
Compelling Reasons for GIS Coordination in NYS

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Introduction

One of the underlying assumptions of the NYS GIS Cooperative project is that GIS (Geographic Information Systems) is a valuable public management tool, whose benefits could be enhanced through increased coordination. The project sought to identify the value of geographic information systems and spatial data in the public sector as well as mechanisms and opportunities for leveraging the benefits and minimizing costs. This value can be seen across a broad array of program areas. Consequently, substantial opportunity exists to share data, knowledge, and other resources across programs and sectors. Following is a discussion of the value that GIS can add to three programmatic areas of vital importance to New York State- economic development, environmental conservation, and public health and safety. While only three areas are discussed, their overlapping information needs and the opportunities for increased benefit through coordination and cooperation are evident. These opportunities and the potential benefits to New York State are enormous when the full range of GIS application areas is considered.

The Role of GIS in Economic Development

Developing New York State's economy is a key goal of the Pataki administration. During the period 1980-1993 New York State ranked 45th in the nation in job growth. In 1994, New York State ranked 44th in job growth. New Jersey grew at over twice the rate of New York, while both Massachusetts and North Carolina grew at a rate more than three times that of New York. Although the rest of the nation has added 6,858,400 jobs since the 1990-1992 recession ended, New York State is still 403,000 jobs below the July 1990 level. People are moving out of the State to find jobs. According to the Census Bureau, the State experienced a net loss of 201,000 people during the period July 1993 through July 1994. New York State now ranks 47th in population growth. Mechanisms and tools for attracting new business to the State and assisting those already here in remaining competitive are therefore of great importance (Public Policy Institute, 1995).

New York State is at somewhat of a disadvantage when it comes to attracting new industries. Based on 1992 data, State and local taxes per capita in New York State were approximately 62.5% higher than the national average while State and local taxes of \$1,000 of personal income were 36.9% higher than the national average. In total, taxes in New York State are the highest in the nation, except for Alaska which "exports" most of its tax burden through excise taxes on oil and natural gas. (Public Policy Institute, 1995).

The second major disadvantage facing New York State is the high cost of energy, another major factor that industry considers when choosing a location. According to data presented by the New York State Department of Economic Development, the average price of all end-use energy in New York State is 1.3 times the national average

while in both New Jersey and Pennsylvania costs are approximately 1.1 times the national average. Further, only four states (Connecticut, Arizona, New Hampshire, and Vermont), have higher average energy prices than New York State (New York State Department of Economic Development, 1994).

Another disadvantage facing New York State is its complicated regulatory environment. Industries considering locating in New York are often told that it will take six months or more to approve the appropriate permits for business start-up. This also serves as a disincentive to business development within the State.

Several gubernatorial and legislative initiatives are underway to mitigate these disadvantages, but New York must also take advantage of existing strengths and resources. Information is one vital resource that can be put to work to achieve economic growth. While other states are leveraging their information resources in support of economic development activities, New York State lacks the comprehensive statewide information infrastructure and tools necessary to do this effectively. According to the Office for Research and Communications in the South Carolina Department of Commerce, “Economic Development is becoming more of an information business, or information game, where people demand detailed data on a broader range of topics” (Lang, 1994). GIS offers enormous potential to support economic development and planning activities. These systems can be used to support analyses related to business expansion as well as the formulation of effective public policies to support this expansion. A GIS can be used to support the following business expansion activities (Drummond, 1995):

- identify optimal sites for a new plant, office, or facility
- determine most effective production method
- identify potential customers for new products
- identify additional customers for existing products
- locate high-quality, low-cost suppliers
- minimize transportation and shipping costs

In a report to the Governor, outlining the rationale for GIS coordination in the State, the Arkansas Mapping and Land Records Modernization Advisory Board outlined the various uses of spatial data by private sector entities. As shown in the table below, digital spatial data can be used by many different types of private sector entities in order to increase efficiencies in operations, select optimal sites for location or expansion, and potentially create competitive advantages.

