GIS TAKES THE CHAOS OUT OF EMERGENCY MANAGEMENT

A COMPREHENSIVE GIS

Electric and Gas Utilities

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Introduction

Emergency management is more than a response to a disaster; it is an ongoing process. It begins well before a disaster strikes and continues after the incident. Because a utility's emergency processes rely heavily on location, geographic information system (GIS) technology is critical to providing timely, accurate, and complete information from various sources. Sound decision-making hinges on rapid data analysis. and sharing that analysis every step of the way with all stakeholders is just as critical.

Esri® ArcGIS® software pinpoints the location of weaknesses, outages, damages, crews, and material. It supports emergency management decisions in three ways, allowing utilities to

- Build resilience.
- Respond with real-time information.
- Recover by rebuilding, coordinating, and sharing.

These processes result in data-driven insights, enabling utilities to prepare strategically, respond rapidly, and recover methodically.

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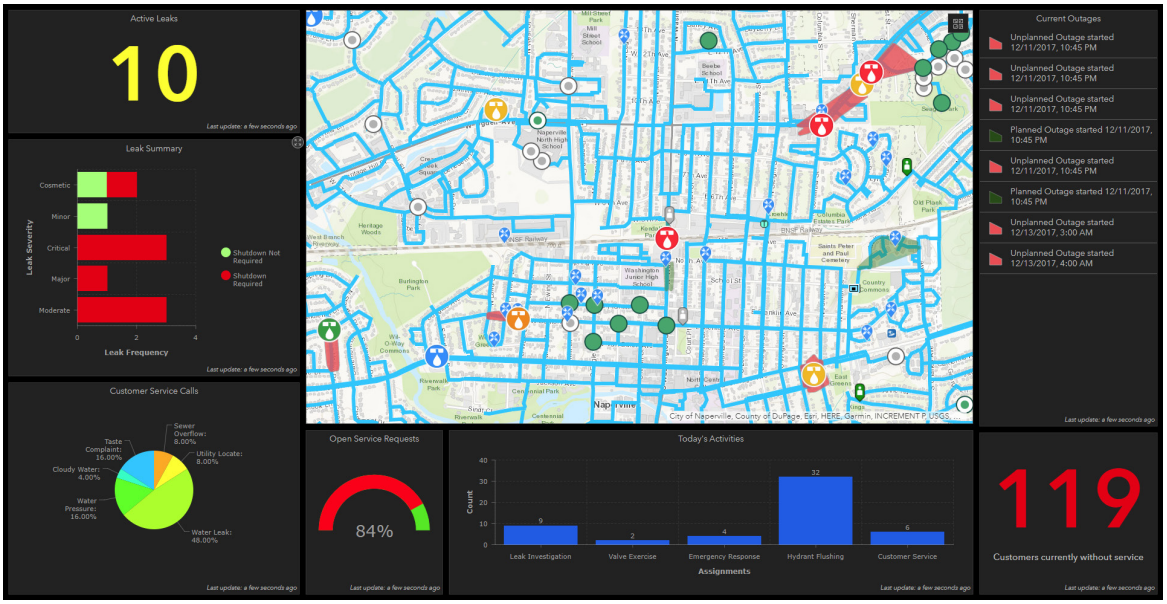

Understanding Why Location Matters

Customers, crews, assets, and buildings are scattered throughout the service territory. Events, such as wildfires, earthquakes, floods, blizzards, snowstorms, and cyber- and physical attacks, can strike anywhere. Knowing where wildfires are most likely to occur or where low-lying areas may flood are examples of how location matters.

Understanding where assets are most vulnerable is crucial. For example, the best location to stage crews and equipment in advance of an approaching hurricane must be fully understood. Questions like where to harden the network, where vulnerable populations are at risk, or where to prioritize recovery must be answered. Utilities must always know what's happening and where.

Workers who are kept informed of real-time traffic and weather conditions and possible threats work most effectively and safely. They are more likely to make decisions faster and deliver better service if they can access location intelligence in the field.

GIS provides that required location intelligence. Situations change quickly, and GIS analysis can help workers adjust at a moment's notice. The ability to transform data into useful information is essential for coordination, navigation, data collection, and asset monitoring. In normal times, this is important, but during emergencies, this ability can be lifesaving.

Location is at the heart of emergency management. Because utility processes revolve around where events occur, spatial analysis helps utilities become agile when it matters most.

