

Executive Briefing Paper

Why Should You Consider Geographic Information Systems?

Nearly all government information has a geographic dimension--a street address, a transportation corridor, a river, a city line. All kinds of descriptive information can be linked to a particular place to present a rich and detailed picture of a neighborhood, a park, a coastline, or an industrial site. Geographic Information Systems (GIS) are effective analytical and decision-making tools that organize, compare, and analyze disparate types of information. This powerful ability to integrate different kinds of information about a place can lead to better-informed decisions about public investments in infrastructure and services. Geographic information systems are good for many purposes including:

- economic development
- environment and natural resources management
- education
- health, safety, and human services
- infrastructure management
- comprehensive planning and zoning
- real property records management

What is a Geographic Information System?

A GIS is an electronic information system that analyzes, integrates, and displays information based on geography. GIS systems have powerful visual display capabilities that present the results of analysis on maps at a wide variety of scales, ranging from very large (accurate to within inches) to very small (accurate only in broad overview). GIS is regarded as the best technology to understand and solve problems associated with data whose common attributes are related to place and geography.

GIS spatial analysis and display capabilities allow a holistically organized view of a community and its citizens because they provide the ability to overlay and analyze interrelationships among these disparate data. This holistic view makes it possible to design and deliver more effective and efficient services. One of the most useful features of a GIS is its ability to overlay information about a variety of topics in order to see how these different views of a place combine to answer questions. A GIS can show the distribution of children under age five within the city limits along with the location of day care providers for pre-schoolers. It can show the watershed that feeds the county reservoir along with the location of industries and housing developments that may threaten water quality. The combinations are limited only by the kinds of questions you need to answer and the kind of spatial data you have available to answer them.

What Can GIS Do For My Community or Organization?

A well-designed GIS can help you answer questions like these:

- Where are the most desirable locations in our community to locate a new shopping mall?
- What is the most efficient route from the fire house to a fire at the Industrial Park at various times of day?
- Is there a relationship between the location of an old dump site and the incidence of childhood cancer nearby?
- How has the habitat of the white tail deer changed over the last five years and what is causing the change?
- What intersections have been the site of personal injury accidents in the past three years?
- How will a proposed manufacturing plant affect our community's water supply?

The value of GIS and spatial data can be seen most dramatically in applications like these that promote economic development, public health and safety, and environmental quality. Moreover, these applications share many common information needs, so information collected by one organization can often be reused by others, thus reducing the cost of the most expensive GIS

resource--the information itself.

What Kinds of Resources are Needed for an Effective GIS Program?

Data. The most important and often the most expensive part of an effective GIS program is data that is specially coded to include information about location. Location can be noted by the use of coordinates of latitude and longitude, elevation, zip codes, highway mile markers and so on. A key consideration of spatial data is its scale. Scales that are accurate enough for one purposes (say describing the habitat of the spotted owl) may not be accurate enough for other purposes (such as knowing exactly where to dig to avoid a pipeline buried in the ground around city hall.). Spatial data can be expensive because of the necessity to keep it up to date and to render it in sufficient detail (scale) for it to be useful and reliable for the purposes to which you apply it.

Standards. In order to share spatial data among different users, it needs to follow established standards that help users understand its characteristics. The federal government and the states are working on standards that will allow users anywhere to understand and evaluate a spatial data set and use it appropriately.

Hardware & Software. A GIS program needs computers, software programs, and perhaps networking capabilities that allow users to gather and organize data, conduct analyses, and map and display results. Desktop technology, as well as more powerful tools, are commercially available for these purposes. The technical sophistication of the software and the processing power of the hardware you need depends on the applications you plan to use.

Staff & Staff Training. An effective GIS program demands staff who are trained to understand the questions and problems that your organization faces, to know when spatial data analysis is appropriate, and to conduct analyses that meet your needs. These staff need ongoing training in both the technologies and techniques of GIS. In many places, public organizations share the cost and time of these specialists and technical resources.

Linkages. Spatial data is shareable and reusable. GIS applications developed in one place can often be used or modified for use elsewhere. In addition, different communities or organization can collaborate to develop new data sets that they can all use. The best way to take advantage of these benefits is to form working relationships with other organizations and to support professional communications among GIS specialists wherever they work. New York State has initiated a GIS coordinating effort that involves state, local, academic, and private sector participants.

What is the Cost-Benefit Argument for GIS Investments?

