governments together through optical fiber. The network should be operational in 18 to 24 months. It will allow India to reengineer its government processes and education system, help agriculture and health industries, and improve public service delivery.

"Our goal is to empower a billion people through knowledge and information," said Pitroda. "GIS has a big role to play. It will help state and federal government share information and work hand in hand to meet India's challenges."

Today, India is building a nationwide GIS platform. For many years, the country has used



Sam Pitroda talks about India's National GIS platform.

GIS in bits and pieces for energy, transportation, agriculture, etc. It uses GIS for government projects and disaster management. By creating a national GIS platform, India will link together these activities and many others.

"All our cities and centric services will be plugged into GIS," Pitroda said. "We would focus on citizen services, as well as enterprise and government applications. As a result, the GIS platform will be built on GIS infrastructure and accessible via a national portal."

Pitroda envisions the national GIS platform supporting good governance; public service; sustainable development; and, ultimately, empowering a billion people. Alongside its GIS platform, India will be growing a work force with the capacity to build and use it. Applications will be designed for e-government, census data, and natural resource management. (See pages 16-21 for more on India.)



Small area boundaries allow meaningful comparisons of population density from city to city.

precedes action. That's why we built the Urban Observatory. To provide greater understanding."

The Exhibit and Application

After months of preparation and organization, Esri UC attendees were witness to the world-wide unveiling of the Urban Observatory exhibit, which featured large digital displays of maps, images, videos, and authoritative data for cities around the world. It stood in a half-circle of 16 pylons—each representing a city—in the center of the Esri Map Gallery, the annual popular Esri UC showcase for exciting maps created by the Esri GIS community. On each Urban Observatory display were HD screens continuously rotating authoritative city maps and recognizable images. Anyone could stand and easily compare and contrast complex systems using visualized map information.

Several cities contributed data. The creative and technical forces at @radical.media and Esri built the first iteration of the exhibit with state-of-the-art software, hardware, fiber optics, kiosks, and high-quality monitors.

As a new thematic map displayed on one city pylon, similar themes appeared for each of the featured cities. For instance, a map showing housing density or urban footprints appeared simultaneously for each of the participating cities. Many different types of map datasets enriched the exhibit and website, including imagery, weather information, and population data. In addition, aerial fly-through videos for each city were displayed on top monitors, while eye-level monitors below showcased specific maps—the combination created a unified experience that continually looped within the interior of the exhibit.

The Urban Observatory organizes maps into five major categories:

- Work
- Movement
- People
- Public
- Systems

Each category includes a number of subcategories organized into "nouns or subject,"

representing more specific map themes relating to one of the five categories. In addition to the nouns, more precise thematic subcategories organized by "verbs or magnitude" provide the capability to drill down into additional specific issues and city phenomena. For example, people may be interested in understanding more about the noun "movement" in a city. They can then drill down to view "verbs or magnitude" including road speed, traffic, or airport locations.

The ArcGIS Online web application allows people to directly interact with rich datasets for each city participating in the Urban Observatory experience. The application, available to the public, allows anyone to zoom in to one digital city map while two other city maps simultaneously zoom in parallel, revealing differences and commonalities in density and distribution. For instance, a person can simultaneously view new developments for Abu Dhabi, Tokyo, and Hamburg or simultaneously view open spaces for London, Mumbai, and Rio de Janeiro.

"Think of the Urban Observatory as a 21st-century live museum," says Wurman. "It's not

static and stagnant. It's dynamic and living through constantly updated information from the cloud."

The Urban Observatory application and exhibit will continue to evolve. Future iterations will include more content and cities. The Urban Observatory will supply extensive benefits for government agencies and private businesses. For example, governments can view commercial, residential, and park land use for one city and compare it to another, making discoveries along the way that have implications ranging from attracting business to planning new communities. Businesses can also greatly benefit. By comparing and contrasting population data, infrastructure, and traffic, better decisions can be made about expanding assets and offices. Anyone with a free ArcGIS Online account can access the web application, which lets people explore mapped information by theme or city.

For more information about the Urban Observatory, visit www.urbanobservatory.org. To learn more about the 19.20.21 initiative, visit www.192021.org.

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Geodesign Education Takes Flight

By Kelleann Foster, Associate Professor, Landscape Architecture,
Penn State University

Our world is experiencing a unique confluence of issues, innovations, and opportunities that is encouraging a hospitable academic atmosphere where geodesign can flourish as a platform for addressing the urgent environmental and community planning, conservation, and restoration needs of today and for the future.

The emerging field of geodesign can be characterized as the collaboration of science and design that takes into account the interconnectedness between humans and nature. Geodesign is a deceptively simple formula that brings together knowledge—in the form of both data and human expertise—and infuses it with design creativity for the purpose of revealing and evaluating alternative futures for a *place*. Geodesign is and will be an important agent for cultural change. Education is taking up the call to address how geographic and spatial information can be combined with design to address some of the most complex challenges facing the environment, including human habitats, and, indeed, the future of environmental care.

At the January 2013 Geodesign Summit hosted at Esri in Redlands, California, some core concepts were broached that can influence current and/or possible future curricula for geodesign educational programs or degrees. These key concepts indicate that geodesign has the following traits:

- Is collaborative in nature
- Is cross-disciplinary
- Is a design method that proposes creative change for a place
- Uses GIS and other technologies for modeling and evaluating impacts
- Engages with community stakeholders and assists them in evaluating design alternatives and making decisions

Geodesign education is taking flight, with several new programs and a few that will begin within the next year, and it is clear that these key concepts provide a foundation on which many of these programs have been or will be built. Additionally, many schools, mainly in landscape architecture or planning programs, offer geodesign classes, as well as classes not so named, that accomplish similar goals. Furthermore, it is highly likely that other programs are under development, and there are other signs of geodesign’s emerging impact on academia, such as recent university job openings with *geodesign* in the position description. Nevertheless, the intent of this article is to provide an overview of some universities with new degrees, certificates, and options that are specifically working to address these core curricular ideas and

to help encourage ongoing dialog, worldwide, about geodesign education.

Seven programs in the United States responded to a short survey, the results of which illustrate an interesting variety of ways that programs are emerging (*see table*). These schools are Northern Arizona University, Penn State, Philadelphia University, the University of Arizona, the University of Georgia, the University of Southern California, and the University of Wisconsin (UW-Madison and UW-Stevens Point).

A Diversity of Reasons to Start Programs

To begin with, there are a diversity of reasons why these programs got their start:

- Two, both of which are undergraduate programs, were part of larger university-level curricular revisions that sought efficiency by combining programs or encouraging interdisciplinary initiatives. These schools saw geodesign as an effective way to advance those goals while crafting a future-oriented program that brings together different disciplinary strengths from across the university.
- Two of the graduate programs decided to pursue geodesign due to the emerging trend and need for professionals who are knowledgeable about how to better integrate science with design.
- Three of the programs trace their roots to ideas and inspiration gained through attending the early Geodesign Summits.
- One evolved in response to a recent university strategic plan that outlined graduate education growth objectives.
- One hosted a geospatial summit that brought together educators and researchers from across the school system, which resulted in the new geodesign program.

Commonalities in Geodesign Education

Though, as we shall see, the different schools have designed their programs to suit their own needs, the programs do have in common several important points. All the schools do the following:

- Emphasize the integrated nature of their curricula, several feeling that the mix of science and design courses is balanced
- Offer an interesting array of related courses that are either required or available as options to geodesign students
- Include studio-based experiences for their students
- Include GIS components early, as either an introductory course in the first year or second year of the program (One program lists GIS as a prerequisite to enter, and it offers an



accelerated GIS summer program for students without a GIS background.)

- Reference GIS skills throughout the remainder of the curriculum, which speaks to the stated goal of integrating science and design

A Variety of Formats for Geodesign Education

Despite these areas of overlap, these schools are embarking on geodesign education from a variety of approaches as evidenced in the results of the survey:

- Four universities are offering only graduate-level programs; two, only undergraduate; and one university will address geodesign at both levels.
- Within the area of graduate education, there is diversity: two will offer master’s degrees; there will be two stand-alone graduate certificates, and two of the programs will offer geodesign as a focus area or option for graduate students.
- All but two of the seven are resident programs.
- Two have online components; one is offered entirely online; and the other will have courses online, as well as some collaborative, face-to-face experiences.

Academic “Home”

While all schools make a point to emphasize the integrated nature of their curricula, it is not a surprise that a program’s academic “home” provides insight regarding the curricular mix of GIS/science and design:

- Two of the programs rooted in landscape architecture schools slightly favor design.
- One housed in a department of geography, planning, and recreation slightly favors geospatial sciences, with only one course specifically focused on urban/community design. However, they feel that design is “scaffolded” throughout the curriculum, with a focus on design history in other classes, and students who take the Community Planning & Development emphasis will do a required conceptual design in a capstone course.
- Another promotes strengths in data inclusion and spatial modeling and therefore has a mix of

approximately two-thirds science and one-third design.

Studio-Based Experiences

Studio courses are unique educational environments rooted in problems-based learning (PBL). In PBL courses, students are presented with a problem and then become active participants—the content is not provided, but rather the students, either individually or in teams, discover and work with content they determine to be necessary to solve the problem. In PBL, the teacher operates more as a facilitator and mentor. The problems are typically open ended, and students learn through a guided, collaborative experience. All the programs surveyed mention the inclusion of studio-based experiences for their students; furthermore, the following are true:

- One has collaborative studios every semester.
- One offers a geodesign concentration where design applications are a culminating experience after other competencies have been developed.
- One incorporates design in the first year, followed by three architecture/design classes.

Optional Classes That Complement Geodesign

As discussed above regarding the likelihood that geodesign programs will develop their own specialties and emphases, the schools surveyed listed an interesting array of related courses that are either required or available as options to geodesign students. These include landscape ecology, communications and professional skills, public policy and regulation, professional and cultural values and ethics, quantitative sociology, heritage conservation, public participation and dispute resolution, building information modeling/CityEngine and other 3D visualization tools, sustainable design methods, and global issues (biodiversity, climate change, etc.).

International Advances

Of course, this article cannot be all-inclusive nor list all schools with new or developing geodesign programs either in the United States or internationally. Outside the United States (e.g., in China, Germany, Japan, Portugal, the Netherlands, and Thailand), there are numerous programs that adhere to the definition of geodesign education but may not use the term *geodesign* in the name. Some of these programs are housed within departments of landscape architecture, geography, urban ecology, engineering, and civil engineering. It will be interesting to track the evolution of new programs and degrees worldwide.

About the Author

Kelleann Foster, RLA, ASLA, is associate professor of landscape architecture; lead faculty for Geodesign Programs; and interim director, Stuckeman School of Architecture and Landscape Architecture, Penn State University.

For more information, contact Kelleann Foster (e-mail: kxf15@psu.edu).

Summary of Schools Offering Geodesign Programs (See an expanded table at esri.com/arcnews .)							
University Name	Northern Arizona University	Penn State	Philadelphia University	University of Arizona	University of Georgia	University of Southern California	University of Wisconsin (UW-Madison and UW-Stevens Point)
Delivery	On Campus	Online	On Campus	On Campus	On Campus	On Campus	Blended Online + on Campus
Type of Program	Undergraduate	Graduate	Graduate	Graduate	Undergraduate and Graduate	Undergraduate	Graduate
Program Title	BS in Geographic Science & Community Planning	Graduate Certificate in Geodesign Master of Professional Studies in Geodesign	MS in Geodesign	Master's of Science in Planning	Geodesign and Sustainable Practices Certificate within BLA, MLA, and Master of Environmental Planning	BS in Geodesign	Geodesign Capstone Certificate Program
Part or Full Time	Full Time (Part-time option)	Part-Time	Full or Part Time	Full Time	Full Time	Full Time	Full or Part Time
Length	4 Years	Certificate: 1 Year MPS: 2.5 Years	1 Year	Same as Base Degree	Same as Base Degree	4 Years	1 Year

Confluence of Trends and Issues Actuates a Path for Geodesign Education

By Kelleann Foster, Associate Professor, Landscape Architecture, Penn State University

Geodesign is about collaboration. Geodesign infuses knowledge, such as scientific data and human expertise, with design creativity to bring out the best in both human constructs and natural environments. We can see the very heart of geodesign—collaboration—gaining traction in many arenas. The trends are clear, and we can watch them develop and intersect.

The Cleveland Clinic

The Cleveland Clinic of Cleveland, Ohio (www.clevelandclinic.org), is recognized as a model for the future of health care. It has forged an innovative approach to patient diagnosis, which not only provides exciting results but also saves money. The approach required a cultural shift in how health care systems operate. “Health care has gone from a single sport to a team sport,” says Dr. Delos M. Cosgrove, the CEO of the Cleveland Clinic. This is fueled by the belief that “collaboration has always, and will always, further discoveries in science and medicine.”

While the Cleveland Clinic has disease-specific institutes that facilitate collaboration among physicians to address some of the most vexing medical problems, geodesign is providing a cultural shift in how geographic and spatial information can be used to address some of the most complex challenges facing the environment. In the case of geodesign, the future of environmental care is the collaboration of science and design.

Intellectual Jazz

The idea of marrying scientific and design thinking is really not new, but the possibilities and rewards are becoming more widely sought and valued. Over a decade ago in his book *Consilience*, E. O. Wilson urged us to consider that the most challenging issues facing humanity cannot “be solved without integrating knowledge from the natural sciences with that of social sciences and humanities.” He clarifies that the humanities includes the creative arts.

More recently in a speech on arts and public policy, Yo-Yo Ma, who was a participant in Richard Saul Wurman’s September 2012 WWW conference (see *ArcNews* Winter 2012/2013), held on the Esri campus in Redlands, California, advocates adhering to the “edge effect.” He says this is “where those of varied backgrounds come together in a zone of transition; a region of less structure, more diversity, and more possibility.” This same notion of the edge effect, which is derived from the science of ecology, is what geodesign is all about—the synergy that is possible when science and design intersect. According to Albert Einstein, art and science have the same root: mystery. He also discusses the importance of curiosity, which is, of course, related to mystery. Focusing on commonalities will help scientists and designers forge a strong working relationship. Collaboration is a vital component of geodesign and will aid in the responsible transformation of places and provide movement toward more sustainable solutions for the land and communities.

Digital Literacy, or “Citizenville”

The world is becoming increasingly tied to and reliant on digital technology and easy access to information. In the five years from 2005 to 2010, the amount of global digital information (including documents, pictures, and Tweets) grew nine times to nearly two zettabytes (IDC Report). The trend shows no signs of slowing, and online content will continue to become easier to share, tag, and find. Important information and data are no longer solely the domain of select scientists or government officials. Regular Jane and Joe Citizen are becoming more digitally literate every day. California’s lieutenant governor, Gavin Newsom, examines this trend and its potential for an even more widely connected society in his recent book, *Citizenville*. He discusses the exciting opportunities that have emerged due to the availability of big data being brought down to the consumer level. He envisions how digital technology has the capability to enable people to take a greater role in governing and increase civic participation. For example, the City of Philadelphia has an open data initiative where half of all datasets are from the city’s GIS.

To be sure, more is not necessarily better—there are many questions about the quality and authenticity of information. But that does not change the fact that people now expect to have information at their fingertips (literally). All this information needs to be filtered and then accompanied by a process to determine its wise use. Therefore, the geodesign process, which ferrets out which data is most relevant to a particular challenge and then helps bring it alive for people, is going to become essential for design and planning. In the GIS world, data collection and availability had been a problem, but now, more and more authenticated data is being made available daily as a service. The geodesign methodology provides an approach that, along with combining data and design, enables increasingly digitally literate citizens to become engaged in this important dialog about their place.

The Age of Innovation and Rapid Adaptation

Many believe we have left the Information Age behind—the proficiency and benefits of technological advancements are now expected and are certain to continue. It is becoming clear that the world we reside in now has moved into a new era, one that requires adaptability, inventiveness, and big-picture capabilities. In his book *A Whole New Mind*, Daniel Pink discusses these ideas and asserts that embracing creativity will provide a competitive advantage in this new era. He posits that both “high-concept” and “high-touch” approaches will rule:

“High concept involves the capacity to detect patterns and opportunities, to create artistic and emotional beauty, to craft a satisfying narrative, and to combine seemingly unrelated ideas into

something new. High touch involves the ability to empathize with others, to understand the subtleties of human interaction, to find joy in one’s self and to elicit it in others, and to stretch beyond the quotidian in pursuit of purpose and meaning.”

It is as if Pink knew about geodesign when he wrote this, as nearly all of it fits neatly into the definitions and aspirations of geodesign. Detecting patterns—the growing capabilities of GIS provide that. Combining those patterns with creativity to realize something new—that is the essence of geodesign. The part about a narrative relates directly to his high-touch discussion of empathizing with people. Here again, if the geodesign process is conducted well, a community’s values should inform design alternatives that will resonate with the people and satisfy the purpose. The best way to engage the people of the place is through a narrative that has meaning—one which they can embrace and will want to implement.

Today’s complex and fast-moving environment requires constant readjustment by responding quickly and creatively to changes as they arise. GIS tools and apps are becoming more efficient and effective to enable rapid evaluation of design alternatives and can better predict the potential consequences of future decisions. These technological advancements, coupled with high-touch and high-concept approaches, illustrate how geodesign truly is a methodology well-suited to this new age of innovation and rapid adaptation.

Geodesign Defined for Education

What distinguishes geodesign from processes that deploy more innovative approaches to GIS? For example, GIS is commonly used to aid in making better decisions about siting and location. Is this geodesign? Possibly, but it depends on whether design thinking was part of the decision-making process, if stakeholders were engaged, and how the results of the process are evaluated. The term *geodesign* is new enough, and evolving fast enough, that it is important to define it for this context: education.

The January 2013 Geodesign Summit, hosted at Esri in Redlands, included two sessions dedicated to geodesign education: a preconference workshop and a panel discussion during the summit. During these forums, educator and practitioner participants agreed that geodesign involves new tools and approaches related to technology and data. There was also agreement that geodesign is cross-disciplinary, that it can be a bridge between professions—scientists don’t know design, and designers are often not fluent in science—and that curriculum methodologies should be spatially oriented. These discussions are helping to shape an overview of the components that may be included in curricula for educational programs or degrees focused on geodesign.

Interestingly, participants at the education sessions did not have consensus regarding whether all students getting a geodesign degree need to learn design.

Neither did they determine whether all geodesign students should learn GIS. This is perhaps indicative that as new geodesign programs and degrees emerge, there may be distinction between differing philosophies regarding the design and GIS components of geodesign. Nevertheless, it would seem valuable that students taking geodesign curricula should, at a minimum, get solid exposure to design thinking and design methodologies. Equally important then would be that students in geodesign programs should, at a minimum, also get solid exposure to GIS principles and basic processes.

A presummit survey generated some thought-provoking topics that merit future consideration in developing curricula, for example:

- How can a geodesign program capitalize on the activist interests of students?
- If the engagement of people is important in the geodesign process, should skills in participatory design be introduced?
- Should geodesign curricula incorporate complex economic development issues?
- Can data and the continuum of analysis be overemphasized, precipitating “analysis paralysis”?

It is anticipated that the fall 2013 Geodesign Summits in Europe and China will provide opportunities to further these curricular discussions from an even wider perspective.

A Bridge Between Professions

Regarding the above-noted concept that geodesign is cross-disciplinary and that it can be a bridge between professions, the academy is a great place to foster that bridge and instill a collaborative approach among all disciplines needed to address a geodesign challenge. This quote, adapted from the preface of Dr. Carl Steinitz’s book *A Framework for Geodesign*, says this well:

“Each participant must know and be able to contribute something that the others cannot or do not. . . . Yet during the process, *no one need lose his or her professional, scientific or personal identity.*”

This may also stem from a related concept: people running a geodesign process can be considered “conductors,” and conductors are not skilled at all instruments in the orchestra. Because of the complexity of the challenges geodesign addresses, no one person can have all the skills necessary to perform a geodesign process.

Clearly, at this early point in geodesign education’s progression, it is important to realize that just as other fields have evolved to have unique variances in curricula based on faculty expertise, program location, and the like, so too it is likely that geodesign education will have variation by school, but one hopes that most programs will be rooted in a common core that includes the above points.

ArcGIS Online

What's New?

This regular column contains information about the latest updates to ArcGIS Online, including new features and capabilities, basemap updates, and content contributed by the global user community through the Community Maps Program. This issue focuses on the July release of ArcGIS Online, which was a major update and includes new capabilities for online analysis, enterprise logins, and a newly designed look and feel.

Map Viewer

The online spatial analysis tools that were previously in beta have been fully released and can be accessed directly in the map viewer. The tools are organized into functional categories: Summarize Data, Find Locations, Data Enrichment, Analyze Patterns, Use Proximity, and Manage Data. Using these analysis tools will consume service credits, and we've included a Show Credits tool so you can calculate the credit usage before starting your analysis.

We've improved Directions and Routing so that now you can add a location directly from a pop-up window. Once you've calculated a route, you can save the route and associated locations as a layer so you can view it later on or perform additional analyses, such as Create Buffers or Find Nearest.

Image service layers have been improved to provide a better default display. Map authors can configure the display, show tables, create filters, display or hide legends (ArcGIS 10.2 for Server services), and configure pop-up windows.

To get better results when you search for an address or place, the map viewer now displays the best result based on the input location or address. It also offers an option ("Not what you wanted?") where you can choose similar locations. For maps that you embed, you can restrict finding addresses or places within the extent of the map. This is useful for applications where you want to enable searches only within a particular area, such as a city or state.

The symbol gallery has been expanded and now includes a new collection of A to Z symbols available in three colors.

Web Applications

The CityEngine web viewer has been enhanced with streamlined map user interface controls, a full-screen button, and better shadow control resolution with cascaded shadow maps.

The very popular Map Tour story map template can now be used by public and organizational account users. You can import pictures from several popular online photo sharing services (Flickr, Facebook, and Picasa), from other hosted locations via a URL, or through a CSV file.

There is also a new Swipe story map template. Configurable and designed to work in browsers and on mobile devices, it allows you to display two web maps or two layers in the same web map in a window split vertically, or you can use the spyglass option to focus on a specific area.

The existing Swipe template has been deprecated, and the code will no longer be updated. The template was available in the web app template gallery and has been replaced with the new Swipe story map template. Existing applications that are using the deprecated Swipe template will continue to work. If you'd like to continue using the old Swipe template, you can download it from ArcGIS Online and host it on your own web server.

ArcGIS Apps

Esri Maps for Office was updated to include statistical hot spot/cold spot analysis, access to additional data for data enrichment and the ability to select individual data variables, new infographics options, new authentication options, and support for Portal for ArcGIS.

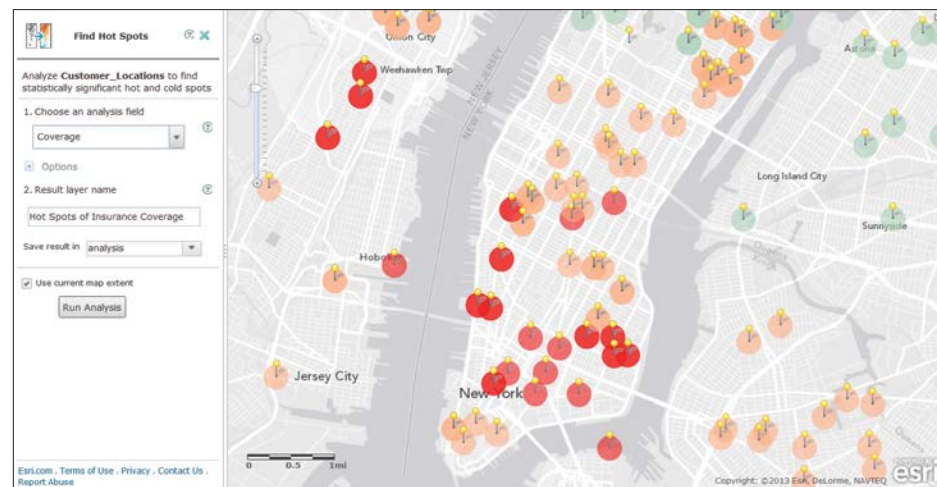
Esri Maps for SharePoint is now one of the apps that are included with the ArcGIS Online subscription. When you purchase a subscription or sign up for a free trial, you can download this app, along with three other apps that are also included in the subscription: Operations Dashboard for ArcGIS, Collector for ArcGIS, and Esri Maps for Office.

