

## **Global Spatial Data Infrastructure: Are the Vision and Concepts Still Relevant?**

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### **Abstract**

The Global Spatial Data Infrastructure (GSDI) evolved from data sharing and program coordination efforts coupled with the emergence of information society concepts and technological revolutions in internet communications and in geospatial tools. The global geospatial information community recognized the opportunity for increased trans-boundary coordination and for improved use of geospatial data across a broad international community. In the mid-late 1990's the Vision, Concepts and Definition of a Global Spatial Data Infrastructure were formulated by the participants of GSDI Conferences. The Vision and Concepts were ground breaking at the time and still provide a firm foundation for Spatial Data Infrastructure (SDI) initiatives today. The relevance of the GSDI Vision and Concepts is no less today than it was 10 years ago when it was first established.

### **Introduction**

This paper explores the vision and concepts, which form the underpinnings of the Global Spatial Data Infrastructure (GSDI) and the relevance of those concepts to GSDI for the future. It is not intended to provide a step by step history or description of spatial data infrastructure development.

In the early 1990's the concept of spatial data infrastructures at national levels began to take hold in various countries around the globe. As a result there was a growing recognition that a global network was emerging which offered the promise of extending these initiatives into a global infrastructure. In September 1996 the first Global Spatial Data Infrastructure Conference was held in Bonn, Germany. The participants of that event established a dialogue and a framework which has matured into a robust GSDI which is able to support issues ranging from sustainable development, emerging economies, improved decision-making, the needs of the information society and the resolution of problems of extreme poverty affecting many around the world.

### **The Global Spatial Data Infrastructure**

**Vision:** The individuals who conceived and developed national spatial data infrastructures and the global spatial data infrastructure all had a vision when they began. Some of these visions were only the shared knowledge of the leading proponents, others were informal agreements, and others were well articulated and documented public statements. All however were based on the common intent of improving the use and application of geospatial data and information. From this observer's perspective, the following are the critical common purposes that all of these visionaries were striving to achieve:

- increased use of geospatial assets by anyone who could benefit,
- greater sharing of data for understanding community issues and for decision-making,
- improved communication about geospatial concepts, practices and experiences,
- and most importantly a desire to improve things for the benefit of all.

The founding visionaries of the GSDI recognized that the concept of a spatial data infrastructure (SDI) is closely tied to the legal, economic and social framework of the nation or location where the SDI is developed. Additionally, they recognized that the existing stakeholder communities had potentially competing visions for a spatial data infrastructure. Their genius was not in trying to impose their view of a GSDI on others, but in facilitating a process that captured the spirit of cooperation, encouraged the sharing of ideas, and stimulated collaborative thinking about GSDI issues.

In many respects, 10 years after the first GSDI Conference, we still do not have one vision statement for the GSDI. The Draft GSDI Strategic Plan proposes the vision “To foster development of an infrastructure that will allow all users simple access to global spatial data at a variety of scales to support all spatial data needs.” The Bylaws of the GSDI Association state that the Association “is dedicated to international cooperation and collaboration in support of local, national and international spatial data infrastructure developments that would allow nations to better address social, economic, and environmental issues of pressing importance.” Individual Nations and Regional Organizations also have SDI Visions tailored to their specific legal, economic and social needs. Perhaps we are still on a correct path by enabling a common infrastructure, which can fulfill a variety of visions from around the world in a cooperative, supportive environment.

**Concepts:** With local, national and regional activities as the basis for action, the concepts of GSDI were drawn from the collective experience of the participants in the first several GSDI Conferences. These concepts were a reflection of many different SDI interests and have remained relatively stable over time. They have formed a framework for development of many of the resolutions of GSDI Conferences and activities of the organization. I believe that the fundamental conceptual elements of the GSDI are:

- Open and Extensive Involvement of Interested Parties – the necessity to have the involvement and support of decision-makers and others from business, government and academia
- Collaboration and Communication with Organizations – a successful GSDI requires the many international activities, which are involved in different aspects of GSDI development to communicate, coordinate and collaborate.
- Education and Research - these are needed to expand knowledge and awareness and to demonstrate the use and application of geospatial data and technology
- Standards - it is essential to have a family of international standards to provide the technical foundation for GSDI. These standards should include geospatial and other information technology standards. The ISO Technical Committee 211 Geographic Information/Geomatics and the Open Geospatial Consortium have developed many of the standards necessary for GSDI to operate.
- Sharing of Benefits – as successful practices, pilot projects, prototypes and demonstrations are shared, organizational and technical best practices are promoted and greater benefits are obtained
- Core Components - in order to find, access, share and use data between local, national and global levels and across organizational and jurisdictional lines,

spatial data infrastructures generally include common core components. The GSDI is recognized to include the following core components:

- Metadata – ISO standards are now in place for geospatial metadata
- Core/base data and other geospatial data – includes basic sets of commonly used data as well as other geospatial data resources
- Clearinghouse/Data Portal network – distributed networks which contain collections of metadata and data which can be searched through common, standards based user interfaces
- Policies/Legal Frameworks – guidelines and rules by which a particular SDI and its resources are administered. Policies and legal frameworks differ greatly around the world
- Partnerships – organizational and other working relationships for communication coordination and collaboration to include activities to reduce duplication, share skills, leverage technology and data investments and conduct joint projects.