Determining the cost-benefit of an investment in GIS is an important and often difficult undertaking. One of the reasons for the difficulty is that GIS programs often allow communities to do things they have not been able to do before--therefore there is no obvious basis for before and after comparison. Nevertheless, the costs and benefits of a GIS program can be identified and estimated and this kind of assessment should help you make sound investment decisions. Some of the costs to consider include: a feasibility study or needs assessment, hardware, software, maintenance contracts, data entry, data transfer, data purchases, data development, training and technical support for system users, supplies, overhead such as rent and utilities, and salaries. Benefits are much more difficult to quantify than costs and they depend on the applications you will run. Some common benefits are increased revenue from making land parcels more productive; decreasing the costs of providing some public services; attracting additional commercial activity and jobs; increasing the efficiency and timelines of public services such as fire protection; and preventing or discovering the cause of health problems stemming from conditions of the environment.

What are Some Examples of Effective GIS Applications?

Economic Development. GIS offers enormous potential to support economic development. These systems can analyze locations for business expansion opportunities and can support the development and evaluation of public policies to guide expansion. A GIS can identify sites, locate customers and suppliers, and help minimize transportation and shipping costs. It can also identify workforce characteristics, educational resources, and other quality of life elements that are important to business developers.

Environment and Natural Resources Management. Geographic information analysis allows planners and policy makers to understand the environmental effects of their policy choices. Since environmental concerns do not stop at the county line, the information needed to assess them must be shared among different jurisdictions and agencies. GIS is used in New York to support

such environmental management activities as managing forests, watersheds, wildlife habitats and wetlands, as well as monitoring various sources of pollution.

Health, Safety, and Human Services. Geographic information systems allow policy makers , analysts, and program managers to promote the health, safety, and welfare of individuals, families, and communities. Using data that pertains to neighborhoods, people, physical infrastructure, land parcels, political boundaries and a host of other topics, GIS spatial analysis and display capabilities make it possible to design and deliver more effective and efficient services. Public health applications include epidemiology, facilities siting, and health needs assessments. Public safety applications include police and fire protection and disaster mitigation. Public welfare applications cover service directories and referral services and program evaluations.

Education. Schools can use GIS for such things as forecasting enrollments, optimizing bus routing and other planning needs. That box on State income tax forms that asks for a school district code is used by a GIS to help ensure that the billions of dollars of State school aid go to the right school district. State aid for education is based in part on the relative personal income wealth in school districts. Income wealth is attributed to districts based on the school district of residence codes reported by taxpayers.

Infrastructure Management. The State's infrastructure--highways, railways, waterways, water and sewer systems, electric, gas, telephone, and telecommunications systems--are the foundation of the State's economic development potential. The planning, design, construction, operation and maintenance of this infrastructure can be managed most effectively through the use of GIS applications.

Comprehensive Planning and Zoning. Comprehensive planning and zoning are essentially the processes by which we balance economic development with environmental protection, and by which we develop strategies for wise use and conservation of our natural resources. In comprehensive planning, a unit of government makes a thorough analysis of all its natural, cultural, and socio-economic characteristics and features, then uses this data to design programs and policies to attract, accommodate, and guide future development and growth. GIS is essential to the effective inventory and analysis of these community assets, to simulate the results of changes in policies, and to explore intricate community dynamics.

Real Property Records Management. Property information is at the crux of municipal information systems, comprising the intersection of private rights and public needs. It is the basis for maintaining, protecting and taxing property, and for planning, zoning, new infrastructure development, and the distribution of many municipal services. GIS can make property data readily accessible for economic development; allow property data to be the information base for many other uses; and can allow access to property data for such interested parties as banks, insurance agencies, real estate brokers and investors, title companies, and multiple listing services.

How Can I learn More?

Here are several good resources for learning more about how to take advantage of GIS:

Reports. Much of the information in this briefing paper was taken from these two reports:

- *Geographic Information Systems: Key to Competitiveness*, NYS Temporary GIS Council, 1996.
- [*Sharing the Costs, Sharing the Benefits: the NYS GIS Cooperative Project*](#), Center for Technology in Government, 1995.

World Wide Web Sites. These and many other GIS related resources can be found on the Internet:

- [National Center for Geographic Information and Analysis](#)
- [Federal Geographic Data Committee](#)

Other Resources

- *Multipurpose Land Information Systems: the Guidebook. Vol. I & II.* Federal Geodetic Control Committee, National Geodetic Survey, NOAA

