

## **GLOBAL SPATIAL DATA INFRASTRUCTURE (GSDI): FINDING AND PROVIDING TOOLS TO FACILITATE CAPACITY BUILDING**

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### **ABSTRACT**

The Global Spatial Data Infrastructure (GSDI) supports ready global access to geographic information. This is achieved through the coordinated actions of nations and organisations 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, organisational remits, data, technologies, standards, delivery mechanisms, and financial and human resources necessary to ensure that those working at the global and regional scale are facilitated in meeting their objectives

The GSDI is currently developing into a formal organisation and has successfully filed to become a non-profit corporation. The nonprofit status is beneficial in partnering with other global, regional, national agencies, NGOs, and industry to facilitate the pursuit and distribution of support funding for capacity building for local, national, and regional SDI development. To be successful, it needs to expand its capacity building program globally. Historically a small group of dedicated individuals leveraged the limited resources of the US Federal Geographic Data Committee (FGDC) and others to conduct training and other capacity building exercises largely in Africa and Latin America. This is not sufficient.

Goals of the organisation are to help governments to be more responsive to complex community issues encouraging the development of business practices to managing critical geospatial data and develop coordinated approaches for open and interoperable access to geospatial data. Accordingly the GSDI needs to develop a realistic financial plan maximizing funding sources from dues, individual donors that support the aims of the GSDI, grants, and other sources.

Further it needs to develop global partners like all of the GSDI permanent committees, the International Steering Committee of the Global Map, the UN organisations, and others to jointly seek and distribute funds for capacity building on a local to a global basis. It will also be necessary to seek out and partner with global donor organisations for capacity to leverage our limited resources locally and globally. Only then can the GSDI build on past and current successes like the GSDI Cookbook, the GM/GSDI/ESRI grant program, collaboration with the ISCGM, the Intergraph grant program, and others to reach out to more nations.

## **Background**

The **Global Spatial Data Infrastructure (GSDI)** has emerged from the world's national initiatives. Leaders in the National Spatial Data Infrastructure (NSDI) movements were invited to Bonn Germany in 1995 to explore common interests and issues in the development of local to regional SDIs. This meeting is considered the first formal meeting of the GSDI. Much credit is due to Fritz Petersohn of the Atlantic Institute, John McLaughlin of the University of New Brunswick, and Klaus Barwinski of Northrhine Westfalia, and others for convening this first gathering. GSDI-6 convened in Budapest in the fall of 2002 with roughly 250 attendees representing over 50 nations, regional and global organisations, NGOs, government agencies/ministries, the commercial sector, and private individuals.

GSDI is a non profit non governmental organisation, chartered in the Commonwealth of Virginia, USA, on August 5, 2002, dedicated to encouraging and facilitating global and national public and the private sector organisations to collect, archive, process, and share its geospatial information using common standards and interoperable systems and techniques. The GSDI is the coming together of many national organisations who individually promoted these same principals within their own countries building on the rationale it makes good business sense to collect data once and use it many times. The same model holds true across international boundaries as well as organisations within national borders.

At its Conference in Budapest, Hungary, in September 2002 (GSDI-6) GSDI approved a resolution to “give special attention to develop capacity building efforts with particular reference to obtaining resources for sustained capacity building in developing nations.” GSDI is trying to partner with other governmental and non-governmental agencies, institutions, corporations and organisations to accomplish this resolution. GSDI, with global partners will collaborate to implement regional strategies for spatial data infrastructure development, particularly in developing regions of the world. These collaborations will consist of groups of SDI specialists who are in a position to communicate the value and concepts of spatial data infrastructure to high level officials and who are also in a position to educate middle and low level decision makers and their staffs who can collectively press for progress in spatial data management.

## **Geographic Information Management at a Crossroad**

Geographic Information Systems (GIS) have greatly expanded opportunities for data integration and analysis, modeling, and map production. As populations grow, as countries boost their economies, as landscapes change, governments have increasingly relied on geographic information for applications such as environmental planning, land registration, disaster response, public health programs, agricultural marketing, and biodiversity conservation. Ready access to digital geospatial data is a clear prerequisite to progressive development.

Government agencies in many developing countries are at a critical transition from producing paper maps to digital maps. Often, the work is being done in an uncoordinated way, without documentation, and without consistent standards. There is considerable duplication of effort, and different standards limit the possibilities for integrating and using the data properly. Data producers are also in a transition from 'guarding' their information to exploring mechanisms for disseminating it on-line. At the same time, there is an overall trend towards pricing data for 'cost recovery' and increasing restrictions on the use of data; this can directly impact data availability for food security, drought and flood monitoring, agricultural development, and biodiversity conservation. High prices for data can put data out of the reach of many potential users. Copyright restrictions can prohibit normal scientific practices, such as sharing the data with colleagues, and publishing data in scientific journals.

