***Published in:** M.J. Salling (eds.); Proceedings of the URISA 2000 Annual Conference. URISA 2000 Annual Conference (Orlando, U.S.A., 19-8-2000), URISA, 2000, p. 537-543.*

Bastiaan van Loenen
Faculty of Civil Engineering and Geosciences
Department of Geodesy
Delft University of Technology
Delft, The Netherlands
Phone: ++31(0)152782554
E-mail: b.vanloenen@geo.tudelft.nl

GLOBAL SPATIAL DATA INFRASTRUCTURE

ADVANCING SOCIETY THROUGH COMMUNICATION

Abstract: Many states, nations and regions around the globe are developing Spatial Data Infrastructures (SDIs) that will better facilitate the availability of and the access to spatial data. The development of these SDIs take place in different settings. But the issues are alike so why not share experiences? The Global Spatial Data Infrastructure (GSDI) is one way to facilitate the communication between spatial data infrastructure developers. It is a global and open process for coordinating the organization, management, and use of spatial data and related activities. It is also a way to promote the sharing of information on how others are developing their NSDI, to judge the effectiveness of existing data policies accompanying the development of the information infrastructure and how to come to a possibly global solution. This paper discusses the need for the GSDI. It also describes the development of the organization of the GSDI over the last five years. It will focus on its Technical Working Group and the Working Group on Legal and Economic Aspects.

INTRODUCTION

In the United States many sources of spatial information exist. Federal, state and local government, the commercial sector, non-profit organizations, the academic community and citizens all may collect, produce and distribute spatial information. The availability of information depends on preconditions of the information infrastructure. An information infrastructure consists of all political, legal, economical, organizational and technological means to facilitate the use of information. It includes access to information laws and policies but also standardization of data and the availability of a clearinghouse. Of course, there is not one single information infrastructure. Some policy makers choose to restrict the use of information. Others provide free of charge access to their information through digital devices like the Internet. Also in the U.S. differences exist between information infrastructures. For example, the USGS provides free access to geographic information through its website (http://www.usgs.gov). But the NOAA has restricted access to its information in the recent past (see e.g. Delorme Publishing Co. v. National Oceanic & Atmospheric Administration of United States Department of Commerce, 917 F. Supp. 867 (D. Me. 1996)).

Similar to the U.S. situation, many national governments throughout the world are involved in developing spatial data infrastructures that will better facilitate the availability of and access to spatial data for all levels of government, the commercial sector, the non-profit sector, academia and citizens in general (Onsrud 1998). As we learn from the "Survey of national and regional spatial data infrastructure activities around the world" (Onsrud 1998), countries are facing similar problems and answer the ostensible same questions differently. This is not surprising given that the development of SDI's in nations and regions takes place in different settings. Different cultures, different people with different ideas and believes influence the direction in which the SDI develops. For example, some countries are in the process of converting analogue information into digital information (e.g. Mongolia), others started to cooperate with other countries (e.g. Latin America), others are trying to cooperate regionally with conflicting national policies (e.g. Europe), some NSDI's suffer from economic recession (e.g. Russia), and public domain information is non-existent in many countries (e.g. South Africa, Russia, South Korea). Some nations were unable to respond to the questionnaire because in their specific setting spatial information concerns the national security.
However, the goal of the development of the infrastructures is the same: to facilitate the availability of information in such a way that the needs of the citizens, the own organization or society are met. The problems may differ in degree but that is all (Brand 1996). If the issues are alike, why not share experiences?
Also the fast development of information technologies and the resulting globalization should be noted in this perspective. We are increasingly communicating and doing (e-) business with people in other parts of the world, and there is an increasing demand for cross-border information. For example, natural disasters, or disasters like Chernobyl caused by human beings, typically do not discriminate nations. In order to plan the safest solution for societies, communities have to communicate and exchange cross-border spatial information. Since it is likely that nations will deal more and more with each other, it may be advantageous to all of us if we start to understand each other better. One way to facilitate the communication between spatial data infrastructure developers is the Global Spatial Data Infrastructure (GSDI).

The objective of this paper is to inform about the GSDI, what it may mean to your country, state or organization. This includes the evolution of the GSDI as an organization, and its activities in working groups. We will pay special attention to the recently found Working Group on Legal and Economic Aspects.

GLOBAL SPATIAL DATA INFRASTRUCTURE

What is the GSDI?
The development of a Global Spatial Data Infrastructure (GSDI) is one way to better facilitate the use of geographic data. The GSDI may be defined as follows:

"A Global Spatial Data Infrastructure is one that encompasses 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 2 Chapel Hill, NC).