Economic Impact of Land Records on Private Sector Economic Development	
Public Utilities	<ul style="list-style-type: none"> • Map transmission facilities including data on land ownership, construction configuration, facilities characteristics, etc. • Used to schedule maintenance, respond to emergencies, and for sales and marketing purposes.
Retail	<ul style="list-style-type: none"> • Target trade areas • Locate new store • Store-specific product stocking plans
Transportation	<ul style="list-style-type: none"> • Delivery and trucking companies are developing optimal routing systems to minimize travel time and costs and to maximize loading • In-vehicle navigation
Farming, forestry, and agribusiness	<ul style="list-style-type: none"> • Management of forest lands
Banking	<ul style="list-style-type: none"> • In response to federal regulations, banks are using GIS to assess the distribution of loans to support community reinvestment analyses and reports. • Target marketing • Strategic planning • Growth and development trends • Deposit structure changes • Identify geographic changes in household finance and composition
Real Estate	<ul style="list-style-type: none"> • Site selection analyses • Identification of characteristics of properties (e.g. school districts) • Assess neighborhood trends in market prices • Client presentations
Health Care	<ul style="list-style-type: none"> • Site locations for offices and clinics • Optimal routes for emergency vehicles • Positioning emergency vehicles
Improved ability to respond to federal requirements	<ul style="list-style-type: none"> • Respond to federal environmental regulations associated with development
Source: Arkansas Mapping and Land Records Modernization Advisory Board	

GIS can also be used to develop and evaluate public policy decisions related to business expansion. The following are examples of activities which support policy development (Drummond, 1995):

- identify current and emerging clusters of globally competitive industries

- determine the best locations for new investments in public infrastructure
- develop fair, effective incentive programs to encourage job creation in distressed areas
- target education and training programs to support vital industries
- organize networks of small businesses for joint marketing and purchasing

Economic development criteria should be key considerations in resource allocation decisions. As funds are allocated across the state to support infrastructure development or expansion, careful analysis of the potential economic impacts must be undertaken in order to optimize the use of public funds. For example, 32 states have developed a linkage between highway improvements and economic development. It has also been noted that infrastructure development funds are best leveraged when highway, water, and sewer projects are planned in a coordinated manner and further that economic growth is optimized when a critical mass of infrastructure exists (Cowen, 1989).

GIS supports the types of analysis necessary to support such resource allocation decisions. In particular, its ability to integrate diverse datasets and support the examination of a multitude of scenarios provides opportunities to evaluate the comparative benefits of different projects. GIS offers the capability of developing both descriptive and analytical models. Descriptive models are a necessary first step in understanding the linkages between statewide and local economic conditions and infrastructure development. Descriptive models will yield information such as which types of industries are most likely to locate within five miles of a railway, as well as those factors that impede economic growth such as water or energy supply capacities.

GIS also supports the use of analytic models which examine the interrelationships between land-use factors, infrastructure capacities and proximities (such as railroads, water and wastewater facilities, major highways), and economic growth. These models can be used to forecast the economic impact of various infrastructure projects, to respond to “what if” inquiries, and to assess the relative economic benefits of projects in various areas across the State.

These types of analyses are key to maximizing the benefit of resources allocated for development or expansion of infrastructure across the State. Comprehensive and dynamic analyses are infeasible under manual processes and require both the tools, such as GIS, and the appropriate information infrastructure.

Industries seeking sites for location or expansion, request information from localities or economic development organizations on wage rates, workforce availability, land costs, building availability and suitability, construction costs, local and state taxes, local and state development incentives, availability and cost of energy, transportation costs to customers and from suppliers, as well as such factors as the availability and quality of medical care in the area, the presence of unionized work forces, the location

and market areas of competitors, the availability of other infrastructure such as telecommunications, sewer, and water, as well as factors related to quality of life. When considering locations for sites, businesses need access to this information and they need it in a timely manner. If the State or locality is unable to provide this information in the required timeframe, or if the permitting and approval process is longer than the business is willing to tolerate, the State loses out to those states that are able to accommodate these requests.