ArcGIS for Windows Phone now includes support for Windows Phone 8 and two new languages, Danish and Portuguese (Portugal).

Ready-to-Use Tools and Layers

Geocoding has been improved for more than 15 countries, including Malaysia and Turkey. Routing is now available for South Korea and 41 other new countries, for a total coverage of 144 countries.

Esri Data and Maps for ArcGIS layers have been updated with recent datasets. You can access these layers through the Esri Data and Maps group in ArcGIS Online.



Analyze data and answer spatial questions with ready-to-use online analysis capabilities anyone can use.

ArcGIS Online Account Administration

Administrators now have the ability to invite users with enterprise login accounts to the ArcGIS Online organization. Users do not need to create additional logins within ArcGIS Online. They can use the logins that have already been set up within their enterprise system. This capability was previously in beta.

The Status page has been updated to include newly added services, such as spatial analysis, and more accurately reflects the usage of services and service credits. The Status page has been divided into four sections: Storage, Analytics—Usage, Premium Content—Usage, and Published Content.

Usability and Design Improvements

The ArcGIS Online website (arcgis.com) has been updated to improve usability based on user feedback and testing and also features a fresh design. For example, under **My Content**, you can now filter the content to display just web maps or just layers of a specific type, for instance, feature layers. One-click actions **Add to Map** and **Add to New Map** have also been added. The map viewer navigation has been enhanced with a new **Home menu** so you can more easily navigate to other areas of the site. You can also now sign in to your public or organizational ArcGIS Online account from arcgis.com home and feature pages or go directly to your organization's site to sign in.

ArcGIS Online Basemap Updates

• *World Topographic Map*—Since the last ArcGIS Online release in March, this very popular basemap has been updated with lots of content from users around world. These contributions were made through the Community Maps Program and include updated or expanded content for the following countries at 1:288,000 to 1:1,000 scale: Finland, Jordan, Saudi Arabia, and Morocco; at 1:577,000 to 1:1,000 scale for Romania and Slovakia; and at 1:144,000 to 1:1,000 scale for Singapore. Content was also added for Hong Kong (1:577,000 to 1:1,000) and Macau (1:144,000 to 1:1,000). We also received contributions for several counties and cities/towns at 1:9,000 to 1:1,000 scale. The following are just a few examples: counties—Bernalillo County, New Mexico; Douglas County, Nebraska; Florence County, South Carolina; Orange County, Florida; Wahkiakum and Yakima Counties, Washington; and Yavapai County, Arizona; cities/towns—Bellevue, Olympia, and Spokane, Washington; Carson, California; Keller and Longview, Texas; Lexington, Massachusetts; Town of York, Maine; Westminster, Colorado; Wichita, Kansas; Canmore, Cochrane, and St. Albert, Alberta, Canada; and Prince George and Squamish, British Columbia, Canada.

• *Three Educational Institutions Contributed Their Campus-Level Data*—California University of Pennsylvania; Kutztown University,

Pennsylvania; and Loma Linda University, California, all at 1:9,000 to 1:1,000 scale.

• *World Imagery Map*—New high-resolution imagery from DigitalGlobe for many places worldwide has been added to the World Imagery Map over the past several months. This includes imagery for At Ta'if, Saudi Arabia; Belfast, Northern Ireland; Chiclayo, Peru; Diyarbakir, Turkey; Edinburgh, Scotland; Hiroshima and Tokyo, Japan; Innsbruck, Austria; London, England; Perugia, Italy; Saint-Malo, France; Seoul, South Korea; Sucre, Bolivia; and Wroclaw, Poland. We also added contributions we received through the Community Maps Program for Cochrane, Alberta, Canada, and Olesnica, Poland, as well as several cities in the United States.

• *World Street Map*—This map now includes large-scale coverage for all major cities in the Americas, including Buenos Aires, Argentina; La Paz, Bolivia; Montevideo, Uruguay; Panama City, Panama; and San José, Costa Rica. For Rio de Janeiro, Brazil, we've also increased the quantity and accuracy for building footprints and associated features, like parks, walkways, and pools. We also included additional coverage for the Middle East and North Africa for the following countries: Bahrain, Egypt, Israel, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

For a complete list of all contributions to each of the world maps, visit esriurl.com/contributors.

If your organization doesn't have an ArcGIS Online subscription yet, sign up for a free 30-day trial. You can invite up to five named users to participate in the trial, and you get 200 service credits and these productivity apps as part of your trial: Collector for ArcGIS, Operations Dashboard for ArcGIS, Esri Maps for Office, and Esri Maps for SharePoint. Once your trial is over, purchase a subscription and continue to use all the features and services in the same ArcGIS Online subscription account. To sign up for the trial, go to esri.com/agoleval.

Get More with ArcGIS Online

Due to the popularity of ArcGIS Online, we have been able to reduce the cost of several services and make others available as part of the ArcGIS Online for Organizations subscription. That means that organizations can create and share more interactive maps and apps using fewer service credits or at no cost altogether. The following changes became effective with the July 2013 release of ArcGIS Online:

- Unlimited bandwidth usage (outbound data transfer) is now included with the ArcGIS Online subscription.
- Uploading tile packages from ArcGIS for Desktop is now also included in the subscription.
- Geocoding now uses 50% fewer service credits.
- Routing and GeoEnrichment service credit usage has been reduced by nearly 65 %.
- Infographic service credit usage has been reduced by more than 80%.

Esri will continue to add new services to the ArcGIS Online subscription, as we have done in the July release with spatial analysis services.

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Real-Time GIS with ArcGIS GeoEvent Processor for Server

Imagine applying real-time data to ArcGIS maps and applications connecting to a wide variety of data streams and services, performing continuous processing and analysis, and notifying key people when conditions or events occur that require immediate attention. With ArcGIS GeoEvent Processor for Server, this is possible.

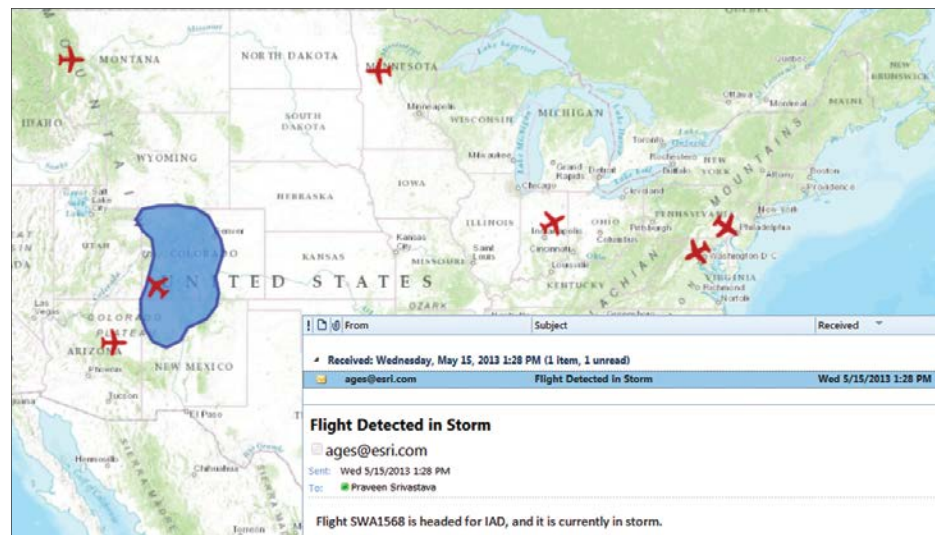
ArcGIS GeoEvent Processor is a new optional extension for ArcGIS for Server Standard and Advanced. It brings real-time data monitoring to ArcGIS by connecting with any type of streaming data and automatically alerting personnel when specified conditions occur. They can respond faster with increased awareness whenever and wherever change happens.

GeoEvent Processor connects to common sensors and data feeds, including in-vehicle GPS devices, mobile devices, and social media providers. It also includes an exceptional set of

real-time filters, processors, and analytical capabilities that can enhance the streaming data to ensure the most important information is returned. Monitor the temperature of goods in delivery trucks, notify customers when their deliveries are 15 minutes away, and track the status of field crews to optimize their performance in the face of ever-changing field conditions. GeoEvent Processor seamlessly integrates real-time streaming data with the modern enterprise IT architecture.

For more information, visit esri.com/geoevent.

ArcGIS GeoEvent Processor integrates real-time sensors and provides instant notifications when events are triggered.



ArcPad 10.2 Improves Integration with the ArcGIS Platform

ArcPad 10.2, Esri's mobile mapping and field data collection software designed for GIS professionals, is now available. The latest version connects desktop, online, and mobile workflows in a seamless platform; improves synchronization with ArcGIS; and speeds field data collection with new automation options.

ArcPad 10.2 gives users the ability to directly open ArcGIS feature services in ArcPad and synchronize edits with hosted or on-premises GIS. This new capability significantly improves mobile workflows by enabling disconnected editing of published services. In addition, ArcPad gives users the ability to automate edits with a Quick Fields option, which can be customized to autopopulate any field during data collection.

For users who rely on desktop workflows that revolve around file sharing and distribution,

ArcPad 10.2 includes new ArcGIS Online integration. Users can now store their ArcPad projects and QuickProject templates as an ArcPad package in their ArcGIS Online account for sharing with members of their group. ArcGIS Online subscribers can also browse ArcGIS Online from inside ArcPad to select and download a project or template, creating an easy, collaborative workflow.

Existing ArcPad users can download ArcPad 10.2 from the Esri Customer Care site.

For more information on what's new and to evaluate ArcPad at no cost, visit esri.com/arcpad.

Store ArcPad projects and QuickProject templates in ArcGIS Online for sharing with others (device shown: Trimble Juno 3D).



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Esri Releases a New Website for GIS Professionals

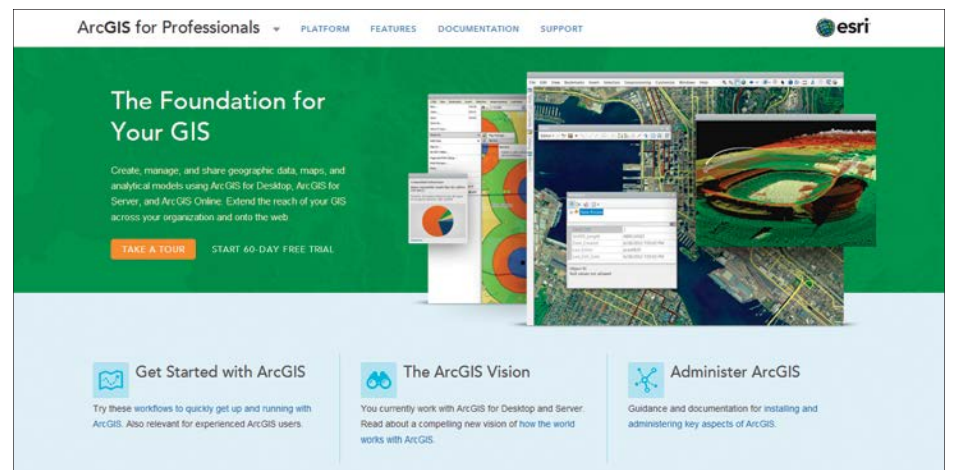
Esri has released a new website to serve the needs of the professional user of ArcGIS at pro.arcgis.com. This website offers organized resources and best practices for professional GIS work. It starts with common tasks, such as data compilation, mapping, GIS analysis, and how to organize and conduct complex GIS projects, and progresses to provide a critically important perspective for how professionals use the new web GIS pattern.

ArcGIS users have quite a comprehensive understanding of using ArcGIS in traditional ways but are new to the web GIS pattern. Getting that exposure can really open their eyes about how it is relatively easy (compared to the GIS heavy lifting they're used to) to provide new tools and applications that benefit them in their own realm as they tackle new kinds of problems and grow the use of GIS across organizations. Our goal is to enable the work of these professional

ArcGIS users to fully leverage their existing GIS investments and help them extend the reach of GIS to everyone.

Says Jim McKinney, ArcGIS program manager, "The work of GIS professionals continues to be critically important and vital and is evolving in support of new web GIS initiatives. Among the key goals we have in mind for this website is to help our professional customers get the most out of ArcGIS and to maximize their effectiveness and success in a wide array of GIS applications. We want to show users how to apply the new web GIS pattern to leverage and extend the reach of their GIS."

ArcGIS for Professionals (pro.arcgis.com) is constantly changing. Check back often as we enhance the content and presentation to keep pace with the evolution of the ArcGIS platform.



The ArcGIS for Professionals website helps Esri's customers get the most out of ArcGIS and maximizes their effectiveness and success in a wide array of GIS applications.

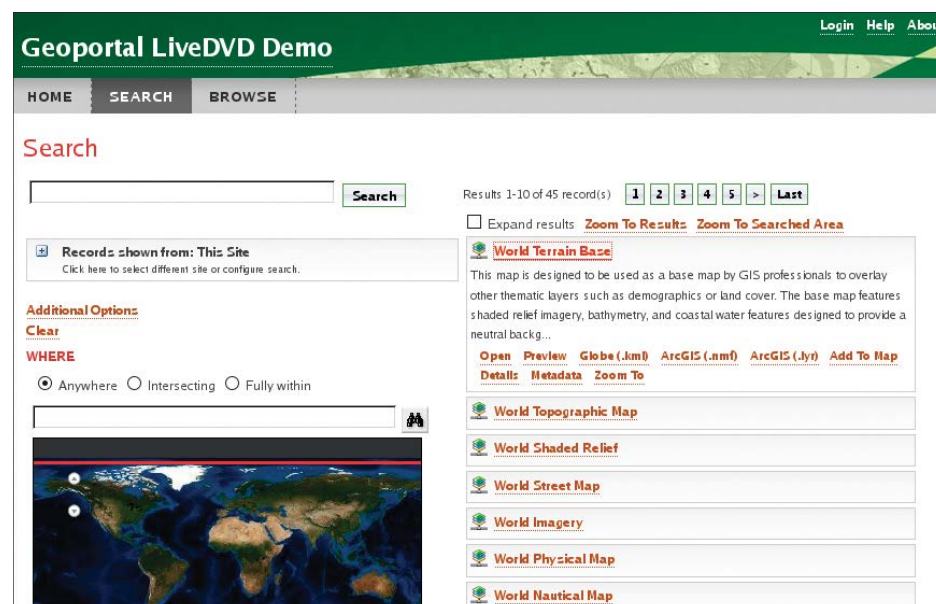
Free, Open Source, and Enables Discovery

Esri Geoportal Server LiveDVD Demo 2013

Esri has released a new version of the Esri Geoportal Server LiveDVD Demo. This LiveDVD Demo allows users to test out a live instance of Esri Geoportal Server without going through the installation and configuration process. Esri Geoportal Server is a free, open-source product that enables discovery and use of geospatial resources, including datasets, rasters, and web services. The LiveDVD Demo provides the perfect test environment to try out customizations of Geoportal Server before implementing them in a production environment.

Geoportal is already installed and configured on its own self-contained Linux operating system. It can be booted directly by putting it in a computer's DVD drive before turning on the system or booted up using a virtual machine. Either way, it does not touch the hard drive of the host computer.

The LiveDVD Demo was built on the openSUSE (www.opensuse.org) Linux



operating system via the SUSE Studio (www.susestudio.com) image creation tool. It is more stable than the previous version and features new functionality. It now supports several wireless network adapters and allows users to install the LiveDVD to their computer's hard drive, giving them a permanent Esri Geoportal Server implementation.

Digital and physical media versions of the Esri Geoportal Server LiveDVD Demo 2013 can be requested for free by visiting esri.com/geoportaldemo.

The Esri Geoportal Server LiveDVD Demo 2013 runs on a fully functional openSUSE Linux operating system.

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Growth, Decline, Change, Diversity

A Demographic Look at the United States in 2013

Highlights

- Diversity continues to increase and change the makeup of the population.
- Median household income for 2013 is 2.3 percent higher than it was in 2012.
- 2013 median home value for owner-occupied households increased 5.7 percent since 2012.

A word that could describe the current demographic state of the United States is *change*. Population and household types continue to change as a few categories grow and diversify, while others decline. Although a number of regional economies are showing positive signs of recovery, lingering effects of the Great Recession continue to hamper growth of the national economy. Job creation remains sluggish, and the growth of household income is negligible. There is concern that rapidly increasing home prices in some markets may trigger another housing bubble.

Population Growth and Decline

Characterized by growth and decline, the US population in 2013 is 314 million. Population in the South and West is growing nearly three times faster than in the Midwest and the Northeast. Reasons vary for the fastest-growing metro areas, such as The Villages, Florida (+13.6 percent)—retirees and seniors; Jacksonville, North Carolina (+7.6 percent)—military presence; Kennewick-Richland, Washington (+6.5 percent)—farming and nuclear production; Austin-Round Rock, Texas (+6.5 percent)—technology and education; and Myrtle Beach-Conway-North Myrtle Beach, South Carolina/North Carolina (+6.1 percent)—tourism. By number, Harris County, Texas; Maricopa County, Arizona; and Los Angeles County, California, have added more than 100,000 people to their populations since 2010.

Traditionally slow growing, populations in North Dakota and Montana are exploding, due in large part to new innovations of extracting oil and natural gas from the Bakken Oil Shale. Employment opportunities in the mining industry have increased by +6.5 percent nationally since 2010.

Conversely, the slowest-growing or declining areas include Flint, Michigan (-2.2 percent); Binghamton, New York (-1.1 percent); Detroit-Dearborn-Warren, Michigan (-1.0 percent); Mansfield, Ohio (-1.0 percent); and Niles-Benton Harbor, Michigan (-0.9 percent). Counties with the largest declines are Wayne County, Michigan (Detroit); Cuyahoga County, Ohio (Cleveland); and Genesee County, Michigan (Flint). These Rustbelt areas suffer from high unemployment as jobs were lost in manufacturing and other heavy industries when companies either moved away or closed.

Increasing Population Diversity

Diversity continues to increase and change the makeup of the population. Esri's proprietary Diversity Index accurately summarizes racial and ethnic diversity in an area. This measure shows the likelihood that two people, chosen at random from the same area, belong to different races or ethnic groups. The index ranges from 0 (no diversity) to 100 (complete diversity). Esri's Diversity Index for the United States has risen from 60.6 in 2010 to 62 in 2013, with a forecast of 64.8 in five years. At 82.1, Hawaii is the most diverse state in 2013; Maine has the lowest diversity at 12.5.

There are several reasons for the increase in population diversity. The non-Hispanic white population is shrinking by a process called natural decrease. The Census Bureau noted recently that for the first time in nearly 100 years, deaths exceeded births among non-Hispanic whites. Demographers had expected this natural decrease, but not until later in the decade. Another factor may be that whites are also either delaying or eschewing parenthood altogether due to economic constraints, such as inadequate employment or student loan debt. Most births in the United States are now to Hispanic, black, and Asian mothers, helping to account for the more dramatic changes in diversity. Based on the current growth rates by race and ethnicity, non-Hispanic whites will become the minority in approximately 30 years. This minority shift will occur more quickly in the younger population than in the total population.

Changing Household Types

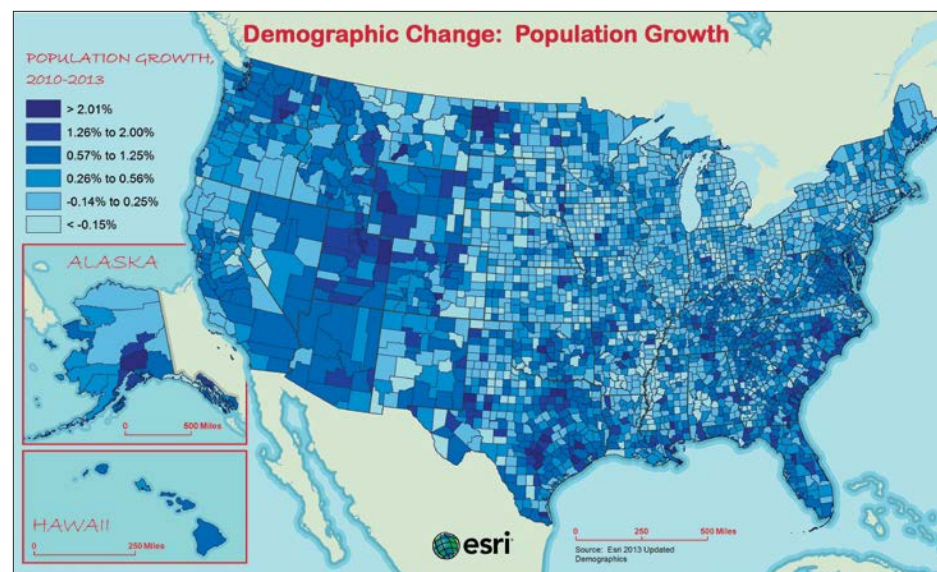
The composition of America's 119 million households is also changing. Although husband-wife families remain the dominant household type, their share of all households continues to slip—from 52 percent in 2000 to 48 percent in 2010. From 2000 to 2010, the real increase in family households was in single-parent families, up by 22 percent, and multigenerational households, up by 30 percent. Husband-wife families increased by less than 4 percent in 10 years, and husband-wife families with children declined. Growing segments of households include nontraditional family types, such as single person, single parent, multigenerational, and same-sex partners.

Housing

Although positive signs are noted in areas more affected by the housing boom/bust and employment decline, recovery of the overall housing market remains slow. The 2013 homeownership rate of 64 percent remains the same as in 2012. The 2013 median home value for owner-occupied households increased to \$177,247, up 5.7 percent since 2012. More people are renting, perhaps because homeownership is still out of reach due to tight credit and the difficulty of obtaining a mortgage, despite historically low rates. Although home prices are increasing (faster than the 2006 rates in many areas), particularly in areas hardest hit by the housing market crash, most of this growth is merely the return of prices to prerecession levels. Fewer homes are "underwater." Vacancy rates are down in more than 44 percent of counties. Additional recovery setbacks occurred regionally in areas hit by natural disasters, such as Hurricane Sandy in New York and New Jersey and the Waldo Canyon Fire in Colorado. Even though the housing market shows signs of recovery, depending on supply and mortgage rates, household income growth remains anemic.

Income

According to Esri's 2013/2018 Updated Demographics data, the median household income for 2013 is \$51,300, 2.3 percent higher than in 2012, but still lower than the 2010 figure of \$54,442. Disparity remains; income rose for only the top 20 percent of households. Unknown is the impact of the Sequester, depending on the number of federal employees affected and the time they are "furloughed." Income for the average household will grow only if steady employment with regular pay raises is available. Industry sectors that are hiring include mining, administration and support, and waste management.



Population growth may be influenced by job opportunities and workers' ability to move to take a job. This map of the US by county clearly illustrates areas of population growth and decline.

