

HOMELAND SECURITY AND GEOGRAPHIC INFORMATION SYSTEMS

How GIS and mapping technology can save lives and protect property in post-September 11th America

Introduction

Timely, accurate information, easily accessed and capable of being shared across federal, state, and local political jurisdictions is fundamental to the decision making capability of those tasked with the homeland security mission. But without the real-time ability to quickly visualize activity patterns, map locations, and understand the multi-layered geospatial context of emergency situations, homeland security will not be achieved.

The current state of geospatial information technology can provide decision-makers the data they need to confidently confront a wide variety of threats including natural disasters, terrorist attacks, sabotage, and similar crises. However, the current *implementation* of that technology, across all the federal, state, and local agencies and jurisdictions necessary to fully coordinate an effective response, is seriously lacking in specific areas.

As the concept of Homeland Security becomes infused into the work-a-day pattern of government and the everyday life of our citizens, decision makers will greatly profit from the crisis management "edge" that GIS provides. Homeland Security leaders should understand and implement the policy changes necessary to fully realize this technology's capability, and make the management decisions necessary to implement it on a national basis.

Background

As never before, in the aftermath of the terrorist attacks of September 11, it has become clear that in emergency situations of whatever origin our Nation is dependent on rapid access to and application of many types of current, accurate geospatial information. Critical information such as:

- Facilities and operations susceptible to attack.
- Critical infrastructure, including telecommunications; electrical power systems; gas and oil production, storage and distribution; banking and finance; water supply systems; emergency services.
- Accurate employment data tied to specific locations.
- Detailed and current "framework" data, including orthophotography, transportation, elevation, political boundaries, property ownership, hydrography and geodetic control.

Powerful geographic information systems are now available that quickly render one to several layers of digital geospatial data into map-like products. These systems can facilitate near-real time performance of a wide range of relevant geospatial analyses. These systems can be used to access and process digital geospatial data virtually anywhere because it, unlike analog data, can be instantly transmitted from wherever it's maintained and stored to any place where its needed.

These characteristics make geographic information technologies, combined with appropriate sets of geospatial information, an invaluable tool for the handling, display, and analysis of information involved in every aspect of Homeland Security. For example:

Detection: Geospatial information provides the spatial and temporal backdrop upon which effective and efficient threat analysis is accomplished. By linking and analyzing temporally and spatially associated information in real time, patterns may be detected that lead to timely identification of likely modalities and targets.

Preparedness: Emergency planners and responders must often depend on geospatial information to accomplish their mission. Current, accurate information that is readily available is crucial to ensuring the readiness of teams to respond. Geospatial information access and interoperability standards are essential elements as they support the means for the Nation's response units to react to terrorist attacks, natural disasters, and other emergencies.

Prevention: Geospatial information provides a means to detect and analyze patterns regarding terrorist threats and possible attacks. This information, coupled with information about borders, waters, and airspace, in turn may lead to the disruption of their plans or the prevention or interdiction of their attacks.

Protection: Geospatial information is a very important component in the analysis of critical infrastructure vulnerabilities and in the use of decision support technologies such as visualization and simulation to anticipate and protect against cascading effects of an attack on one system as it relates to other interdependent systems.

Response and Recovery: Geospatial information has been used by many organizations in response to and recovery from natural disasters. Similarly, this information is invaluable for emergency response services of all kinds, as well as for carrying out long-term recovery operations. The Federal Response Plan, developed by 26 federal agencies and the Red Cross, identifies overall responsibilities and the concept of operations for presidential declared disasters. A number of emergency support functions are identified, with the Federal Emergency Management Agency (FEMA) having the lead for coordinating response to natural disasters and the federal wildland agencies responsible for coordinating response to wildland fires.