Without the tools and information infrastructure to support these requests, New York State is at a disadvantage in attracting new business to the State. The lack of tools and infrastructure precludes the state from adopting a proactive approach to development. In other words, New York State is forced into a reactionary mode, scrambling to provide information to those seeking it, and precluding planners from adopting a strategic approach to development. A strategic approach to development includes identifying the existing businesses in the State, their locations, their inputs and outputs, maintaining an inventory of existing sites for development, the workforce characteristics of the area and other associated socio-demographic factors, resource availability, and infrastructure capacities. The integration of this information would allow economic development entities to identify those industry types that would be most competitive and desirable in a given region so that targeted marketing activities could be geared toward attracting appropriate business types. Under the current situation, New York State economic developers are forced into reactionary mode. Comprehensive and strategic planning efforts are hindered by a lack of readily available information and the tools with which to access and analyze that information. Opportunities for creating business partnerships are hindered. For example, opportunities for agglomeration economies where multiple smaller firms located in a geographic region can achieve scale savings from joint purchases are unrealized. Additionally, information to support and evaluate effective public policy decisions for development is unavailable. While other states have comprehensive statewide GIS systems containing the information that businesses demand, New York State continues to lag behind.

Economic Development GIS in Other States

Many other states have developed comprehensive GIS to support economic development programs at the state and local levels. These systems, often combined with other presentation technologies, are being used to identify sites for new or expanding businesses and to enhance marketing activities. Alabama's Resource Center (ARC) which supports its economic development programs, includes a 75-seat auditorium, guest offices, a dining room, and a helipad which utilizes touch-sensitive TV monitors to navigate through databases, photographs, maps, and other graphics describing available sites and buildings in Alabama. The Resource Center includes a GIS which is used to create customer maps and provides zooming and searching capabilities. The ARC's data and multimedia are accessible via a telecommunications

network in four satellite offices and the databases are accessible to 20 local economic development offices as well as the Alabama Development Office and power company project managers.

The Georgia Resource Center in Atlanta boasts an amphitheater with three large video screens on which demographic and other data, as well as geographic and property features can be displayed simultaneously. It also includes a GIS system which allows for the production of three-dimensional graphics and animation to visually represent a prospect's new facility on a particular site including such features as truck access, rail, landscaping, and parking. The system also allows for the enhancement of photos to demonstrate how an existing building could be modified for a particular project.

The South Carolina Department of Commerce has also developed a multimedia presentation center featuring an extensive GIS. The GIS contains more than 30 different databases including information on available properties. The system allows a user to derive anything from the number of college-educated workers to the number of suppliers of plastics within a specified drive time from a potential site (Ebisch, 1995).

The Massachusetts Alliance for Economic Development has developed a SiteFinder system which incorporates mapping software allowing for a variety of geographic manipulations and queries.

In short, many other states are using GIS to respond rapidly to inquiries from prospects and to readily create visual demonstrations of a site's overall suitability. These systems are being used to enhance marketing capabilities and to more effectively allocate resources to encourage statewide and regional development. Geographic information systems, combined with multi-media presentation technologies, are being used to provide comprehensive information for site selection. Many states have the additional capability of providing access to this information on lap-top computers, and over telecommunications lines. Several states are also offering this information over the World-Wide Web, reaching audiences all over the world.

Economic Development GIS in New York State

Several entities in geographic regions within the State have recognized the value of this technology in support of economic development activities and have developed systems to support these activities. The Adirondack Park Agency (APA), recognizing the need to work cooperatively with local governments within the Park, has been developing partnerships with town and county governments to share resources in the development of digital tax map data. Additionally, the Park Agency is reaching out to these local entities to provide information on tools such as GIS as well as the availability of data resources from APA, other State and federal agencies, and the private sector that can be used to support bottom-up community development.