About 2013/2018 Updated Demographics

How can you learn more about the demographics of the United States? Esri's 2013/2018 Updated Demographics data can provide answers. To perform actionable location analytics in these challenging times, you need the industry's most accurate, trusted data. Ranked number one for accuracy in a blind, independent study, Esri's demographic estimates and forecasts were produced with proven methodologies to provide the highest possible level of accuracy.

Esri's 2013/2018 Updated Demographics database includes a full roster of current-year estimates and five-year projections for categories such as population, income, race/ethnicity,

home value, net worth, disposable income, and more.

Delivered in a variety of geographies and formats, Esri 2013/2018 Updated Demographics data can be accessed as a map service from ArcGIS Online and in products including Esri Business Analyst Online, Business Analyst for Desktop, Business Analyst for Server, and Esri Community Analyst. The data is also available by table or database for seamless integration into GIS software.

For more information about Esri 2013/2018 Updated Demographics, visit esri.com/demographicdata.

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India's Geospatial Success

By Jack Dangermond



When I visited India in April 2010, I had the honor of meeting with Prime Minister Dr. Manmohan Singh and many other Indian leaders. It was during that visit that I learned of India's vision for a comprehensive National GIS. I had many interesting conversations with various experts where we discussed some of the challenges for such a national endeavor, not the least of which was that a project of such massive scale could only be successful if it involved all levels of government, private enterprise, and the citizens of India themselves—thereby making it a truly *national* enterprise.

I returned to India in September 2011 and was thrilled to see the progress India had made toward realizing its vision of National GIS. In the National GIS workshop that I attended, I interacted with some of the key visionaries of the National GIS—Mr. Montek Singh Ahluwalia, deputy chairman of the Planning Commission; Mr. Sam Pitroda, adviser to the prime minister on information technology; Dr. K. Kasturirangan, member (science) of the Planning Commission; Dr. Shailesh Nayak, chairman of the National GIS Interim Core Group and secretary, Ministry of Earth Sciences; Dr. T. Ramasami, secretary of the Department of Science and Technology; and Dr. Mukund Rao, secretary of the National GIS Interim Core Group and chairman of the GIS Task Force of the Karnataka Knowledge Commission—who, I must say, over past years has played a prominent and leadership role for this Indian endeavor. Apart from these key personalities, the Interim Core Group had 10 other national experts—together it was their experience and visionary perspectives that have shaped the National GIS vision. In that workshop, there were 200 experts—from government, industry, and academia—who spent a whole day debating, sharing, and fine-tuning the already crafted (and well discussed) National GIS vision. In all these

interactions, what struck me was that a national movement had been set in action that was shaping a new dimension of nationally and socially relevant GIS.

This July at the 2013 Esri International User Conference (Esri UC), the vision of National GIS was unfolded by Pitroda in a Keynote Address that struck the plenary audience of thousands with awe about how India was slowly transforming its strengths (and complexities) into a great innovation advantage to set about a new information regime that empowers citizens, brings good governance, and encourages sustainable development—thereby bringing benefits of GIS to citizens, government, and enterprises. As Pitroda said at the Esri UC, "... addressing the bottom of the pyramid" was essential, and a National GIS is expected to do that. He also pointed out that the program has now been approved and sanctioned by the Indian government and that the program will take off this year and even establish a separate Indian National GIS Organization that will be dedicated and committed to further the use of GIS. It is truly visionary of the Indian government to undertake such a broad-based social infrastructure project that promises to bring tremendous dividends and benefits to the citizens of the world's largest democracy.

Even as India has made this great stride toward visualizing National GIS, a big challenge that it faces is the need for technically strong and visionary leadership for implementing National GIS successfully. I am very impressed and thrilled by what India has been able to accomplish in such a short amount of time. The following article shares some of the unique and important characteristics of India's National GIS vision. I believe that India is on the right track and that it can serve as a role model for other nations looking at the idea of National GIS as a platform for bringing together governments, businesses, and people. The world can learn a lot from India.

A Model for Good Governance, Enabled Citizens, and Successful Enterprises

India: A Vision for National GIS

India has long been a leader in using modern spatial technologies and started its tryst with satellite images and GIS in the 1980s by having its own Indian Remote Sensing satellites and image-based mapping and creating GIS databases and applications. In the early 2000s, it took steps toward designing a National Spatial Data Infrastructure. With a large talent pool and many veterans providing the vision, leadership, and drive, now a national movement has taken shape in India's next-generation GIS program—National GIS. Moving away from looking at GIS as just a mapping or database tool or as scientific software, India recognized that the

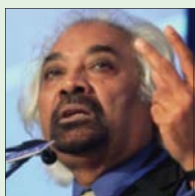
true power of GIS can be realized only when it reaches the hands of the governed—those who can demand efficiency of governance/development and transparency in democratic action.

India is a vast country, with a population of more than 1.2 billion people spread over 3.29 million square kilometers. The country is composed of more than 600,000 villages and 7,000 cities and features a varied geography with a rapidly changing and complex social and economic character. As a democracy, India is constantly dealing with ways and means to comprehend social and economic challenges and bring a good quality of life to all its

citizenry—aiming to bridge the wide disparity in economic and social character. It is in this democratic character that India visualizes National GIS as important—to easily map, note changes to, and understand the complex interplay of social order and economic growth. India has visualized that GIS is not just essential but is now an urgent necessity—so as to empower

its citizens and bring an inclusive economic growth and prosperity to its people. It hopes to reap demographic dividends, expedite development, and reduce disparity—thereby bringing more equity among its people.

To many, developing a national GIS would seem to be an insurmountable task. How would a single, comprehensive system ever



Sam Pitroda, Adviser to Prime Minister on IT and Innovations

"India is at the cusp of another technological and development curve, and in its drive for inclusive growth, social equity, and development, a major requirement would be to reengineer many systems and processes. Information will be the fourth pillar of democracy, and GIS will be that important element of the fourth pillar—helping in the concept of unified information infrastructures. National GIS is envisaged not just to provide GIS data and GIS applications but serve as a platform for a host of e-services to every citizen—be they in urban or rural areas—and thereby leading India into inclusive growth and prosperity, expediting development, reducing disparity, and bringing rich demographic dividends."

—"A National GIS for India's Development," Keynote Address, Esri International User Conference, San Diego (July 8–12, 2013)

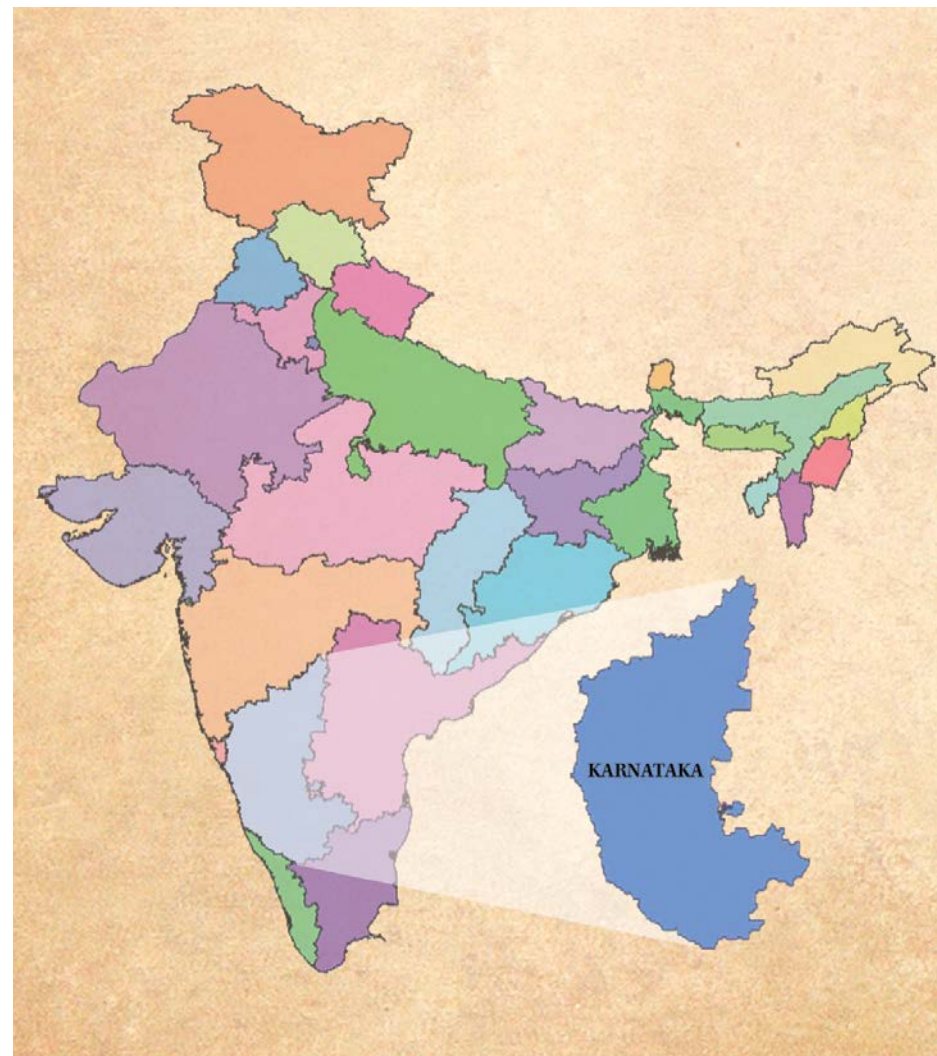


Dr. K. Kasturirangan, Member (Science), Planning Commission

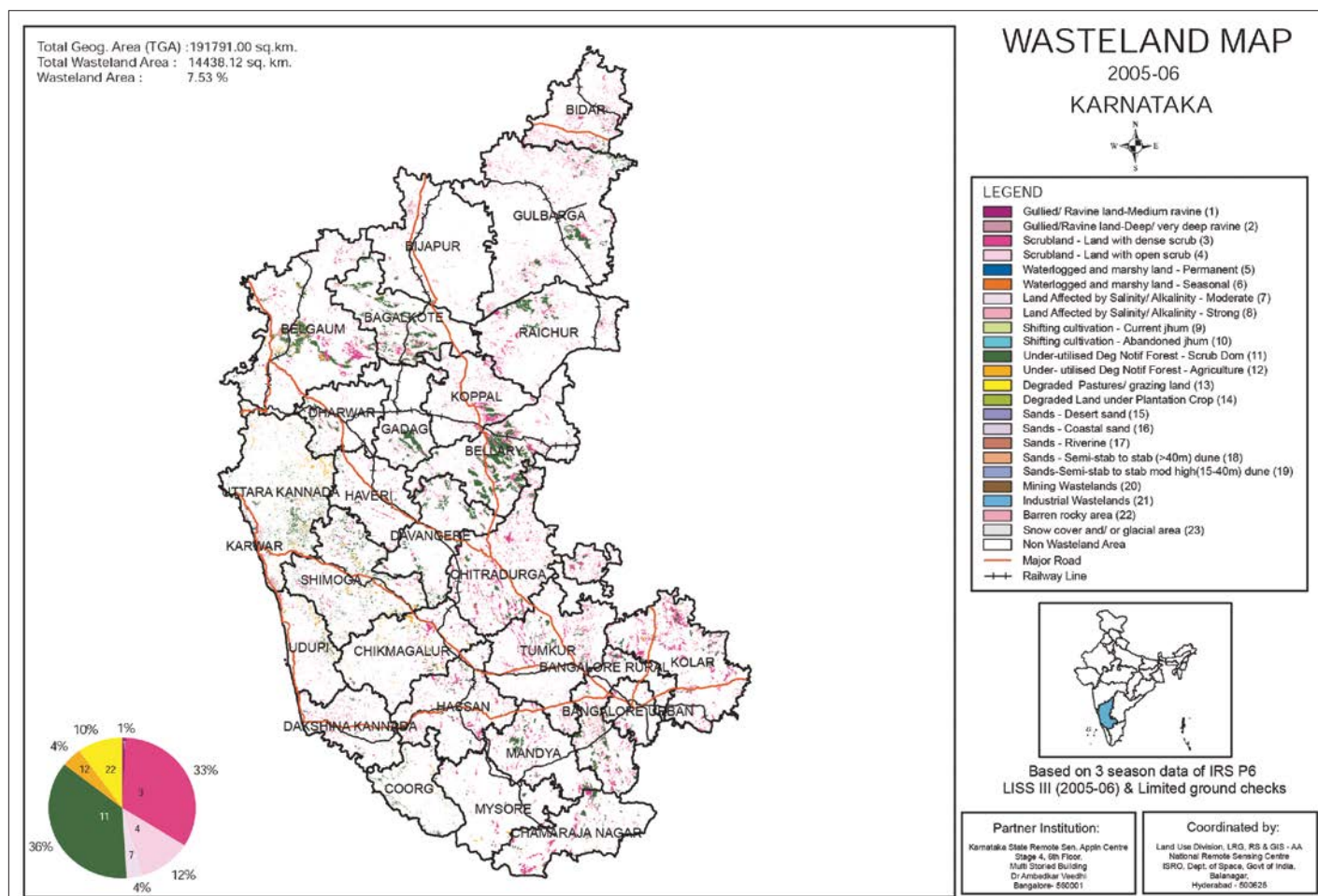
"There are three important issues related to GIS. First, how can we ensure that our decision/governance system is supported by a comprehensive, easy-to-use GIS decision support system—whatever the *decision maker* wants must be supported by GIS?

Second, how can any user be rid of the hassles of GIS data organization that he now faces—ensuring that GIS-ready data is readily available? Third, how can we have an institutional system in the country that is responsible for GIS and is accountable to meet the GIS needs of the country?"

—Key Address, National GIS Workshop, Delhi, India (September 14, 2011)



The state of Karnataka's GIS program is a successful model for National GIS.



Wasteland map of the state of Karnataka based on three seasons of data, 2005–2006. Source: Director, Karnataka State Remote Sensing Centre (KSRSAC, Bangalore).

be expected to serve the varied and separate needs of so widely contrasting elements? To others who know the challenges of GIS data availability in India, it would sound almost impossible to visualize a seamless national GIS that covers the whole nation. But a blueprint has been developed, and there is now a clear agenda that has been set for establishing and making operational National GIS—becoming one key element of a new innovative information foundation that will empower governance, enterprises, and citizens across the country.

The vision of National GIS for India has now been widely debated, discussed, and endorsed in a series of national-level meetings involving users, stakeholders, technical experts, policy makers, and the government. The National GIS vision document can be accessed at moes.gov.in/national_gis.pdf. The National GIS has now been incorporated into the Government of India Planning Commission's *Twelfth Five Year Plan 2012-17* as a new initiative for the future (planningcommission.gov.in/plans/planrel/12thplan/welcome.html Vol. I, page 248).

Reaching Full Potential

The vision report states that in spite of the wide usage of GIS as a technology, the potential of GIS has not yet been fully exploited for decision support by planners, stakeholders, decision makers, citizens, and others. Some of the initiatives have certainly been successful and have proved the potential of GIS for project work, but in many places, GIS has yet to achieve a full-service orientation and become a core component of the process of governance, planning, and nation building. Some key challenges that India faces in this regard include the following:

- How can the nation ensure that its decision-making/governance process is supported by a comprehensive, easy-to-use GIS decision support system that brings scientific, participatory, and quality dimensions into decision, planning, and development?
- How can the nation ensure that GIS-ready data is always easily available and maintained/

updated by adding that critical capability differentiator over the images and maps that have already been invested in?

- How can India maintain a high level of national capability in this important technology area and leverage itself to be in the forefront of GIS technology in the international arena?

India has also recognized that there are some gaps in the widespread adoption of GIS in the country, and these need to be addressed as part of the process of building National GIS. GIS is technology-centric but needs to be decision-centric. This means that all types of decision makers—governments, enterprises, and citizens—should have the ability to easily make use of readily available GIS data and applications that can help solve their problems. GIS needs to become so easy to use and so deeply embedded in workflows and processes that it becomes integral to modern governance and nation building. In addition, there is as yet no widespread availability of GIS-ready data for the whole country, and no agency in India has overall responsibility for this activity. These shortcomings have been identified as critical and need to be addressed before GIS can become pervasive at both the state and national levels.

Key elements of India's National GIS vision include the following:

- A National GIS platform with GIS-centric computing and networking infrastructure
- Seamless, nationwide National GIS asset at 1:10,000 scale, as well as city-level data at larger scales
- Targeted National GIS applications to support government ministries and departments, private enterprises, and citizens and delivered through a National GIS portal; planned GIS dashboards for use by the Prime Minister's Office, Planning Commission, Cabinet Secretariat, and key dignitaries
- Focused GIS capacity-building initiatives
- Pragmatic geographic information (GI) policy positioning and best practices for National GIS

India has recognized that a strong organizational framework is essential for bringing focus and for institutionalizing National GIS and promoting geospatial technology use by government, enterprises, and citizens. To ensure success, it considers having an agency be made responsible for overseeing the vision of National GIS important. The Indian National GIS Organization (INGO) would have the primary mandate for the establishment, maintenance, and operation of National GIS. It would be responsible for guiding and shaping disparate components relating to infrastructure, technology, and services into a cohesive system.

In addition, a robust management structure has already been put in place to bring high-level focus and alignment across multiple ministries and all states and territories and to provide a flexible operational mechanism for implementation of National GIS. The Department of Science and Technology (DST) has been assigned the responsibility of implementing National GIS, and Dr. T. Ramasami, secretary, DST, is driving all the actions for the implementation. A National GIS Advisory Board has been established, with Dr. K. Kasturirangan as its chair, to provide overall policy direction and advice on implementation of the National GIS vision. A high-level National GIS executive committee has also been established to facilitate National GIS implementation, ensure INGO establishment, and help position across the entire country the concept of e-governance; e-governing is governing that takes advantage of the convergence of the newest geoinformation and communication technologies, such as improved spatial data management, GIS, GPS, remote sensing, satellite

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Montek Singh Ahluwalia, Deputy Chairman, Planning Commission

"National GIS can serve multiple needs—government, enterprises, and citizens—and must power more open government and thereby leverage economic and social development and reach the gains of development to the most needy and at the right place. National GIS must also aim to bring accountability and responsibility of public activities where decision making can be centered around GIS—thus factoring location and time-domain map information."

—Inaugural Address, National GIS Workshop, Delhi, India (September 14, 2011)



Dr. Shailesh Nayak, Chairman, National GIS Interim Core Group/Secretary, MoES

"GIS is of great relevance for many government activities and enterprises and for citizen services. National GIS has the main aim of thrusting the use of GIS applications into governance/planning/development activities. While India has made some progress in using GIS, a national system of a GIS is very important and timely for the nation to adopt. An organizational focus on GIS is important as an agile, rescoping organization—Indian National GIS Organization."

—Key Address, National GIS for G-Gov Workshop, Delhi, India (December 12, 2012)



Dr. T. Ramasami, Secretary, Department of Science and Technology

"National GIS is a logical requirement—while e-Governance (e-Gov) is the current paradigm, the future is in embedding the GIS in governance and in establishing G (G signifying GIS-based)-Governance (G-Gov) as the next frontier. India is poised for developing GIS-based solutions as the next paradigm in governance. National GIS would also catalyze and transform the methods in which GIS is practiced in the country, the way maps/images as GIS-ready data get organized and the way customized GIS applications get created, managed, and deployed as unique GIS services. An institutional framework for National GIS is also a necessity, and evolving INGO [Indian National GIS Organization] must be a priority."

—Key Address, National GIS for G-Gov Workshop, Delhi, India (December 12, 2012)

India: A Vision for National GIS

continued from page 17

and mobile communications, and the web. A mission-mode implementation of National GIS is being taken up under DST, and soon, a mission director will be positioned to be responsible for implementing National GIS.

A National GI Policy

India also recognizes that a strong policy foundation is essential for National GIS and also for furthering a good GIS ecosystem in the country. An independent study on GI policy perspectives has been undertaken by the National Institute of Advanced Studies, Bangalore, for the Government of India. The study has brought out a comprehensive report that outlines the framework of India's GI policy document (www.nias.res.in/docs/R11-2012-GI-Policy.pdf).

Presently, India has five policy tenets:

- **National Map Policy**, defining the scope, distribution, and access of Survey of India topographic maps
- **Civil Aviation Requirement**, detailing procedures for issuance of flight clearances for agencies undertaking aerial photography, geophysical surveys, cloud seeding, etc.
- **Remote Sensing Data Policy**, defining the process for distribution of satellite imagery
- **Delhi Geographical Spatial Data Infrastructure (Management, Control, Administration, Security, and Safety) Act**, defining the mandatory sharing, accessing, and utilization of Delhi geospatial data
- **National Data Sharing and Accessibility Policy**, declaring open access to data generated through public funding

The above existing policies have been analyzed, and the need for an overarching policy regime for GI has been emphasized. To bring rationality in policy analysis, seven basic segments were identified that describe a national capability in GI and that need to be factored into a GI policy: imaging capability, precise positioning capability, advanced surveying capability, mapping capability, GIS capability, GI knowledge capability, and GI policy capability. In addition, four major cross-cutting GI policy considerations were identified as key factors for policy definition: national security, social relevance, legal issues, and creation of industrial capacity. Based on these seven segments and

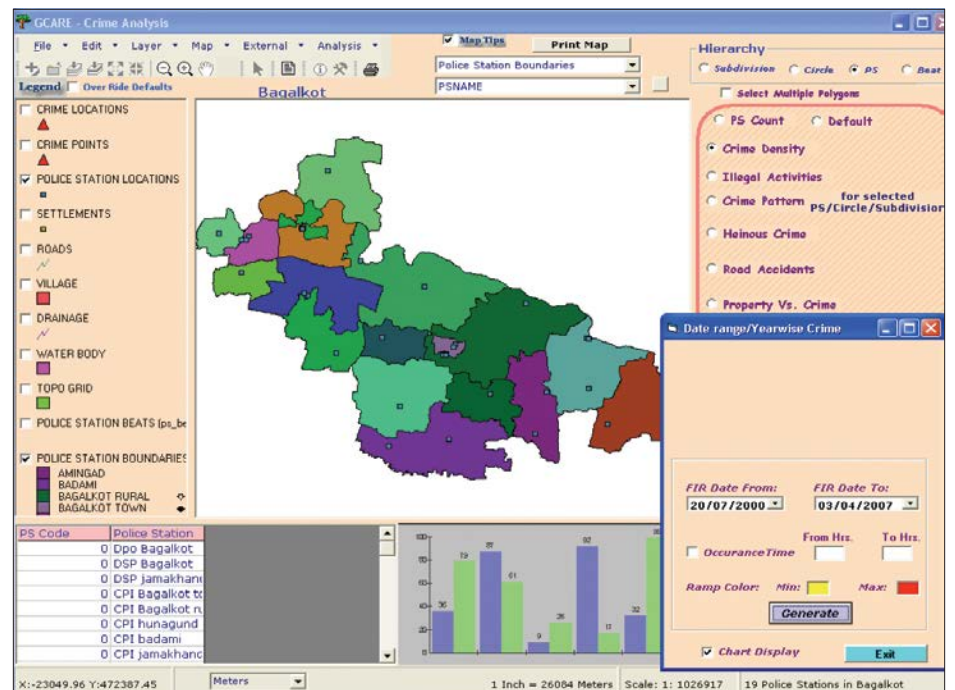
four cross-cutting considerations, the policy analysis identified 62 critical parameters that are constantly assessed from a policy definition point of view. Based on these factors, the case has been built for a comprehensive, overarching, and visionary policy. The report has also drafted the text of the national GI policy that aims for an advanced and impacting national capability in GI that empowers citizens and governance and also for positioning India as a global leader in GI. Toward this aim, it identifies two important near-term goals:

- Establish National GIS in the next three to five years.
- Institute g-governance models in Indian society.

