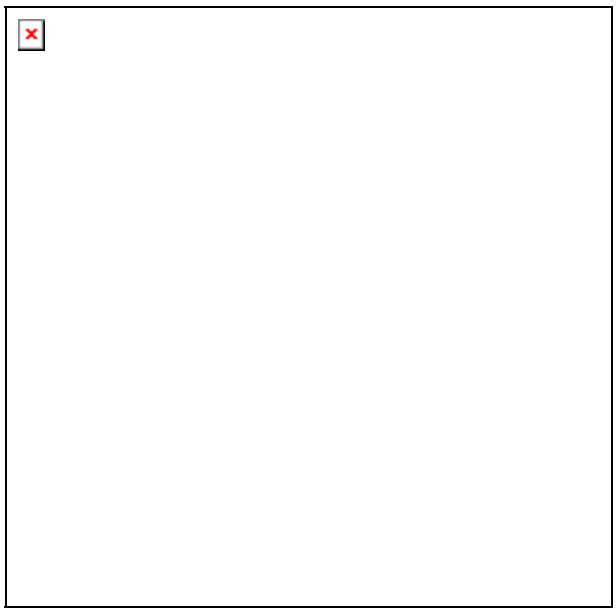
FINAL

STRATEGIC PLAN FOR STATEWIDE GIS TECHNOLOGY COORDINATION IN SOUTH CAROLINA

VOLUME I: GIS BACKGROUND AND BUSINESS CASE



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April 30, 2001

PREFACE

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This *Strategic Plan* has been prepared under the direction of the South Carolina Standing Committee for Geographic Information (CGI). Its purpose is to provide direction and focus for improved GIS coordination and expanded use of GIS technology in South Carolina. This *Strategic Plan* follows a detailed GIS Needs Assessment and successful coordination work carried out by CGI since its creation in 1996. Several fundamental precepts set a context for this *Plan*:

- Future GIS initiatives will build on a long and successful history of GIS technology use and multi-agency coordination in South Carolina.
- GIS technology is of fundamental importance to South Carolina and is a core part of an overall enterprise information technology architecture.
- GIS coordination is approached from a statewide perspective encompassing different types of stakeholders at all levels of government, private industry, academia, and the public.
- The plan deliberately focuses not on the technology itself but how the technology can be used to address the needs of users and deliver benefits.

The full *Strategic Plan* consists of two separate volumes:

- **Volume I: GIS Background and Business Case—**Explains GIS technology, briefly summarizes the history of GIS development and status in the State, describes key State goals and business drivers impacted by GIS and potential benefits from improved GIS coordination and expansion in GIS technology use. This Volume provides a basis and context for understanding Statewide GIS goals and suggested initiatives.
- **Volume II: Strategic Foundation and Work Program—**Presents the stakeholders, mission, and major goals for Statewide GIS coordination that gives a long-term foundation for the program and presents specific work elements, responsibilities and timing, and resources required for accomplishing goals.

This *Strategic Plan* provides a long-term vision for statewide GIS coordination and use. The specific goals and work elements cover a 5-year period.

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INTRODUCTION

1.1 THE POWER AND ROLE OF GIS TECHNOLOGY

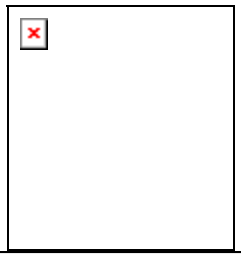
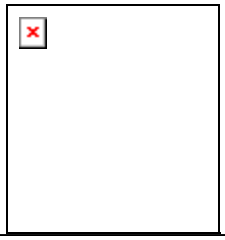
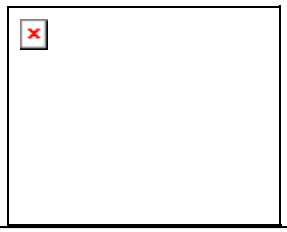
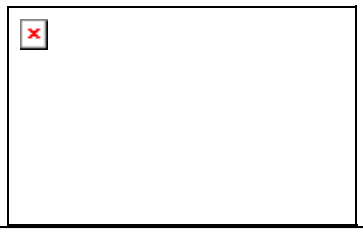
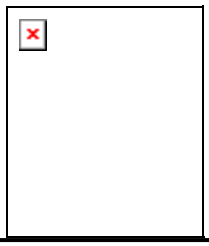
1.1.1 What is GIS Technology?

Awareness about the value of GIS technology in public and private organizations has grown dramatically since the late 1980s. Close to 80 percent of the information collected and used by government agencies, utility companies, and many commercial firms is geographically referenced. Geographic information includes data and records associated with the land and its natural and man-made features (e.g., streets and highways, political jurisdictions, building and utility locations, property parcels, administrative districts, watersheds, rivers, etc.). This information supports day-to-day operations, decision-making, and planning.

GIS is a core information technology with capabilities to effectively collect, organize, access, and analyze geographic information. In its simplest form, GIS technology supports automated mapping—the creation, update, and production of maps providing great advantages over manual mapping methods. But GIS is much more than a mapping tool. GIS software has the ability to store graphic representations of map features and to access diverse types of data and records that are geographically referenced. It allows users to access, examine, and analyze geographically referenced information.

Simply put, GIS technology can extend the reach and the ability of users to access information about the land, its man-made facilities, jurisdictional boundaries, and natural resources to help administer programs and support decisions that impact their future. As shown in Table 1-1, GIS technology may be used to support a diverse range of applications important to government agencies, private companies, and the public.