**Definition** A definition of GSDI was developed in 1997 at the Second GSDI Conference held in Chapel Hill, North Carolina. This definition stated that GSDI was "the policies, organizational remits, data, technologies, standards, delivery mechanisms, and financial and human resources necessary to ensure that those working at the global and regional scale are not impeded in meeting their objectives. " This definition was modified at GSDI 5 in Cartagena, Colombia. The revised definition which remains as the current definition is: "The Global Spatial Data Infrastructure supports ready global access to geographic information. This is achieved through the coordinated actions of nations and organizations that promote awareness and implementation of complimentary policies, common standards and effective mechanisms for the development and availability of interoperable digital geographic data and technologies to support decision making at all scales for multiple purposes. These actions encompass the policies, organizational remits, data, technologies, standards, delivery mechanisms, and financial and human resources necessary to ensure that those working at the global and regional scale are not impeded in meeting their objectives"

**GSDI Association** In July 2003 the GSDI Association was put in place with the adoption of the Association's By-laws. The GSDI Association now carries forward the Vision, Concepts and Goals of GSDI through an organization, which is "dedicated to international cooperation and collaboration in support of local, national and international spatial data infrastructure developments that would allow nations to better address social, economic, and environmental issues of pressing importance."

### **Relevance of GSDI Vision and Concepts for the Future**

The relevance of GSDI is entirely dependent upon the vibrancy and support of SDI's at the local, national and regional levels. As conceived and as it has developed, the GSDI does not exist without the SDI networks, which operate throughout the world. Yes, without a GSDI, there will be data sets which are global, and networks of information, but without dynamic Spatial Data Infrastructures at many different levels operating on a set of common concepts and with a shared visionary purpose, the GSDI and its potential for improved use of geospatial capabilities, would not be a reality.

At the GSDI 8 Conference in Cairo, the participants of the Conference reaffirmed the value of the GSDI and its relevance with a Resolution supporting the following goals from the GSDI Association bylaws:

- support the establishment and expansion of local, national, and regional (multi-nation) spatial data infrastructures that are globally compatible,
- provide an organization to foster international communication and collaborative efforts for advancing spatial data infrastructure innovations,
- support interdisciplinary research and education activities that advance spatial data infrastructure concepts, theories and methods;
- enable better public policy and scientific decision-making through spatial data infrastructure advancements;
- promote the ethical use of and access to geographic information;
- foster spatial data infrastructure developments in support of important worldwide needs such as:
  - improving local to national economic competitiveness,
  - addressing local to global environmental quality and change,
  - increasing efficiency, effectiveness, and equity in all levels of government, and
  - advancing the health, safety and social well being of humankind in all nations.

Clearly those who are participants in the GSDI, see its relevance for today and the future. Do others likewise view the GSDI as important for the future? While I would like to say that the answer is a resounding yes, that is not the case as Spatial Data Infrastructures are still an unknown mystery to most decision-makers, geospatial professionals and citizens around the world. However, in recent years, we have seen a rapid growth in geospatial awareness, in the use of geospatially-oriented technologies and in the realization of the value of standards-based interoperability for geospatial data and technology. Additionally geospatial information technologies are increasingly being seen as part of mainstream information technologies and are being integrated into enterprise architecture approaches. Lastly and possibly most importantly, more people and organizations are seeing that geospatial information provides a common link between almost all other data and offers a new paradigm as an organizing principle to connect and understand relationships between people, things and activities.

The GSDI has thus far proven to be relatively stable, while at the same time being flexible and able to evolve. In today's world, technology changes rapidly and new applications for the use of geospatial data and services are conceived all the time. NSDI's have evolved to adapt to technology changes as is shown by the adoption of web services as important elements. GSDI is likewise incorporating web services and other emerging technologies. In recognition of this evolution, web services should now be included as a Core Component of the GSDI concept:

- Web Services – standards-based web applications for exchanging data or performing other functions ranging from simple transactions to complex business processes

## **Conclusions**

The GSDI Concepts are as relevant today as they were in the 1990's when they were agreed to by GSDI Conferences.

The common purposes for a GSDI embraced by the initial GSDI visionaries are even more relevant for today and the future.

Why do I believe this to be the case?

The GSDI concepts have proven over time and in many different locations and political/economic situations to be sound. As technology has advanced, the Core Components of the GSDI are becoming more and more feasible to implement and are enabling many innovative approaches for developing, sharing and using geospatial information and technology. Standards are in place for many geospatial technologies and service interfaces. More and more commercial products are using those standards. As was the case when GSDI concepts were initially formulated, organizational barriers remain as a significant hurdle. While technology changes rapidly, organizational policy and culture change slowly. Thus the concepts of openness, collaboration, communication, education, and sharing benefits are still necessary to continue the progress of the past 10 years.

The essence of the GSDI vision is to help improve the world through better use of our geospatial capabilities. While many things in the world have improved over the past 10 years, I believe that all of us will agree that there are significant and urgent problems facing national and global societies and economies. We are a long way from achieving a peaceful and ecologically sustainable world. The Vision of a GSDI, which achieves:

- increased use of geospatial assets by anyone who can benefit,
- greater sharing of data for increased understanding of community issues and for better decision-making,
- improved communication and
- improved quality and sustainability of life

is more important and relevant today than in the past and I believe will be even more relevant in the future than at the present.

## **Acknowledgements**

I wish to express my thanks to the visionaries who helped found NSDI's in many locations around the world and to those who initiated the GSDI, and particularly to the late Fritz Petersohn for his vision and for his many contributions to the establishment of the GSDI and its conceptual framework.

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