In India, individual states are the main delivery mechanisms of development and social programs, so it became clear very early in the visioning process for National GIS that success would be dependent on acceptance and buy-in at the state level. Various state GIS initiatives have brought good operational examples of statewide applications to the national forefront. Some very good statewide GIS examples that have been established are in states like Gujarat and Karnataka. Gujarat has developed comprehensive statewide GIS data and has operationalized GIS services to grassroots level in a unique way. Karnataka has multilayered statewide GIS data and a wide range of GIS applications. In other states like Andhra Pradesh, Maharashtra, Rajasthan, and Haryana, GIS usage has been good. Many other states also use GIS for specific projects. These state-level efforts, in addition to establishing the relevance of GIS for development in a wide spectrum of areas, provide significant insight into successful applications, which are closer to citizens' needs and direct governance. In addition to these government agencies, many private-sector agencies have also been successful in implementing GIS solutions and in providing GIS services.

Karnataka GIS

The state of Karnataka determined to define state GIS in the context of National GIS implementation and to address the model of *governance-enterprise-citizen*. The prototype that the state then developed



The Karnataka state police department has undertaken a pilot project for crime analytics and real-time monitoring. Source: Director, Karnataka State Remote Sensing Centre (KRSRSC, Bangalore).

resulted from close examination of governance issues and citizen empowerment (see www.karunadu.gov.in/ksac/documents/K-GISVisionDraftVerWshop_Jan18.pdf and www.karunadu.gov.in/ksac/documents/KGisUserNeedsDraftWshop_Jan18.pdf). Once Karnataka had developed its strong state GIS model, it became a successful model for both state and national GIS implementation.

The state GIS would easily dovetail with and link to National GIS, and both could benefit from a common GIS data content (thereby reducing data duplication and redundancy) but service different applications (founded on a GIS services model). Such an approach is seen as essential to meet the needs of central and state governance and thereby its citizens.

Karnataka recognizes that GIS provides tangible benefits and that it is a key platform for the future of state governance. An institutionalized system that will ensure the availability and accessibility of GIS data and applications to different user groups and citizens is an important consideration in the vision of Karnataka's 21st century governance. With the vision for Karnataka GIS now defined, the result is a robust information and decision support system that upholds the decision-making process for planning and implementing various state developmental programs and also for empowering citizens in the state, apart from contributing common content and linking to National GIS. Thus, the Karnataka GIS is well-aligned with the vision of National GIS, ensuring seamless interoperability and cooperation between the states and national-level government.

The Karnataka GIS visioning exercise, undertaken by the Karnataka Knowledge Commission's GIS Task Force, has resulted in focusing unique and innovative ways of implementing GIS. Apart from the vision definition, a comprehensive assessment of user needs, in terms of GIS data and applications for various state departments, citizens, and others, has been documented. A good matrix structure has been identified for implementation where multiple agency capability is integrated at the state level.

India's National GIS: A Model for the World

The Indian government's vision is to create a new paradigm for governance and development with emphasis on inclusive growth and development—especially to reduce disparity, expedite

development, and bring demographic dividends that will be unique. The vision of National GIS is aligned to enable a scientific mapping of resources, disparities, and needs to meet the aspirations of beneficiaries and society, especially the most disadvantaged; support sustainable and spatial planning; assist quick and reliable monitoring of plan implementation and status of development; enable transparent systems for inclusivity of society; and support real-time mapping of feedback and redress systems.

The process of establishing and implementing the state and national vision will also provide considerable opportunities for the private sector to contribute to and be part of this national endeavor. The national and state GIS will also boost education and research in GIS with specific school, university, and research programs focused on training the leaders of tomorrow in spatial thinking concepts and the core principles of GIS.

In today's rapidly changing world, India recognizes that nations that possess a sound and progressive GIS vision will lead and chart ways not only within their own borders but also across the international arena. India is gearing up to implement National GIS and make it fully operational.

Concluding Note from Jack Dangermond:

There is something for all GIS users to learn from this vision. It is sincerely hoped that what has been conceived as a national GIS platform to help bring growth, efficiency, transparency, equity, and inclusiveness to India will also serve as a useful model for other countries wishing to implement a national GIS.



**S. V. Ranganath, Chief Secretary,
Government of Karnataka**

"The role of Karnataka GIS to the state's planning and development process is critical. Karnataka is committed to support a Karnataka GIS initiative to serve as an important tool to support governance and particularly to empower people of the state.

Karnataka GIS is an innovative knowledge initiative and has far-reaching implications to the state."

—Inaugural Address, Karnataka GIS Workshop, Bangalore, India (January 23, 2013)



**I.S.N. Prasad, Principal Secretary (IT&BT),
Government of Karnataka**

"Various Information Technology tools are being used for providing various citizen services and government programme outreach in Karnataka. Now, GIS will be yet another decision-support system that will bring benefit to the various departments of the state of Karnataka and citizens who seek the GIS data and services for their needs. The vision of Karnataka GIS has emerged after inclusive consultation and discussions amongst various department officials, industries, academia—thereby defining a statewide GIS ecosystem for growth and governance."

—Panel Discussion, Karnataka GIS Workshop, Bangalore, India (January 23, 2013)



An Interview with Mukund Rao



National GIS of India is an innovative program within the country's Twelfth Five Year Plan that has generated much interest. Spearheading many of its component efforts is Dr. Mukund

Rao, member-secretary of the National GIS Interim Core Group and chairman of the GIS Task Force of the Karnataka Knowledge Commission. Rao has more than 32 years of experience in earth observation (EO) and GIS programs and building space activities. His unique experience—working in both government and the private sector and now in the consulting domain—brings impactful and effective practices. Over the years, he has also provided leadership to many national and international forums related to EO, GIS, and space. Recently, *ArcNews* had an opportunity to speak with Rao.

AN: What is National GIS?

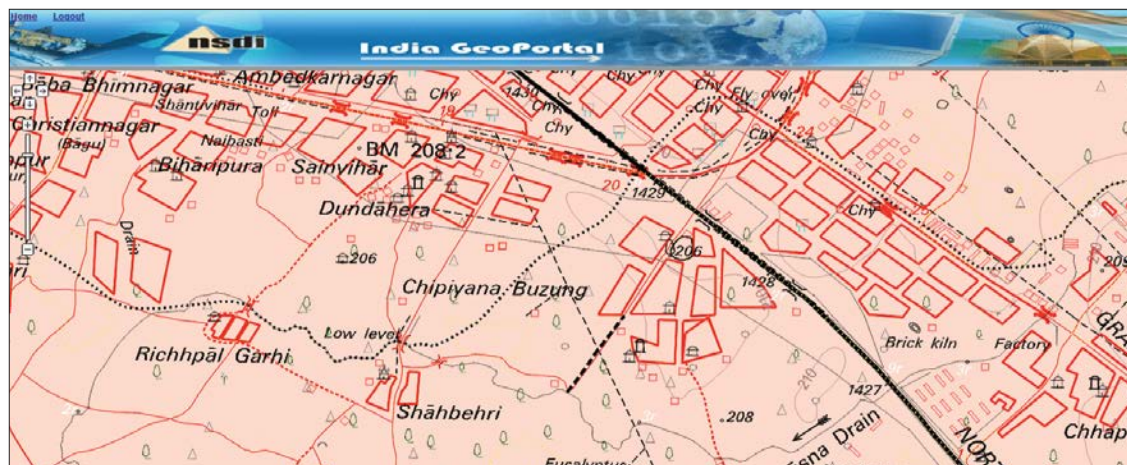
Rao: National GIS is India's next-generation GIS program, envisioned as critical support to the national governance and empowering its citizens—thereby extending GIS to all levels of society. In the long term, National GIS is envisioned to build national capability in GI and enable India to maintain global leadership in GI. India has vast experience in mapping and GIS—systematic mapping has been carried out for more than 200 years; remote-sensing images have been used for the past 40 years, and GIS technology has been used for almost 30 years. India has realized that the true power of GIS can only be realized when GIS is embedded within governance and taken to every citizen.

AN: What is the significance of National GIS now?

Rao: First, as a nation, we are witnessing tremendous progress, and our economy will grow significantly in the coming 5 to 10 years. With such growth, society will demand very high efficiency in governance and quality services, and the government will depend on very efficient, guaranteed methods of nation building and bringing equity in quality of life for people—doing so with transparency, speed, and compassion. Immense amounts of analytics will be called for. Support data/information systems have to be ready to use and no longer limited by the need to start getting organized. As demand on governance is becoming anticipative and futuristic, the decision process must always be a step ahead of the people's demand. Similarly, democracy demands inclusiveness, and thus citizens must be able to participate in and judge every development option/decision or even demand specific development needs—this, too, National GIS should be able to provide. Thus, National GIS will not only improve the efficiency of governance but also enable citizens to participate in the development process.

AN: How is this different from GIS in India today?

Rao: I think the key differentiator is the shift from a data generators drive to a user demand or national needs drive. Meeting what the user needs (or what the nation wants) is the supreme goal rather than providing only what is available—most times, data generators seem to be driven by what technology can offer or make available, whereas user needs require ready-to-use authoritative GIS data; therefore, a wide gap emerges between these two ends. Thus, even though the nation has a long history of surveying and mapping, years of imaging,



India has a demonstration National Spatial Data Infrastructure (NSDI) portal that uses all the technology elements required for metadata and map data organization. (Source: India NSDI Portal at nsdiindia.gov.in/nsdi-portal/index.jsp.)

and many years of GIS project activities, the usage of images/maps/GIS has yet to be impactful and meaningful to grassroots levels. Until such GIS-ready and user-specific data for the whole nation is easily available, how can a user or governance mechanism or citizen make the best use of GIS technology in decision making, and how can citizens be really empowered? National GIS would bridge this wide gap and ensure that GIS-ready data that is regularly updated as users require is made available.

Another differentiator is in the shift toward a mandated, organizational structure for National GIS and the shift away from just doing GIS projects—thereby critically aligning the existing multifarious remote-sensing and GIS activities to this national goal. Over the past 20–30 years, many GIS projects have been carried out by quite a few organizations—thus, while projects have been completed, these are contributing less to effective and efficient use in decision making and becoming part and parcel of good governance. We have realized that simply doing GIS projects is not leading us to this goal, and we need an organizational mandate at the national level—that way, GIS will get the responsibility and also bring accountability. To this important shift, the visualization of the Indian National GIS Organization is something critical, important, and unique.

AN: What are the challenges for National GIS?

Rao: The biggest challenge is already behind us; that is, getting the concept debated/discussed and endorsed. This has happened very efficiently, thanks to the Planning Commission's efforts. Almost all ministries (in central and states), GIS industries, GIS academia, etc., have been consulted, and a wide range of discussions have taken place. This first round of consultations led to the vision document for National GIS (in October 2011). Even after the vision document was prepared, the Indian government has undertaken another round of in-depth consultation for programmatic and financial approvals. Now, National GIS has been marked down as a new initiative in the Twelfth Five Year Plan. As I gather, the last round of processing is in its final stage of approval by the Indian Cabinet. So, I think, now the issue is not what National GIS is or whether National GIS is required but when National GIS will become operational.

Workwise, there are many challenges, but none of these are insurmountable. Technically, one challenge is organizing the National GIS asset that is seamless, nationwide, and GIS ready. Getting almost 41 parameters of data organized into a national spatial frame is a challenge—India still does not have an authoritative spatial

foundation framework, and this will have to be organized for the first time. Similarly, bringing in myriad sets of available survey data, maps, images, tabular development data with geotagging, cadastral data, etc., is also going to be a challenge—a voluminous challenge! Designing and developing a data updating cycle and creating a GIS warehouse for timeline GIS assets will also be important. Even as the GIS asset is organized for the first time, the importance of updating existing content, adding more content, and keeping the GIS asset live and updated will become a prime goal.

At the same time, creating an environment for the widest usage of GIS applications is yet another challenge—especially considering the wide variety of user ministry (at central and state levels) and citizen needs that will have to be met from a GIS perspective. Thus, a culture of National GIS apps has to be developed and positioned. Similarly, establishment of the GIS infrastructure and systems has to be undertaken.

There would be critical policy, access, and licensing issues that would have to be positioned. Already, some thought has been given to the GI policy (through a study undertaken by the National Institute of Advanced Studies), and tenets for a national GI policy have been worked out. Human resource development in states, central government, and citizens at large will also be important, and program elements for these have been defined in a report being prepared by the Ministry of Human Resources Development.

What will be also challenging (and proof of success) is to make all these elements work in tandem and establish an operational framework by which GIS data and GIS application services become a reality and for National GIS to be firmly embedded in the nation's information and governance regime.

AN: What about policy needs? You have also been associated with the GI policy study.

Rao: National GIS will need innovative policy instruments that are quite different from those available today in the five individual policies. Policy has to be determined in an analytical manner—defining the long-term “GIS ecosystem” goals and short-term achievements. Such an overarching GI policy should not only operationalize National GIS (in the short term) but also enable national GI excellence, industry participation, academic emphasis on GIS, and the nation's commitment to citizens for GIS. In a study undertaken in India, we have prepared a comprehensive, first-of-its-kind policy report that includes a draft of the national GI policy (www.nias.res.in/docs/R11-2012-GI-Policy.pdf). The report has already been submitted to

the government and is a major input for positioning National GIS.

AN: What about the Karnataka GIS?

Rao: When we completed the visioning of National GIS in October 2011, it was recognized that the success of National GIS will be exponential if states' GIS needs are also met; after all, states are a more direct mechanism for delivering governance and are directly closer to citizens. So, thanks to the government of Karnataka, we took up a task force study to logically

drill down National GIS to a state requirement study. We conducted state-level discussions and workshops and stakeholder/user meetings and determined that states' needs would be much greater and quite different than what would be required in a national GIS. The GIS data needs comprise almost 60 parameters, and most of the GIS applications need to be linked to cadastral—that becomes very important at the state level.

What we also see happening is that if state GIS programs are organized, they not only achieve some key goals of National GIS but also trigger a set of GIS apps at the state level—thus, Karnataka GIS (and other state GIS programs) can become vehicles for quickly and systematically organizing an aligned GIS that not only serves state-level governance and citizen needs but also integrates well into National GIS. Many other states are also being primed to align their GIS tasks into the National GIS system. Now, with the vision of National GIS and the Karnataka GIS, we understand what it will mean to develop state systems and how the dovetailing to National GIS would happen. Now, we see a GIS system of systems—meeting state and central governments, citizen, and enterprise needs.

AN: What about schedule and budget and official sanctions?

Rao: National GIS is now part of India's Twelfth Five Year Plan. The proposal is to deploy National GIS in two stages and complete the establishment process (with many GIS data and app services also rolled out) in about three to five years—after which the operations and maintenance phase would be undertaken. As I said earlier, all the groundwork is now done, including financial approvals, and it is just the last step of cabinet approval that must be accomplished. Within the state of Karnataka, the schedule for Karnataka GIS is about two years, and here, too, the state-level processing is in its final stage.

Budgetwise, I can only say that, as the government of India (and state governments) is determined to implement National GIS, budget would not be an issue—especially for such a well-developed program that has endorsement at all levels.

Like many in India, I am keenly looking forward to National GIS becoming one core element of the development process and for GIS to be firmly embedded in every governance process and for empowering every citizen of India.

For more information, contact Dr. Mukund Rao (e-mail: mukund.k.rao@gmail.com).

A NATIONAL GIS BENEFITING INDIA

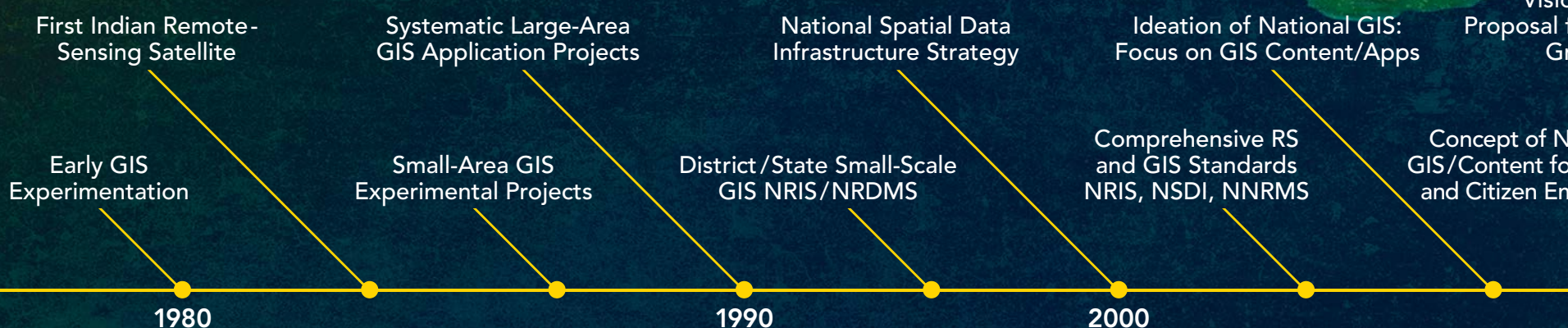
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State GIS to power development and citizen engagement

KARNATAKA



National GI Policy



GIS to power governance and enterprises and empower citizens



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The Future of Governance

Formation of National GIS:
for INGO National Core
Group Committee

National GI Policy
Project Report

Government Approvals and
National GIS Mission Definition

Establishment of Indian National
GIS Organization (INGO)

National GIS:
for Governance
Empowerment

National GIS Program:
Part of 5-Year Plan
Government of India

State-GIS Definition:
Vision of Karnataka GIS

National GIS:
V.1 GIS Asset /Limited
App Services (2014)
V.2 Full-Scale Content, 25-30
GIS App Services (2017)

Maintenance, Updating
and Operations of
National GIS by INGO

2010

2011

2012

2013

2014-17

2018

2018-

Heritage Sites Viewed with 3D Models and Virtual Tours

Asenovgrad, Bulgaria, Attracts Tourists with Web GIS

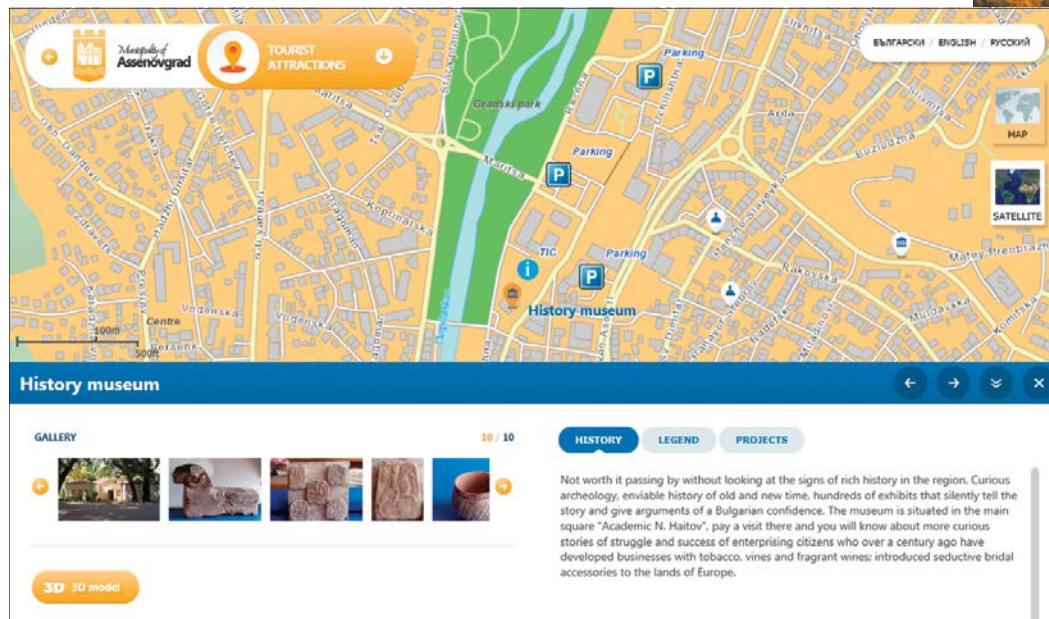
Highlights

- GIS optimizes tourism management and ensures effective interaction between the government and third parties.
- GIS for Tourist Attractions manages all spatial and descriptive information.
- A web GIS application promotes the tourist sites in a new and attractive way.

Some of the most fascinating tourist attractions in Bulgaria are managed and popularized by the first-of-its-kind GIS in the country.

Located in the heart of the Balkan Peninsula, Bulgaria has a long, rich, and fascinating history. Present-day Bulgaria was a cradle of some of the most ancient civilizations in Europe. Known as the “holy gate to the Rhodope mountains,” Asenovgrad is located in the South Central region of the country and is a natural link between Central Bulgaria, the Rhodope Mountains, and the Aegean Sea. Its favorable geographic location and the unique combination of mountain and plain are the reasons Asenovgrad has been inhabited since ancient times. On its territory can be found some of the most ancient and notable cultural, historical, and natural sites in the country. One of the biggest concentrations of holy sites is located there—four monasteries, 33 churches, 60 chapels, and many sanctuaries.

All this makes tourism the priority sector for Asenovgrad. Furthermore, the municipal government sets the goal of transforming the tourist attractions into a business card of the town.



The public web GIS app for the tourist attractions features virtual tours and 3D models. The history museum is a top destination in Asenovgrad, as it reveals curious archaeology and hundreds of exhibits that tell the story of the region.

The Challenges

The transformation of Asenovgrad into an attractive and popular tourist destination is not an easy task, and the administration faces many challenges. One of the main problems is the fact that many of the natural, historical, and cultural heritage sites are almost unknown. There is also a varied spatial concentration of tourism, as some of the tourist attractions are visited often and others remain neglected by tourists, and this causes severe fluctuations in attendance—a direct consequence of the undeveloped geographic structure of the tourism in the region. Information about the attractions is

maintained in many different registries in various departments in the municipal government or is even missing. This leads to ineffective and poor tourism management.

To solve these problems—as part of the project Asenovgrad–Holy Gate of the Rhodope Mountains, funded under the European Operational Programme Regional Development—Asenovgrad began a project to develop a GIS for the tourist attractions. Esri Bulgaria Ltd. was selected to develop and implement the systems.