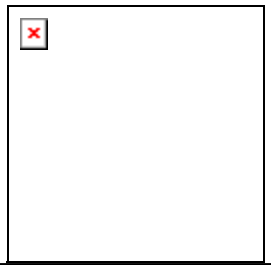
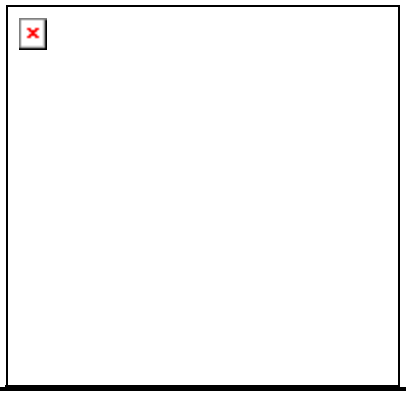
Table 1-1: GIS Technology Applications

Applications of GIS Technology		*Examples:*
	Data Query and Map Display	• Highway condition and maintenance status • Water quality problems at permitted withdrawal sites • Demographic information (age, income, etc., by County or other geographic unit) • Portraying public expenditures by geographic area
	Spatial Analysis for Patterns and Trends	• Historical land use changes and projections for the future • Disaster risk and amelioration analysis • Public health service needs analysis • Transportation modeling and planning • Site suitability analysis for economic development
	Custom Map Presentation	• Wall maps or hand-outs for public hearings • Inclusion in reports and plans to augment text • Infrastructure status and master plans • Natural resources and land cover maps • Special maps to support tourism
	Field Operations Support	• Field inventory for facility or environmental information • Support for highway and utility maintenance personnel • Environmental inspections • Support for health service workers • Property survey and field appraisal
	Public Inquiry	• Public kiosks in support of State tourism • Public counter access for questions on permit status • Web-based access to geographic information

1.1.2 Important GIS Concepts

A GIS consists of three major components—system resources, geographic data, and the institutional structure—as shown in Figure 1-1. All three of these components work together to support GIS applications and deliver results to users.

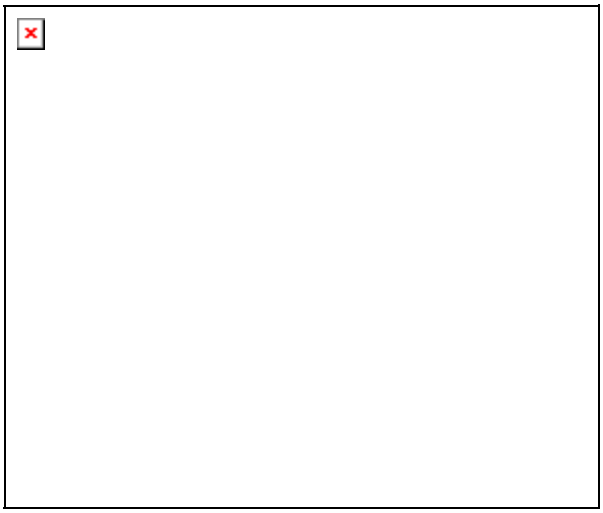
Figure 1-1: Components of GIS

• **System resources,** including hardware, software, and networks	
• **Geographic data** consisting of digital map layers and associated attribute data about map features	
• **Institutional structure** encompassing the people, organizational structures, organizational roles and responsibilities, and GIS management, policies, and procedures.	

1.1.3 GIS—Foundation for Information Integration

GIS is core information technology that is multi-disciplinary in nature and which cuts across disciplines and departmental lines through its ability to manage data of all types based on common locational information. GIS acts as an integrator of information from many sources as shown in Figure 1-2.

Figure 1-2: GIS as Integrator of Information



With GIS technology, data from multiple sources and different computer systems can be integrated and compared on the basis of a geographic area or feature. The results can then be provided in map and report form. GIS technology is well-positioned as an integrator of information from diverse sources.

The work program described in this plan will ensure that GIS technology is in the hands of those who need it and that high-quality data is available to drive effective information integration and applications of GIS technology.

1.2 OVERVIEW OF THE HISTORY AND USE OF GIS IN SOUTH CAROLINA

There is a long history of GIS use in South Carolina. Even before the advent of the technology, State agencies in South Carolina were coming together to communicate needs for mapping. In 1978, the State Mapping Advisory Committee (SMAC) was formed to identify mapping needs across the State and to communicate those needs to USGS through a single voice. By the mid 1980s, digital map data and the analysis that accompanied those data were taking hold in South Carolina State agencies and educational institutions.

Some of the major milestones in the development and deployment of GIS in South Carolina are documented below:

- 1972: University of South Carolina begins teaching computer mapping in the Geography Department.
- 1976: First GIS course taught at the University of South Carolina.
- 1978: The State Mapping Advisory Committee (SMAC) was formed.

- 1983: The City of Greenville implemented GIS, one of the first municipalities in the USA to do so.
- 1984: The State Cooperative County Mapping Program began.
- 1986: The Land Resources Conservation Commission (LRCC) implemented GIS and remote sensing technologies to assist State and local governments in planning and decision support.
- 1987: The South Carolina Development Board, now the Department of Commerce, first implemented GIS.
- 1988: The Water Resources Commission implemented GIS and remote sensing technology in 1988, including initiation of 1:24,000-scale database development.
- 1989: Initiation of the South Carolina Infrastructure/Economic Development Planning Project (SCIP) and ongoing data gathering and GIS application program now managed by the Department of Commerce.
- 1995: The Natural Resources Information Management and Analysis (NRIMA) Section of the Land, Water, and Conservation Division was created to provide comprehensive systems and network, database, and applications management for GIS.
- 1997: The SC DNR GIS Data Clearinghouse was established for on-line access to natural resource GIS data.
- 1997: The first meeting of the Standing Committee on Geographic Information was held.
- 1998: DLG hypsography and boundaries were completed for 566 quads of South Carolina, and a statewide urban change project was initiated.
- 1999: CGI initiates statewide GIS Needs Assessment and Strategic Planning Project with the *Needs Assessment* completed in July of 2000.

This illustrates a considerable history of GIS implementation at the local level and statewide coordination activities and also provides an excellent foundation for enhanced GIS coordination and expansion.

