

A Strategy for the NSDI

Written with the help of many individuals and organizations in the geospatial data community

Published by the Federal Geographic Data Committee

April 1997

If the NSDI is to be truly successful for the nation, it must be embraced by state and local government and the populace as a whole.

--Wally Bowen, Mountain Area Information Network, North Carolina, writing to the Federal Geographic Data Committee, 1996

Integrate scientific research and local experience into a deeper understanding of the cultural, ecological, and economic patterns of change within...individual communities and the bioregion as a whole...Help develop a network for the exchange of information about the entire rain forest bioregion; make geographical information systems mapping ,imaging, and ecosystem modelling technology available to local communities as a tool for decision making...

--Ecotrust. Strategic Plan, 1994

Right now I am in the process of defining a way for water permit users to access the various water permitting agency's databases--preferably through GIS. Whereas my group interest is defined, it is easy to see that when this group's needs are served, others will want the same access.

--Paul Braun, Department of Water Resources GIS Administrator, Kansas, writing to the Internet mailing list DISTGIS, November 3, 1995

Contents

The Problem.....	3
A Solution	4
Renewal of the Strategy	5
Goals and Objectives	5
Carrying the Strategy Forward.....	8
References	9
Appendix A. Activities and accomplishments in the development of the NSDI, 1994-1996.....	10
Appendix B. Updating the 1994 strategic plan for the NSDI.....	14

The Problem

Over the past few decades the computer has made geographic information about the natural world and its inhabitants much more useful to governments, businesses, and communities for making critical decisions. Once confined to paper or mylar maps, geographic information is increasingly migrating to digital form. Geographic information systems (GIS) allow users to integrate, analyze, and manage information about locations in ways never before possible. Improvements in software, increased storage capacity, and plummeting hardware costs have put geographic information systems and associated technologies on desktops everywhere.

Government organizations of all kinds—from towns and cities to federal agencies—routinely use GIS as a tool to coordinate disaster relief, manage land, and understand and solve environmental and social issues. Private companies use GIS for facilities management, resource location, and marketing. Farmers use data about their land to improve their crop yield while practicing soil conservation. Citizens' groups interested in sustainable development map their watersheds electronically with mobile global positioning units. Teachers integrate information from many disciplines into their classrooms using spatial technologies.

In the United States, geographic data collection is a multibillion-dollar business. In many cases, however, data are duplicated. For a given piece of geography, such as a state or a watershed, there may be many organizations and individuals collecting the same data. Networked telecommunications technologies, in theory, permit data to be shared, but sharing data is difficult. Data created for one application may not be easily translated into another application. The problems are not just technical—institutions are not accustomed to working together. The best data may be collected on the local level, but they are unavailable to state and federal government planners. State governments and federal agencies may not be willing to share data with one another or with local governments. If sharing data among organizations were easier, millions could be saved annually, and governments and businesses could become more efficient and effective.

Public access to data is also a concern. Many government agencies have public access mandates. Private companies and some state and local governments see public access as a way to generate a revenue stream or to recover the costs of data collection. While geographic data have been successfully provided to the public through the Internet, current approaches suffer from invisibility. In an ocean of unrelated and poorly organized digital flotsam, the occasional site offering valuable geographic data to the public cannot easily be found.

Once found, digital data may be incomplete or incompatible, but the user may not know this because many data sets are poorly documented. The lack of metadata or information on the "who, what, when, where, why, and how" of databases inhibits one's ability to find and use data, and consequently, makes data sharing among organizations harder. Paul Braun of the Kansas Department of Water Resources, quoted on the frontispiece, hints at the potential economic value of access to geographic data. If finding and sharing geographic data were easier and more widespread, the economic benefits to the nation could be enormous.

Greater sharing and better access to high quality geographic data could also improve the well-being of our communities. The President's Council on Sustainable Development's report *Sustainable America* states: "Quality of life in a free society is determined by the collective decisions of its individual citizens acting in the home, the workplace, and together as members of the community." Collective decisions cannot be arrived at in a vacuum. Responsible stewardship of our natural resources for sustainable development depends on making sound scientific information available to local decision makers. The quote on the frontispiece from Ecotrust, an organization devoted to saving the temperate rainforests of the Pacific Northwest, speaks to a desire to integrate scientific research and local experience into community planning.