From Inconsistent, Scattered Information to Complete, Integrated GIS

To achieve the project objectives, Esri Bulgaria's team analyzed the available information for the tourist attractions, including the information requested and provided by the municipal government, as well as information available from other sources. The team also analyzed the information interaction between the municipal government, the public, business and third parties, and the need for improvement in this area. Based on this analysis, Esri Bulgaria designed GIS for Tourist Attractions based on ArcGIS technology that provides collection,

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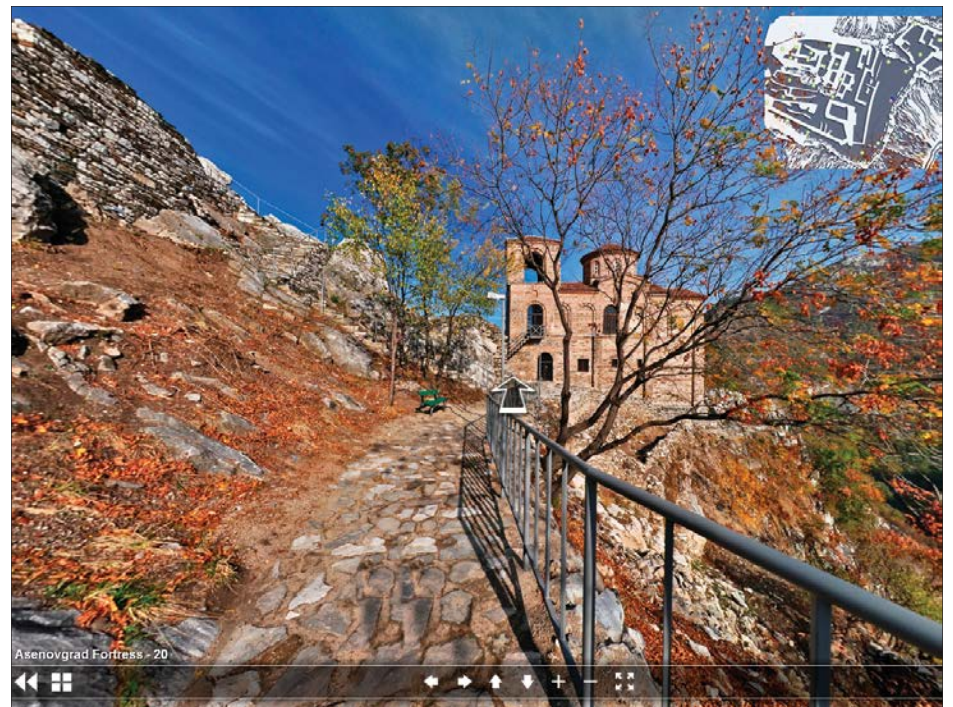
A notable feature of the Asenovgrad fortress region is the Church of the Holy Mother of God from the 12th–13th century.

integration, storage, editing, and analysis of all the spatial and descriptive information for the tourist attractions in Asenovgrad. This GIS optimizes the processes of tourism management and ensures effective interaction between the municipal government and third parties. As part of the GIS, a special web GIS application was designed to promote the tourist sites in a new and more attractive way.

GIS for Tourist Attractions was built to be centralized. It creates and maintains a single centralized database and provides all users with online access to its features and capabilities, depending on their permissions. Desktop users

can access the system capabilities through the LAN network in the municipality, and web users, through an Internet browser.

The GIS consists of two subsystems and a module for system administration. The subsystem Tourist Attractions is developed as a web application designed for use by all the municipal employees. The subsystem allows the employees to enter and edit spatial and attribute data, make analyses, and prepare different reports. The subsystem Data Publishing allows the employees to publish information for the tourist attractions on the Internet.



The public geoportal offers a 360-degree virtual tour of the Asenovgrad fortress.

Tourist Attractions Go Virtual

A special public geoportal (gis.asenovgrad.com/tourism/) provides access to rich information about the cultural, historical, and natural attractions in the municipality. The geoportal also allows visitors to learn their locations and how to reach them and to discover related projects. In addition to the gallery of video and photography, there are also 3D models of all the tourist attractions.

As part of the project, a 360-degree virtual tour of the Asenovgrad fortress—one of the most fascinating and notable attractions in Asenovgrad—was developed and integrated into the geoportal. For this purpose, special virtual tour images were captured and then processed and retouched. The virtual tour of the Asenovgrad fortress enables people to see and explore the attraction. The tour allows the user, by clicking the mouse, to pan up, down, and all around a view and thus gain a sense of realistic sightseeing.

First Prize for the GIS

On January 22, 2013, at an official ceremony, the Bulgarian Association of Information Technologies awarded those organizations in Bulgaria that have significantly contributed to the development of information and communication technologies in the country within the last year. In the category Municipal Administration, the award went to Asenovgrad for the development of GIS for Tourist Attractions. The award was received by the mayor, Dr. Emil Karaivanov. “The GIS that was developed is unique for Bulgaria and has no analog,” says Karaivanov, adding, “It meets the best international practices and is a completely new model for popularizing tourist attractions in the country.”

For more information, contact Velichko Atanasov Pramatarov, project coordinator, Planning Programs and Project Management, Asenovgrad Municipality (e-mail: evoint.asenovgrad@abv.bg), or Katerina Kuzmanova, marketing expert, Esri Bulgaria Ltd. (e-mail: k.kuzmanova@esribulgaria.com).



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US Department of Homeland Security Simplifies Its Enterprise Mission with Web GIS

Geospatial Information Is Served to Tens of Thousands of Users

Highlights

- With GIS, DHS supplies geospatial data, services, and applications to the homeland security community.
- DHS OneView, a viewer that addresses homeland security issues, is built on top of ArcGIS API for Silverlight.
- The Geospatial Information Infrastructure services are hosted in a virtualized environment running ArcGIS for Server.

There are a few instances where television gets it right. Whether it's *Homeland* or the now defunct *24*, the hit shows delve deep into fantastical faux-real-life adventures where government agents work at a fever's pitch to protect people—and the nation—from enemies both foreign and domestic. While the plots and technologies often require the requisite "suspension of disbelief," the one area consistent—and grounded in reality—with these shows is the use of information as the asset for investigation and protection. It's where truth and reality meet. Real homeland security and law enforcement agencies comb through mountains of data to piece together clues for catching criminals. The key hurdle for the 21st century isn't collecting the data—it's making it easily understood and accessible. By using location as a common denominator between disparate datasets, users can connect the dots in a meaningful way that drives more informed decision making and more targeted and forward-leaning response.

The US Department of Homeland Security (DHS) Geospatial Management Office (GMO) has designed and deployed a truly remarkable enterprise system—the Geospatial Information Infrastructure (GII)—that just might seem like the stuff of television. The GMO was established to advance the use of geospatial technology across the DHS enterprise to promote geospatial tradecraft in support of DHS operations, promulgate geospatial standards, and implement a geospatial data strategy that enables individual DHS geospatial program offices and empowers frontline operations with location-based tools. The GII is a critical, common component that supplies geospatial data and application services to the diverse suite of DHS missions encompassing law enforcement, border protection, emergency management, critical infrastructure protection, and national operations and data fusion centers. The GII is a consumer-driven geospatial enterprise resource that is built based on mission needs and operational requirements that are aligned to the Homeland Security Geospatial Concept of Operations (GeoCONOPS) and informed by national geospatial policy and doctrine.

"With the increased demand for centralized services, especially with the data center consolidation, the need arose for centralized geospatial services," says Noah Goodman, GII project manager with Ardent Management Consulting. "GII delivers common data to the DHS enterprise."

GII currently supports the 200,000 DHS employees and 50,000 DHS contractors, plus homeland security partners within the state, local, tribal, and territorial communities. What makes the system so unique is it provides fast, efficient access to Sensitive but Unclassified (SBU) or Controlled Unclassified Information (CUI) data. Agencies across the country have



The GII Platform, which is based on Portal for ArcGIS, supplies shared and trusted geospatial data, services, and applications for use by the homeland security community.

access to valuable information for a wide range of mission-critical needs.

"We want to improve access to geospatial resources across all operating networks," says David Alexander, director of the Department of Homeland Security's Geospatial Management Office, "and use geospatial technology to facilitate meaningful information sharing that helps not only connect the dots but also make those connections more understandable through geospatial visualization and maps. Geospatial capabilities must be fast, reliable, easy to use, and intuitive if we want to have a greater effect on frontline missions and alter perception about the utility of geospatial technology, as well as strengthen the relevancy of geospatial tradecraft. The goal was to increase operational effectiveness and introduce new efficiencies by providing the Homeland Security community with mission-relevant information that is map enabled. The GII provides a national resource to do just that."

From Public to Private Information

The Department of the Interior's geospatial information officer, Jerry Johnston, took the lead on developing a public-facing geospatial solution that could provide maps and data to anyone. Alexander and Dan Cotter, DHS's geospatial information officer, reached out to Johnston to discuss how they could collectively work on this government geospatial transformation. The initial collaboration involved integrating GeoPlatform.gov into the DHS GeoCONOPS as the public platform for all DHS data.

The GII was then identified as the platform for managing and distributing SBU or CUI geospatial information. Since then, the two teams have worked collectively toward a common goal of improving access to geospatial maps and data services, regardless of the data classification and security.

"GII was designed as a national geospatial platform," says Alexander. "Large volumes of information are needed by agencies to do their jobs effectively. Much of it isn't publicly available."

SBU is unclassified information that is simply too sensitive to make public. This is the arena in which most first responders, emergency managers, and homeland security professionals work.

One of the key attributes that make the GII such a unique and powerful platform is it serves all 22 DHS components, including the Federal Emergency Management Agency (FEMA), the US Coast Guard, the United States Secret Service, Customs and Border Protection, Immigration and Customs Enforcement, and the Transportation Security Administration. In addition, all state emergency response centers, state fusion centers, local emergency managers, and other state and local agencies have access. The GII capabilities and services are used at all levels of government.

The power of enterprise access means decisions are improved by being able to obtain the information in a much quicker time frame. And analysis is bolstered. People can analyze natural disasters and technological hazards and assess critical risks, such as population, infrastructure, or natural resources. Critical infrastructure and cultural centers can be identified and protected against potential threats. GII analysis and maps also help with special event planning (Republican and Democratic National Conventions; the Presidential State of the Union address), illegal border activity, search and rescue operations, continuity planning, and more.

Virtually every DHS mission has some touch point with natural disasters and terrorism threats for the continuity of operations or as emergency support functions to national response scenarios. The FEMA GeoPortal was established using shared services from the GII and GeoPlatform.gov—in advance of 2012's Hurricane Isaac and Superstorm Sandy to provide quick access to data from disaster response and recovery operations and give the community access to near real-time data to inform its action plans. The enterprise geospatial capabilities are transforming how DHS provides situational awareness and shares information with support organizations and citizens.

GII Building Blocks

The DHS GII takes advantage of the Open Geospatial Consortium, Inc. (OGC), Web Feature Services (WFS), Web Map Services (WMS), and REST services to make data available to stakeholders that access control systems to provide system- and user-level access. GII services allow users and system owners to

connect to data they would otherwise maintain across their own IT infrastructures or workstations. Today, the GII comprises four key areas that provide global support to the homeland security community:

- **Geospatial Discovery Platform (GII Platform)**—The GII Platform, which is based on Portal for ArcGIS, supplies shared and trusted geospatial data, services, and applications for use by the homeland security community through the SBU Homeland Security Information Network (HSIN). The platform enables authoritative real-time data exchange. The GII team actively collaborates with the Federal Geospatial Platform team that manages GeoPlatform.gov, the unclassified public platform that provides the same data discovery capabilities.

- **Turnkey Map Viewer (DHS OneView)**—The GMO invested in developing an intuitive viewer—called DHS OneView—that is tailor-made to address homeland security issues. OneView is a web-based mapping application that delivers visualization capabilities for GII. The viewer is built on top of ArcGIS API for Silverlight and has been identified by the DHS CIO as the standard common operating picture for all DHS components.

- **Hosted Content Delivery Services (GII Services)**—The GII provides more than 400 hosted geospatial web services for the homeland security community to consume. The hosted web services contain important DHS datasets, as well as key national infrastructure data, including the Homeland Security Infrastructure Program. Through the GII, DHS provides access to these critical hosted services to state, local, tribal, and territorial homeland security systems, including those in Oregon, Idaho, and Virginia. The GII services are hosted in a virtualized environment running ArcGIS for Server.

- **Geospatial Enablement of Enterprise SharePoint (HSIN)**—The GII is embedded into the HSIN enterprise SharePoint environment, which is based on Esri Maps for SharePoint. Each community of interest, of which there are 68 today, has the ability to include a mapping component as part of its SharePoint community that supplies access to the full set of GII data services. The environment currently supports 46,000 federal, state, local, tribal, and territorial homeland security professionals.

Future Innovation

The DHS GMO's future road map for the GII involves expanding DHS geospatial content holdings available to the community. This expansion will provide mobile applications and hosting services, federate catalog services between the GII and GeoPlatform, and lead efforts to streamline geospatial data discovery and access. This can be accomplished by encouraging registration of publicly available data to the Federal GeoPlatform and SBU-level data registration to the GII and advancing a "no wrong door access policy" through the implementation of Global Federated Identity Management exchanges across the geospatial community.

For more information, contact Bill McGilvery, Esri (e-mail: bmcgilvery@esri.com).

Mapping Tool Provides Africa with a Better View of Global Warming

Highlights

The CCAPS Climate Security Vulnerability Model uses GIS to locate areas most vulnerable to climate change.

The CCAPS mapping tool allows policy makers to analyze data from multiple sources at once.

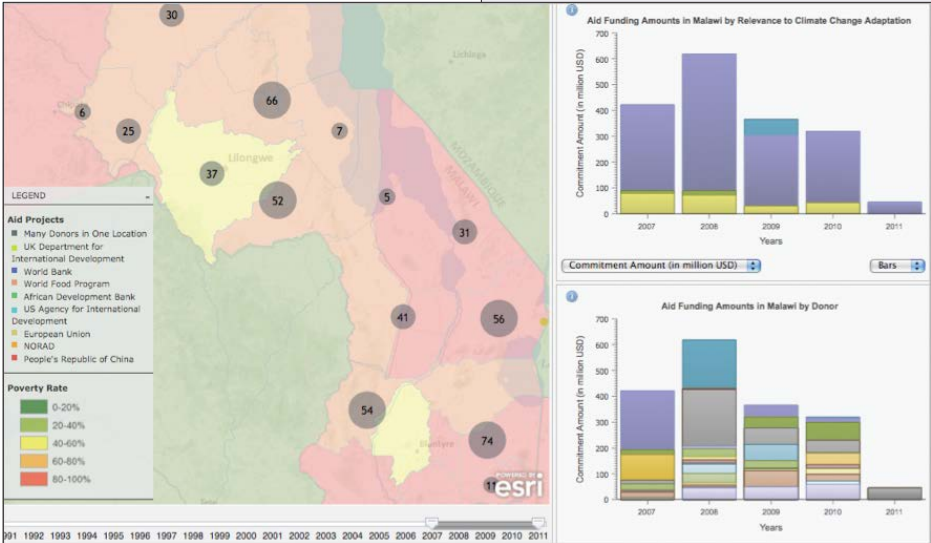
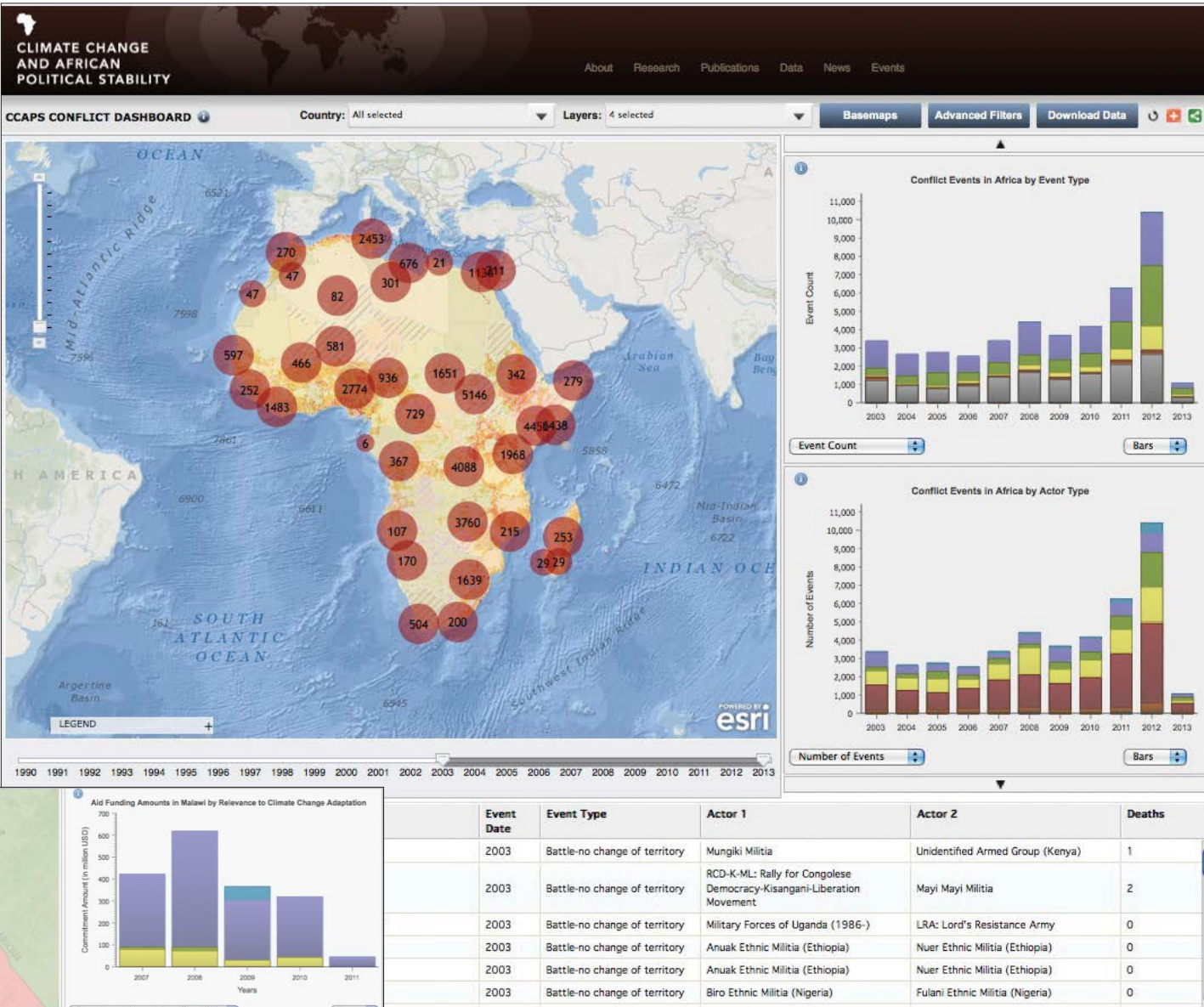
GIS-based dashboards help users filter data and see the results as maps, charts, and tables.

NGO

Non-Governmental Organization

Earth's rising temperatures have a strong impact on African countries that are dependent on rain-fed agriculture. Climate change makes them vulnerable to drought, crop shortage, and extreme weather.

A community's level of vulnerability to climate change can be measured by assessing its capacity for resilience. Resilience is weakened further by a government that lacks resources to support it, political unrest, and violent conflict. Government and aid organizations are using GIS to better understand where and how to lower climate change vulnerability and alleviate suffering for African communities.



The CCAPS Aid Dashboard allows users to explore trends in aid allocation by donor, sector, and demographics within a country.

The Robert S. Strauss Center for International Security and Law at the University of Texas at Austin coordinates the Climate Change and African Political Stability (CCAPS) program. Its purpose is to locate where security attention and foreign aid are most needed and offer advice about the types of intervention that best suit a situation. Several components of CCAPS research use Esri GIS technology. For example, researchers use GIS to model climate security vulnerability, track the location of conflict events in near real time, and assess the distribution of aid for climate change adaptation.

“The complex pathways from climate change to security impacts have demanded new datasets to fill knowledge gaps but also new ways of presenting the data to be of most use in policy planning,” says Francis J. Gavin, director of the Strauss Center. “The CCAPS mapping tool allows policy makers to analyze data from multiple sources at once, providing integrated analysis of the drivers and responses related to security risks stemming from climate change.”

The CCAPS Climate Security Vulnerability Model uses GIS to locate areas most vulnerable to climate change and understand the factors that contribute to that vulnerability. The model assesses four elements that influence

vulnerability: physical exposure to climate-related hazards, population density, household and community resilience, governance, and political violence. Each source has its own set of indicators, which the model combines to assess how these factors coalesce to affect an area's overall vulnerability.

By adding vulnerability assessments to GIS map layers and combining them with geocoded data from other areas of CCAPS research, analysts can see problem areas and understand how these issues intersect. If analysts want to study how regional conflict patterns in Uganda intersect with climate change vulnerability, they select areas to study on a basemap and add the climate vulnerability and conflict map layers. This makes it easy to see where and how these overlap.

CCAPS program managers wanted to make it easy for anyone to use model data and maps. Therefore, the program partnered with Development Gateway (a nonprofit headquartered in Washington, DC) to create map dashboards that bring together mapping, trends analysis, tabular data displays, and data downloads for a comprehensive view of the areas under study on the program. The mapping tools were built using ArcGIS for Server and ArcGIS API for JavaScript (strausscenter.org/ccaps/

Bringing together mapping, trends analysis, and raw data, the CCAPS Conflict Dashboard provides a comprehensive view of emerging and historical conflict trends in Africa.

mapping-tool.html). Dashboard users can apply a suite of filters for selecting attributes in the individual datasets. They can also access robust geospatial analysis, which was produced by CCAPS researchers.

The integrated CCAPS Mapping tool (ccaps.aiddata.org) is an online mapping platform that enables researchers and policy makers to visualize data on climate change vulnerability, conflict, governance, and aid and to analyze how these issues intersect in Africa. The mapping tool allows users to select and layer any combination of CCAPS data onto one map to assess how myriad climate change impacts and responses intersect.

The CCAPS Aid Dashboard helps users see where aid projects are located (ccaps.aiddata.org/aid). This dashboard is a collaborative effort that accesses datasets from CCAPS, the African Development Bank, and the World Bank that have been geocoded by AidData (aiddata.org). This is the most comprehensive collection of geocoded data on aid projects in Africa. Using the dashboard's tools, an analyst can filter aid data by year, sector, donor, recipient, and so forth, and see it on the map.

The CCAPS Aid Dashboard allows users to track aid by showing official donors in each sector of a given country. CCAPS and AidData published a geocoded and climate-coded dataset for Malawi. CCAPS rated aid projects according to their relevance to climate change adaptation and used the results to make a map layer. The user selects an area on the basemap and adds a map layer of climate adaptation-related projects. The user can then see if projects that are highly relevant to reducing vulnerability are actually located in vulnerable areas.

The CCAPS Conflict Dashboard (ccaps.aiddata.org/conflict) gives a comprehensive view of emerging and historical conflict trends. This dashboard allows users to analyze conflict dynamics by actor, event type, issue, intensity, and so forth. By overlaying map layers, one can understand how conflict exacerbates climate change vulnerability and see where and how aid programs are trying to reduce conflict problems.

Development Gateway built the dashboards on ArcGIS for Server. Using ArcGIS API for JavaScript, developers added functionality that allows users to easily interact with the GIS and perform GIS tasks. Users can filter data to see the results as maps, charts, and tables and see them displayed on the dashboard.

Development Gateway designed the online dashboards so organizations that host them on their GIS servers can easily manage them on the back end. Organizations' site managers select the datasets they want to include, preset filter defaults, set the year range, and specify donor organizations.

CCAPS datasets are available for download from the CCAPS program at www.strausscenter.org/ccaps/data. The dashboard applications and geographic data layers are hosted on Development Gateway's server. Once developers have finished developing and testing map applications, they will move them, along with the code and data layers, to the Strauss Center's GIS servers.

For more information, contact Ashley Moran, senior manager, CCAPS program, Robert S. Strauss Center for International Security and Law, University of Texas at Austin (e-mail: amoran@austin.utexas.edu).

Managing a \$1.1 Billion Airport Expansion Using GIS and Intelligent Web Mapping

Highlights

- ArcGIS for Server integrates aerial imagery and current data to provide a compelling visual for communicating airport expansion progress.
- The self-service portal provides an easy-to-use map of basic airport information, such as buildings, roads, and parking lots.
- Using GIS has significantly increased efficiency when responding to utility locate requests.

Those traveling through Edmonton International Airport (EIA) in Alberta, Canada, recently may have noticed the renovated central terminal and newly opened US terminal facilities, as well as other construction activities throughout the airport. EIA is undergoing a \$1.1 billion expansion project that will nearly double its 5.5 million passenger capacity to accommodate the rapid growth in passenger traffic.

In addition to a more spacious terminal building, travelers can now enjoy more comfortable passenger lounges and more than 30 new shopping and dining outlets at the expanded terminal. The airport is also constructing a new central tower, a power substation, an upgraded utilities plant, and more than a dozen new aircraft bridges and ramps for aircraft parking.

