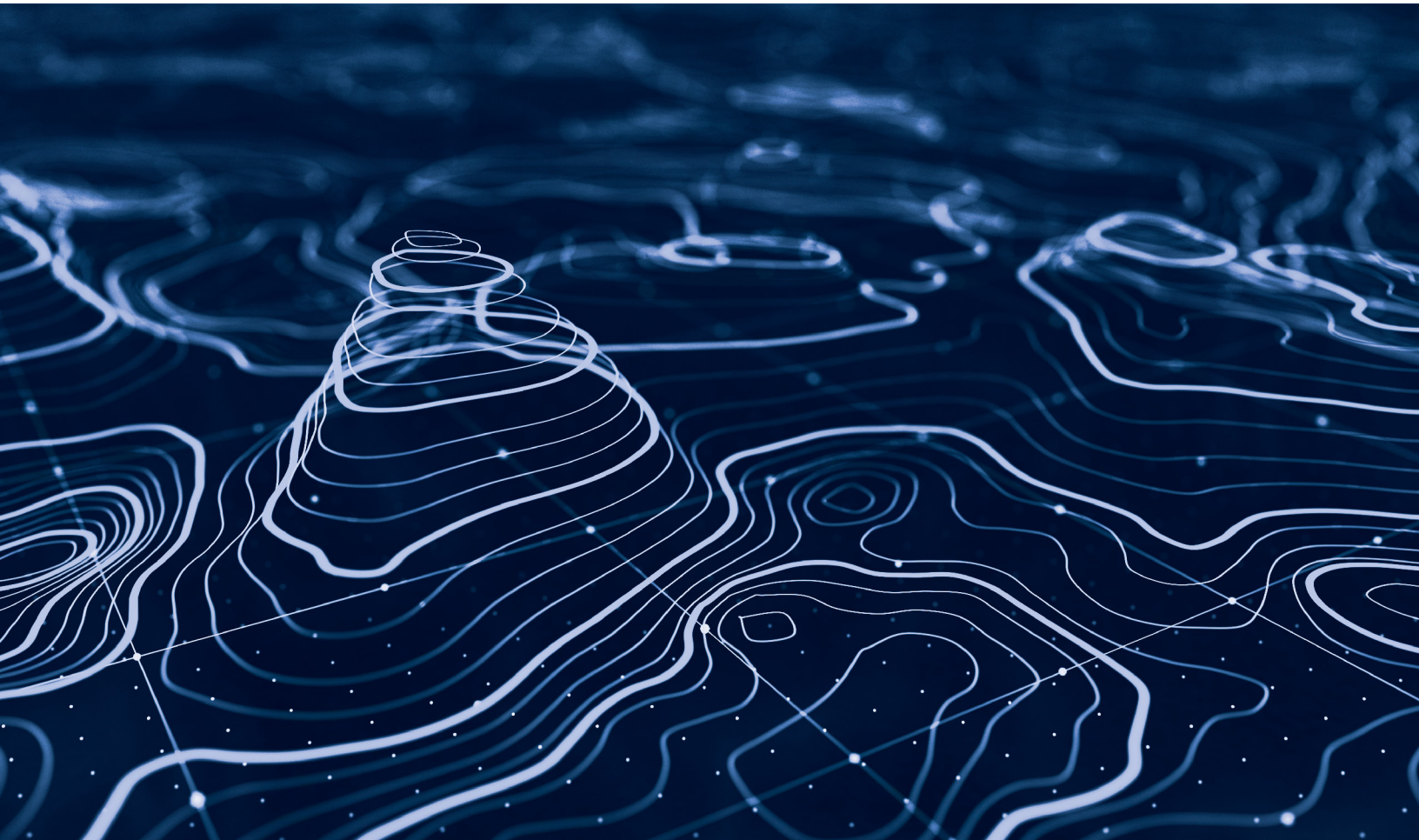




Benefits of Open Geographical Information Systems (GIS) Data



The National 911 Program

is housed within the National Highway Traffic Safety Administration's Office of Emergency Medical Services at the U.S. Department of Transportation.