A Solution: A National Spatial Data Infrastructure

A critical national need for improved means for finding and sharing geographic data was recognized by President Clinton in Executive Order 12906 of April 1994. This document called for the establishment of a coordinated National Spatial Data Infrastructure (NSDI) "to support public and private sector applications of geospatial data in such areas as transportation, community development, agriculture, emergency response, environmental management and information technology." The NSDI was seen as part of the evolving National Information Infrastructure which would provide citizen access to essential government information and thus strengthen the democratic process.

The executive order described activities that were to be undertaken by the federal government to promote data sharing among federal, state and local governments, citizens, private sector organizations, and academia. The purpose was to make accurate and timely geographic data readily available to support sound decisions over a geographic area, and to do so with minimum duplication of effort and at a reasonable cost. The Federal Geographic Data Committee, composed of 14 agencies that produce and use geographic data, was charged with coordinating the federal government's development of the NSDI. State, local, and tribal governments also have an integral role in the evolution of the NSDI. A Strategic Plan for the NSDI was developed in 1994, setting out the vision for the NSDI:

Current and accurate geospatial data will be readily available to contribute locally, nationally, and globally to economic growth, environmental quality and stability, and social progress.

Major initiatives were undertaken by federal agencies and by organizations outside the federal government to develop the NSDI:

- Creation of a distributed electronic network of data producers and users, known as the National Geospatial Data Clearinghouse.
- Development of standards for data documentation, collection, and exchange.
- Formulation of procedures and partnerships to create a national digital geospatial data framework that would include important basic categories of data significant to a broad variety of users.
- Development of new relationships that allow organizations and individuals from all sectors to work together to share geospatial data.

Some milestones in the development of NSDI to date are listed in [Appendix A](#) and more information on NSDI activities can be obtained from the [Federal Geographic Data Committee](#).

Renewal of the Strategy

In today's rapidly changing world, strategies must be frequently renewed. This document updates the 1994 Strategic Plan for the NSDI. The vision remains the same. Rather than listing specific tasks for different organizations, the new strategy has become the focus of a process through which broad community consensus was achieved on desirable goals and objectives. These goals and objectives will serve as a structure under which many organizations can work together. Each community will craft its own tactical plan to advance the goals and objectives. The strategy was reviewed by a number of organizations, culminating in an open meeting in Chicago in November, 1996.

The executive order stressed partnerships. No one organization can build the NSDI. The NSDI can only become a reality through cooperation among state, local, and tribal governments, the private sector, the academic community, and the federal government. Each of these communities of interest has different and sometimes conflicting ways of defining problems, of looking at geographic solutions, of collecting data, and of representing data. Common solutions are not easy to achieve, and agreement on a strategy will not succeed unless the different voices used for talking about geography find their way into that strategy.

As Wally Bowen of the Mountain Area Information Network suggested:

If the NSDI is to be truly successful for the nation, it must be embraced by state and local government and the populace as a whole.

The goals and objectives of the strategy should be considered an invitation for every citizen who deals with geographic data to become part of the NSDI.

Goals and Objectives of the NSDI Strategy

Vision *Current and accurate geospatial data will be readily available to contribute locally, nationally, and globally to economic growth, environmental quality and stability, and social progress.*

Goal One **Increase the awareness and understanding of the vision, concepts, and benefits of the NSDI through outreach and education.**

The benefits of identifying and coordinating development of geographic data to address community problems may not be obvious to all. Most geographic information systems are built for a critical operational need by a school district to route buses, by a fast food chain to locate new stores, by a scientist to model a watershed. In many cases these application-specific needs limit the potential for data-sharing by enforcing particular ways of representing phenomena. Data sharing involves activities that may initially be seen as extra work, for example documenting data sets with metadata, or canvassing other organizations for data.

Enhanced participation in the NSDI will result from clearly communicating rationales for data sharing in languages appropriate to differing communities. The goal recognizes that understanding can be a lifelong process and seeks to foster the spread of NSDI concepts through communication and education. This goal encourages all communities who work with geographic data to communicate widely with others and to actively seek opportunities to work in concert.

- Objectives**
1. Demonstrate the benefits of participation in the NSDI to existing and prospective participants.
 2. Promote principles and practices of the NSDI through formal and informal education and training.
 3. Identify and promote the attitudes and actions that help to develop the NSDI.