The linking of national and regional spatial data infrastructures forms the GSDI. It is a global and open process for coordinating the organization, management, and use of spatial data and related activities. It is also a way to promote the sharing of information on how others are developing their NSDI, to judge the effectiveness of the existing data policies accompanying the development of the information infrastructure and how to come to a possibly global solution. It may also be a tool to distribute background information on SDI's so that we understand better the policies or choices other nations made to develop their SDI.
This should lead to the minimization of duplicating national efforts, minimization of the cost of Research and Development and to the identification of the critical opportunities and threats inherent in creating a global spatial data infrastructure (Rhind 1997).

It is believed that a global spatial data infrastructure backed by international standards, guidelines, and policies on access to the data is needed to support global economic growth, and its social and environmental objectives (http://www.gsdi.org).

The GSDI may be compared to the U.S. National States Geographic Information Council (NSGIC) in that it tries to bring together parties from many different infrastructure settings in order to inform them and to be informed by them on issues related to geographic information infrastructures.

The goal of the GSDI
The GSDI facilitates the development of policies and actions that ensure access to information and the delivery of information to users that ensure fitness for purpose. Industry will deliver the tools and governments, industry plus government/ industry partnerships will deliver the information (Brand 1998).

Visions on the GSDI, its definition and its tasks have evolved since the official start of the GSDI in 1996.

The Development of the GSDI
The first time the need for a GSDI was discussed was at the first GSDI conference in 1996. From there the discussions have developed from exploring the issues (1996), to the need for leadership and a place on the political agenda (1997), to policy and organizational aspects of SDI, and balancing the interest of developed countries with those of the developing ones (1998). This year's meeting in South Africa the central themes were "engaging emerging economies" and "sharing knowledge". Next year's meeting (May 2001 Colombia) will be in the light of output from the working parties.

During the previous conferences the need for a GSDI became evident. It is critical to the attainment of substantial and sustainable development in both the developed and developing countries of the world (GSDI 1997).

Organization of the GSDI
The participation in the GSDI organization is voluntary. One of the envisioned tasks of the GSDI organization is information sharing, awareness, education, the

promotion of model strategies and policies, the provision of a forum, the promotion and monitoring of standards efforts. A Steering Committee is in charge of the GSDI initiatives.

Four working groups reside under the GSDI flag (see figure 1). These are the Operations Working Group, the Technical working group, the Communication and Awareness Working Group, and the Legal and Economic Working Group. The Operations Working Group oversees the implementation of the umbrella organization structure and administration of the GSDI. The Communication and Awareness Working Group informs the broad community about GSDI and the value of spatial data, and to promote the GSDI concept. The Technical Working Group advises the Steering Committee on technical aspects of the GSDI. The Legal and Economic Working Group formally advises the Steering Committee on economic, legal and funding mechanisms underpinning the GSDI. We will discuss the Technical working group (TWG) and the Working group on legal and economic aspects in more detail.

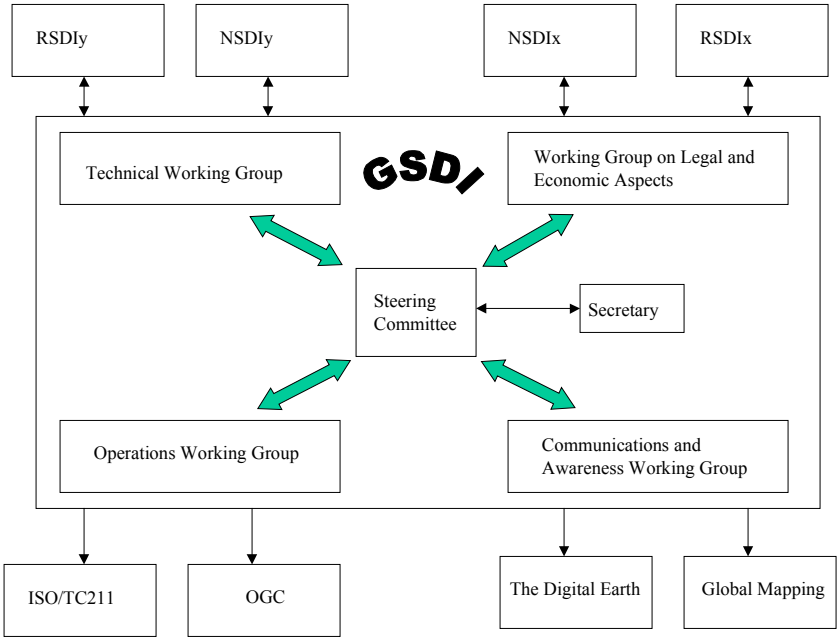

FIGURE 1: GSDI ORGANIZATIONAL MODEL

The Technical Working Group

The TWG was founded in November 1998 at the conference in Canberra. The TWG advises the Steering Committee on technical aspects of the GSDI. One of the first tasks of the technical working group was to acquire the domainname http://www.gsdi.org and to build the GSDI website. The website should include catalogs of services, data, projects, organizations, software and consultants. Many more elements are foreseen including the development of a consulting knowledge base, the recognition of the principles to address business, software,

or data as categories, the identification of procedure and process for the rules of engagement of the TWG and the creation of an international SDI services registry.