Implementing such a large-scale construction project involves coordinated planning and execution among many groups, including hundreds of staff, contractors, and consultants. To efficiently manage the project, EIA leveraged web mapping technology to create a complete picture of who is where at the site and what construction project or activity may be occurring within its vicinity.

Gaining a Clear View of Assets

Previously, the airport's technical services team supplied field-workers with paper drawings of construction sites and utility networks generated through a computer-aided design (CAD) system. While the drawings delivered rich graphic representations of airport assets, they did not provide a spatial context for analyzing relationships between the assets. As work plans changed daily, it became a costly, time-consuming task to update, reprint, and redistribute the drawings to field-workers.

Following a review of potential solutions, EIA engaged Esri Canada Limited to develop an innovative web-based Utility Locator application that allows staff and contractors to quickly access accurate and up-to-date information about the airport's utility assets. The application was deployed in June 2011, just in time for the busy summer construction period.

ArcGIS allows EIA to deliver information over the web without requiring additional user training. This is critical because many of its target users do not come from a technical background. EIA uses ArcGIS for Server to integrate numerous databases containing information on the airport's utility assets, including air-side and ground-side electrical systems; natural gas, water, storm water, and sewer networks; as well as construction projects, road networks, buildings, and other geographic data, into a geodatabase.

The application was built using ArcGIS API for Silverlight. The system enabled EIA to provide role-based user access to specific information and tools within the application and maintain data integrity and accuracy. Members of the technical services team could fill out



Edmonton International Airport. (Courtesy of Edmonton International Airport.)

forms through the application, while project delivery staff was given secure, read-only access.

"Using the GIS application has significantly increased efficiency in responding to utility locate

requests," says Jerri Purdie of 3-D Line Locating (Thorsby, Alberta, Canada), which provides utility locating services for the project.

"Creating drawings and delivering information to field staff

take far less time than the CAD drawing system previously used for the task. This cuts down on field time and assists with keeping construction schedules on track."

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Buried Facilities Location Request

Ticket No. (One Call System): 12345-A

For Emergency Fire/Medical (24 Hours) 780-890-7911
Duty Manager (24 Hours) 780-890-8327

Type of Facility: ☒ Pipeline ☐ Cable ☐ Other

Appointment kept by the Party Requesting the Locate: ☒ Yes ☐ No

Inspection Required: ☒ Yes ☐ No

Scheduled Meeting 16/09/2011 1:30 PM

Contact For Inspection (Name, Phone No.): John Smith 555-555-1212

THIS LOCATE IS EFFECTIVE FOR 14 DAYS

L.S.D. SEC. TWP. RGE. W.

Civic Address:

MAP Legend

Water lines shown as:

Cables shown as:

Gas lines shown as:

Sanitary/sewer shown as:

Overhead power shown as:

Fences shown as:

Work Area Boundary shown as:

Valves shown as:

Hydrants shown as:

NOTE:

The location marked is approximate only. Any facilities involved must be exposed by hand digging before excavating with machinery within 2.0 m from the marked location for electrical/communication or 1.0 m from all Edmonton Airports' owned utilities. You are responsible for damage caused to the facilities by your operations. All damage must be reported to your Edmonton Airports' representative.

Located By: Company: Contact Phone: Date: 21/09/2011 15 Arrival: 8:00 AM Departure: 8:30 AM

Accepted by: Contact Number: Customer: Company:

CAUTION

Markings or flags may disappear or be displaced. If any delays should occur in acting on the locate information, as given, or should the sketch and markings not coincide, a new locate must be obtained. This locate is based on information given at the time of the locate. Any changes to the locate or nature of work requires a new locate.

IMPORTANT

Please remove all locate flags and stakes upon completion of excavation activities.



Above: Users can view all aboveground and buried airport assets and their locations through the web application. Left: The Utility Locator makes it easier for contractors to analyze the site and understand the risk before they put the backhoe into the ground.

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- **The Latest Research** - Presentations and posters by leading scholars and researchers
- **Exhibit Hall** - Booths and exhibits showcasing recent publications and new geographic technologies
- **Career and Networking Opportunities** - An international networking reception, a Jobs in Geography Center highlighting the latest employment opportunities for geographers, and career development sessions
- **Special Events** - Keynote presentations from distinguished speakers from inside and outside of geography, World Geography Bowl, and Awards luncheon
- **Workshops** - Training sessions and workshops to help further your professional or academic career
- **Field Trips** - Attendees also will have several options to explore the rich cultural and physical geography of Florida through informative field trips and excursions

Improving Construction Planning

The quality of locate reports has improved immensely. Staff can now produce more insightful reports that include complete details about a specific site, enabling better decisions. The application allows them to create drawings that look exactly like the site, both in context and scale.

As well, having a consistent view of utility and project data fosters better communication and teamwork among staff and contractors. The self-service portal provides an easy-to-use map of basic airport information, such as buildings, roads, and parking lots. This has already reduced the number of inquiries for site information received by the technical services team from internal staff, allowing them to focus on other tasks. The GIS integrates aerial imagery and current data, providing a compelling visual for effectively communicating EIA's development plan and progress to the public. The application also displays boundaries of construction projects, allowing staff to check for conflicts between consecutive projects.

EIA was recently named the Most Efficient Airport in Canada by the Air Transport Research Society. Maintaining this exceptional level of efficiency requires embracing technology that helps the airport continually improve its services. With the numerous important benefits GIS provides, the technology has become a critical information management system that is propelling EIA's service level to even greater heights.

For more information, contact Amanda Graff, Esri Canada Limited, (e-mail: agraff@esri.ca).

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A Model Sustainable Community

Coon Rapids, Minnesota, Uses GIS to Tackle Rise in Vacant Properties

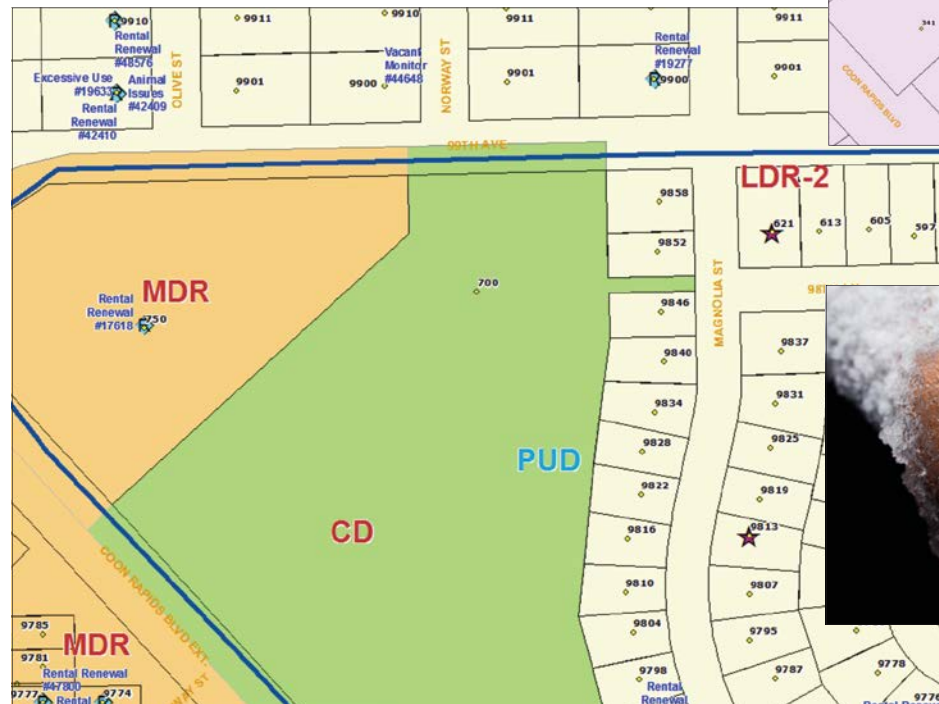
By Lindsay Ferguson and Cindy Hintze

Highlights

- GIS-based maps using citywide data provide the city with the big picture.
- Using GIS, the city easily fixes issues, organizes inspections, and maintains properties.
- GIS-based work orders track rental property licensing, inspections, communications, and police responses.

Coon Rapids, Minnesota, is located 20 minutes north of Minneapolis and is home to about 61,000 residents. With more than 850 acres of public green space within its 40 parks and a 20-mile trail system, including trails along the Mississippi River, the city is a recreational-minded community. Residents boast of Coon Rapids' unique combination of urban excitement and small-town friendliness. With so much to offer its citizens, the City of Coon Rapids is committed to sustaining a desirable community in which to live.

Coon Rapids has had between 450 and 600 foreclosed properties per year since the housing crisis began in 2008. The sudden rise in vacant properties presented a difficult challenge for the city as water pipes burst, grass went uncut, and other problems accumulated due to the vacancies. Increased efficiency was needed to organize repair work.



A planned unit development (PDU) of single-family homes built alongside a city park and a large apartment building.

Prior to 2008, a simple spreadsheet was used to track the handful of vacant properties and rental properties around the city. But when

the housing crisis began and the number of vacancies rose, issues regarding the properties became much more complex, and this method was no longer effective. Documents and letters pertaining to properties were difficult to track and organize. Digital copies were stored among staff members' computers, and paper copies were filed in folders, which were scattered between staff desks, file drawers, and the field staff, making the papers difficult to locate.

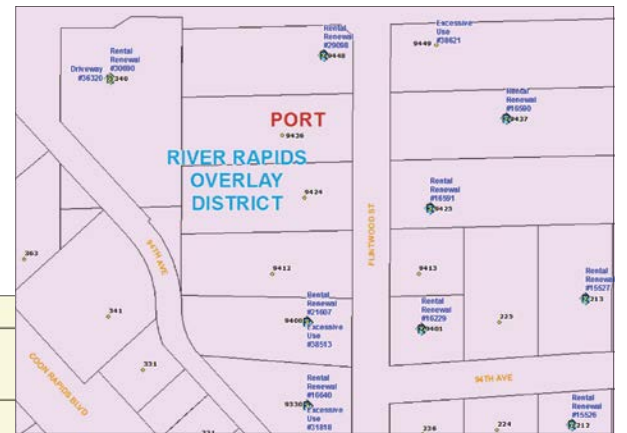
The sudden increase of vacant properties threatened property values and quality of life for many neighborhoods in Coon Rapids. The city council wished to see which neighborhoods were affected, and a quick way of seeing what was happening in the City of Coon Rapids was needed, along with a way to track the complex issues of these properties.

Cityworks, by Esri Platinum Tier Partner Azteca Systems, Inc., of Sandy, Utah, was already in use in the city's Public Works Department. Cindy Hintze, administrative specialist for Coon Rapids, saw that the same software could be utilized for tracking vacant properties.

Cityworks and ArcGIS provided the solution Coon Rapids needed. The combination of these platforms now helps the city preserve these vacant properties—maintaining them as assets rather than allowing them to become liabilities. The solution also helps Coon Rapids track and fix problems with rental homes.

Now, through obtaining a clearer picture of where properties are and what is happening to them, the city is better able to mitigate issues associated with these homes. An address point is used to attach all Cityworks code enforcement work orders to the property, including vacant, rental, long grass, and other yard and lot work order templates. Tasks within the work orders track information regarding the property, for instance, posting the property for water shutoff or turning water on, communicating with the owner/agent, abatement, and property status.

"We use the GIS map as our go-to source for anything that's going on," says Hintze. "When



Open work orders/Current private property issues for single-family homes zoned to be higher-density residential development.



The sheer number of recent foreclosed properties exacerbates maintenance issues, such as frozen water pipes bursting. (Photo: iStock.)

we get a phone call about a property, the first thing we do is pull up our map and see if we might have other things going on there." The work orders provide valuable data about the history of each property—when issues occurred, how they were fixed, what was observed during inspections, and much more.

Abating Problems with Rental Properties

ArcGIS also helps the city track and fix problems with rental properties.

"Landlords need to run a good business, and if they're running a poor business, we need to respond to that so the neighborhood doesn't deteriorate," says Hintze. "Rental properties need to be licensed each year, which may or may not include a visual inspection by our housing inspector. The inspection process is based on how well the property is managed and whether issues have been found at the rental property. Work orders generated by the new system help track the history of rental properties, licensing, inspections, and communications, which also includes being used by our Police Department if police respond to issues at rental properties."

By displaying all the data on a map using Cityworks and ArcGIS, the city can easily see the big picture—and the details. By mapping these properties, the city has made great strides in fixing issues, organizing inspections, maintaining properties, and even sharing information. "We can easily show our city council what's going on in neighborhoods, because all this information is tied to the address point," Hintze says.

About the Authors

Lindsay Ferguson is a writer for Azteca Systems, Inc. She has a degree in communication from the University of Utah. Cindy Hintze is administrative specialist with the City of Coon Rapids.

For more information, contact Cindy Hintze, administrative specialist, City of Coon Rapids (e-mail: chintze@coonrapidsmn.gov), or Lindsay Ferguson, PR & Marketing, Azteca Systems, Inc. (e-mail: lferguson@cityworks.com).



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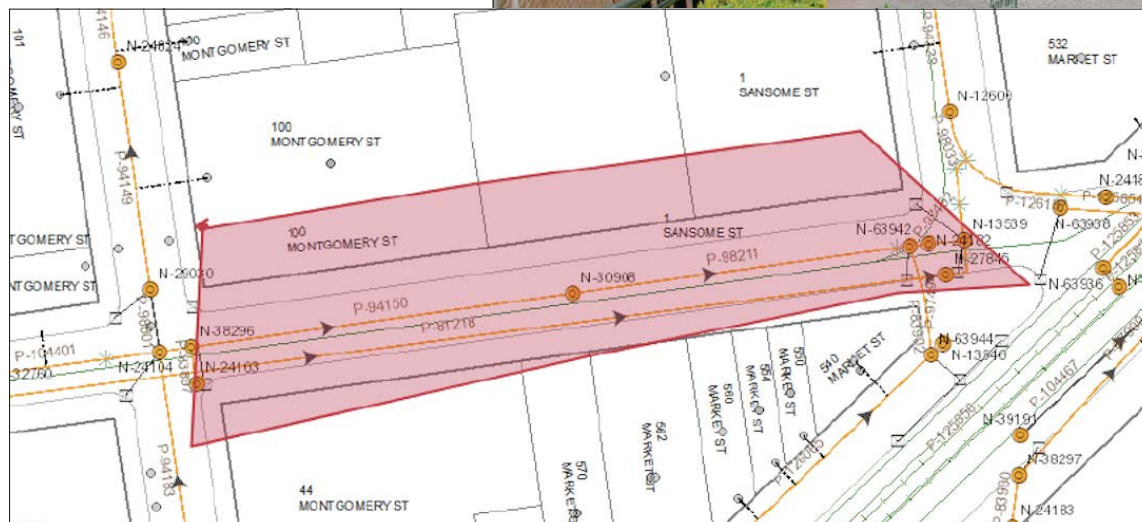
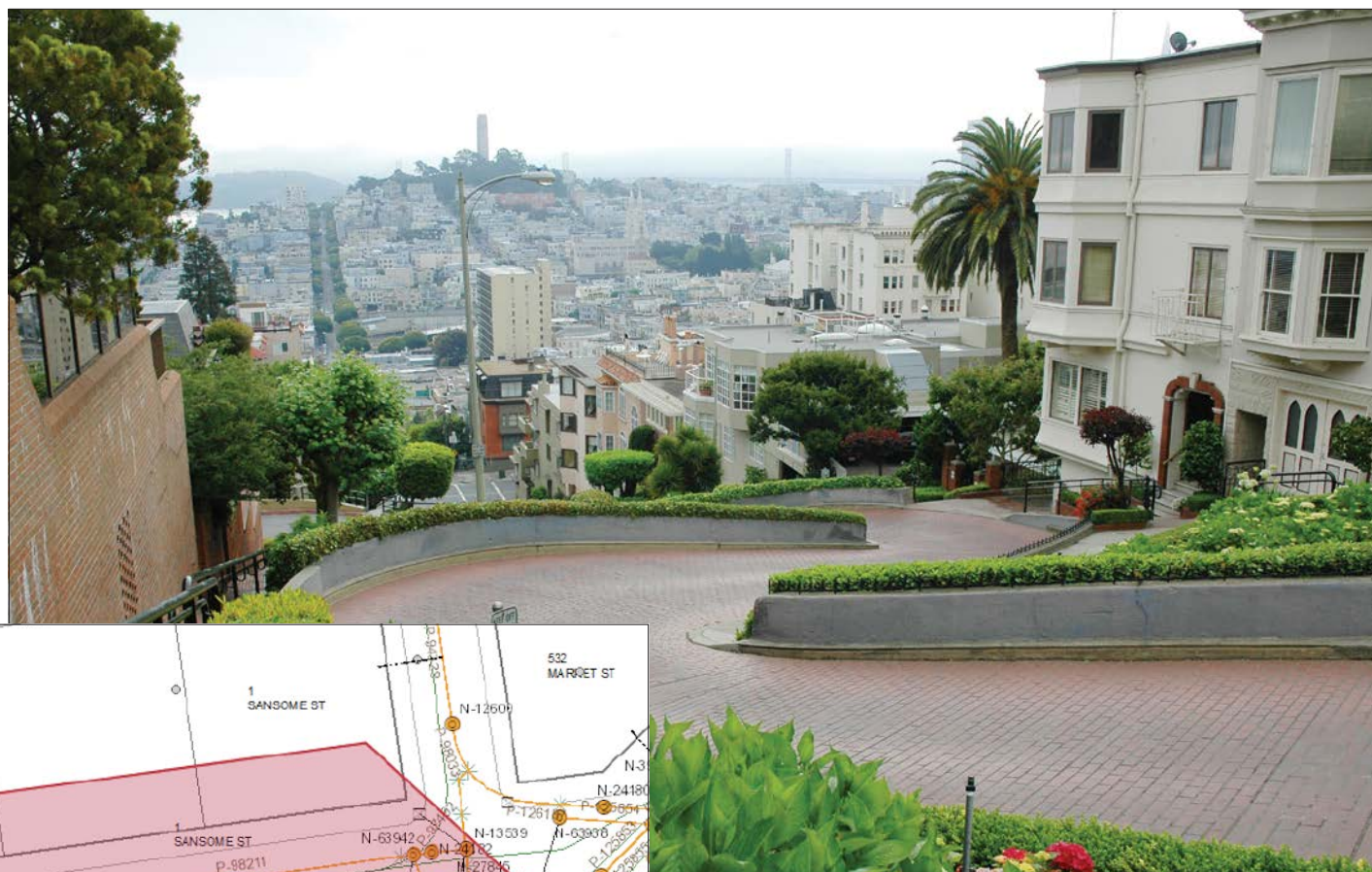
GIS Integrates and Transforms Sewer Operations

For the San Francisco Public Utilities Commission, Benefits Abound

Highlights

- Create work orders directly from service requests and aggregate duplicate service calls.
- Assign asset IDs to service call addresses in one system.
- Access up-to-date asset/location information even in the field because of improved asset data quality.

Situated on the Northern California coastline, San Francisco is consistently among the top tourist destinations in the world. Rich in history and culture, the “City by the Bay” is home to iconic landmarks, such as the Golden Gate Bridge, cable cars, Alcatraz, Fisherman’s Wharf, and the famed Chinatown district. The city also is known for its striking architecture and notably steep, rolling hills.



Above: San Francisco iconic slope—Lombard Street. (Photo: iStock.)
Left: The redlining feature allows SFPUC field service crews to red-line errors while in the field and send them to the GIS data steward via the work order.

The hilly terrain that so readily defines the city also poses special challenges for area utilities, such as the San Francisco Public Utilities Commission (SFPUC). Rain events can produce flooding so significant that SFPUC can generate up to 100 service requests/work orders an hour. The question for SFPUC becomes, How do we mitigate these calls and deploy staff quickly to resolve the problem? While the problem simply may be clogged storm water drains, if not handled swiftly, intense flooding threatens to damage nearby homes.

The Challenge at SFPUC

SFPUC Wastewater Enterprise operates and maintains 993 miles of combined sewers, collecting sanitary sewage from homes and businesses and street runoff. It also operates and maintains storage facilities and three sanitary sewage and storm water treatment plants.

The immediate need in SFPUC’s Sewer Operations was to resolve the disconnect that existed between the work order and asset management system and the field service work taking place. As existing users of ArcGIS and IBM Maximo, staff could view asset data in tabular format within the work and asset management system and see assets using ArcGIS but could not view assets and work orders in proximity to each other.

The existing process was tedious and time-consuming. Sewer Operations received service calls based on address/service locations. Calls were converted into work orders and assigned to field personnel on 3 x 5 cards. Work orders were then assigned manually to assets by looking up asset IDs in GIS and copying the information into work orders.

“We had two islands of information that were not connected,” says Lewis Harrison, manager, SFPUC’s Wastewater Collection System Division. “There was a synergy there just waiting to happen.”

SFPUC sought to integrate its existing GIS with IBM Maximo Spatial Asset Management to resolve workflow issues and help address other challenges, including the following:

- *Odor issues*—Visualizing on a map to better understand and solve calls relating to odor issues
- *Intersection flooding*—Responding quickly and efficiently to emergencies caused by heavy rains and identifying hot spots using GIS, asset data, and location data from incoming calls
- *Duplicate work orders*—Eliminating multiple work orders opened on the same service issue
- *Asset data*—Identifying key assets in the sewer system
- *Access to data in the field*—Reducing time and travel to obtain asset information and perform service
- *Formalized asset management program*—Developing a program to better understand asset condition and life cycle costs

Esri Silver Tier Partner EMA, Inc. (St. Paul, Minnesota), was selected to help the utility with the implementation. EMA’s experience with GIS, asset management, and technology integrations supported SFPUC’s goal to create tools that would enable service calls and assets to be viewed geospatially.

“Our work order history needed to be visible on the map,” Harrison says. “Integration of our data and systems was key.”

developed solutions during the project’s pilot phase. Implementation in Sewer Operations included a workflow gap analysis, configuration with the work and asset management system and geodatabases, data loading, synchronization, and testing.

ArcGIS Interaction with Spatial

Using an ArcGIS API for JavaScript technology platform, maps were embedded inside Maximo screens, allowing users to interact and perform common GIS tasks and to access and view their data on actual maps.

Integrating GIS and Asset Database

GIS data resides outside the asset database in a separate geodatabase. GIS feature classes are registered as objects in the asset database, keeping the data separate but available for use in all systems. GIS attribute data would be fully accessible via the geodatabase interface, which would use an Esri SQL API to integrate the database. The direct link between the geodatabases would eliminate any need to replicate data.

Key aspects of the implementation included the following:

- Redefining/Recasting assets to address existing data errors
- Securing GIS data steward services with another city department to ensure timely data updating
- Training both before and after launch that encouraged active participation and feedback, kept everyone informed, and supported the project’s success
- Integrating with San Francisco’s 311 (citywide 24-hour customer service center) to leverage the citizen service request and dispatch system

The Project

The project team identified the functional requirements of the integration and designed and

Benefits

The new functionality brought monumental improvements to the wastewater enterprise. The project improved the planning, scheduling, and dispatching of work in Sewer Operations by enabling staff to see what work is being done and where. Staff can cluster incoming service calls to identify problem areas to deploy crews rapidly, particularly during storm events.

“In the past, we were not concerned about the type of equipment that responded to a site but just that someone was responding,” Harrison explains. “Now we’re looking at our screens, understanding more about a problem, and determining what kind of equipment to send.”

Workflow improvements have eliminated multiple work orders for a service issue and reduced the dispatching of multiple service crews to the same site. At the same time, asset management tools are efficiently tracking and planning maintenance work.