Goal Two Develop common solutions for discovery, access, and use of geospatial data in response to the needs of diverse communities.

For the NSDI to succeed, geographic data must become easier to find and work with. Ideally, geographic data would be readily available as part of a common utility like the road system or the power supply. Libraries of data could reside online that users could access from anywhere. Once found, data would be easy to transfer and use in different applications; every data set would have full and complete metadata to ease the process of transfer and use. Some analyses could be performed remotely by integrating data from several sources. This goal addresses technical solutions and approaches to achieve these common solutions. Technical solutions alone are not enough, however. There must be a willingness of many communities to work together to forge the common means from the bottom up.

- Objectives**
1. Continue to develop a seamless National Geospatial Data Clearinghouse.
 2. Support the evolution of common means to describe geospatial data sets.
 3. Support the development of tools that allow for easy exchange of applications, information, and results.
 4. Research, develop, and implement architectures and technologies that enable data sharing.

Goal Three Use community-based approaches to develop and maintain common collections of geospatial data for sound decision-making.

Large centralized national data holdings are costly to assemble and maintain. The most accurate and highest resolution data are created and maintained close to the locations where they are used. As data moves away from their geographic base, away from those who have vital use for them, there is less incentive to maintain them. This goal looks toward developing the organizational relationships and technologies to build distributed locally maintained collections of data. These

collections will be available for many citizens for different purposes. The framework initiative will provide a foundation layer of basic data themes on which many applications can build. A coordinated national effort will provide other thematic data layers to improve economic growth, environmental quality and stability, and contribute to social progress. Much of this effort will involve establishing common languages for talking about the natural and man made environments and the data that represent them through standards development and data models. Finally, this goal seeks to involve different communities of interest in building these common data stores.

- Objectives**
1. Continue to develop the National Geospatial Data Framework.
 2. Provide additional geospatial data that citizens, governments, and industry need.
 3. Promote common classification systems, content standards, data models, and other common models to facilitate data development, sharing, and use.
 4. Provide mechanisms and incentives to incorporate multi-resolution data from many organizations into the NSDI.

Goal Four Build relationships among organizations to support the continuing development of the NSDI.

Decisions about common pieces of geography whether they be towns, watersheds, states, or the nation should be made by the people most directly concerned. The impediments to citizen participation are not just those of awareness or of access to information. In many cases new funding sources must be found to support the information infrastructure. Often there is organizational inertia to overcome. Laws conceived in the past for different circumstances prevent groups from working together today. Access to technology can be a factor. As much as is possible, this goal intends to identify potential new resources and, at the same time, identify and remove difficulties. The goal is to achieve a vibrant network of organizations working together and with their counterparts internationally.

- Objectives**
1. Develop a process that allows stakeholder groups to define logical and complementary roles in support of the NSDI.
 2. Build a network of organizations linked through commitment to common interests within the context of the NSDI.
 3. Remove regulatory and administrative barriers to agreement formation.
 4. Find new resources for data production, integration, and maintenance.

5. Identify and support the personal, institutional, and economic behaviors; technologies; policies and legal frameworks that promote the development of the NSDI.

6. Participate with the international geospatial data information community in the development of a global geospatial data infrastructure.

Carrying the strategy forward

Many organizations are using the structure defined by the goals and objectives of the NSDI strategy to develop tactical plans appropriate to their individual organization, to push the NSDI in new directions. The activities will be as varied as the communities. Some activities will be very broad, integrating several goals and objectives, some very narrow. For example:

A university geography professor might develop a seminar on geospatial data description or metadata, for a distance learning seminar on geographic information systems. A governor may decide to make data sharing among state agencies a top priority and provide funds and incentives for shared technologies and shared data standards. A local government might establish a site on the Internet where citizens could find information about their local community. Vendors of geographic information systems technology could agree on geoprocessing standards. Federal employees who work within states could partner with state agencies to solve problems based on a common geography.

Federal agencies that produce geographic data are currently crafting work plans reflecting the updated strategy. These work plans will be available from the FGDC. If your organization would like to adopt the NSDI strategy and needs suggestions about how to implement the strategy, call or write the FGDC for more information.

Federal Geographic Data Committee

U.S. Geological Survey
509 National Center
Reston, VA 20192
tel 703-648-5514
fax 703-648-5575
e-mail fgdc@usgs.gov
web <http://www.fgdc.gov>

References

Clinton, William. April 13, 1994. Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure, Executive Order 12906, Federal Register, 59 (71), pp.17671-17674.