U.S. Department of Transportation
**National Highway Traffic Safety
Administration**

About the National 911 Program

The National Highway Traffic Safety Administration (NHTSA) National 911 Program (Program), in the Office of Emergency Medical Services (OEMS) at the United States (U.S.) Department of Transportation (DOT), provides leadership and coordination of federal efforts that support 911 across the nation. A seamless interoperable 911 system-of-systems across the U.S. advances NHTSA's mission to eliminate fatalities, illness, and injuries from motor vehicle crashes and improve post-crash care.

The Program works with many stakeholders—including federal, state, local, tribal, and territorial (FSLTT) governments, technology vendors, public safety officials, and 911 professionals—toward a goal of advancing 911 that takes advantage of existing and emerging communications technologies, improving response times and information available to first responders prior to and during a 911 incident.

Background

There are many types of data used in the public safety ecosystem maintained by a wide array of data stewards both within and external to public safety. Geographic Information Systems (GIS) or geospatial data, is at the foundation for Next Generation 911 (NG911) call routing and has thrust this technology to the forefront in the public safety sector. The benefits of accurate GIS datasets are obvious; it helps save lives. But GIS has many uses beyond the NG911 environment further quantifying the return on investment for such expensive data.

Geospatial data collection can be sponsored at the local, regional, state or federal level or spread across multiple agencies within multiple levels of government. The United States Geological Survey (USGS), for example, has a long and successful history of partnering with states and counties to collect orthoimagery. These collaborations produce a multitude of geospatial data that can be used not only in public safety but also in transportation (traffic studies and crash reconstruction), planning, engineering and public health.

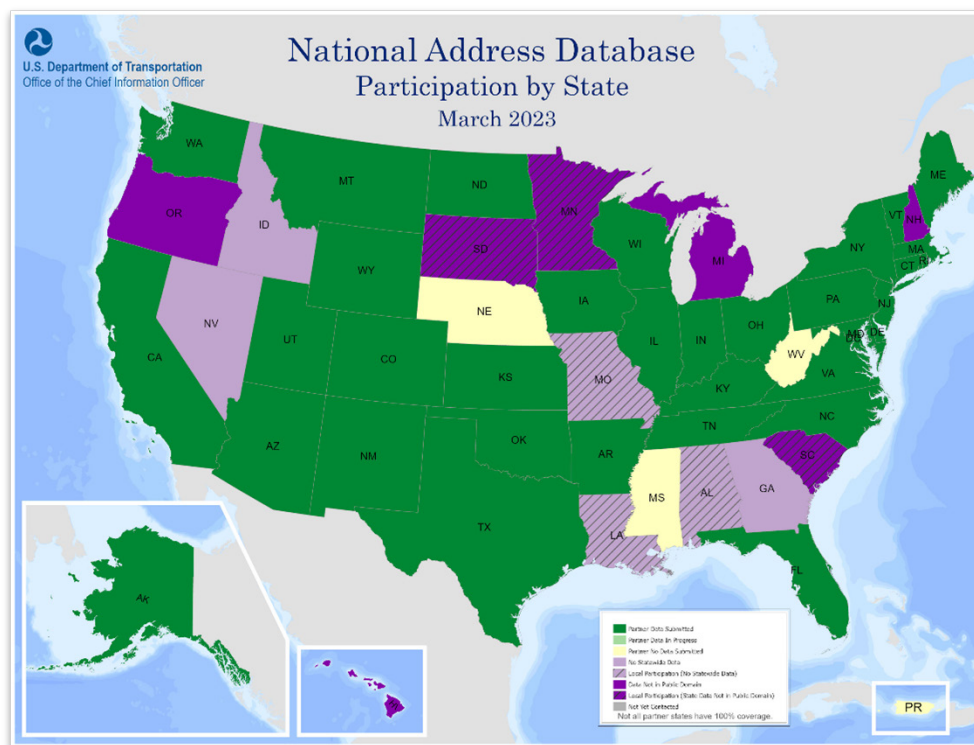
GIS data may be collected for a specific purpose such as NG911 or transportation, but that same data can be utilized across multiple disciplines. This paper will discuss the many benefits of broadly sharing geospatial data.