Saratoga Economic Development Corporation, (SEDC) in cooperation with Niagara Mohawk, Saratoga County, and the NYS Adirondack Park Agency, is developing a GIS to support regional economic development activities. Their strategic approach includes the development of a GIS containing digital tax map data for Saratoga and surrounding counties, socio-demographic data, available sites for industrial development, as well as an inventory of existing businesses so that economies can be realized in new business development. Additionally, SEDC will be better able to analyze the benefits of potential infrastructure improvements on the regional economy. SEDC has successfully utilized a GIS to identify appropriate sites for an industrial park in the town of Corinth using such criteria as minimum acreage, proximity to rail lines, soil type, proximity to wetlands and water sources, land classification, and power capacity.

In the Western region of the State, the Greater Buffalo Partnership, a geographically-based not-for-profit corporation, is also currently developing a fully functional GIS as part of its Information Central Initiative. Targeted uses for this information infrastructure include economic development activities such as assisting firms and executives relocating to the area and attracting new business to the existing base in the area.

The Capital District Regional Planning Commission (CDRPC) is a non-profit organization whose primary mission is to study the needs and conditions of the Capital Region and to formulate and implement plans and recommendations which promote sound and coordinated development. CDRPC also provides local technical assistance and serves as a regional data bank and information center. CDRPC is using GIS to support a number of activities and plans to implement a more comprehensive system in the near future. The system currently in place has enabled CDRPC to work cooperatively with the State Department of Economic Development as well as local and regional economic development organizations in compiling information requested by businesses considering locating in the Capital Region. Additionally, CDRPC has used the GIS to compile demographic information in support of marketing activities for industrial parks in the Capital Region. The GIS has enabled the rapid integration and analysis of information which would have been infeasible under a manual process. Additionally, the agency used a GIS in support of a Groundwater/Wellhead Protection Program for Southern Saratoga County. The agency, recognizing the need to integrate environmental considerations into regional economic development activities, is in the process of expanding its GIS capabilities to include more comprehensive and diverse regional information which it intends to share with local governments and State and regional planners and economic developers.

Several economic development activities in New York City are also being supported through the use of GIS. The Environmental Simulation Center at the New School for Social Research has developed a three-dimensional database for neighborhood planning and development in the various parts of New York City. The Staten Island (SI) Economic Development Corporation, aligned with the SI Borough President's

Office has released an RFP for a GIS specifically for use in support of economic development activities for the Island.

These organizations are becoming able to provide comprehensive information to businesses considering locating in New York State. Additionally, they are developing the tools to adopt strategic planning initiatives which will benefit the citizens within their respective regions and the State as a whole through increased tax revenues.

While pockets of activities to support the use of GIS in regional economic development endeavors are emerging, no statewide plan has been implemented. As a result, regional efforts compete not only with other states, but also with one another. New York State's ability to comprehensively and effectively use information to attract and expand business in the State has therefore been hindered. As policy-makers work toward making the State more business-friendly through tax reductions and decreases in the complexity of the regulatory environment, they must also expand opportunities to effectively develop and use vital information resources.

The Role of GIS in Environmental Conservation

In order to effectively and responsibly expand the business sector in New York State, it is necessary to examine growth and development in light of associated environmental impacts. While increasing employment opportunities and tax revenues are vital to the State, maintaining the quality of our natural resources is equally important. In short, 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. In New York State, GIS is being widely used to support such activities.

The NYS Adirondack Park Agency and the New York State Departments of Environmental Conservation and Parks and Recreation all use GIS to support their agency's programmatic operations. The New York State Department of Environmental Conservation has developed a GIS to support the identification and remediation of hazardous waste spills saving the State costs associated with consultant fees in identifying and notifying property owners within affected areas.

Managing Flood Plains

The DEC Division of Water is currently developing a three dimensional color infrared electronic map for the entire state which will support many activities related to flooding. The first digital coverage is hydrography which includes the streams, lakes, ponds, and wetlands of the State. This coverage has been completed. The second is the Digital Elevation Model (DEM) of the State's terrain which describes the contours of the land. The hydrography and the DEM are used along with geodetic control to

correct color infrared aerial photography that was flown under the National Aerial Photography Program of the US Geological Survey. This will produce the third layer of information which is a Digital Orthophoto Quarter (DOQ) Quad at 1:12,000 scale. The DOQ Quad will provide information on land use and land cover for the state.