A number of noteworthy national initiatives are already underway in developing regions, but generally, most countries still lack a national framework to ensure that geographic information is consistent, available, and affordable. Capacity building will further the development of such frameworks. With these frameworks in place, people who needs access to data will know where to go for it, what format it is in, its scale, how reliable it is, how much it will cost, and whether they can duplicate it.

### **Specific objectives**

The idea behind capacity building is to convey the basic cannons of SDI development and sustainability. These cannons include but are not limited to:

- Seek incentives not mandates
- Distribute power and function
- Build on trust, credibility, and common shared interest, not a hierarchy of control
- Implement and govern by consensus
- Design national standards to guide agency and local actions
- Support decision-making with infrastructure
- Collect once, use many times
- Search before spending

- Provide equitable access to data, tools, and decision-making
- Protect privacy and confidentiality of personal information
- Capacity building NSDIs require several things to be able to start:
  - A central organisation charged with building an NSDI
  - High level political and policy support
  - Specifically identified SDI development funding
  - Technical savvy to help in developing the basic building blocks (metadata, clearinghouse, standards, framework, etc)
  - Some interest among sister ministries that SDI development is worthwhile
  - The ability to **grow and sustain** the movement

Capacity building comes in many forms. It generally needs to be broad enough to include all of the following levels:

- Awareness training for ministerial level people with the focus on political importance/benefits, cost savings, and good governance in general. It typically has to be direct, fast, and provoking because these people will not be able to commit much time.
- Policy, management, and modest technical background training for those actually managing implementation within ministries and throughout the government of the country, as well as managing those actually carrying out some of the technical development.
- Detailed, hands-on exposure for those that will actually be collecting and cataloging data and information, building metadata, designing clearinghouses, framework development, distributing the data, and working with standards development and application. This exposure is typically longer, more intensive, and follow-up is critical.

There are many ways to go about this:

- It can be conducted on-site, regionally, or in some centralized facility.
- Through under graduate and/or advanced degrees at educational institutions
- Through organisations set up to bring training to a site or region like the ITC
- Distance/virtual learning on the web
- A combination or other forms

### **One Model**

The ultimate goal would be to achieve these objectives globally. It is more realistic to, however, direct these efforts in country or better in smaller more manageable regional facilities throughout the world. GSDI, with global partners such as the **International Steering Committee for the Global Map (ISCGM)** and the **Environmental Systems Research Institute (ESRI)**, and others with global and regional interests, will form Task Forces to implement regional strategies for spatial data infrastructure development, particularly in developing regions of the world.

The Geographic Information for Sustainable Development (GISD) initiative outlines a USAID-U.S. State Department-led international collaboration and alliance whose objective is to apply a new generation of earth observation data, state of the art GIS-linked technologies, and field-tested geographic knowledge to ongoing sustainable development problems in diverse target areas within Africa. This alliance is being done in collaboration with activities and funding by many partners both within and outside of the continent of Africa (<http://www.opengis.org/gisd>). The aim is to assist local, national, and international agency users working in Africa to better address long-term challenges such as disaster mitigation, natural resource management, trade, and poverty alleviation. The results and lessons-learned will demonstrate the value of international collaboration in using geographic information for a broad range of sustainable development challenges over the next decade.

Predating but building on the GISD initiative, ESRI has launched the International Steering Committee for the Global Mapping (ISCGM)/Global Spatial Data Infrastructure (GSDI) Grant program to support spatial data infrastructure development by national mapping agencies and national spatial data development organisations. Each country grant includes software, training, and support valued at \$60,000. To date, over 100 grants have been awarded worldwide. ESRI will provide up to 150 grants. Three-week hands-on training was initially conducted at the ESRI facilities in Redlands California. Many of the grantees were not be able to afford travel and living cost for the opportunity. Additionally, three consecutive weeks proved too much material at one time, and too much time away from the office.

What is needed are funds to cover travel expenses, workshop facilities and coordination, and preparation/translation of materials for the workshops. Also, since the Task Force will have an active dissemination program, some funds may be needed for website development and update. The Task Force will take advantage of electronic networking to encourage the broadest possible discussion of issues, and this includes putting workshop agendas and summary reports on the regional website. Many of these websites are already in development.

The Task force will organize one regional conference for 4-6 juxtaposed nations during which the goals of the Task Force and the regional strategy for spatial data infrastructure development will be discussed. Participants will be encouraged to compile a database of all projects in their countries that are related to spatial data infrastructure, regardless of the sector, donor, scale, etc. It is important that the Task Force is informed of all projects, so that the projects can be integrated into the overall plan and so that duplication of effort can be minimized.

