

Applications of Geospatial Technology in Emergency Management

GIS in Action BEFORE Disasters...

Building Datasets

Using photogrammetry and remote sensing products, along with datasets from sources such as cities (medical and elderly care facilities, schools, daycares, government buildings, and utilities), counties (parcels, e-911 address points, government buildings, and additional data), FCC (wireless communication towers), US DOT (main pipelines), FEMA (Hazus), and private organizations (additional infrastructure data); datasets of critical infrastructure can be developed.

The best data sources to get started with are a combination of the parcels and E-911 layers, details given by the cities themselves, and orthoimagery. The parcels layer allows you to easily identify above-ground critical infrastructure by running queries for owners such as municipalities ("Ames, City of") or utility companies ("Alliant Energy" or "AT&T"). Likewise, the City of Ames utilized the county E-911 addressing points layer, and included post-fixes for infrastructure such as water pumps, substations, and wells. City municipalities will be able to get you accurate and timely data on infrastructure within their jurisdiction because they are the ones who maintain it and know about it the best. But to place accurate points, orthoimagery gives a birdseye view and shows where it truly is. After analyzing infrastructure patterns with orthoimagery, infrastructure patterns will start appearing from ground clutter.

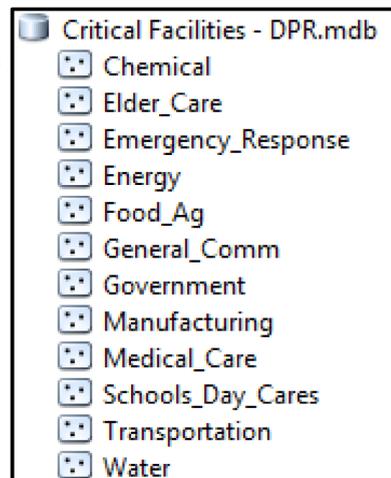


Figure 1. Screenshot of the Story County Critical Facilities Geodatabase layer structure.

Designing Applications

Using the ArcGIS public safety templates released from ESRI, geospatial solutions can be built and implemented in the Incident Command Post (ICP), Emergency Operations Center (EOC), and the field. Having these pre-built solutions is key to a quick response with easy deployment. These applications include ArcGIS Flex Common Operating Picture (COP) and the ESRI Mobile Damage Assessment Tool.

The ArcGIS COP template works best in the ICP and EOC, allowing authoritative officials to edit layers on an ArcGIS server, without a need for ArcGIS Desktop and user licenses for computers or an internet connection. By having a COP built with ArcGIS, Incident Command (IC) is able to make better decisions faster and stay spatially aware during the situation by having data input from all 12 Emergency Support Functions.

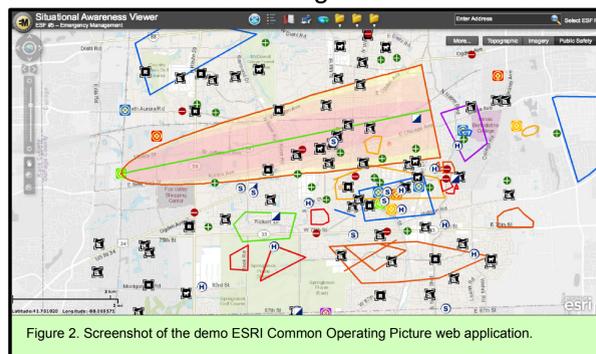


Figure 2. Screenshot of the demo ESRI Common Operating Picture web application.