1.3 SUMMARY OF GIS NEEDS ASSESSMENT

The August 2000 *GIS Needs Assessment* provided a detailed inventory of current GIS technology use in State government and among other stakeholder organizations. It also defined needs and presented a basic structure and recommendations for improved Statewide GIS coordination and expended use of GIS technology. This *GIS Needs Assessment* report concluded with a conceptual design to give a target for the *Strategic Plan*. This design addresses the three major elements of a successful GIS effort:

1. The technical configuration—the hardware, software, and network environment within which the GIS operates
2. The content and format of the GIS database and access to it, as well as the integration of

important geographically-related data on a non-GIS system

3. The institutional environment and all issues impacting management, staffing, and coordination of GIS activities.

This design has a strong focus on State government as the leader in facilitating more effective GIS coordination and in providing a practical set of standards, certain important GIS services, and program coordination for all users. The design recognizes a role for and participation of all stakeholder groups in the State, most importantly local governments and the Councils of Government.

The design includes a number of major components that are described in more detail below:

- A **GIS coordinator and eventually a GIS Office** to coordinate GIS programs, facilitate collaboration in GIS projects, and work with CGI and all stakeholders to promote and encourage GIS use and information sharing by organizations in the State

- A **State GIS Service Center**, with a robust technical infrastructure, using the Internet to support GIS access and virtual links to other servers

- An overall **GIS Application Framework** in a 3-tiered structure that gives a context for development and deployment of GIS applications

- A continued active and influential **Committee on Geographic Information** that, as an organ of the Information Resources Council, provides a forum for standards and policy creation and dialogue among stakeholder organizations

- An **organizational and coordination structure** (with appropriate mechanisms, documentation and procedures, and administrative tools) that supports and encourages multi-departmental collaboration, communication among GIS users, State-local coordination, and public-private partnerships for GIS

- Easily **accessible geographic data**, including high-priority GIS data "layers," commonly needed geographic databases, a well-designed metadata environment, and effective procedures for database maintenance and access

- An **organized, standards-based environment for GIS applications**, with common access to those that are of general applicability to multiple users

- Multiple **options for technical support and a range of GIS services** (e.g., training, data compilation, application development, etc.) that user organizations may access to support their GIS implementation and operation.

SECTION 2

SECTION 2
BUSINESS CASE FOR COORDINATED GIS

2.1 GIS COORDINATION AND USE IN OTHER STATES

More than 30 states have active, centrally coordinated GIS programs most of which provide a basis for collaboration and information technology sharing among State agencies, local governments, and other stakeholder groups. These states—the most mature of which include North Carolina, Florida, Georgia, Texas, Kansas, Kentucky, Minnesota, Wisconsin, Vermont, Virginia, and West Virginia—have operated with formal committees or councils similar to South Carolina. Many of these states have also created central GIS offices with management and administrative staff to direct GIS activities, oversee policies and standards, provide data and other services, and facilitate coordination among state agencies and other governmental bodies.

GIS technology has been used effectively in other states to support operations and planning decisions, and to deliver tangible benefits to its users. Some examples are listed below:

- Maine has used GIS to improve air quality. The GIS Unit of the Department of Environmental Protection is deploying a GIS application to visualize pollutant sources contributing to elevated ozone levels. The Grided Emissions Inventory (GREMIN) provides a visual interface for calculating ambient levels of carbon monoxide, nitrogenous compounds, and volatile organic compounds and will be used to support air quality regulatory and improvement programs.

- The Florida Department of Transportation has implemented a GIS-based Transportation Decision Support System (TDSS) that supports the 5-year transportation plan preparation. Users can access road maps, design information, and ancillary information (photos and video logs) to test alternatives and to quickly view information needed in the planning process. This approach has increased the quality of the planning process and road development work. It has supported grant applications for securing federal funding for road projects.

- Minnesota has installed Web-based kiosks accessing GIS databases allowing travelers to get information on road and weather conditions, as well as tourism information. The program is the only one in the United States that provides an application combining real-time information, interactive live routing, and driving directions.

- The state of New York is using GIS to retain affluent retirement age residents. In this case, GIS technology merges map features with a centralized database of property, demography, and tax information to communicate to aging residents the tax benefits of not moving to out-of-state locations for retirement. The State's Department of Equalization and Assessment also uses GIS to evaluate property tax rates for local authorities statewide. In this way, the department maintains a stable tax base while ensuring consistency and equity in rates.

- GIS has been an important tool used by policymakers to establish sound and equitable guidelines for Growth Management statutes in Vermont and Maryland. GIS analysis helps state and local planners make land use and development decisions.

- The Delaware Department of Labor (DOL) constructed a Web site that is breaking ground for the automation, integration, and access to social services information, employment

opportunities, and labor market information. People looking for employment now have a new tool at their disposal in the form of an interactive, GIS-based Web site called Career Directions, located at www.delawareworks.com or www.oolmi.net. The Web site includes information from the Department of Education, Delaware Health and Social Services, Delaware Economic Development Office, Department of Transportation, and The Family and Workplace Connection.

- The State of Louisiana uses GIS to help fight erosion as the state loses 25 to 35 square miles of coastland per year, which accounts for 80 percent of all coastal land loss in the United States. Louisiana's Department of Natural Resources (DNR) deploys a very successful department-wide GIS and is deploying Web-enabled GIS applications to support coastal restoration programs.

- GIS supports North Carolina requirements to make georeferenced digital surface water data sets available to many government and private organizations to visualize hydrographic conditions and to support the award of millions of dollars in grant monies. The North Carolina Clean Water Management Trust Fund assists Board members as they make decisions to disburse up to $48 million annually for land purchases and projects to improve water quality conditions statewide, spatial analyses, and otherwise model and plan for quality growth in North Carolina communities. The Center for Geographic Information and Analysis (CGIA), in collaboration with its partners statewide, is developing the next generation of surface water resource data and applications to support this program.