This set of electronic data will be used to create flood insurance maps, assess potential flood and beach erosion impacts, as well as design mitigation programs to minimize the risks associated with these events. These maps are the ideal tool for real-time flood control and prevention. Using US Army Corps of Engineers models, areas vulnerable to flooding will be more easily and efficiently identifiable. DEC plans to submit these computer-generated flood plain maps to the Federal Emergency Management Agency (FEMA) in lieu of paper maps to allow flood insurance premium rates to be established for the structures in the flood plain. Because the DEM is sensitive to as little as four inches of elevation, more precise flood plain zones can be defined, thus creating savings for homeowners and insurance underwriters. The ability to produce electronic maps will generate both time and cost savings for the agency and its clients.

In addition to the modeling of floods, these tools will provide a mechanism for identifying and enacting pollution prevention measures for New York State's waters. They will also allow DEC and other agencies to conduct analyses related to natural resource management and environmental impact. The data and associated maps will be of great use to other state agencies as well as local governments and private organizations. For example, they will assist the State, County, and Local Emergency Management Offices in both mitigation and real-time response to flooding and tracking of hazardous materials. Further, these maps and the accompanying attribute data can be used by insurance companies for risk analysis.

New York City Watershed

A landmark conservation effort bringing together upstate and urban interests to protect New York City's drinking water was announced in November of this year. The plan is intended to avert the need to build a multi-billion dollar filtration plant and to promote nonpolluting economic development in those areas surrounding New York City's 19 upstate reservoirs. Under this agreement, New York City will increase by three-fold its land holdings within the drainage basins that feed its reservoirs and will spend \$350 million on projects that support environmental protection projects for the communities in these basins. Additionally, the agreement will institute the first revisions in water protection since 1953. This agreement, saving New York City residents millions of dollars, exemplifies the need for comprehensive information which will ensure that the development of economies around the basin areas will not imperil the quality of New York City's water sources. It also furthers the case for comprehensive data collection and coordinated efforts between economic development and environmental protection activities in New York State.

In short, in order to ensure that growth and development activities do not compromise the environmental quality of the State, environmental information and tools to support the analysis of such information must be readily available.

The Role of GIS in Public Health and Safety

GIS supports a number of activities related to the health and safety of the State's citizens. For example, GIS is being used in 911 plus systems to first locate and then efficiently route the appropriate services to an emergency situation. Additionally, GIS systems have been used in epidemiological studies, the siting of emergency outreach facilities, and the development of emergency evacuation plans.

The State Emergency Management Office

The value of GIS as well as the need for coordination and an increased ability to gather and integrate information from a variety of sources is readily apparent when viewed from the perspective of the State Emergency Management Office. The New York State Emergency Management Office, located within the Division of Military Affairs, is the staff arm of the State Disaster Preparedness Commission. The Commission's goal is to provide leadership, and direction to prevent, counteract, defend against, and recover from the dangers and problems arising from disasters which result in loss of life, property, and income and disrupt the normal functions of government, communities, and families, and cause great human suffering (State of New York Disaster Preparedness Commission, 1991). SEMO's role is to assist local governments in avoiding and responding to disasters. In order to do this, SEMO relies on diverse information sources. In facilitating response to disasters, SEMO must have readily available information on the areas affected by a disaster including the population and properties. Additionally, the agency must have comprehensive information on the resources available to assist in alleviating the disasters. SEMO must work closely with a number of State and local government agencies. It is imperative that all of these entities work from the same base of information and that the information be current and accurate.

Vulnerability Assessment

A resolution creating a State Hazard Mitigation Policy Committee was approved by the New York State Disaster Preparedness Commission in June 1995. A Risk Management Committee was formed to identify and assess the State's vulnerability to hazards. The purpose of the Risk Management Subcommittee is to periodically identify and assess the State's vulnerability to hazards both natural and technological. To accomplish its goals, the Risk Management Subcommittee was given the following mission:

- Hazard identification: The identification of hazards that affect people and property, both locally and statewide.
- Vulnerability Assessment: The assessment of the risk those hazards present to the people and property of New York State.
- Prioritize Hazards: The prioritization of hazards to be mitigated, based on the risk or vulnerability assessment.