Taking the Chaos out of Emergency Management

Many processes occur before, during, and after a major emergency event. These include decentralizing staff, securing foreign crews, handling material, clearing trees, dispatching, staging, housing, and providing meals. These tasks all deal with location.

Utilities depend on technology such as SCADA (supervisory control and data acquisition), network analysis, OMS (outage management system), ADMS (advanced distribution management system), AMI (advanced metering infrastructure), WMS (work management system), and ERP (enterprise resource planning), which are all dedicated stand-alone systems.

However, the greater the danger, the more workers fall back on legacy habits: use of paper, map books, manila folders, pens, pencils, yellow pads, and spreadsheets. GIS drives utilities to eliminate these old, wasteful habits.

Between the plethora of processes, technologies, and data, managing emergency incidents can be chaotic. The traditional method is marked by paper maps on the floor, piles of printouts of spreadsheets, and people jammed into conference rooms. The result is a lack of timely collaboration, communication, and coordination when they're needed most. Due to the silos of various activities, separate point solutions, and manual processes, science-based analytics becomes impossible.

Decision-making is tough when people don't have the data they need at the time they need it. ArcGIS transforms chaos into order. It consumes data inputs from SCADA and ADMS to metering and financial systems and traffic and weather services. It organizes everything by location, breaking down silos. It provides advanced analytics using technologies like machine learning and augmented reality. GIS delivers situational awareness to all—making sure everyone is on the same page and answering the most pressing questions, like What's going on right now? and How best do we prioritize for the greatest recovery impact?

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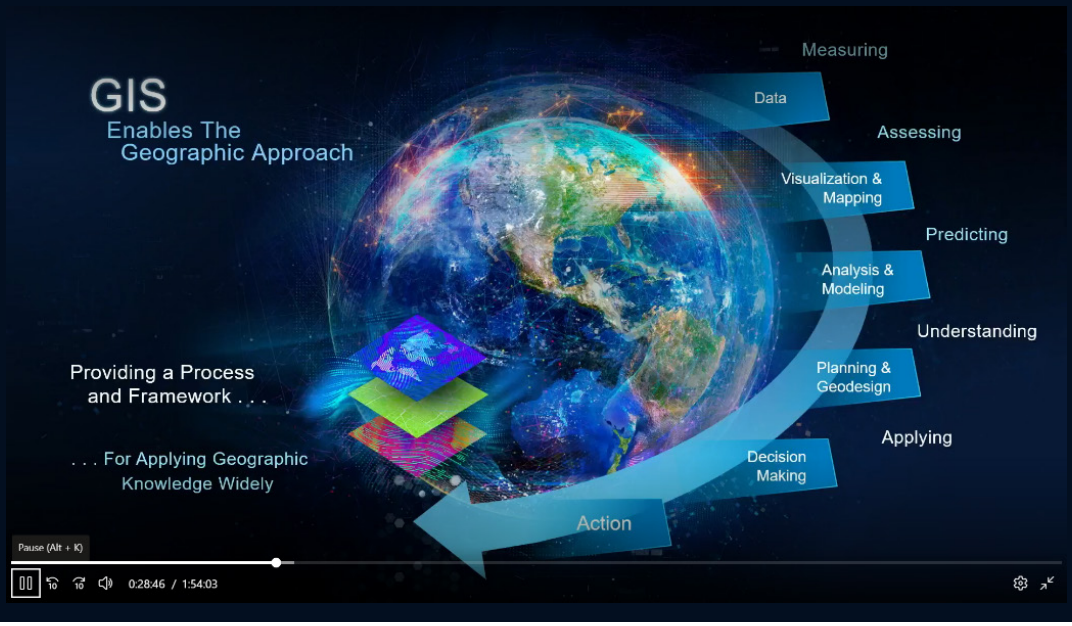

ArcGIS elevates emergency management in three ways, allowing utilities to do the following:

Build Resilience

Fifty percent of electric utility assets in the US are over 30 years old. The average age of gas utility equipment is greater than 35 years old, with more than 50 percent older than 50 years. Given the enormous challenge of aging assets, in preparation for emergencies, utilities must clearly understand where to prioritize their hardening efforts. GIS provides the analytics to prioritize clearly. Greater understanding leads to the development of equitable mitigation strategies through risk analysis based on location. Spatial analysis also aids in the assessment of equipment needs and the development of potential staging strategies for various emergency scenarios. And it helps emergency managers optimize logistics and better navigate today's supply chain disruptions.