Current Status

Accurate and comprehensive data are the heart of information technology, **and geographic location is a key feature of 80-90% of all government data.** It is critical that as a Nation we take the steps necessary to assure that strategic information assets relative to Homeland Security -- particularly geospatial information assets -- are created, are maintained for currency and accuracy, are readily available to those who need them, and are interoperable. Although Homeland Security requires much of the same basic real-time spatial information needed for other uses and applications, we know from recent events that it must be immediately and comprehensively available.

In short, we need to assure:

- Implementation of a comprehensive national spatial data infrastructure,
- Interoperability of the systems that process this information, and
- Commonality of the processes that collect, manage, and disseminate geospatial information.

Fortunately the Nation already has a well-founded interagency effort under way to build such a National Spatial Data Infrastructure (NSDI) under the auspices of the Federal Geographic Data Committee (FGDC) which is chartered by the Office of Management and Budget. The NSDI provides crosscutting mechanisms for organizations of many types, affiliations, and responsibilities to be able to collaborate in assuring that geospatial data and systems are in-place, ready for use. The data, technology, and associated intergovernmental and government-private mechanisms forged in this effort will be invaluable to intelligence, law enforcement, and other national security-related elements, as well as to local communities, in dealing with terrorism and other major threats to public safety and welfare.

In collaboration with all levels of government, industry, and academia, the FGDC and its member federal agencies have in-place a wide variety of effective organizational relationships and processes that could readily be used and expanded upon as needed -- given appropriate sanction and backing -- to produce a nationally consistent framework of Homeland Security-related base data characterized by common data content standards and supported by interoperable technologies. Several examples already exist of how this process works well:

- The coordinated application and use of geospatial data in New York City in response and recovery to the World Trade Center attack.
- Development of geospatial data as a foundation for critical infrastructure protection and emergency preparedness/response in the greater Chicago area.
- The use of geospatial information in wildfire suppression through the coordinated work of the Geospatial Multi-Agency Coordinating Group

However, at present there are gaps that should be filled to achieve assurance of data and technology accessibility and interoperability. Examples are:

- National data standards still need to be developed for a number of framework and other data themes to provide data that is immediately useful in Homeland Security events.
- NSDI Framework Themes are not yet complete.
- E911 capabilities are limited by the lack of consistent, standardized road data across the Nation, preventing true interoperability between all levels of government.
- Current and accurate information about the Nation's critical infrastructure is not consistently available or shareable among relevant agencies, leaving the Nation unable to effectively plan for modern terrorist activities.

The FGDC believes it is imperative that the Nation accelerate implementation of the NSDI. As we move forward to improve and support planning and management activities, the contribution of geospatial information and technologies in support of critical decision-making should be fully utilized. The NSDI has already established certain standards, processes, and relationships that serve to advance Homeland Security including:

- Well established relationships with Federal, State, Local and Tribal governments and ongoing coordination mechanisms such as I-Teams, an initiative to collect basic framework data collaboratively among all levels of government.
- A multi-node geospatial information Clearinghouse Network that can be extended to promote rapid discovery, sharing, and protection of critical geospatial information.
- Access to industry and international standards bodies and programs to advance standards that promote data consistency and interoperability of spatial technologies.

Recommendations

It is our opinion that more needs to be done to fully realize the potential this technology brings to decision making. To that end, we recommend that the Office of Homeland Security consider the following recommendations:

1. Address the gaps outlined above by supporting:
 - a. National data standards
 - b. Completion of all NSDI Framework Themes
 - c. Nationwide geospatial data compatibility for E911 operations
 - d. Compilation of comprehensive georeferenced information on Critical Infrastructure
2. Bring additional focus on these activities to elected officials at all levels of government across the Nation.
3. Promote, enhance, and provide sufficient resources for collaborative relationships between federal, state and local agencies and with the private sector.
4. Develop uniform approaches to planning for Homeland Security events while relying on standardized data and systems.
5. Develop sophisticated mobile GIS labs and trained staff that can be delivered to any site in the Nation within 12 hours of an event.
- 6.

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