“The increased knowledge we have on the state of our assets helps us with our maintenance, repair, and replacement decisions,” Harrison says.

ArcGIS query capabilities can be performed within the work and asset management system, and asset data and location data is up-to-date—even for those in the field.

“Data quality has improved dramatically,” says Lily Dryden, enterprise GIS coordinator at SFPUC. “Field service crews redline errors in the field and send them to our GIS data steward via the work order. Updates are seen within a day, so our knowledge on field conditions is reflected on our GIS maps.”

For more information, contact Lily Dryden, enterprise GIS coordinator, San Francisco Public Utilities Commission (e-mail: ldryden@sfgwater.org), or Dave DiSera, vice president and IT practice director, EMA, Inc. (e-mail: ddisera@ema-inc.com).

Rancho Cordova Is Growing Strong Neighborhoods

GIS-Based Program Decreases Both Crime and Costs

Highlights

- GIS helped develop proactive plans to improve the quality of life in targeted hot spots.
- Using ArcGIS, crime reports were reduced and arrests decreased.
- GIS streamlines communication across city departments to improve the services for residents.

Located in Northern California, the City of Rancho Cordova is just east of Sacramento. With roots in the California gold rush, early railroading, and vineyard agriculture, the city is rich in community pride and has a diverse population of more than 66,000 residents.

The Growing Strong Neighborhoods initiative is a cooperative effort among various departments and agencies to improve the appearance of properties, overall safety, and quality of life in Rancho Cordova. The city focuses efforts to establish pride and investment at the local community level with the goals of connecting residents as part of a common cause, ensuring residents feel safe in their environment, creating a thriving business climate, and increasing communication opportunities between the community and the city.

To achieve these goals, the city focused specific services on hot spots within the community and took action to encourage an increasing number of people in the community to take an active role in the future of their respective neighborhoods. Efforts were coordinated among the city's Code Enforcement, Building and Safety, Police Department, Sacramento Metro Fire, and County Probation to target the areas with the highest concentration of issues.

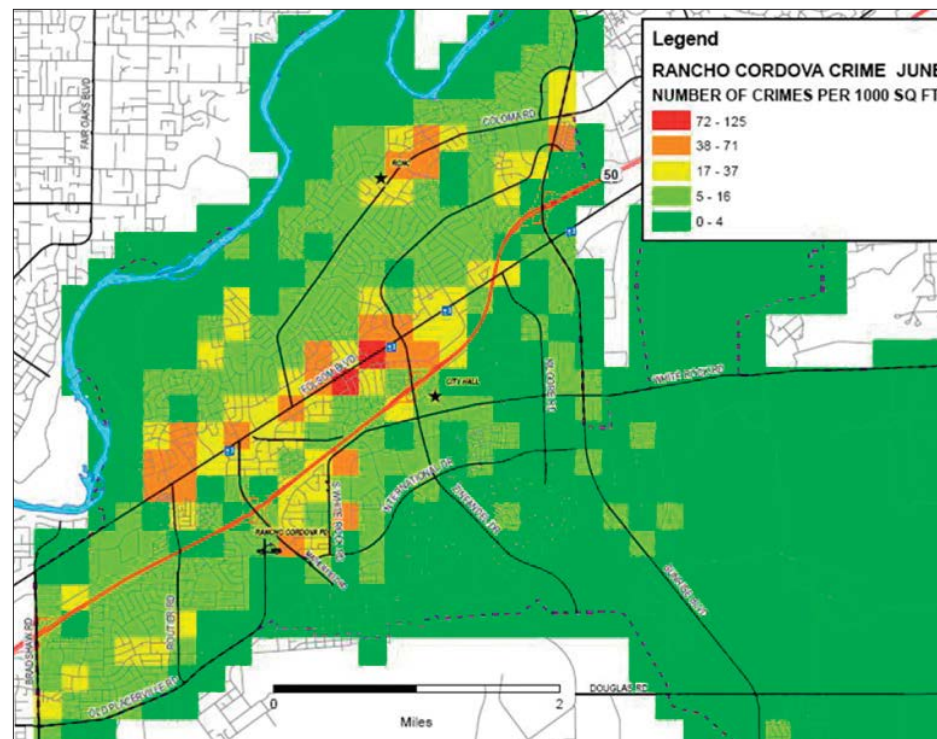
The program, which began in 2007, has changed the face of the city and continues to be expanded to encompass new areas of focus. Initially, the program focused on police calls for service, police reports, code enforcement violations, probation, and Megan's Law enforcement. Today, the city has increased its focus to include

a panhandling task force and beautification efforts, such as graffiti abatement, landscaping, and street cleaning. The beautification efforts span city properties and encourage businesses and residents to take an active role in enhancing the appearance of their properties.

The city worked with Esri Silver Tier Partner Interwest Consulting Group of Elk Grove, California, which is a GIS solutions provider with extensive experience implementing Esri products within local governments. The city was already using mapping products from Esri for other projects and daily maintenance of GIS layers. ArcGIS for Desktop and a customized ArcGIS for Server online application were selected because of their ability to spatially analyze and distribute data efficiently. GIS was used to define neighborhood boundaries; analyze community metrics; create and analyze hot spots; support police, probation, and code enforcement; and provide spatial before-and-after views of the city as progress was made.

Multiple departments met to decide a weight to be applied to each of the factors that were mapped. The weights were applied to parcel data, and hot spot maps were created to help the city focus its efforts. Interwest Consulting Group's GIS team identified a list of focus areas with high overall scores when aggregating crime, code cases, and probationer locations. This information was then represented on a map, identifying focus areas for proactive action to change the negative impacts on the neighborhoods. GIS has helped to collect better annual metrics to detect citywide changes involving crime rates, housing characteristics, and school-related data (truancy/turnover rate).

The city is able to focus work in a way that directly coincides with the needs of the community, allowing problem areas within the city to improve to a degree that does not drain city resources. Using the "Focus on 50" approach to target the 50 properties identified by GIS with the most issues, the city saw a dramatic decrease in crime reports and arrests for the three months following the targeted period compared with the three months prior to enacting the targeted approach.



The City of Rancho Cordova created hot spot maps using ArcGIS to analyze and identify areas with the most crime- and code enforcement-related issues.

Better communication across city departments and related agencies has improved the services the residents receive. Community members see the work being done and want to become involved in shaping the future of their neighborhoods. Crime rates are down and probationers are removed if they are in violation of their parole, which translates into residents feeling safer in their neighborhoods. Property values have increased due to proactive code enforcement work and graffiti abatement. Attractive streetscapes created through Public Works' capital improvement projects have led to more commercial investment and activity, which benefits both the city and its residents.

In 2009, the city spent \$110,000 and 1,300 staff hours on graffiti abatement. From the

month following the implementation of the Comprehensive Citywide Graffiti Plan until now, the city has reduced the costs to abate graffiti by 18 percent. This is due in large part to its efforts to restore pride in neighborhoods, enabling citizens to easily report graffiti they find and providing kits to citizens to repair minor graffiti violations within their neighborhoods themselves.

For more information, contact Dr. David Sander, city council member, City of Rancho Cordova (e-mail: dsander@cityofranchocordova.org), or Mark Dumford, GIS manager, Interwest Consulting Group (e-mail: mdumford@interwestgrp.com).



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Esri Regional User Conferences Planned for Singapore and Cape Town, South Africa

Between November and next May, many hundreds of GIS users will converge on Singapore and Cape Town, South Africa, where they will attend Esri's regional user conferences—the biggest celebration of “all things GIS” outside of the Esri International User Conference.

These events are part of a season of regional UCs that begin this month with the Latin America User Conference (LAUC) October 16–18 in Lima, Peru, and the Europe, Middle East, and Africa User Conference (EMEAUC) October 23–25 in Munich, Germany.

Like the LAUC and the EMEAUC, the Esri Asia Pacific User Conference (APUC) and Esri Africa User Conference (AUC) will combine the best of the Esri International User Conference with the best of each region. Each is loaded with Plenary Session keynote presentations, technical workshops, demonstrations, vendor exhibits, paper sessions, seminars, and gala social events.

However, the Esri regional user conferences are so much more, says Esri founder and president Jack Dangermond. “Regional UCs also provide an ideal platform where we can listen to our users and learn what they really want and need. This principle formed our foundation and is still in place today,” Dangermond says. “It has enabled us to develop GIS technology that's truly driven by our customers.”

His message to Esri users: “Our world is evolving without consideration, and the result is energy issues, congestion in cities, and a loss of biodiversity. But geography, if used correctly, can be used to redesign sustainable and more livable cities.”

Learning to use geography correctly—more precisely, GIS—is the purpose of Esri regional UCs. So if you're planning to attend, prepare for a total immersion experience—your hours will be filled with training sessions, seminars, and workshops led by Esri staff and world-class experts who not only will hone you to state-of-the-art GIS proficiency but also fine-tune your analytical abilities. You'll have ample time to make new friends and contacts over lunch, networking breaks, and gala dinners.



Cape Town International Convention Centre.

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Esri Asia Pacific User Conference

Esri software users from across the Asia-Pacific region eagerly anticipate a skills-expanding exploration of GIS technology November 12–14 at the Asia Pacific User Conference in the Southeast Asia island city-state of Singapore. Hosted by Esri Singapore, the APUC will be held at the Suntec Singapore International Convention and Exhibition Centre.

“The Esri APUC provides a unique opportunity for attendees to learn, collaborate, and be inspired by the latest advancements in GIS technology,” says Leslie Wong, managing director of Esri South Asia Pte. Ltd., which includes offices in Singapore, Indonesia, and Malaysia. “APUC 2013 will be an exciting event for many of us as we focus on how GIS is playing a pivotal role in a variety of industries across the Asia-Pacific region.”

The APUC will offer a packed agenda, ensuring conference delegates a wide selection of events, including training, plenary sessions, technical workshops, seminars, a GIS Solutions EXPO, luncheons, networking breaks, and

opportunities to collaborate and share their best work with colleagues.

“Attendees will notice a strong focus on 3D GIS, real-time GIS, and geodesign—as speakers aim to share Esri's vision for the future and the direction GIS technology is heading,” Wong says. “Apart from having a chance to hear from local and international specialists, APUC offers the opportunity to meet more than 500 of the region's leading GIS professionals. With GIS technology—and its scope for application—changing at such a rapid pace, the APUC offers geospatial professionals the opportunity to keep up-to-date with all the latest developments.”

Registration is still available for the event. Visit esri.com/apuc to register and view the full agenda.

Esri Africa User Conference

About 850 tech-savvy GIS users representing sub-Saharan Africa will gather in Cape Town May 6–8 for the 2014 Esri Africa User Conference. Hosted by Esri South Africa (Pty) Ltd., the AUC will be held in the Cape Town International Convention Centre.

“It will be the first-ever Esri Africa User Conference—it's San Diego comes to Cape Town,” observes Esri South Africa spokesperson Lauren Sweidan.

“For Esri users in Africa, this is a momentous event, one not to be missed. We are working on a program that will raise the profile of GIS in Africa globally and offer capacity building within the region,” Sweidan says.

Participants at AUC, from nations such as Namibia, Mozambique, Zambia, Rwanda, Kenya, Botswana, Swaziland, Ghana, and Cameroon, will learn how to make a big difference in their organization, community, and country via several days of seminars, technical workshops, and demonstrations led by top Esri experts. They'll be able to acquire the latest GIS skills and delve into important industry issues, returning home freshly empowered.

“We will be hosting hands-on training sessions, which are extremely popular with our local users, as well as Lightning Talks,” Sweidan says.

It is expected that approximately 30 exhibitors will be on hand from across the region and the world to put products and services on display. Attendees will have opportunities to question Esri experts and product specialists and to hear presentations from peers sharing best GIS practices.

“Attendees will have a chance to network with hundreds of users from across the continent, sharing stories, best practices, and mostly to be inspired,” says Sweidan. “One of the highlights of the conference will be the Education and Aid and Development tracks.”

Regional users are encouraged to submit abstracts of papers for consideration. The call for papers includes topics such as industries, government, resources, utilities, education, aid and development, mapping, SDI, agriculture, mining, forestry, planning, oil and gas, electricity/water/wastewater, and health.

This abundance of user-to-user communication opportunities is crucial for learning about real-life GIS experiences, best practices, and tips and will ensure a rich AUC experience.

Visit esri.com/au for more information about this exciting new addition to the regional user conferences.

Get Excited as GIS Day Draws Near

GISday

Less than one month from now, the international GIS community will kick off an annual celebration that has captured untold imaginations since 1999: GIS Day.

Scheduled for Wednesday, November 20, this worldwide grassroots ritual is expected to draw thousands to a festival of learning and fun like no other. GIS showcases, training workshops, map gallery tours, geocaching treasure hunts, and civic or corporate open houses will educate and enthral participants seeking to understand, capture, and leverage the power of GIS at nearly 1,000 venues across the planet.

Most look forward to attending a local event in their community, workplace, or school, where they can get some GIS technology training or even take in an expo on educational and career opportunities. Others may want to volunteer or to host an event. GIS Day events will take place on college and high school campuses and in public libraries, corporate offices, and government agencies. Last year's GIS Day was one of the biggest yet, with more than 950 hosts and thousands of participants worldwide.

As popular as the event is, it's up to you—the GIS community—to make this year's celebration bigger and better than ever. We encourage you to attend, volunteer, or host a GIS Day event—or to ask your customers, colleagues, friends, and other GIS users in your field to share their passion and be part of the celebration. This is an opportunity for everyone to demonstrate how GIS is used in daily work and how this powerful technology plays a role in making our world a better place.

Here are two planned events that typify the worldwide spirit of GIS Day:

Democratic Republic of the Congo

The United Nations uses GIS to provide humanitarian assistance to people in need. The Democratic Republic of the Congo (DRC) is planning 2013 GIS Day events in Kinshasa, Goma, Bunia, and Bukavu—four cities where UN Missions for Stabilization of DRC are installed, says Philippe Musumba Teso, GIS assistant at the Bukavu mission. “I would like to propose a theme, such as ‘GIS Can Help Save Lives,’ in a peacekeeping mission that we

shall develop together with our colleagues,” Musumba Teso says.

Bowling Green State University

Last year at Bowling Green State University in Bowling Green, Ohio, about 150 undergraduate students attended GIS Day, which included an introduction to GIS, ArcGIS demonstration, and GIS quiz, says Dr. Yu Zhou, associate professor of geography. This year, Zhou plans to invite undergrads to a large classroom and give them a 30-minute GIS demonstration. “After that, I'll give them a 5-minute pop quiz about GIS and a GIS demonstration, which will include some of my students' class projects and some graduates' work,” he says.

New GIS Day Materials

On gisday.com, you'll find an interactive map of events near you as well as how to register your GIS Day event. Plus, you'll have access to free resources and activities that you can use at your event to teach others about GIS. For example:



GIS Day in Liberec, Czech Republic.

- New this year is *The Amazing Mapman* coloring/comic book. Show kids, teens, or adults how GIS can save the day.
- View videos, such as *Beautiful Maps*, *GIS/Geography Trivia*, and *Map for Every Story*.
- Read e-books, including *What Is GIS*, *Understanding Earth*, *Climate Change Is a Geographic Problem*, *Renewable Energy*, *GIS in Africa*, *GIS for the Oceans*, and *Polar Regions*.
- Hosts can use free National Geographic Geography Awareness Week (November 17–23) materials for their events, such as the GIS MapMaker Interactive Map, Investigating Your World with My World GIS Teacher Guide, and the Exploring Ecosystems Using GIS Activity.

Esri Partner Offerings

Esri maintains relationships with more than 1,800 partners around the globe that provide solutions and service-based solutions to our mutual customers. In this issue, we highlight several of these organizations that exhibited to more than 13,000 attendees at the 2013 Esri International User Conference. For a complete list and description of partners and their offerings, visit the Esri website at esri.com/partners.

Across Industries

Hyland Software, Inc.

www.hyland.com

OnBase

With the OnBase Integration for ArcGIS, processes no longer stop while GIS users search for related documents. Projects are completed quickly because all necessary information—including permits, licenses, and other related documents—is accessible from the maps staff use every day. OnBase also enables users to place documents onto a map, providing users with a spatial view of their content from OnBase. Users can view their information at their workspace or out in the field using their preferred mobile device.

iFormBuilder

www.iformbuilder.com/esri

Mobile Apps for ArcGIS Online

iFormBuilder is a field platform for gathering knowledge in any language. It is now possible for teams to replace their clipboards with mobile devices to capture good data, whether online or off the grid. Used in more than 110 countries for secure mobile data capture on iOS and Android devices in many industries, including government institutions, nongovernmental organizations (NGOs), and engineering firms. iFormBuilder allows the ability to easily create multitier relational forms with robust custom logic. Data can be linked to feature services as attributes or related tables in ArcGIS Online or ArcGIS for Server. Existing ArcGIS Online customers can leverage the iFormBuilder Arc Connector to mobilize feature services within minutes and deploy to field teams.

Unmanned Aerial Vehicles

senseFly

www.sensefly.com

eBee and Swinglet CAM Drones for Aerial Mapping

The eBee is a professional mapping tool. It is an easy-to-use, fully autonomous minidrone (96 cm/37.8 inch wingspan, less than 700 g/1.5 lbs). The eBee has a flight time of up to 45 minutes, allowing coverage of areas of up to 1,000 hectares, or nearly 2,500 acres, in a single flight at down to 5 cm precision. This drone is a turnkey solution and includes all the accessories required for operation, as well as the control and monitoring software eMotion 2 and senseFly's image processing software Postflight Terra 3D-EB. Esri technology enables drone users to share and analyze their acquired data. Just after the flight, senseFly's Postflight Terra 3D software allows the automated generation of a georeferenced orthomosaic and digital elevation model at centimeter accuracy, which can be directly imported into ArcGIS.

Maritime Geodata

exactEarth

www.exactearth.com

exactAIS

exactEarth supplies location-based maritime vessel information on a global scale, and its exactAIS data service is beneficial for anyone wanting a geospatial view of the world's shipping. Providing data as web services and with connectors to ArcGIS GeoEvent Processor for

Server, exactEarth provides Esri users with Satellite AIS data both on-demand and as a real-time feed. With access across the Internet and through ArcGIS Online, the world's shipping data is now easily accessible across the full range of Esri products.

Education

Maps.com

www.maps.com

Maps.com

Maps.com provides services using Esri technology in the education industry. Maps.com delivers original content in social studies, math, science, and language arts using spatial concepts through mobile, online, and print media. From weekly news maps to interactive timelines and thematic classroom maps, Esri technology provides the basis for materials that engage students in thousands of K-12 schools across the United States. Cartography, software development, design, editing, printing, finishing, and packaging are provided to major educational publishers and a wide range of other businesses. The latest developments include

story maps to deliver collections of materials on topics such as world exploration.

Digital Marketing

PromoJam

www.promojam.com

PromoJam Social Media Marketing Platform

PromoJam is the leading self-service social media marketing platform for small, medium, and enterprise businesses. PromoJam's easy-to-use platform allows brands and marketers to create and launch social media promotions on Facebook, Twitter, Pinterest, and Instagram in minutes without the need for code or complex technical builds. Using Esri ArcGIS technology, PromoJam maps the IP addresses of each promotion's social media users with Esri Tapestry Segmentation demographic profiles to provide marketers with qualitative and real-time mapped geographic demographic data of their social audience. PromoJam's platform provides actionable data and metrics that can then be used to hyperlocate and hypertarget audience segments and the ability for marketers to forecast future marketing campaigns both online and offline.

ArcNews

Reach more than 700,000 GIS professionals by advertising in *ArcNews*.

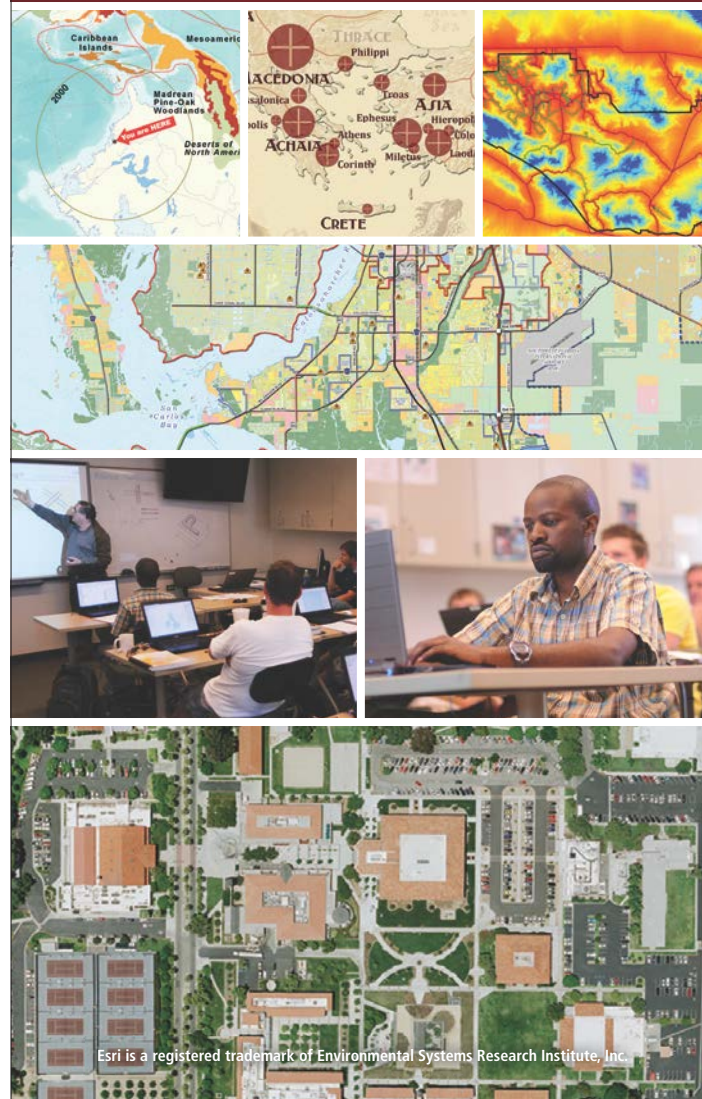
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Interesting ArcGIS Services

Esri ArcGIS for Server adds geographic data and analysis to web applications that serve organizations and communities in a variety of ways. To submit an ArcGIS for Server site address and view other websites powered by ArcGIS for Server, visit esri.com/serversites.

City of Charles Sturt, Australia dekho.charlessturt.sa.gov.au/Dekho

The City of Charles Sturt, Australia, created an easy-to-use mapping site to provide council residents with address, zonal, storm water infrastructure, and flooding information.

Languages of Melbourne
demoportal.esriaustralia.com.au/public/LanguagesOfMelbourne
To understand the linguistic makeup of Melbourne, Australia, Esri Australia Pty. Ltd. created a web map overlaid with Twitter data showing the top five languages spoken in Tweets sent from Melbourne.

Solar Simplified
solarsimplified.org/solar-resources/solar-map
Salt Lake County, Utah, and Utah's Automated Geographic Reference Center created an interactive map to calculate solar rooftop potential in Salt Lake County.

New from Esri Press

Understanding GIS: An ArcGIS Project Workbook, Second Edition By Christian Harder, Tim Ormsby, and Thomas Balström

Use ArcGIS to find the best location for a new park along the Los Angeles River with *Understanding GIS: An ArcGIS Project Workbook*. The nine included lessons investigate how to approach and solve a spatial problem from beginning to end using geospatial technology. The text has been revised and tested for compatibility with versions 10.1 and 10.2 of ArcGIS for Desktop. Also available are valuable learning materials, including videos and exercise results for each lesson. July 2013. ISBN: 978-1-58948-346-0, 392 pp., US\$79.95.