Respond with Real-Time Information

When utilities are faced with an unfolding situation like the discovery of a wildfire, they must have the required infrastructure in place, ready at any moment to execute a coordinated, well-planned response using established applications and analytics. These include comprehensive situational awareness dashboards populated with real-time data feeds. Once damage happens, they must craft real-time damage assessment, deploy mobile resources to monitor progress, and manage the flow of information. Finally, utilities must have the capability to ensure a safe and equitable work plan to minimize disruption during the event.

Recover by Rebuilding, Coordinating, and Sharing

Once the event has passed, the utility must begin the rebuilding process. Many customers are without essential services. There may be obstacles such as downed wires, fires still burning, trees obstructing traffic flow, or exposed gas pipes. The task ahead can be daunting. The key to optimizing the recovery effort is rapid assimilation of data and close coordination with utility workers, first responders, and community officials. GIS helps organize the work by location, monitoring progress and sharing recovery results widely. Utilities must keep track of temporary quick fixes and be precise in reporting material usage for future asset management and record keeping. Finally, they must document their lessons learned to help refine future recovery plans, noting patterns, obstacles, and missed opportunities.

Case Study: CORE Electric Cooperative

Challenge: CORE needed to address the trend of increasing potential damage from wildfires.

Solution: The utility used ArcGIS to approach wildfires in four ways: risk analysis, mitigation, situational awareness, and response.

Result: CORE leveraged detailed location-based information, analytical functions, and swift communication to safeguard its stakeholders against wildfire danger. Read the complete story.

Building Resilience

Building resilience requires careful planning for any emergency. There are three elements needed to prepare for a severe and damaging event. The first is to fully assess what kind of external impact is likely. This is often from mother nature but not always. The second is to be fully aware of network capability and vulnerability. This requires a solid understanding of places in the network that need addressing, either due to age, failure to upgrade, or being in a high-risk area. The last is scenario planning—creating simulations and exercises that test data gathering, analysis, and engagement practices.

An example of the impact of an external factor is the tendency of an area to flood. Utilities require the most up-to-date data on low-lying areas and soil types. GIS can provide up-to-the-minute access to floodplain and soils information web services. It is critically important to have those services in place and tested, ready to be used in preparation for potential flooding. Another example is to have GIS layers in place to identify wildfire tendencies. These would include an area with high fuel load or an unusually high density of dead trees. By the time the event occurs, these areas should already have been delineated.

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It's vital to understand the weaknesses of the network. With that information, utilities can create emergency management plans and scenarios. Places of network vulnerability overlayed with areas of external impacts give warnings of where the most significant damages are likely to occur.

During this process, utilities understand where to focus mitigation efforts, lowering the network vulnerability. It also helps to predict equipment needs, staging, and supply chain issues. Workers can identify one-of-a-kind materials that would be hard to replace in the event of damage.

Building resilience before an event requires the following:

- Consuming external impact data from as many sources in advance, then using GIS to align that information. Useful data includes demographic, equity, topography, and even COVID-19 details.
- Forming a complete model for network vulnerability using GIS spatial analysis. That requires pulling in data from disparate corporate systems.
- Creating the foundation for the utility emergency management plans, including tactics for foreign crews, staging areas, and backup plans.

Case Study: Lakeland Electric

Challenge: The utility was not content with the length of time required to collect, organize, and process paper damage assessment forms.

Solution: ArcGIS, ArcGIS Collector, ArcGIS Dashboards

Result: ArcGIS technology enhanced the utility's emergency preparedness. Structured damage data can now be collected in a very organized fashion. Efficiency of restoration and compliance with Federal Emergency Management Agency (FEMA) reimbursement requirements are greatly improved. Read the complete story.

Responding with Real-Time Information

As an emergency incident, such as a flood, unfolds, the utility shifts into response mode. As the event matures, the utility must do many tasks continuously while maintaining safety awareness.

Preserving situational awareness constantly during the event is crucial, as damage assessment and analysis for resource allocation take the front seat. Predicting short-term needs for restoration to optimize limited mobile resources becomes vitally important, as do monitoring progress and sharing the results with the media and stakeholders.

The key to avoiding chaos is to capture as much data as possible—which ArcGIS does so well. Some of the information includes weather conditions, crew locations, work orders, network status, traffic events, the movement of people, and the establishment of shelter and staging areas. Utilities must also constantly monitor the status of health-care facilities and critical services.

As damage reconnaissance details are pumped into the GIS, utilities carefully coordinate and optimize field resources, tree crews, and dispatchers to provide a smooth and orderly response process. The utility should have the equity profile of its service territory in the GIS. This data enables it to ensure and communicate an equitable response that is sensitive to the needs of vulnerable communities.