- The Kentucky Water Resources Development Commission used GIS technology and statewide GIS data to develop a strategic plan for the "2020 Water Plan." GIS technology is being used on an ongoing basis to evaluate water use and availability in the state.

The use of GIS technology has been most successful in states that have set up strong coordination bodies and central offices to provide support. **South Carolina has not yet put in place all of these organizational elements that are critical for proper statewide coordination, deployment, and utilization of GIS technology.**

Many states have taken important steps to coordinate their state GIS programs and to provide central support for GIS initiatives. Often, with strong mandates in the form of Executive Orders and/or legislative actions, state governments have put in place effective multiorganizational coordination (like South Carolina's Standing Committee on Geographic Information), central GIS coordination offices, and formal clearinghouses for distributing GIS data and other services for GIS users.

Figures 2-1 and 2-2 depict the national status of state GIS coordination efforts. Figure 2-1 shows those states that have established a statewide GIS Coordinator position and/or a formal GIS coordination office. Figure 2-2 shows those states that have set up electronic clearinghouses to support queries and access to GIS data via the Internet.

With few exceptions, Central GIS offices have been created inside the state government executive branch. States with a formal GIS coordinator or office have used different options for the administrative placement of these offices. Of the 32 states that have taken this step, the most common organizational locations for a GIS coordinator and office are—a) a central Information Technology Department (16

states), b) within a state organization with defined responsibilities for land planning and management (5 states),
and c) within the Governor's Office (5 states). A small number of other states have located the GIS coordination function in an existing line department or another organizational entity.

A total of 33 states now operate GIS clearinghouses, but the range of data and services and overall quality of service varies greatly. In some cases, these electronic clearinghouses are maintained by single agencies without formal multiorganization participation, and, in other cases, they have been designed and are operated to augment an overall GIS coordination program.

In some cases—notably Georgia, Rhode Island, Vermont, and West Virginia—state universities have been assigned significant roles for GIS program support and/or clearinghouse functions.

Figure 2-1: States with Formal GIS Coordinators or Coordination Offices

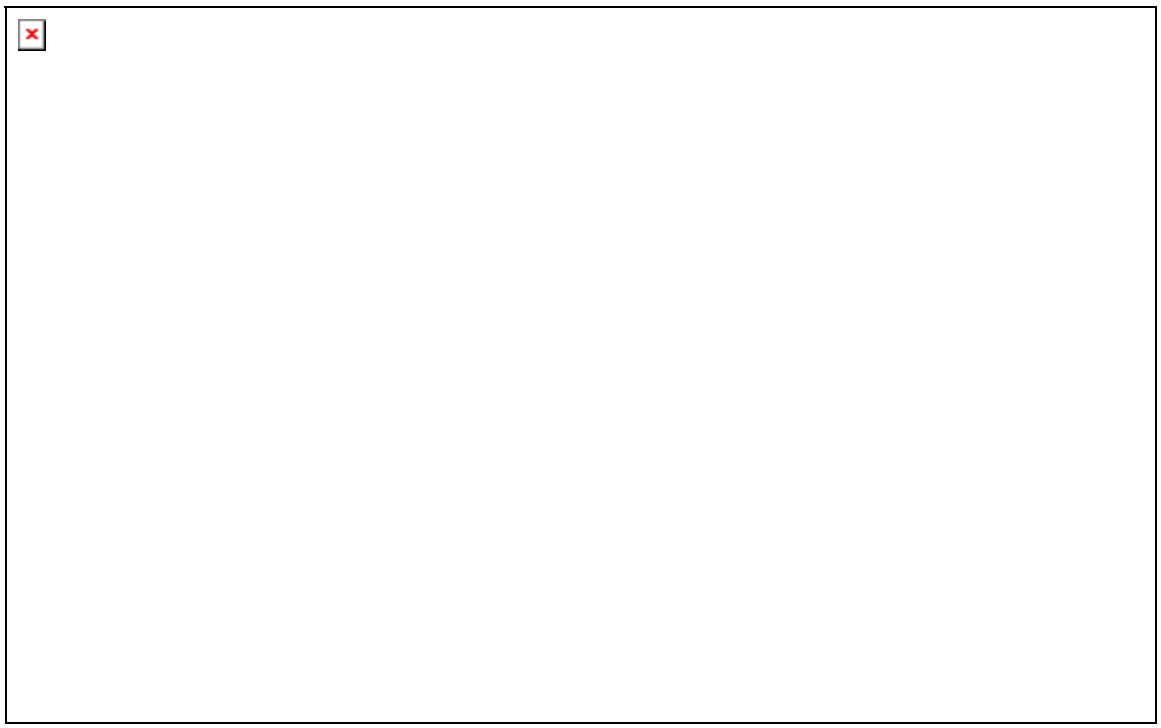
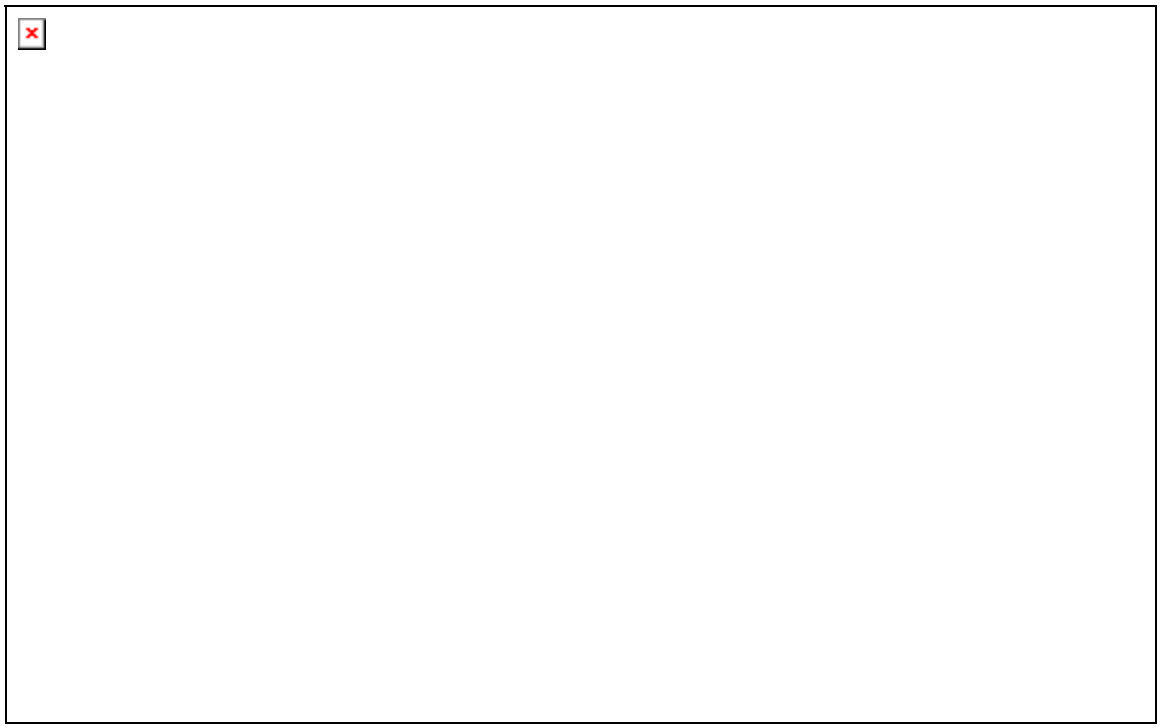