The GIS 20: Essential Skills, Second Edition By Gina Clemmer

Author Gina Clemmer has trained thousands of GIS users, and this book is her effort to offer a focused approach to learning GIS tasks for the busy professional. The book covers the top 20 GIS skills most commonly used, such as creating basic maps and layouts, editing, and sharing and publishing maps. The second edition offers nine bonus topics to further advance GIS skills, exercise data on the accompanying DVD, and ArcGIS 10.1 for Desktop software (180-day use) to work through the exercises. August 2013. ISBN: 978-1-58948-322-4, 204 pp., US\$49.95.

Esri ArcGIS Desktop Associate Certification Study Guide

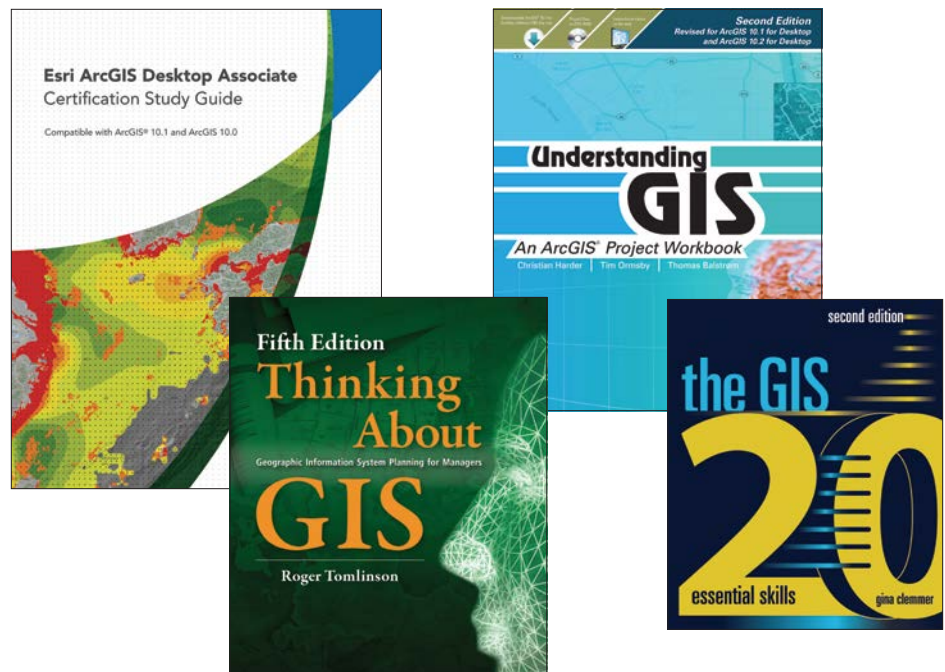
By Miriam Schmidts
Esri offers exams to certify professionals in Esri products and technology, including versions

10 and 10.1 of ArcGIS for Desktop. Esri Press recently published the first handbook to assist with exam preparation, the *Esri ArcGIS Desktop Associate Certification Study Guide*, which gives an overview of the skills measured in the ArcGIS Desktop Associate Certification exam. Written by an experienced instructor, Miriam Schmidts, this easy-to-use guide includes trial software, exercises, and challenging questions to test your knowledge. August 2013. ISBN: 978-1-58948-351-4, 392 pp., US\$79.95.

Thinking About GIS: Geographic Information System Planning for Managers, Fifth Edition By Dr. Roger Tomlinson

Dr. Roger Tomlinson created the first computerized geographic information system in the 1960s while working for the Canadian government. His book, *Thinking About GIS*, provides a common platform on which to base GIS planning and helps managers determine the data and technology their organization will need. The fifth edition reflects the latest trends in geospatial technology and includes updated case studies. Exercises from Tomlinson's course *Planning for a GIS* and a video of the "Planning and Managing a GIS" seminar from the 2012 Esri International User Conference are included on the accompanying DVD. September 2013. ISBN: 978-1-58948-348-4, 280 pp., US\$54.95.

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"Crossing Borders"

A column by Doug Richardson,
Executive Director,
Association of American Geographers

GIS and Public Policy

The potential for GIS and GIScience to contribute to the formation of public policy has long been a reality, but it is now becoming more broadly understood and central to governmental policy making at all levels, as well as in society at large. A core theme of the upcoming Association of American Geographers (AAG) Annual Meeting will be "GIScience, GIS, and Public Policy," which will explore the expanding role of GIScience and GIS in the public policy arena on crucial national issues, such as climate change, immigration, health, civil rights and racism, transportation, energy, electoral redistricting, natural resources, social justice, the environment, and many others.

The AAG annual meeting is one of the largest venues in the world for sharing and communicating the broad range of contributions by geographers, GIScientists, and GIS specialists to basic and applied knowledge and to problem solving. The 2014 AAG Annual Meeting, with more than 6,000 presentations on the latest scientific, technical, and policy research in geography and GIS, will be held April 8–12, 2014, in Tampa, Florida.

The theme of "GIScience, GIS, and Public Policy" also encompasses another dimension, that of federal and state policy making regarding GIS itself. At the AAG Tampa Bay meeting, several special sessions will focus on the work of two key national organizations that make policy for GIS: the Federal Geographic Data Committee (FGDC) and the National Geospatial Advisory Committee (NGAC). Both of these organizations are leading the development of a new Strategic Plan for the US National Spatial Data Infrastructure (NSDI). The US Census Bureau and other federal agencies, as well as private-sector organizations, will also discuss their latest policy and technical developments related to the generation and use of geographic information systems and data and how these interact with the NSDI. Parallel international policies and activities of the Global Spatial Data Infrastructure (GSDI) will also be discussed.

Key issues in planning for the future of the NSDI include the explosive generation and availability of real-time interactive GPS/GIS spatiotemporal data, GIS cyberinfrastructure, web-enabled GIS, geography education and work force development policies, GIS certification, standards development, interoperability, and many others. Current challenges in GIScience, such as locational privacy implications of the widespread availability of real-time geographic data, will be

an area of special focus. Other sessions will address issues such as public access to governmental GIS data, federal procurement procedures for GIS and mapping services, and evolving legal frameworks of a spatially enabled society. We would also like to solicit your own ideas and suggestions for GIS and policy issues or topics you would like to see addressed at the meeting (please contact me at the e-mail below with your thoughts).

In addition to the 2014 theme of "GIScience, GIS, and Public Policy," other cross-cutting themes for the Tampa conference include "Geographies of Climate Change," "Racism and Violence in America: Fifty Years since the March on Washington," and "Scale and Sustainability." These featured themes are designed to provide structure to a large, exciting, and well-attended meeting. As always, the AAG Annual Meeting is an open venue, and we look forward to your attendance and contributions, either as a paper or poster presenter on topics that particularly engage you or as an attendee who can add to the discussions. More information for registering or submitting special sessions or panels is available at www.aag.org/annualmeeting.

Ten Years . . .

In closing, I would like to note that I have been writing this column, "Crossing Borders," in *ArcNews* now for 10 consecutive years (without missing a column). It has been a great pleasure to engage in dialog with you and the global Esri community, and I would like to thank all of you for the opportunity to be part of and to help build the dynamic GIS industry we all value, with its extraordinary innovation and creativity and general good will. In future installments of "Crossing Borders," I plan to open up the column and invite other leading geographers and GIScientists within the AAG to author or coauthor some of the columns. I hope you will like the new format, as well. Finally, I would like to personally thank Jack and Laura Dangermond and Esri staff, including *ArcNews* editor Tom Miller, for sustaining an open and sharing GIS community that is a remarkable force in our world and for indulging my column for the past decade.

I look forward to seeing you in Tampa in April, where we can continue our discussion of key issues around the theme of "GIScience, GIS, and Public Policy" and much more.

Doug Richardson
drichardson@aag.org

Online-Only Articles More ArcNews

The Fall 2013 issue of *ArcNews Online* (esri.com/arcnews) presents the following special online-only articles:

- Irish Students Go Web Mapping
- Pierce County, Washington, Lowers Road Maintenance Costs
- Cloud-Based Mapping Helps Lake County, Florida, Deputies Carry Out Tasks

"Geo Learning"

A column by Daniel C. Edelson,
Vice President for Education, National Geographic Society



Connecting Schoolchildren to the Real World? That's Extraordinary!

One of the perks of my job is that I get to visit extraordinary schools and classrooms. It is rare that I don't find a school visit to be inspiring, but over the years, I have seen a couple of places that really stand out. They are so inspiring that I have used each of them as an example in presentations and conversations hundreds of times, but I still want to share them more broadly.

Why do I find them so inspiring?

First, in a world where people have come to associate excellent teaching with heroic effort, these examples show what can be done through simple, commonsensical activities that any teacher can do with ordinary levels of training and resources.

Second, they involve establishing meaningful connections between students and the world outside of school. I often say that we have designed schools and schooling to be optimal for learning to read, write, and do math, but they couldn't be worse environments for studying the real world. Both of these examples overcome the limitations of modern schools to enable students to study the real world.

Finally, they do not seek to fill students' minds with as much knowledge as they can in a short period of time, which has become the default practice in modern schools. Instead, they develop conceptual understanding through experience over an extended period of time. Given the choice between having young people acquire large quantities of knowledge in short periods of time or developing conceptual

understanding over extended periods, which do you think will be most valuable to them and their communities in the long run? For me, there is no question.

The Goodwillie Environmental School

The first example is a school just outside Grand Rapids, Michigan, that I visited seven or eight years ago, but I remember like it was yesterday. Called the Goodwillie Environmental School, it is a magnet middle school on a 28-acre plot of mostly wooded land. Here are a few of the facts about the school that made such an impression on me:

Every day, the buses let the students off on the opposite side of the property from the school building, and the students walk a half-mile through the woods to the school building.

The students eat lunch outside every day all year, rain, snow, or shine, unless there is lightning or a dangerous storm.

At the beginning of the year, every student identifies his or her own spot in the woods. Every student spends at least 30 minutes, at least once a week, in that location, observing and recording in words and pictures what they see, hear, smell, and feel in a phenology ("seasonal change") journal.

Every aspect of the curriculum is tied to environmental themes, and the temperature in the school is kept at 65 degrees F during the colder months to make it easy to transition from inside to outside throughout the day.

Since many students wear fleece and hats throughout the day, one of the school's slogans is "hat hair is cool," and there are no mirrors in the bathrooms.

Bank Street School for Children

The second example is very different on the surface and nearly identical in concept. This one is found in the heart of New York City at Broadway and 112th Street. It is a program at the Bank Street School for Children, an independent school that is part of Bank Street College.

They have many wonderful programs at the School for Children, but the one that captured my imagination is a project focusing on the Hudson River that is conducted in second grade. In this project, the students in each class collaborate on a study of all aspects of the river through firsthand observation, interviews with adults, and consultation of primary and secondary sources.

The most important parts of their study are the firsthand observations and interviews of adults. Students travel the two blocks from their school to the river on multiple occasions throughout the year to observe what takes place in, on, and around it. They plan and conduct interviews of people who work on or near the river as well as experts in the history and science of the river.

This study is wonderful on its own, but what makes it such a fabulous example of excellent teaching is what the students do with what they learn. Over the course of the school year, they build a physical model of all the aspects of the river on a tabletop measuring approximately 15 feet long and 3 feet wide.

The students create their model out of everyday materials, adding to it bit by bit, as they learn new things. When I visited in March, the model was extensive. It included a papier-maché hill on one end, representing the headwaters of the river in the Adirondacks, and butcher paper painted blue at the other, representing the bay past the tip of Manhattan. In between was a 1.5- to 2-foot-wide, blue-painted river with boats on it; bridges across it; and all kinds of signs,

buildings, people, and vehicles on either bank.

Through serious discussion and debate, the students had determined what to build and how to build everything in their model. They had designed ferry landings and built ferry boats, which they could move from one side of the river to the other in a simulation of their daily schedule. Soon before my visit, they had been learning about pollution in the river, and so there were also freshly made signs along the banks requesting that people not litter.

Since this is second grade, the students were allowed to play with the objects in their model during lunch and recess, but the rest of the time the model was reserved for serious building and simulation.

I was intrigued to learn that the students were just about to start studying the history of the river, which they were going to learn in reverse chronological order. The teacher explained that as they went backwards through history, they would start removing elements from their model in a step-by-step process that would leave the river and its surroundings in a pristine state, representing the time before humans settled in the watershed.

An Underlying Lesson for Education

As I said before, I find these inspirational because they are simple, connect students to the real world, and develop real understanding, but I also believe they have a deeper lesson for good geoeducation. Young people will do amazing things when we ignore our usual expectations about what is appropriate for them and what they are capable of. Second graders will conduct sophisticated interviews of adults and create functional models and simulations. Middle school students will suspend their concerns about physical appearance and will develop deep connections to natural cycles. Making this happen doesn't require a heroic effort, just a change in priorities and approach.

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"Managing GIS"

A column from members of the
Urban and Regional Information Systems Association



Collaborating Regionally Is Vital to GIS Management in Rural Settings

By Greg Newkirk, GIS Manager, Fremont County, and Adjunct Faculty, Brigham Young University-Idaho

Despite the tendency of geogeeks to bury themselves in their work, professional collaboration (contact with other humans) is essential to identifying the broad spectrum of challenges facing GIS professionals, as well as the range of viable solutions. This is something we all learn sooner or later in our careers. We must crawl out from behind our monitors and interact with other professionals. This is helpful not only in finding solutions to our challenges but also in making sure we have identified these challenges in a broad and comprehensive manner. Otherwise, our solutions are too short-lived.

Idaho

Idaho is largely rural in nature. Boise and its environs are rapidly urbanizing, but there remains a significant amount of farmland, open range, and natural lands surrounding the urban area. Outside this island of urbanity, Idaho's character is rural as far as the eye can see. Small towns dot the landscape, and larger cities (translation: population 50,000) are few and far between. Still, most of the counties in Idaho use GIS as part of their daily operations and employ one or more GIS professionals to staff their operations. As a result, GIS cohorts are scattered hither and yon with little or no daily contact outside of e-mail and phone calls.

Idaho's GIS activities have been robust for some time now, yet in the last few years significant efforts have been undertaken to provide better coordination between state agencies, counties, and cities. Idaho now has a geospatial information officer and a geospatial office for coordinating statewide GIS activity. This is helpful when dealing directly with the state, as access to resources and personnel is easier to find. With regard to regional collaboration, the state expanded its efforts by bringing in the consulting firm Crowell-Schulte. This resulted in Idaho being divided into three geographic areas represented by a Regional Resource Center to assist local GIS professionals to collaborate on issues of regional and statewide importance. In 2010, two regions adopted a business plan providing organization, structure, and guidance for improving GIS coordination and collaboration between cities, counties, the private sector, and others.

EIRRC

Moving to Idaho in 2011, I was surprised to find an active regional GIS group in the form of the Eastern Idaho Regional Resource Center (EIRRC). This group consists of GIS managers, analysts, private-sector GIS users, university staff, and survey professionals who meet on a monthly basis to discuss challenges facing the region. The group also coordinates with statewide officials, agencies, and councils. Its business plan says the following:

"Regional Resource Centers (RRCs) are organizational components of The Idaho Map (TIM), Idaho's statewide GIS program. RRCs have the primary mission of

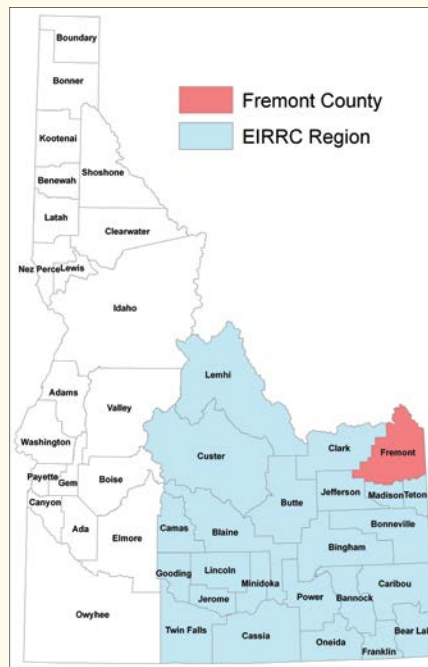
supporting and coordinating GIS activities and users in specific geographic regions of the state, in coordination with the Idaho Geospatial Council (IGC) and the Idaho Geospatial Office (IGO)."

EIRRC is refreshingly active, with a full agenda of topics and undertakings that affect all the local participants. The group has active leadership and members who serve on both regional and statewide subcommittees. The group faces many challenges. Perhaps the biggest challenge is how to standardize a spatial data infrastructure that works for everyone. This challenge is being tackled both from the top down in the form of statewide leadership and from the bottom up in the form of regional collaboration and problem solving. As a rural state, Next Generation 911 is a critical opportunity to provide better geolocation from cell service. And more basic challenges, such as improving road centerline data or standardization of parcel data, remain a perennial focus.

Fremont County

I represent Fremont County, which covers more than 1,800 square miles with a year-round population of just over 13,000. It doesn't get more rural than that. However, it is one of the gateways into Yellowstone National Park, and a large part of the county consists of the Caribou-Targhee National Forest. Fremont County is the most popular fly-fishing location for all Idaho and maintains one of the best snowmobile trail networks in the West. The southern portion of the county is rangeland and farmland with significant harvests of potatoes and barley. Fremont County is very active and faces many challenges, especially at the peak of summer tourist and harvest seasons. Most of the time, I am the only GIS professional working at the county. I try to keep a GIS intern employed, but with semester changes and graduation, there is downtime. Before the recession, Fremont County GIS maintained a staff of four. Now, fiscally challenging times make regional collaboration all the more important.

Neighboring counties face many of the same challenges. Sharing data and collaborating on the development of regional datasets are part of any successful GIS work program. Few things can be more exasperating than completing a project only to find someone else has already done the work or found a better way to do it. Being part of a regional GIS allows face-to-face interaction and the development of friendly and helpful associations. Meetings can be designed so that everyone can gather at a local restaurant afterward. In the business world, many deals have been struck during a meal. When people are relaxed and enjoying themselves in a less formal setting, challenges are seen in a different light. Often, assistance is more freely offered, and personal friendships develop that improve working relationships.



Geographic area of the Eastern Idaho Regional Resource Center.

Travel

Traveling long distance for meetings is also part of the work program. Just about anything that cannot get done over the phone or by e-mail requires traveling. Rural Idahoans are used to it; it is part of daily life. Still, EIRRC employs online conferencing to include those individuals who cannot always travel. This helps to keep everyone involved and the work moving forward. Personally, I look forward to face time and to interacting with other GIS professionals, even if it burns up much of a workday. In the long run, it improves productivity through insight into creating products that have a longer life cycle. Thornier issues, such as standards for core GIS datasets (i.e., parcels and roads), are more easily addressed through a little give and take around the table. And the ability to read nonverbal communication helps steer the topic in a helpful direction.

As a young professional, I dreaded meetings as unproductive downtime and useless bantering by people who seemed never to get anything done. Over the years, however, I found that such meetings were tools of collaboration that prevented problems and produced products useful to everyone. Now I look forward to opportunities that allow collaboration and professional relationships to flourish. Because Idaho provides such opportunities, the future looks bright for the state, the region, the organization, and the individual.

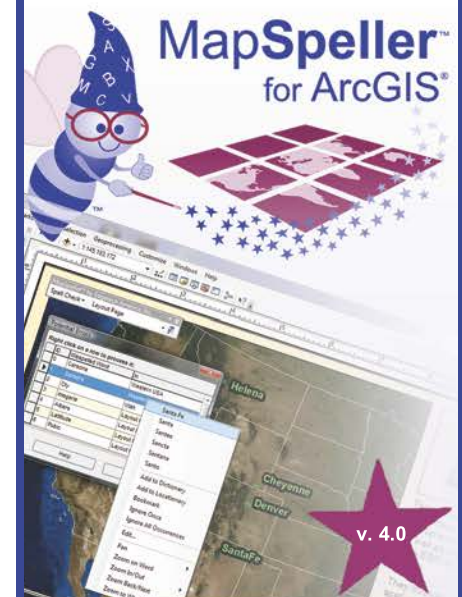
About the Author

Greg Newkirk, GISP, AICP, is the GIS manager for Fremont County and adjunct faculty for Brigham Young University-Idaho. He has more than 20 years' experience working with GIS.

For more information, contact Greg Newkirk (e-mail: gnewkirk@co.fremont.id.us).

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The *Esri ArcGIS Desktop Associate Certification Study Guide* is designed to help prepare candidates for the ArcGIS 10.0 or 10.1 Desktop Associate exam. Published by Esri Press and authored by experienced Esri instructor and certified ArcGIS for Desktop professional Miriam Schmidts, the study guide includes overviews of the essential concepts measured by the exam, step-by-step exercises to practice and reinforce ArcGIS skills, and challenge questions to test knowledge.

Says Schmidts, "You can study the chapters in sequence or pick and choose the ones you want to concentrate on. The hands-on exercises help you remember the tools and workflows needed for the test."

The study guide includes access to 180-day ArcGIS for Desktop trial software and an exercise data DVD. You can view the table of contents and a sample chapter and purchase the study guide at esri.com/esripress.

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Enterprise Systems Category

This category recognizes outstanding use of information systems technology in a multi-department environment as part of an integrated process.

Exemplary System

The GEM Project: Bringing Information to the Emergency Operations Centre (City of Calgary)—Liz Findlay, GEM project sponsor and manager, and Nancy Merritt, geospatial consultant and GEM project adviser, Geospatial Business Solutions Division, Corporate Services, City of Calgary, Alberta, Canada: Using a strategic implementation in a phased approach, the GEM project supports a population of more than one million and a city with more than 14,000 employees.

Distinguished Systems

- Department of Homeland Security Common Operational Picture—David Alexander, director, Geospatial Management Office, Department of Homeland Security, Washington, DC
- Department of Homeland Security Geospatial Information Infrastructure—David Alexander, director, Geospatial Management

Office, Department of Homeland Security, Washington, DC (*See article on page 24.*)

- National Capital Region Geospatial Data Exchange—Robert Horne, GIS Committee chair, Metropolitan Washington Council of Governments, Washington, DC

Single Process System Category

This category recognizes outstanding application of information system technology to automate a specific *single* process or operation involving one department or subunit of an agency.

Exemplary System

The Transportation Investment Act Process: Georgia Department of Transportation—Jane H. Smith, State Transportation Data Administrator, Georgia Department of Transportation, Chamblee, Georgia: Serving state agencies, 159 counties, and more than 500 cities, the process provides a single, accurate, and up-to-date road database (55,000 miles of road centerline) covering the entire state.

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"Show Me My House" for Snow Ordinance Searches (Des Moines, Iowa)—Anna Whipple, GISP, GIS manager, City of Des Moines, Iowa.

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Indonesia—Where Memories and T-shirts Abound!

Greg Babinski, finance and marketing manager, King County GIS Center, Washington, says, "En route to Australia, I stopped in Indonesia. From Jakarta, I made my way via Makasar and Ternate (by air), then by ferry and bus from Ternate, across Halmehera Island, then by ferry to Morotai, where my father had been stationed in late 1944 and 1945 as a ball turret gunner on a B24 bomber in the Thirteenth US Army Air Force. Of course, I brought my Esri Sports t-shirt. Here I'm on the grounds of the Indonesian Air Force Base that had been the USAAF Pitoe Field during WWII."

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Greg Babinski in Indonesia.

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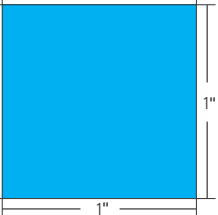
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