People understand that shutting off gas mains and switching off power during an emergency event is necessary. However, continually sharing fresh information is equally important. What people remember most during a major crisis is how well (or not so well) they were kept informed. Maps act as a universal visual language of understanding.

The multitude of tasks requires a grasp of the role of location in data gathering, analysis, and dissemination. ArcGIS provides the tools to do all three.

Case Study: Southern California Gas Company (SoCalGas)

Challenge: The utility needed a better way to connect its authoritative data with data from other sources on a common geographic basis and securely share that integrated data in real time with all authorized users.

Solution: SoCalGas chose Esri for its industry-leading ArcGIS software

Result: Damaged gas lines were secured in record time. The entire restoration operation took 28 days—much less time than in the past. Potential disasters were avoided, and residents were kept safe. Read the complete story.

Recovering by Rebuilding, Coordinating, and Sharing

Now that the sun is shining and the floodwaters have receded, the long and arduous work of rebuilding begins. Many of the same processes in place during the event remain. Three primary processes dominate—all dependent on location and the data gathered during the response phase. They include the following:

- Priority analysis—Damage assessment is complete. Now utilities manage how best to dispatch crews and restore critical facilities. They need to order materials for the restoration process, which might take days or even weeks.
- Workforce execution—This can be a logistical nightmare. Utilities make difficult choices, such as which areas to work on that are more critical than others.
- Recovery communication—People are restless. The lights are out, water and gas may not be flowing, and communication is limited. Businesses are shuttered, and roads and bridges are impassable. Thus, frequent communication is mandatory.

Ponder these questions:

- ✓ How to analyze the damage for the most efficient recovery?
- ✓ How to craft the logical sequence of work, given the crews' location and status?
- ✓ How to focus on meeting the greatest need?

The answers all involve location. ArcGIS optimizes work assignments by location, leveraging spatial analysis to allow the best execution of the work in the right areas at the right time. During the event, utilities will have performed quick fixes and temporary work. Now they must track them and make permanent fixes. Utilities must monitor where their resources were deployed and produce all kinds of reports and audits, including those required by FEMA and their plant accounting systems. Since much of the work was performed in a hostile emergency setting, they must return to inspect sites to ensure that the work done was made permanent and, if not, make the necessary repairs.

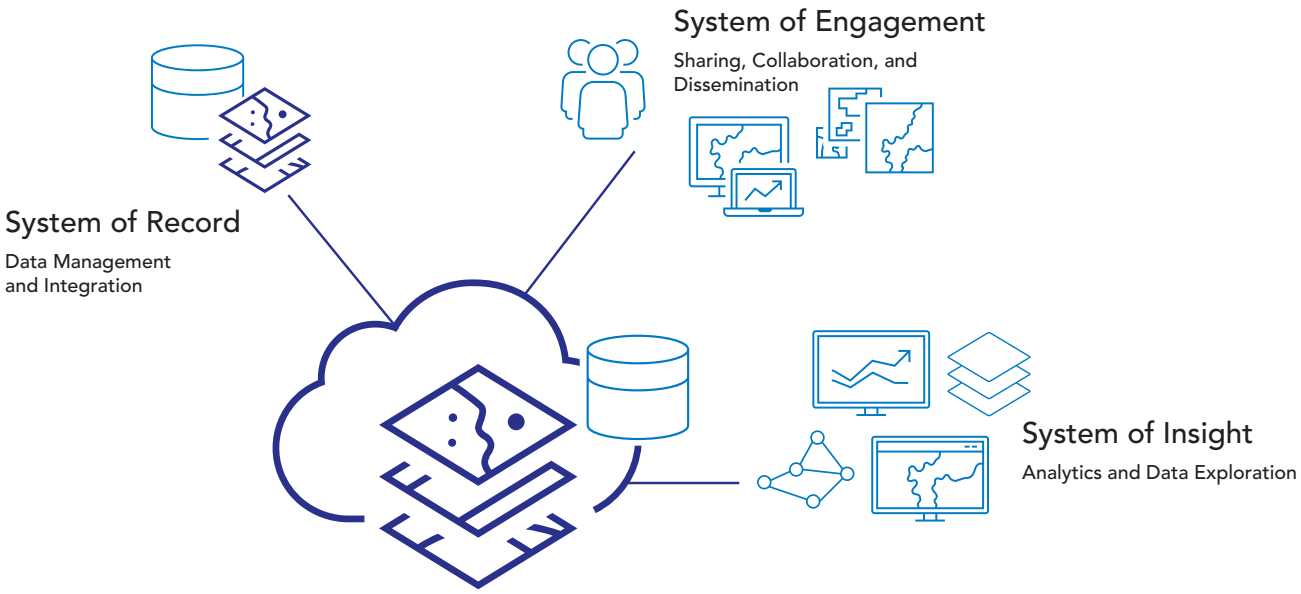
Every event is different. So no matter how well preparations were made beforehand, the final step of restoration is to take a deep breath, rewind the event process, and document lessons learned. ArcGIS can be an essential tool in doing just that.