Figure 2-2: States with Electronic Clearinghouses for Providing GIS Data



2.2 BUSINESS DRIVERS FOR GIS

Geographic Information Systems (GIS) provide a means of accessing and analyzing spatial information. Through GIS, map data are stored, manipulated, and analyzed to support agency responsibilities. GIS is used as a tool to organize and plan for the methods of meeting those responsibilities. The responsibilities will not be changed through GIS, but proper use of GIS will enhance the ability of an agency to fulfill its duties.

GIS technology and a higher level of GIS coordination in South Carolina directly address priorities established by the current administration and which are important to public agencies, businesses, and cities statewide. These business drivers provide a focus for GIS development and will become themes used in preparation of the *Strategic Plan*.

Three overriding business drivers, which are supported by GIS, have a great impact on all public programs and are aimed at the delivery of benefits to organizations, businesses, and individuals in the State:

- **Improved Citizen/Customer Responsiveness**: As technology has increased the accessibility of information, citizen expectations for information and services have risen, and government agencies and utility companies must respond. GIS, combined with the Internet, provides an improved means for delivering information and services to citizens and customers.

- **Improved Efficiency and Coordination in Governmental Services**: Information technology and GIS offer opportunities to greatly reduce waste and inefficiency in the provision of services by government agencies by allowing these agencies to share information and combine resources.

- **Advancing Access to Technology by Citizens in the State**: GIS is technology that will be used to communicate ideas and messages to the citizens of South Carolina, whether as a method for presenting planning alternatives at public hearings, a component of tourist information multimedia stations, or as part of Web sites that provide citizens with a variety of information about their State and communities.

GIS technology delivers benefits to several topical areas of critical importance to public agencies, citizens, and the business community in South Carolina. These strategic initiatives, explained in Table 2-1, include:

- Emergency Planning and Support
- Improving Education Services
- Natural Resource Planning and Environmental Protection
- Economic Development
- Property Assessment and Equitable Taxation
- Transportation Infrastructure Enhancement
- Development and Growth Planning.

Table 2-1: Strategic Initiatives for GIS Technology

STRATEGIC INITIATIVES	OPPORTUNITIES FOR GIS IN SOUTH CAROLINA
Emergency Planning and Support	
Multiple State agencies and local governments have important roles in emergency planning and the operational response to emergencies in South	• Preparation of emergency plans, including the testing of disaster scenarios and alternate responses.

Carolina. Many aspects of post-disaster assessment and mitigation are also addressed through the use of GIS mapping and analysis tools.	• Screening for risk from natural disasters and improving allocation of resources for protection and mitigation (e.g., flooding). • Providing maps and geographic information for tactical responses to emergency situations. • Coordination of emergency response and the creation of local E911 databases and public safety applications.
Improving Educational Services	
Effectively delivering educational services at elementary, secondary, and higher-levels is, in part, a geographic issue—matching services with the people who need them. GIS related fields represent an important academic focus of a number of universities and technical schools in the State. This contributes to attracting quality students and giving them marketable skills for the work force.	• Analysis and mapping of demographic characteristics and student loads for school planning. • Support for bus allocation and bus route planning. • Analysis and allocation of funds for special educational programs around the State (adult education, special job training, special needs students).
Natural Resource Planning and Environmental Protection	
The State's natural resources—the physical landscape, water, forests, air, and wildlife—represent one of the most valuable resources in South Carolina. These resources support the State's economy and add to the high quality of life by the State's citizens. Effectively managing, protecting, and enhancing these resources requires geographic information and tools for mapping and spatial analysis.	• Respond to federal and State environmental regulations, including review and tracking of permits. • Environmental impact assessment for transportation and other development programs. • Supports the DNR GAP program to assess and map the State's bio-diversity. • Review of public health statistics and analysis of geographic patterns to determine causes of problems. • Assist programs for watershed and water quality monitoring in response to State and federal laws. • Perform site analysis and selection for solid waste disposal sites. • More effective monitoring and management of wildlife and hunting/fishing programs. • Support State forest management and long-term planning and operational support for the forest industry.