The TWG created a Cookbook in paper form. It intends to demonstrate the tangibility of such a GSDI product and to enlist the involvement and contributions of more individuals. At this moment participants in the TWG are developing an online Cookbook.

On-line Cookbook
Technical experts from the nations with SDI Implementation programs are developing a draft work plan to meet both their national needs and common GSDI obligations. The draft work plan will take the form of an on-line implementation guide document (GSDI Cookbook) whose chapters cover essential topics in the creation of compatible Spatial Data Infrastructures. The implementation guide document will reflect existing and prospective GSDI participant interests in common SDI implementation strategies through description of the essential technical aspects of the GSDI balanced by worked examples and relevant scenarios. International contributions to this effort reflect a coordinated commitment by participant organizations in the development of a cost-effective and non-duplicative approach to SDI development. A revised version of the cookbook is expected on-line at May 1, 2000 and open for comment.

Future Directions
Two future directions for possible TWG work are considered that are not being directly addressed by standards bodies and consortia such as ISO TC 211 or the OpenGIS Consortium.

- Development of internationally agreed-upon methods for identifying spatial data collection “products”. Along the lines of ISBN (International Standard Book Number) and Digital Object Identifiers, a convention for the issuance and use of such a system should be identified and adopted by the wider GIS community.
- Identification of an appropriate and competent thematic classification system or thesaurus that could be applied using theme codes (numbers possibly). Search of information held in international catalog supporting various character sets and languages requires such a list, and the means to augment it.

Standards
Standards for geographic information and services are currently being developed within the international standards committee ISO/TC 211 and the Open GIS Consortium. The GSDI Steering Committee recommends that these standards be supported.

GSDI Working Group on Legal and Economic Aspects
The WGLEA was founded in March 2000 and is co-chaired by H.J. Onsrud and B.C. Kok. The objective of this working group is to promote the sharing of information concerning the legal and economic policies affecting the use of geographic data. The working group will discuss national and regional practices

of and experiences with legal and economic aspects of geographic information. It also provides a means to share such experiences. In this respect, the working group does not intend to provide thé answer to current legal and economic SDI issues in a particular country or state. Instead, it strives to provide tools for policy makers to come to the best solution for their specific situation.

Finally, we have information available: now what?
In general, legal and economic aspects of geographic information get considerable attention after the technical issues are partly or completely solved: we have all this digital information… now what? Disseminate the information free of charge to everybody in the world like the US federal government or charge a market price like the British so that we may improve the quality and create even more digital information? In Finland they found a midway: they allow Finnish citizens (i.e. requesters with a .fi domain) to access certain spatial information for free But they charge for access to more accurate maps or coordinates (see: http://www.kartta.nls.fi/karttapaikka/eng/info/kansalaisen.html).
Intellectual Property Rights are another issue. Legislation in most European countries allows governments to impose copyright on spatial information. The Ordnance Survey of England but also the Dutch Mapping Agency are examples of government agencies that use this right intensively. Similarly the new European database legislation provides them with a new legal tool to control the use of their information: the database right. Government agencies in other parts of the world do not have the database right available (yet) and U.S. federal government cannot copyright its information. Both settings have advantages and disadvantages but which one is to be preferred?
With the increasing availability of digital spatial information also privacy and confidentiality issues arise. And what if we all integrate our spatial information into one database supporting our GIS and disseminate the information through an intermediate? Who is going to be liable for errors in the information provided? The intermediate, the data providers or someone else? This issue will be of increasing importance when different organizations and nations start to integrate geographic information into one information system. The different legal settings in countries alone contributes to the uncertainty of the outcome of possible law suits.

Central question
The central question that will be addressed in the working group is as follows:

Given the legal and economic framework of a nation or region, what legal and economic policy lines affect the use of geographic data, which policy lines affecting the use of geographic information are available to the different parties participating in the development of a SDI within nations or regions, how do these lines relate to each other, how are they currently utilized, how have they been utilized in the past and how may others, including the emerging economies, learn from this?