Current Data Sharing Policies

There are a variety of data sharing policies across local, state, and federal landscapes. Some localities freely share their data with neighboring jurisdictions and their respective state while others still charge for the distribution for GIS data.

State data sharing policies vary as well. The Department of Transportation's National Address Database (NAD) hosts GIS address points all voluntarily sourced from state, local and tribal entities. The address points are available for public download and support a number of governmental and private sector services requiring accurate location information.

The map below highlights state participation in the NAD¹. There are several states that do not have data in the public domain but some jurisdictions within these states have chosen to submit data based on local data sharing practices.



Federal agencies typically share their GIS data with partnering state and local entities or even freely with the public. For example, United States Department of Transportation (USDOT) shares GIS data to the public in a variety of ways. GIS data such as road centerlines, bridges, tunnels, railways, and other transportation features are accessible through the internet as services, interactive maps or product downloads. Some of the data attributes may be removed for security concerns before being made available to the public, which remains an option for all GIS data stewards.

¹ <https://www.transportation.gov/gis/national-address-database>

Uses of GIS Data Across Disciplines

One of the key benefits of GIS data is the ability to utilize the data across many disciplines throughout numerous departments and agencies. For example, a road centerline dataset with road name and address range attributes can be used for vehicular routing with turn-by-turn directions, snow removal, pavement management, NG911 and countless other applications. This dataset can be developed once and shared with every agency or it can be maintained individually by each agency with a use case, exponentially increasing the cost of data maintenance.

The same potential for cost savings and added benefits can be linked to address points. Parcel and food delivery require accurate location information as do the efficient delivery of 911 emergency services. Tax assessment and permitting also rely on proper addressing of parcels and each building on every parcel.

Benefits of Sharing

Reducing the cost of creating and maintaining multiple copies of a dataset is not the only benefit to implementing open GIS data policies. The benefits of sharing GIS data dwarf the possibility of cost recovery through selling GIS data. A dataset produced for one agency can be shared and expanded for other uses within or outside of an organization. Many times, this data benefits from the addition of attributes and further quality control for accuracy of both the spatial location and attribution. The public also benefits from improvement of services by way of using GIS data for routing trash pickup or snow plows more efficiently.

Highly accurate road centerline data also is a valuable tool for reconstructing crash data. The Federal Highway Administration (FHWA) provides guidance and best practices for the collection of AADT data while the responsibility lies on local and state entities to procure and analyze the data annually. This data is shared with the FHWA, state, local and partnering entities to help transportation officials gain insight on which roads are most heavily traveled and in need of funding for maintenance and repairs. This data also aids city planners on new developments and already congested routes. Without this collaboration and sharing of data, important analysis that benefit citizens from an inconvenience to life saving events would not be possible.

At the county level, web mapping applications are developed to inform citizens of voting, health department and animal rescue locations, provide locations with schedules for trash collection and emergency snow removal routes. Many localities also offer tax and parcel maps over the internet for public consumption.