Table 2-1: Strategic Initiatives for GIS Technology (continued)

STRATEGIC INITIATIVES	OPPORTUNITIES FOR GIS IN SOUTH CAROLINA
Economic Development	
Effective State and local economic development programs are dependent on information about the land. The ability to quickly examine and compare such factors as demographic characteristics, infrastructure, land use, accessibility, etc., directly provides advantages in attracting businesses for location in the State. This information and GIS tools for analysis put State and local agencies in a proactive position to direct growth and to actively promote development for types of business in regions that make the most sense.	• Examination of multiple geographic variables and sites to answer questions posed by prospects and to identify optimal site locations. • Response to potential prospects by the Dept. of Commerce. • Web-based GIS access to support queries from potential investors worldwide. • Analysis of physical and environmental land features and road and utility infrastructure in selecting, planning, and developing community industrial parks. • Labor market analysis to match job seekers with job opportunities.
Property Assessment and Equitable Taxation	
An important function of local and State government is assessing the value of public, private, and commercial real property and taxation based on this assessment. This is a geographic problem with the need to sustain tax revenues while ensuring consistency and equity statewide.	• Support for consistent parcel mapping and property appraisal throughout the State. • Proper reconciliation and establishment of official State/county boundary lines. • Special analysis of real and personal property for taxation and fee programs. • Support for consistent taxation of a private utility infrastructure. • Tracking, management, and disposition of public property and rights-of-way. • Provision of maps and information to support land use planning and economic development projects.
Development and Growth Planning	
Development planning involves evaluation of short-term and long-term impacts of development and the guiding of development in a way that preserves and enhances the quality of life while delivering material benefits to citizens. Because development and land use planning require the examination of so many physical, demographic, economic, and political variables, GIS tools are needed to help decision makers assess impacts, compare options, and build consensus.	• Evaluation of land use and development patterns, comparing growth scenarios and presenting results in map and tabular form. • Providing accurate information and maps to help resolve the conflicting views about growth and development. • Land use and development planning at Statewide, regional, and local levels. • Long-range planning in support of smart growth initiatives.

Table 2-1: Strategic Initiatives for GIS Technology (continued)

STRATEGIC INITIATIVES	OPPORTUNITIES FOR GIS IN SOUTH CAROLINA
Transportation Infrastructure Enhancement	
Directly related to smart growth is the broad issue of transportation management and planning. Transportation networks must be planned, constructed, and maintained with a focus on all important financial, commercial, and quality-of-life concerns.	• Analysis of traffic impacts and testing of alternate plans in support of the State highway system. • Map visualization to enhance the SCDOT transportation databases and Linear Reference System (highway facilities, construction and maintenance status, pavement condition, accidents, etc.). • Support for engineering design and cost estimation for proposed engineering projects. • Placement of officers and planning highway safety improvement methods • Environmental impact studies for road construction projects.

Meeting the State's strategic objectives is very dependent on effective monitoring and tracking to evaluate accountability and to assess results. This process is inherently a geographic problem—gathering data on a geographic basis, analyzing it, and presenting it through maps and reports that highlight the "what" and "where" of program impacts. State, local, and federal agencies in South Carolina have already used GIS technology successfully in the areas discussed above. However, there is a broad consensus about the need for better coordination, improved information technology standards, and a more effective environment for collaboration and sharing of resources. These advancements will ensure that South Carolina can capitalize on the groundwork already laid and the opportunities that GIS technology promises.

2.3 BENEFITS AND OPPORTUNITIES FOR IMPROVED GIS COORDINATION AND USE IN SOUTH CAROLINA

The benefits of GIS technology are profound. As a geographic information management and analysis tool, it delivers opportunities for:

- **Better decision-making, service, and responsiveness** to citizens by providing staff and management with the information needed to respond quickly to problems or concerns, to provide quality service, and to make sound, equitable decisions, which take into account all pertinent issues and impacts.

- **Improvement in the quality and timeliness of services**, particularly through use of GIS capabilities, often integrated with the Internet, to respond to information requests of citizens and businesses asking questions that are geographically related.

- **Productivity gains** by greatly reducing the redundancy, labor, and cost in accessing information, integrating multiple data sources, performing complex analyses, and presenting information in map form. Staff efficiency for access and analysis of information gains with GIS in the range of 20 to 60 percent have been observed in government agencies. Indications are that time now spent in compiling and processing data can be reduced by well over 40 percent through the use of geographic information standards and better coordination in data administration.

- **Management and protection of extremely valuable renewable and non-renewable**

resources through mapping of forest, water, and cultural resources to support regulatory programs, recreational planning, forest and habitat enhancement, and use enforcement activities.

- **Avoidance of infrastructure design and maintenance costs** associated with remedial maintenance and construction work by using the GIS to better coordinate and plan road and utility maintenance work and avoid high-cost replacement. This benefit is especially relevant to the State's DOT and local government public works departments to reduce costs of engineering design and to more efficiently plan and carry out infrastructure maintenance work.

- **Avoiding future costs** by using the GIS to aid decision-making in such areas as planning and designing major capital projects; lowering the potential for risk and loss in natural disasters; more effectively meeting requirements of new State or federal regulations; and supporting many other potentially costly requirements of local governments.

- **Information security and protection against catastrophic loss** of valuable paper maps and records in the event of a fire or other disaster.

- **Partnerships and resource sharing** using the fundamental basis of GIS as an integrator of information to leverage partnerships and encourage joint projects, share systems and data, and encourage uniform practices based on sound standards. GIS is proven as a catalyst for State/Local government collaboration, as well as public/private partnerships to share funds and resources.

- **Opportunities for outside revenues** by selling GIS data or products, using the GIS to help obtain outside grants, or joining in partnerships with other organizations in a local area (e.g., private utilities) to help fund GIS implementation.

- **Catalyst for technology advancement** by stimulating the growth of the private GIS industry in South Carolina, augmenting the job market for significant South Carolina university graduates with training in GIS and geospatial sciences, and enhancing related economic and educational benefits.

- **Quality of life enhancement** because GIS technology contributes directly to planning and development work that influences the long-term quality of the State's economic, environmental, and cultural environment and the welfare of its citizens.

