

POLICY NOTES

More than Maps: Making Full Use of Geographic Information Systems

By John O'Looney

Geographic information systems (GIS) is the generic term for various technologies that share a spatial orientation, from production of maps (e.g., line-based, polygon-based, and equal area cell-based maps) with multiple layers and underlying data to computer-assisted design (CAD) of facilities based on three-dimensional models of terrain and landscapes. GIS technologies can help local officials make more informed policy and management decisions and deliver services more efficiently, equitably, and effectively.

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Geographic information systems that are used across a broad spectrum of local government activities (see box, next page) can help local officials understand how the public sector values of efficiency, equity, community viability, and environmental quality are traded off in the policy and management decisions they make. GIS has been employed historically to promote efficiency in basic governmental activities such as parcel, land-use, and zoning map making and in the routing of service-delivery and repair vehicles. With the appropriate databases, GIS technology can also help make other basic tasks of local government more efficient, including right-of-way acquisition; facilities, capital project, and storm water management; crime analysis; and economic development planning.

GIS can be used to promote equity through its unique ability to spatially analyze data related to the geographic distribution of public costs and benefits associated with specific projects and services. For example, GIS applications can help answer the classic question of "Who benefits?" from taxation, economic development, or budgeting decisions. A system can be used to help locate new governmental offices or services in order to provide more equitable access among groups of citizens. Moreover, because GIS technologies allow for quick and inexpensive development of "what if" scenarios, citizens can use these tools to conduct their own analyses and to develop their own policy alternatives.

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Community viability can be enhanced through GIS-related analyses to improve the design and functioning of key community attributes and services such as location and mix of public health services; linkages among transportation networks and places of work, play, shopping, and residence; and citizen access to open space, polling places, or governmental services.

Addressing issues related to environmental quality has been a traditional strength of GIS. Because most negative environmental impacts can be exacerbated or minimized depending on the location of the hazard, pollutant, or the spatial layout of an impacted area, GIS has been used to better site landfills and water treatment plants, to determine shape and location of new conservation or wildlife areas, to improve the performance of new prevention or hazard-control programs or infrastructure, and to better manage reactions to natural and man-made environmental disasters.

Although state and local governments have invested millions of dollars in GIS in recent decades, they have yet to begin to tap the potential offered by these systems. Some of the barriers to more effective utilization of these technologies include the following:



- GIS involves relatively new technologies, and it has been difficult to find qualified staff to use and develop applications. The technologies used in these systems are complex, making GIS difficult enough to use for relatively simple purposes, much less for more demanding tasks.
- Much of the initial funding for GIS has been spent on developing the base maps for a local area, leaving limited funds for application development.
- Common placement of GIS technology in a single governmental department and designation for a single use can undercut the potential for using it across a broad spectrum of purposes, functions, and tasks. Even when a technology is dedicated to serving a broader constituency, the problems related to data sharing and to the development of standards across departments can foil development of advanced applications.
- Vendors of GIS technologies have tended to sell their capabilities in numerous small packages. Consequently, the typical government user may not have access, even at the experimentation level, to some of the more sophisticated GIS capabilities.
- Because of the complexity of these technologies, many state and local governments rely on consultants and vendors to develop their GIS applications. While a moderate use of consultants in this field may be necessary, research suggests that outsourcing extensive parts of GIS projects can be shortsighted and costly (Brown and Brudney 1998).
- Many elected officials and department heads are not aware of the various potential uses of GIS and the capacity that these technologies have to enable them to make better policy and management decisions.

In a recently published book, *Beyond Maps: GIS and Decision Making in Local Government*, I identify and describe some of the potential uses of GIS, offer advice about GIS-related policy issues and the institutional positioning of GIS within a government's structure and culture, and reveal how GIS map-making capabilities can be abused both at the visualization level (e.g., using overly dramatic colors or contrast to undeservedly highlight a particular feature or map theme) and at the task level (e.g., presenting data that serves narrow political purposes rather than the larger public interest).

Selected Resources

Brown, Mary Maureen, and Jeffrey L. Brudney. 1998. "A 'Smarter, Better, Faster, and Cheaper' Government: Contracting and Geographic Information Systems." *Public Administration Review* 58 (July/August): 335–45.

O'Looney, John. 2000. *Beyond Maps: GIS and Decision Making in Local Government*. Redmond, Calif.: Environmental Systems Research Institute (ESRI) Press. Previously published in 1997 by the International City/County Management Association, Washington, D.C.

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Local Government Uses for GIS

Land-use and urban growth planning and permit tracking
Economic development planning
Infrastructure and transportation planning
Infrastructure and transportation management
Needs assessments and epidemiological analyses
Legislative redistricting
Crime tracking and law enforcement planning
School districting and school bus routing
Educational planning across secondary, university, and technical school levels
Comparison of program effectiveness across jurisdictions
Taxation analysis and record keeping
Benchmarking in human services
Public health risk analysis
Site selection for service facilities, housing, etc.
Site selection for locally unwanted land uses, such as landfills and prisons
Emergency management
Environmental monitoring and wildlife and greenway corridor siting
Public housing and housing weatherization and rehabilitation planning
Public information services