The purpose of conducting such analyses is to examine specific hazards facing a community, jurisdiction, facility, property, or organization to gain a greater understanding of each hazard and rate and rank each hazard to determine its significance for mitigation and planning purposes. Given that resources are scarce, it is important that priority is assigned to those hazards which pose the most risk to the people and property in the geographic region of consideration. In order to do so, probability models must be developed to assess the likelihood of an event and the potential damage that these events may pose to the community. In order to conduct such analyses a variety of information types must be integrated.

Disaster outcome or risk is the result of the interaction of a physical event or hazard and the vulnerability of the community. The Australian National Emergency Management Committee (Granger, 1994) defines vulnerability as “the degree of susceptibility and resilience of the community and environment to hazards.”

Data Needs for Vulnerability Assessment			
Vulnerability Factors			Hazard Surfaces
People of the Community	The Built Environment	Community Organization	
Total population and density Language spoken at home Annual household income Households without cars Unemployment Educational level Age by Gender Persons with disabilities	Land use density Sensitive facilities Individual structures: Ground height Number of stories Floor Height Building material Building age Building size	Formal or informal Organizational networks Level of protection and service boundaries: Fire Police Ambulances Medical care	Flood plains Storm tide maps Earthquake maps
Source: Ken Granger, URISA Proceedings, 1995			

As indicated in the table above, many different types of information must be integrated in order to effectively conduct vulnerability assessment. It is also important to note that the information on which these analyses must be conducted is dynamic. The likelihood of events shift over time. The community characteristics on which risk assessment must be based will change over time as will the availability and location of resources to react to events. It is imperative that risk assessment activities be dynamic as well. For this reason, these activities must be supported by technology. It is unreasonable to expect that these types of analyses can be conducted comprehensively and dynamically using manual processes. GIS and the continuously updated information needed to support these systems are necessary if risk assessment activities are to be properly conducted within the State. In other words, a comprehensive information system must be developed and mechanisms must be put in place to ensure that accurate and timely information is collected and used.

Overlapping Information Needs

The important programmatic areas described above, depend on the implementation and use of GIS and the availability of and access to information needed to support these systems. While some of the information requirements to serve these different application areas are divergent, there is also an enormous amount of overlap among them. Much of the data needed to support economic development activities are the same as those required for disaster preparedness and mitigation and environmental conservation activities as well as a host of other programmatic activities. The table below provides several examples of data types which support the three application areas discussed above. The list of data types is not meant to be exhaustive for the three application areas nor does it include the multitude of other application areas that the respective data types might support. Rather, the table represents a subset of the enormous overlap in data needs across a small subset of important programmatic areas.

Overlapping Information Needs			
Economic Development, Environmental Conservation, Public Health and Safety			
	Programmatic Area		
Data Types	Economic Development	Environmental Conservation	Public Health and Safety
Digital Tax Maps (Boundaries)	X	X	X
Hydrography	X	X	X
Transportation Networks	X	X	X
Socio-demographic	X	X	X
Infrastructure (Water, Power, Sewer, Telecommunications)	X	X	X
Natural Resources	X	X	X
Land Ownership (Real Property)	X	X	X

Zoning (Land Use Planning)	X	X	X
Environmental Hazards	X	X	X

In short, the effective creation, maintenance, and sharing of data sets across government entities will serve a variety of vital purposes within the State. These overlapping information needs can be effectively met only through increased coordination among information users and information creators.

Conclusion

GIS technology is being used in support of a number of application areas critical to New York State. GIS offers the capability to integrate diverse data sets and conduct modeling and analysis activities infeasible or unaffordable under manual processes. Much of the data created to support one application area can be used in support of other programmatic areas. The benefits of the technology and the data in particular, can be maximized through increased coordination of GIS-related activities.

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