Effective use of GIS technology by State agencies, COGs, and local governments has already yielded tangible benefits and enhanced the level and quality of services and decision-making. Some recent examples include:

- The Department of Commerce has used GIS to evaluate sites for economic development and to attract investments. The packaged GIS program, INSIGHT, has been developed to support local governments in economic development initiatives. This has helped attract commercial and industrial development projects in the State. This site has delivered an average of 3,500 maps per week to public agencies and economic development prospects inside and outside the State.

- The Forestry Commission uses GIS to support land use management functions by overlaying and mapping timber types, endangered species, and other data layers to support forest stand management decisions. In addition, the Commission has used GIS to support a new fire dispatch and communication system allowing significant reduction in the number of towers, communication facilities, and personnel with savings of nearly $1.5 million.

- State-County cooperation in address assignment and mapping to support Enhanced-911 has greatly improved local emergency dispatch operations with considerable savings of property and lives.

- The Budget and Control Board's Office of Research and Statistical Services uses GIS technology to support the Department of Social Services in planning for welfare reform and allocation of funds.

- The Upper Savannah COG has realized considerable savings in contracted services and information collection costs in preparing grants for outside funding.

- Lexington County has used its GIS to evaluate Fire Station locations resulting in a plan that saves considerable money in construction of new facilities over previously proposed plans.

- Preliminary uses of GIS technology by the State Department of Social Services and the Department of Health and Human Services have provided support in defining casework zones resulting in improved efficiency in allocation of resources and service provision. GIS technology shows great promise to help apply labor and funds more efficiency and improves the quality of social service and health programs.

- By comparing significant differences in construction values from historical building permits to current assessed values, the City of Greenville Revenue Division is targeting specific properties for reassessment to result in a more equitable assessment and hire overall tax

receipts. Also, the City's License Division is using GIS to improve business license revenue. State Retail Business Licenses obtained from the state Department of Revenue were address-matched in GIS and compared to current licensed business locations, resulting in over $16,000 collected in new business fees.

- The Department of Parks, Recreation and Tourism has used GIS for master park planning reducing staff time and contract costs for Park development.

- GIS and associated technology tools have contributed significantly to efforts by the State Geodetic Survey to officially define State and county boundaries. This has major importance for many State and local programs, including property appraisal and taxation, political redistricting and elections, allocation of State and federal funding, educational programs, and economic development initiatives.

- GIS terrain data recently acquired by Richland County has been used in preliminary engineering design projects already saving $130,000 for a single project.

- GIS technology will be increasingly used by the Department of Transportation to support preliminary engineering design saving considerable sums in the collection of data and contract fees in the early phases of project planning.

- With the help of geographic data from the State, the Aikens Council of Aging used GIS technology to evaluate options and plan new transit routes. This result in better efficiency and an 80 percent increase in ridership.

- The Department of Education has worked with local school districts and used GIS technology to help evaluate sites for new schools and related facilities resulting in an estimated savings of $10 million over the last 5 years in school development costs.

- GIS technology has greatly increased the efficiency and quality of environmental monitoring and regulatory reviews carried out by multiple Divisions in the Department of Environmental Control. GIS has reduced staff and calendar time in the 401 Program Certifications, the 305 Water Quality Program monitoring and reporting, Agricultural Permitting, and calculation of pollutant loads.

- The Department of Natural Resources' GIS Data Clearinghouse has allowed electronic distribution of digital data. Over the last two years, there has been an average of over 60,000 GIS data download transactions from the Web site each year by government and non-governmental parties. This electronic service has eliminated the need for at least 1 FTE.

- South Carolina Electric and Gas has incorporated GIS technology into mapping, system planning, facility inventory, and emergency operations drastically reducing staff time and response time. GIS has saved money by providing information necessary for decision-making.

Considerable resources are being devoted to GIS programs at all levels of government in South Carolina because the benefits are so great. However, there is a concern and an interest to see that these investments are used wisely and most effectively. A more formally coordinated Statewide GIS program will support resource sharing and collaboration and wise expenditure of funds.

2.4 INVESTMENTS IN GEOGRAPHIC INFORMATION AND GIS TECHNOLOGY IN SOUTH CAROLINA

For the past 15 years, considerable funds and resources have been expended in GIS data and technology at the State and local levels in South Carolina. Resources that are being devoted to GIS development efforts in South Carolina should be considered an investment for delivering benefits now and in the future. With adequate coordination in planning for and implementing GIS, money can be spent wisely to the benefit of a large community of GIS users.

The Statewide needs assessment shows that several State agencies are now active users of GIS, and their use of the technology and efforts to compile GIS data is expanding. Key State agencies that have been leaders in GIS technology use include the Department of Natural Resources, the Department of Commerce, the Forestry Commission, the Department of Health and Environmental Control, and the Budget and Control Board's Office of Research and Statistics. Many other State agencies (e.g., the Department of Transportation; the Department of Archives and History; and the Department of Parks, Recreation, and Tourism) have begun using GIS technology and will implement significant GIS programs in the near future. This activity at the State government level has been matched by organizations at the local level.

A recent survey shows that at least 12 city and county governments in South Carolina have active GIS programs, and over 15 others are contemplating GIS implementation. At least six of the ten Councils of Government now use GIS technology on a daily basis. Many of these COGs work closely on joint GIS projects with local government agencies. Private utility companies and public utility organizations are also adopting GIS at a rapid rate.

University programs in GIS-related disciplines, such as those at the University of South Carolina, Clemson University, South Carolina State University, the College of Charleston, and Coastal Carolina University, are responding to the demand for professionals with GIS skills. Greenville Technical College has recently launched a degree program in "Geomatics" providing technical training in mapping and GIS technology, and the University of South Carolina has established a new Center for GIS and Remote Sensing to support research and training, and to provide GIS services.