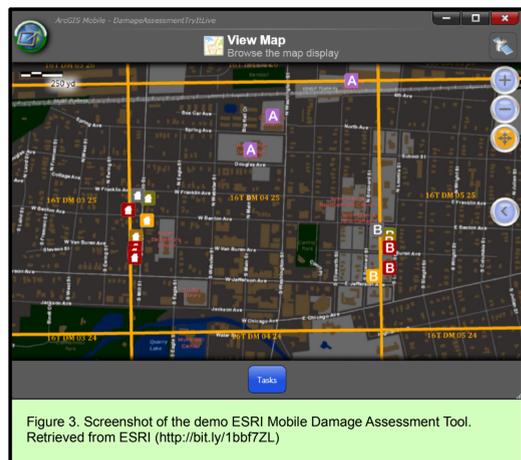


Figure 3. Screenshot of the demo ESRI Mobile Damage Assessment Tool. Retrieved from ESRI (<http://bit.ly/1bb7ZL>)

The ESRI Public Safety Mobile Damage Assessment Tool eliminates the need for paper damage assessment sheets and minimizes the number of duplicated reports. The Mobile Damage Assessment Tool also gives IC real-time data within the COP, to help IC make geospatially aware decisions.

GIS in Action DURING Disasters...

In the Incident Command Post

The Incident Command Post (ICP), is the on-site operations 'center' where Incident Command leadership is located, usually in the form of a tent, trailer, or an RV. In the ICP, GIS can be used to visualize assets such as medical services (triage and morgue areas, hospitals, and ambulances), operations support (road conditions and closures, staging areas, etc.), and utilities (downed powerlines, gas leaks, water main breaks, and other hazardous areas). It could also be used to track assets in real-time such as ambulances, search and rescue teams, other teams in the field, along with areas that have been searched and cleared.

Integrating GIS into disaster response is just smart. Not only does it give the ICP a Common Operating Picture (COP), but it allows them to be directly tied into their Emergency Operations Center (EOC), and allows the EOC to visualize live data while it is collected at the scene and make geospatially aware decisions. The other positive of bringing GIS into the workflow, is that data from many sources can be implemented and visualized in the COP, such as weather stations, USGS river gauges, web cameras, and other authoritative and crowd-sourced data.



Figure 4. The Incident Command Post at the 2013 Missouri Hope Exercise. Retrieved from the NWMSU Humanities and Social Sciences Facebook Page

In the Emergency Operations Center



Figure 5. The Pulaski County, Missouri Emergency Operations Center (EOC) that was activated in August, 2013, due to the flooding in Waynesville. Photo by Steve Zumwalt/FEMA

Although the Emergency Operations Center (EOC) is often far from a disaster site, it plays a critical role in coordinating the 12 Emergency Support Functions (ESFs) that support disaster response efforts.

A well-implemented geospatial solution allows decision makers to visualize the full, real-time extent of the disaster to make geospatially aware decisions. An added benefit of using GIS in the EOC is the capability to incorporate other authoritative data (such as weather stations, USGS river gauges, DOT web cameras, utility statuses, etc.) into your workflow. The ESRI Common Operating Picture web application helps coordinate the response efforts of all the ESFs, other key players, and section chiefs, while staying connected with the on-site Incident Command Post.

In the Field

GIS is also useful to teams sent out into the field. The teams in the field are boots on the ground within the disaster zone. Utilizing mobile devices, Incident Command (IC) is able to give teams situational awareness in disaster zones using data pulled from the Common Operating Picture (COP). This could mean the matter of life or death when teams encounter a hazardous situation. By having a mobile device with tracking enabled, they can be located easier and faster, while alerting others to hazards in real-time.

GIS solutions also assist the field teams in contributing valuable data back into the COP. Field teams are able to record data such as damaged and cleared buildings and hazardous areas. This is important data that can be visualized and analyzed in real-time by the Emergency Operations Center and IC.

Organizations such as the American Red Cross, FEMA, and Community Emergency Response Teams could utilize mobile data collection in their workflows to benefit IC.



Figure 6. A team moves a patient to a triage area during the 2013 Missouri Hope EDM Tornado Simulation. Photo by Darren Whitley/NWMSU



Figure 7. Victoria, Canada Police use a handheld Trimble Juno to complete damage assessments in the field. Retrieved from <http://bit.ly/1aEOEcq>

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