- o Countries within the region will have, at a minimum, a start-up geospatial information system and be able to access medium resolution core data. Example data will include land cover (particularly agriculture and forestry), roads, population distribution (in rural and urban centers), poverty, as well as watershed and water resources availability and use. Additional data might be coastal resources and use, biodiversity and protected areas, cropland and livestock, mining, environmental health, and many more.
- o Governmental agencies, NGO's, and producers in general will be collaborating on mechanisms for the collection, processing, archiving, and sharing geospatial information using common standards and interoperable systems and techniques.
- o Decision-makers at national level will be using these core spatial data and other information to shape policies, programs, and projects.
- o Case studies of GIS use will be undertaken and assessments made to determine effectiveness and efficiencies.
- o Local decision-makers in a number of countries will have access to GIS and remotely sensed information to help them make resource management decisions in collaboration with local communities.
- o Countries will be able to locate and document projects by ecosystem type, economic, and social results. Geo-spatial data about the region will increasingly be available from servers located in regional institutions.
- o A network of geo-information producers and users will be in operation and will be addressing problems of building spatial data infrastructure for the country, local communities, and the sub-region.
- o Spatial data infrastructure workshops and training will be available and results used. The capacity of experts and decision-makers will be improved through hands-on-use, workshops, and briefings.
- o Training programs will be initiated; formal educational institutions will expand their courses on geography, natural resources, and geo-spatial information technologies; the Internet will be available to most government agencies.
- o Donor and regional financial and technical resources will be used to strengthen geospatial information capacity.

### **Sustainability:**

**Workshops, training, seminars alone are not capacity building.** Capacity building, by its very nature, intends to leave an operating program on the ground

with the opportunity to build on it. In this case, the goal is to ensure that the organisation(s) that have received the initial training can continue to operate and operate effectively as well as involve other ministries/agencies within their country in an effort to build a truly National SDI.

Toward this end we suggest the following components are essential in order to sustain the efforts within country:

- Follow up visit(s) from the trainers or related staff to discuss the successes and/or challenges to implementing and operating the new programs. Successful business case examples are extremely valuable in helping other fledgling SDIs. Similarly, problem areas are important. The help from the instructor/facilitator in overcoming an issue is just as critical to helping other SDI development. The instructor/facilitator may also help with interfacing with senior management to explain the rationale for various technical solutions, and potentially help with convincing political leaders on some critical policy matters.
- Provision of a moderate level of support for in-country SDI development is another key factor in ensuring sustainability. Walking away from the country after training does little to grow an NSDI. It is critical to have an in-country champion to foster the SDI message to build on trust, credibility, and common shared interest, to encourage implementation by consensus, to facilitate the design of national standards to guide ministry and local actions, to support decision-making with infrastructure, and the like. In partnerships of this nature, the GSIDI encourages the government to hire a local advocate that will provide the leadership within country to build its NSDI. Accordingly, we are suggesting that the partnerships provide half of the salary necessary for such a position. The salary can be staged lower annually until the ministry assumes the total salary support. Alternatively, the entire salary might be provided in the first year, reducing the percent each year over 3 years until total salary support comes from the country.
- Sustainability is also encouraged by making modest amounts of money available for small grants to be given to ministries, agencies, bureaus, provinces, or others to encourage them in their efforts for building a clearinghouse, creating metadata, contributing to and working with national standards and/or related activities. The US Federal Geographic Data Committee (FGDC) uses small grants annually to encourage local, regional, state agencies, universities, and others to build components of the SDI within their respective jurisdictions. It has been very effective in promulgating the SDI concepts from the highest to the most local governments helping to build a more fully integrated infrastructure.

**User Training:**

A final component of capacity building deals with the use of SDIs rather than their generation. While building capacity to create and maintain the data is critical, it is not the GIS professionals that will be the primary users of the data. The true value of an SDI is in its ability to be exploited by a vast world of users that are largely untrained and unfamiliar with the possible applications of an infrastructure for spatial data. This is really where the process begins and ends. To ensure funding for SDI programs, Ministers of Health, Agriculture, Transportation, the Environment, Education, and Security, to name only a few, must support their creation. This will be facilitated by the generation of case studies, demonstrating the qualitative value, and the monetary returns on investment such systems can and have provided. In turn, experts from those fields need to be brought in for training on the basics of SDIs, and then on potential applications, directly related to their areas of responsibility, e.g., the use of GIS for relief operations in Central America following Hurricane Mitch. Only in this way will SDI operations become truly sustainable, and the capacity building cycle become complete.

**Closure:**

There is no right/wrong way to conduct capacity building. Each situation, nation, regional organisation, etc. has its own set of opportunities and challenges, and the program needs to be molded to fit. The critical component is to be able to sustain an NSDI. All too often, good programs have faded because no one was around to help the activity over a small bump.

The GSDI and other public/private partners are willing to collaborate on getting the SDI message out and help nations with their SDI development.