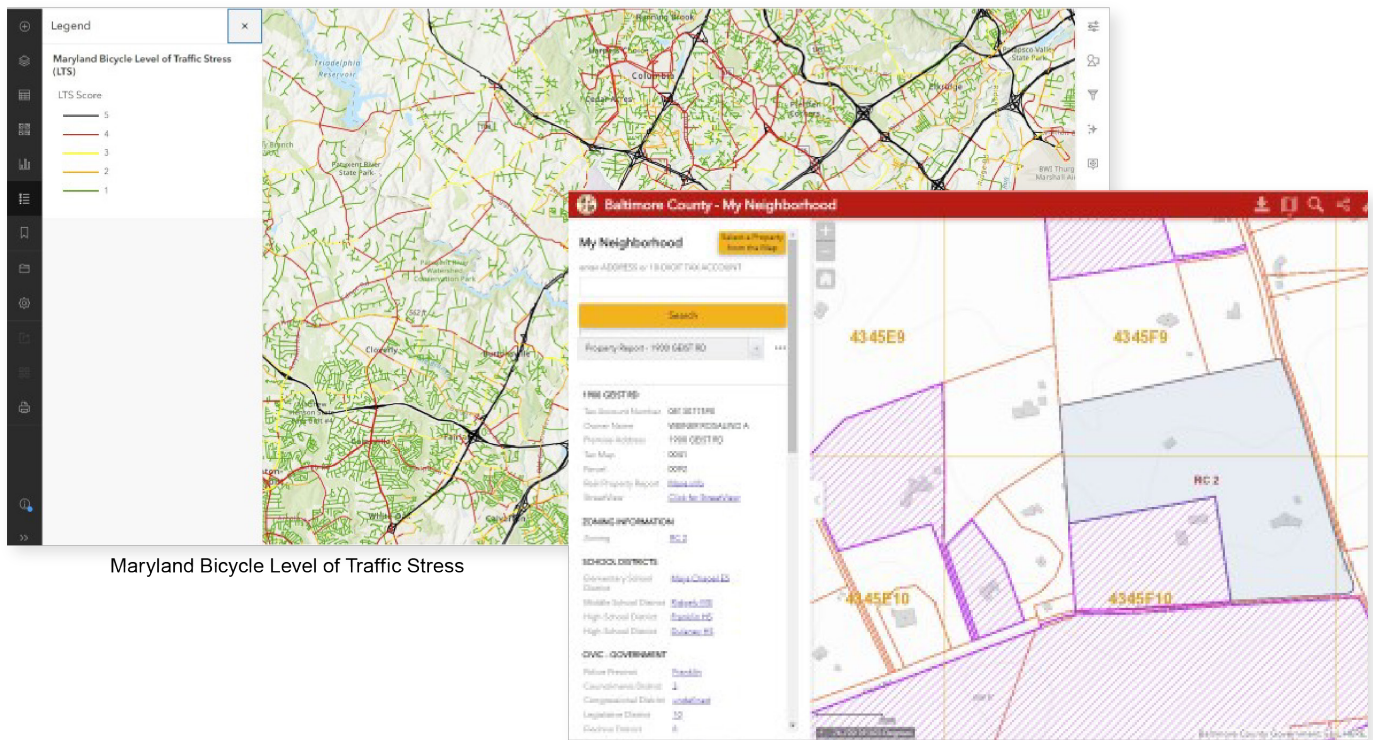
Federal funding of multiple programs is directly affected by sharing highly accurate GIS data. In fact, 31% of all federal assistance and 75% of federal grant funds are linked to the United States Census. The Census heavily relies on local GIS programs sharing GIS data to ensure thorough Census data collection.

Many states offer their own GIS data as well compiling data from across the state for distribution to localities and other state and federal partners. Many states have realized great success in spatial data sharing along with educational outreach on the available data. States implementing open data policies for spatial data have a higher return on investment for the GIS data they maintain through higher quality public services.

Sharing of GIS data in the Federal government is dependent on the agency and the sensitivity of the data. The Federal Geographic Data Committee (FGDC) acts as the lead entity for geospatial standards, policies and procedures. The FGDC encourages data sharing, stating in the Geospatial Data Act of 2018 Chapter 46 "...collect, maintain, disseminate, and preserve geospatial data such that the resulting data, information, or products can be readily shared with other Federal agencies and non-Federal users". Classified and sensitive data is not intended for public consumption and will not be available. Individual GIS data stewards can remove personally identifying information and other sensitive information from data attributes before sharing the GIS data.

How Data is Shared

GIS data is shared in a variety of ways within the confines of inter-governmental partnerships or broadly with the public. The internet provides a platform through which tabular and geospatial data can be shared, publicly or privately. Individual GIS datasets can be made available for download or via services which allows the data steward to update the source dataset and effectively update all users of the GIS service with new data. Web mapping applications easy can be created and updated using existing GIS data on an organizations portal or website and served to the public.