Case study: Fort Pierce Utilities Authority (FPUA), Florida

Challenge: Severe weather caused damage that challenged FPUA's response and workflows.

Solution: FPUA decided to manage storm information by capturing damage data based on location, assigning work, restoring power, maintaining situational awareness, and creating supporting documentation in the process.

Result: The utility can now assess damage quickly and optimize restoration. Read the complete story.



Delivering the Answers for Decisive Action through a Comprehensive GIS

Emergency management requires a geographic approach, a new way of thinking in order to get the most out of the comprehensive GIS. It's a science-based way of problem-solving that integrates all the available locational information, whether from engineering, equity, facility, real-time, network, or environmental data. GIS and the geographic approach bring this information together and help utilities better understand—and predict—critical events.

The geographic approach sets up a framework for action by applying all the available knowledge in meaningful ways directly into a utility's workflows. Since most of the work involves location, an enterprise geographic information system enables this approach. It allows utilities to measure things in very focused ways; make maps; and visualize, understand, and predict the future. It's also an environment where employees, from senior management to mobile workers, make better decisions through geographic understanding in support of their actions.

Location technology is essential to improving productivity, safety, and quality of work performed. ArcGIS is a comprehensive GIS—a system of record, insight, and engagement.

"Understanding precedes action."

—Jack Dangermond,
Founder and President, Esri

Providing the Tools to Elevate Emergency Management

ArcGIS provides utilities with a complete digital twin of their network. ArcGIS Utility Network captures utility assets and their relationship to one another. For example, it tracks the relationship between electrical equipment and support structures, both overhead and underground. State-of-the-art visualization tools give on-site workers full visibility through 2D and 3D representations, freeing them to do their work without interpreting hard-to-read paper maps and notes. In addition, ArcGIS Field Maps helps mobile staff improve the accuracy and timeliness of the system of record used by other employees and contractors. Designers, digging crews, call-before-you-dig contractors, dispatchers, engineers, asset managers, and utility workers benefit from ready access to the complete and accurate data that the GIS delivers.

ArcGIS tools give workers needed insight into their surroundings by allowing them to perform instant analysis of network conditions. Predictive analysis alerts them to hazards and potential customer issues.

ArcGIS arms them with analytics about customer attitudes, behaviors, and history.

Two keys to effective communication are clarity and timeliness. This is especially true during emergency situations. Communication gives workers confidence that their decisions are based on the most up-to-date information possible.

Esri so highly regards the value of GIS during emergencies that over the last many years, it has been donating GIS software and services to organizations during crises such as major storms, earthquakes, tornadoes, and even terrorist attacks. Read more about Esri's Disaster Response Program (DRP).

ArcGIS provides organizations with data by location, analyzes it for decision-making, and then disseminates that information to all stakeholders. This process forms the basis for building resilience ahead of, during, and after an emergency event, taking the chaos out of emergency management. Thus, ArcGIS enables utilities to prepare strategically, respond rapidly, and recover methodically.

Empower transformation through innovation.
To learn more, visit our site:

esri.com/en-us/industries/utilities

ArcGIS is a comprehensive GIS—the strategic investment that every utility needs to make to move forward.

About Esri

Esri, the global market leader in geographic information system (GIS) software, location intelligence, and mapping, helps customers unlock the full potential of data to improve operational and business results.

Founded in 1969 in Redlands, California, USA, Esri software is deployed in more than 350,000 organizations globally and in over 200,000 institutions in the Americas, Asia and the Pacific, Europe, Africa, and the Middle East. Esri has partners and local distributors in over 100 countries on six continents, including Fortune 500 companies, government agencies, nonprofits, and universities. With its pioneering commitment to geospatial information technology, Esri engineers the most innovative solutions for digital transformation, the Internet of Things (IoT), and advanced analytics.

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