The working group will give special attention to the role of government in the development of NSDIs. It will try to address how government in a nation or region interacts with the other parties involved, and on which principles policy lines are developed with regard to the use of spatial data. One of the elements influencing the role of government is the existence of legal and economic barriers in

accessing spatial data. These legal and economic issues with an impact on the use of geographic data will also be addressed in the GSDI Working group on legal and economic aspects.

How to accomplish the objective of the working group?
In 1998, a "survey of national and regional spatial data infrastructure activities around the globe" was sent to over a 100 countries and regions in the world. Its goal was to gather baseline information on the nature and characteristics of the national spatial data infrastructures (NSDI's) currently being developed. This survey performed by professor Onsrud (responses are online presented at http://www.spatial.maine.edu/~onsrud/GSDI.htm) explored the similarities among access approaches around the globe. So far 32 nations and 6 regions have responded. Many more responses are expected by the end of this summer. An update on the current situation will be sent to nations that filled the initial questionnaire out. More actions are considered.

The proposed outcomes of the working group are:

- Overview of the current and past use of policy lines within a specific legal and economic framework affecting the availability of and access to geographic data in nations.
- Overview of the (history of) organizational or coordinating aspects of the SDI in nations.
- Start of the development of a data policy flow chart. The responses to the questionnaire should give sufficient information to start the development of a data policy flow chart. Based on experiences elsewhere, this flow chart should indicate to policy makers the possible consequences of a policy option.
- Providing references for further study and discussion: papers, proceedings, etc.
- Bringing together a community of people who are thinking along common lines.

RELATED ACTIVITIES OF THE GSDI

The GSDI relates to many global projects. Two of them are The Digital Earth and the Global Mapping Project.

The Digital Earth
Some of the benefits of the GSDI may be found in the concept of the Digital Earth. The Digital Earth is seen as a multi-resolution, three-dimensional representation of the planet,
into which vast quantities of geo-referenced data can be embedded. The applications possible with broad, easy access to global spatial information will be, in the words of the Vice-President of the USA, Al Gore, limited only by the imagination (Gore, 1998).

Global Mapping Project
The Global Mapping Project (http://www1.gsi-mc.go.jp/iscgm-sec/index.html) is addressing the development of a suitable spatial data product which will provide a tool to assist decision-makers addressing society's global environmental concerns. The Global Mapping concept was advocated by the Ministry of

Construction of Japan as a response to the United Nations Conference on Environment and Development held in Brazil in 1992. Agenda 21 is an action program drawn up by the conference, and it clearly makes the case that global baseline spatial data is important. It is envisaged that the Global Mapping Project address the development of a suitable spatial data product. This would provide a tool to assist decision-makers addressing society's global environmental concerns.

CONCLUSION

Different nations and regions are in different situations with the development of their (N)SDI. The infrastructures will develop regardless of what we do or say (Brand 1998) but no-one will take advantage of a development in a non-harmonized way, increasing the costs to everyone and not capitalizing on opportunities made possible by data and experience sharing. The GSDI is a backdrop, a group they can turn to, to see what other countries in a similar situation have done, and to see what their benefits or negatives have been. The GSDI is a very young organization. As one can see, we have many plans, and proposals for the future. For an optimal result we need the continuing support of the GI community. We strongly encourage people who are willing to think with us, and discuss future plans, to participate in the GSDI. We hope that the information we provide each other will lead to understanding in the short term and to the minimization of data access roadblocks in the long run. In the future we hopefully drive on a technically, legally and economically smoothly paved superhighway, called GSDI.

REFERENCES

Brand, M., 1996, "Emerging Global Spatial Data Infrastructure", paper presented at GSDI 2, Bonn, Germany. On line available at: http://www.gsdi.org/docs/greetings.html

Brand, M., 1998, "Global Spatial Data Infrastructure: Policy and Organisational Issues- Theme Paper", paper presented at GSDI 3, Canberra, Australia, 17-19 November. On line available at: http://www.gsdi.org/canberra/theme.html

Gore, Al, 1998, The Digital Earth: Understanding Our Planet in the 21th Century, California Science Center, Los Angeles, California, January 31.

Onsrud, H. J., 1998, "Survey of national and regional spatial data infrastructures activities around the globe", paper presented at GSDI 3 Canberra, Australia,17-19 November. On line available at: http://www.spatial.maine.edu/~onsrud/GSDI.htm.

Rhind, D., 1997, "Implementing a Global Geospatial Data Infrastructure-Theme Paper", paper presented at the 2nd GSDI Conference, Chapel Hill, North Carolina, USA, 19-21 October 1998, On line available at http://www.gsdi.org/docs/ggdiwp2b.html