Maryland Bicycle Level of Traffic Stress

Baltimore County - My Neighborhood

The State of Maryland provides a Bicycle Level of Traffic Stress map to its citizens while one of its jurisdictions, Baltimore County, provides a My Neighborhood mapping application. The My Neighborhood application allows the public to select an address and find out school and voting districts, view properties with imagery, watersheds, or census blocks. Users can add data, draw graphics, take notes and share the map. Both of these web mapping applications use road centerlines sourced from the same GIS data steward which reduces cost, the chance for errors or discrepancies.

Sensitive Data Sharing

Public safety GIS data and public safety-adjacent data are not automatically sensitive datasets. The GIS data used in computer aided dispatch (CAD) software and within the NG911 environment also are used by navigation systems in vehicles, shipping and logistics companies, Google and Bing maps, real estate websites and more. Sensitive attributes can be removed before sharing the geometry and benign attributes.

It is vital for public safety GIS data to be shared with neighboring jurisdictions, with state and federal agencies and within the public safety ecosystem. The success of NG911 relies on the aggregation of GIS data across North America and the removal of gaps, overlaps and errors within every GIS dataset.

Classifying of GIS Data

Focusing just within the NG911 required GIS datasets, the logical breakdown of GIS data sensitivity can be as follows:

- *GIS dataset – recommended accessibility*
Justification for recommendation
- Site Structure Address Points (SSAP) – Public data
Address information already is available through multiple other sources such as tax assessment and public map and travel direction websites. SSAP also should be shared with the National Address Database (NAD): <https://www.transportation.gov/gis/national-address-database>. In addition to providing quality control on the GIS data shared with the NAD, the address points also are distributed to location search engines such as Google and Bing Maps and package delivery service providers like FedEx, UPS and Amazon.
 - If a jurisdiction adds critical infrastructure information to an address point, these attributes should be removed from the shared GIS dataset
 - If a jurisdiction adds health or mobility information to an address point, these attributes should be removed from the shared GIS dataset
- Road Centerlines – Public data
Road centerline information already is available through multiple other sources such as commercially available GIS data for download and public map and travel direction websites.
- Public Safety Answering Point (PSAP) boundary polygon – Public Safety and Government to Commercial data
There is not a risk to the public safety mission in sharing this information, but there also is little to no public value for this information. However, these boundaries are used for 911 call routing and should be shared with neighboring jurisdictions and with neighboring states to support 911 call routing functions. Further, cellular service providers can add PSAP boundaries to their 911 call routing algorithm to expedite the location-based call routing of wireless calls to 911. Sharing this GIS data can increase the likelihood of a positive outcome for the 911 caller.

- Service Boundary polygons (Fire, Police, Emergency Medical Service [EMS]) – Public Safety and Government to Commercial data
While there is little to no security risk to sharing response boundaries for public safety service providers, political implications may dictate reserving these GIS datasets to government use only; where first due fire or EMS is from a neighboring jurisdiction based on accessibility restrictions for example.
- Provisioning Boundary polygon – Public Safety and Government to Commercial data
The provisioning boundary is used by the NG911 service providers to determine the GIS authority for an area. This GIS data does not provide any value beyond NG911 GIS data management and therefore does not need to be shared beyond the public safety ecosystem.

Data Sharing Guidelines

The sharing rules associated with each GIS dataset can be defined in memoranda of understanding (MOUs) and attached to each GIS dataset as it is distributed. This allows use and further dissemination restrictions to be associated with each GIS dataset. Templates for GIS data sharing and collaborative GIS data development can be found in the resources section of the 911.gov website.

Conclusion

GIS data is expensive to develop and maintain. The duplication of GIS datasets exponentially increases both the cost of maintenance and risk of conflicting GIS data. The key tenets of GIS for NG911 dictate that the GIS data is accurate, without spatial or attribute error and consistently maintained in synchronization with the real-world. Sharing GIS data as liberally as possible provides additional quality control on each GIS dataset – more eyes, better quality – while reducing development and maintenance costs. Multiple studies have been conducted on the return on investment from selling GIS data versus openly sharing GIS data and overwhelming support the open sharing of GIS data as a way to increase the value of the GIS data. With an overarching goal of NG911 to improve the life safety mission under limiting budgets and restrictive time constraints, sharing GIS data is a logical companion to meeting success metrics.