Federal Geographic Data Committee, 1995. Development of a National Digital Geospatial Data Framework, Washington, D.C.

Gore, Jr. Albert. 1993. From Red Tape to Results: Creating a Government that Works Better and Costs Less, Washington, D.C.

National Research Council, Mapping Science Committee. 1993. Toward a Coordinated Spatial Data Infrastructure for the Nation. Washington, D.C.: National Academy Press.

National Research Council, Mapping Science Committee. 1994. Promoting the National Spatial Data Infrastructure through Partnerships. Washington, D.C. National Academy Press.

National Research Council. Mapping Science Committee. 1995. A Data Foundation for the National Spatial Data Infrastructure. Washington, D.C.: National Academy Press.

The President's Council on Sustainable Development. 1996. Sustainable America. Washington, D.C.

Appendix A. Activities and Accomplishments in the development of the NSDI, 1994-1996

The 1994 NSDI Strategic Plan

Vice President Gore's National Performance Review report of 1993 and President Clinton's Executive Order 12906 of 1994 called for the establishment of a National Spatial Data Infrastructure (NSDI) to support efficient production, easy access to and shared use of accurate, high quality spatial data to meet national needs. The Federal Geographic Data Committee, composed of the 14 Departments and independent agencies that produce and use geographic data, approved a strategic plan for the NSDI in 1994. That plan defined a series of actions to be undertaken by the FGDC and by other stakeholders in the NSDI under six strategic categories. These were:

Identify, establish and/or utilize various forums to facilitate discussions, interactions, and actions necessary to evolve the NSDI.

Ensure effective means for finding, accessing, sharing, and using geospatial data.

Through partnerships based on standards, produce a framework of national digital geospatial data from which other data sets may be derived or to which other data sets can be referenced, both on and off-shore.

Develop thematic data sets that meet critical national needs.

Develop an educational curriculum and training programs that ensure the availability of sufficient trained personnel for geospatial data activities in the future.

Identify options for fostering productive partnerships among all sectors for coordination of geospatial data collection, management and use.

The following list highlights achievements in developing the NSDI by Federal agencies and by other participants during the period 1994 to 1996.

Evolving the NSDI through Partnerships

In 1994 The Competitive Cooperative Agreements program was begun to provide small amounts of funding to form partnerships among non-Federal organizations for NSDI implementation. By 1996 cooperative funding had been provided for 65 projects.

In 1994 the FGDC issued a policy that established procedures for official FGDC recognition of cooperating groups. By March 1997, 18 State GIS councils have been recognized as cooperating groups.

In May 1995 the National Geodata Forum was held in Crystal City, Virginia. This meeting, sponsored by the FGDC, focused on building partnerships for the NSDI.

Between 1994 and 1996, the FGDC Secretariat staff and subcommittee members made over 200 NSDI presentations to audiences across the nation.

In 1995 the FGDC became a member of the Open GIS Consortium (OGC) Management Committee. The OGC was founded in August 1994 to create interoperability specifications and open systems approaches to geoprocessing.

The Mapping Science Committee of the National Research Council published reports on the NSDI-*Promoting the NSDI Through Partnerships*(1994) and *A Data Foundation for the NSDI* (1995). In April 1996, the Mapping Science Committee and the FGDC sponsored a workshop on the future of spatial data and society.

By 1996 the FGDC newsletter had over 8,000 people on its distribution list.

In July 1996 the FGDC and URISA sponsored a day long GeoData Partnerships Forum in Salt Lake City, Utah.

Open meetings and conferences have been held by FGDC Subcommittees at national conferences such as ACSM, ASPRS, AM/FM, URISA, and GIS/LIS. Many State GIS councils likewise have hosted sessions on the NSDI.

Developing a National Geospatial Data Clearinghouse

In 1994 the National Geospatial Data Clearinghouse was established. Guidelines for implementing the Clearinghouse were issued by the FGDC in June 1994.

By 1995 ten State, Federal, and academic organizations were operating a prototype of a remotely-searchable Clearinghouse.

In July 1996, a prototype for a Clearinghouse node with geographic search capability was demonstrated at the URISA conference and pilot tested.