State agencies, local governments, COGs, and university-affiliated groups have already invested considerable amounts of money and staff resources in GIS programs and are deriving benefits from their GIS implementations. A survey of selected State agencies (including Commerce; Parks, Recreation, and Tourism; Archives and History; Transportation; Natural Resources; the Forestry Commission; DHEC; the Emergency Management Division; and the Budget and Control Board) reveals that over the last 5 years, well over $18 million has been invested in GIS staff, GIS hardware and software products, and GIS support and development services. In addition to this figure, additional documented investments in GIS include:

- Approximately $3.5 million for the development of Natural Resources GIS data and clearinghouse services
- Approximately $1.6 million that has been allocated to counties as part of the County Cooperative Program (administered by the Budget and Control Board—Geodetic Survey)

- Significant investments by other State agencies in GIS and geographically related system development which, while not specifically documented as part of this survey, is assumed to be well over $10 million over the last five years

- More than $8 million invested in GIS research and services on the part of groups at the University of South Carolina (the Geography Dept., Baruch Institute, Earth Sciences Resources Institute, and the Digital Mapping Services unit).

The Department of Transportation expects to spend $1.5 million over the next two years for road network base map development and annual expenditures for other Departments will continue to be significant. The estimated total of more than $40 million already invested in GIS programs at the State level has delivered benefits and established a strong foundation for continued use of GIS technology.

As cited above, GIS implementation at the COG and local government level is proceeding quickly. While no comprehensive survey of financial investments has been made, input from selected COGs and local governments has been examined. COGs across the State serve multi-county areas with a range of conditions, resources, and needs for GIS. Based on information received, average annual investments in COG GIS programs are in the range of $50,000 to $200,000 per COG. Information gathered from 15 counties with active GIS programs shows cumulative expenditures of over $16 million for GIS development and operations over the last five years. School districts around the State are considerable users of geographic information and technology spending an estimated $500,000 per year to support site selection, student load allocation, and bus route planning.

The increased interest in GIS in all public agencies suggests that financial investments will increase in the future.

The demand for GIS and its current use is high. For most organizations in the State, **it is no longer a question of whether to adopt the technology. The problem is one of implementing GIS in a sound, efficient manner with a focus on sharing of resources and delivery of results and benefits.**

2.5 CURRENT LIMITATIONS AND CHALLENGES FOR GIS COORDINATION IN SOUTH CAROLINA

With all the success enjoyed by South Carolina organizations in the adoption and use of GIS, serious obstacles exist that inhibit improved coordination and efficient expansion in the use of the technology. These obstacles are technical, institutional, and financial in nature. This *Plan* addresses these limitations with an agenda for action to put in place the pieces of a successful GIS program.

The major obstacles and limitations are identified as follows:

- **South Carolina has no formal GIS Coordination Office** with management and staff to encourage and coordinate GIS activities, establish and oversee standards and policies, and to promote GIS in the State. CGI, SMAC, and certain agency representatives have been responding to some of these concerns but lack necessary resources and cooperative authority to be effective.

- **CGI's parent organization, the Information Resources Council (IRC), has not been active over the last year**. CGI is the main body in the State for developing standards and procedures,

obtaining multi-organizational consensus, and encouraging joint GIS development efforts. But in order for it to be fully effective, it requires a strong link with an active IRC that helps craft oversees information technology direction and initiatives in the State.

- **Collaboration and sharing of information and technical resources between State and local agencies should be improved.** The work of CGI and the State's Cooperative County Mapping Program has helped, but institutional relationships, funding support, and technical support from the State or COGs and State universities should be expanded.

- **Many counties, cities, and other public entities (utility districts, school districts) in the State are small in population and do not have the resources to implement GIS—**although they could benefit from GIS technology. Greater support from the State and partnerships to give access to the technology, or products generated from GIS, can help respond to the needs of counties and cities without adequate resources.

- **Technical system obstacles, despite many improvements, still inhibit access to and sharing of information—particularly between agencies.** This has not been the result of poor planning but the lack of clearly stated standards for networks, software, and database development. CGI has been playing an important role in standards setting, and this work should continue through execution of this *Strategic Plan*.

- Despite a strong spirit of cooperation, **institutional barriers still exist that can limit collaboration and joint development work**. While such institutional obstacles will never be eliminated entirely, acting on this Strategic Plan and creating the recommended coordination environment will help avoid cases of conflict or concern with individual agency programs and projects.

- There is a **limited understanding of GIS** among many senior officials and management personnel. This inhibits the adoption and use of GIS and realizing the benefits that GIS can provide. There is a strong need, therefore, to inform senior officials about the role that GIS can play to solve real problems and to provide clear information about development approaches, costs, and benefits.

- **The high national demand for GIS professional staff makes it difficult to find and retain appropriate management and technical people**. The tight labor market also results in increased salary demands that limit the ability of many organizations to hire qualified staff. More appropriate job classifications, clear career tracks, and raising the prominence of GIS programs in government agencies can ease these staffing problems. State and private universities in South Carolina produce professionals educated and well-trained in GIS, but many leave the State for job opportunities. Raising the profile of GIS in all sectors can support economic, as well as, educational goals in the State.

- While State agencies, often in partnership with federal agencies, have developed an impressive set of statewide databases, **a considerable amount of work is required to compile additional geographic data** to support GIS applications. This plan includes critical work elements to continue GIS database development and to keep data sufficiently up-to-date over time.

- **Adequate funds have not been allocated for full GIS database development and ongoing maintenance**. The lack of a coordinated program for compiling and maintaining high-priority

geographic data has limited the use of GIS technology and added to inefficiencies in uncoordinated data gathering efforts.

- **No single, recognized entity currently exists to play the important role of providing access to GIS data and general use applications and services** to users around the State. This *Plan* calls for the creation of a formal State GIS Service Center, building on existing electronic clearinghouse services that can fill this function.