By August 1996 approximately 200 sites, not all of them remotely searchable, were directly linked to the FGDC NSDI Clearinghouse site. This number does not include the many other NSDI sites that are run by smaller units of a larger organization.

Standard documentation of data (metadata)

The Content Standard for Digital Geospatial Metadata was endorsed by the FGDC on June 8, 1994.

Between 1994 and 1996, federal, local, and state organizations began to implement the metadata standard. Over fifty metadata training sessions were conducted by the FGDC to aid in implementation.

In 1995 a metadata implementor's workshop was held as a first step towards refining the standard.

In February of 1996 a review of clearinghouse implementations of metadata was conducted throughout the community of geospatial data users. This review determined that a number of effective software tools existed to help in metadata collection. The review concluded that a refinement of the standard was needed to make implementation easier.

In September of 1996, work began to refine the standard. This work is coordinated with the International Standards Organization(ISO). The ISO will develop an international metadata standard based on the FGDC metadata standard.

Thematic Standards

In September 1995 the FGDC issued a standards reference model to provide guidance and direction to FGDC standards developers and users.

In 1996 the FGDC issued an invitation to over 70 coordinating groups and organizations to request their participation in developing geospatial data content and classification standards.

As of January 1997, eleven different thematic standards were in development by FGDC subcommittees and working groups. The FGDC has endorsed the Spatial Data Transfer Standards (SDTS), and content standards on cadastral data and classification of wetlands. The standard for vegetation classification has completed public review.

Framework

In 1994 the FGDC convened a working group of federal, state, local, and regional representatives to develop a framework concept.

On March 31, 1995 the FGDC approved the framework concept as proposed in the working group's report.

In 1995 the FGDC began a framework pilot program to examine how to implement the framework. Over 20 different groups from around the country who were already working on projects that were related to the framework participated in a series of meetings, culminating in a final meeting in September 1996, to share ideas, results, and implementation suggestions.

In 1996 the FGDC began the development of a handbook for framework implementors. The handbook will incorporate the results of the framework pilots as well as other material.

In 1996 the FGDC awarded seven Competitive Cooperative Agreements for framework demonstration activities and made seven Framework Demonstration Project Program awards. These demonstration projects will investigate institutional, technical, operational and business requirements for building successful NSDI framework activities.

Appendix B. Updating the 1994 Strategic Plan for the NSDI

Although much progress has been made, it became evident that the development of the NSDI would benefit from an update of the original plan, building on the successes achieved since 1994. The new strategy would be developed with broad input, not just from the Federal agencies whose activities were the subject of the executive order, but from the many other organizations and individuals who have a stake in developing the NSDI. The updated strategy also would be routinely reviewed and revised.

A strategy document is a guide used by an organization to reorient its daily activities by marshalling all its resources to achieve long-range goals. The NSDI is not a goal that a single organization can achieve alone, rather it is an umbrella of policies, standards, practices, and technologies through which many organizations work together. That there is no formal structure to the NSDI in no way diminishes the value of a common strategy. The NSDI has become a reality in the minds and actions of those individuals who continue to participate in its evolution. One may therefore argue that a common strategy is even more necessary and compelling. A strategy document created and endorsed by the communities for whom the NSDI vision has meaning will serve as the necessary structure for moving forward.

The updated strategy for the NSDI evolved from comments received at an April 1996 meeting on NSDI future directions held in conjunction with the National Academy of Sciences' Mapping Science Committee. Beginning in August of 1996, a draft strategy was circulated for comment among a large number of groups including the FGDC Coordination Group and the 14 federal agencies represented by this group, the FGDC Steering Committee, the Mapping Science Committee, the National States Geographic Information Council, the National Association of Counties, the Corporation for Public Information, the University Consortium for GIS, The Open GIS Consortium, the Association of American Geographers, the American Society for Photogrammetry and Remote Sensing, AM/FM International, the Urban and Regional Information Systems Association, and the American Congress on Surveying and Mapping. Announcements of the public review were made to major GIS mailing lists and the draft document was made available over the World Wide Web for review and comment. An open public meeting was held November 7 and 8, 1996, in Chicago during which the goals and objectives of the strategy were finalized. A report of this meeting can be obtained from the FGDC. This report contains a summary of the discussions as well as many thoughtful implementation suggestions that might be useful for those planning implementations.