NEW INITIATIVES IN ISDI (ISRAELI NSDI)

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ABSTRACT:

The Israeli National Spatial Data Infrastructure is undergoing fast changes.
Most activities are led by the Survey of Israel (SOI) with reference to on-line services. These include an upgrade of the National Geo-portal to enable fast and user friendly web services to the public and to government offices. The new Israeli national Geo-portal has the ability to store user created content and maps. This ability may encourage small governmental agencies to use GIS technology for the management of their assets and operations. This Geo-portal provides a new set of tools for data sharing and integration among governmental agencies and the public.
Another activity with respect to the ISDI is a new project of developing a geodetic-topographic-cadastral on-line information sharing centre for professionals and an initiative for a national Land Information Centre, including information and data from all government and public organizations.
As part of its effort to improve the ISDI, the SOI is also leading an intensive revision of the national Geo-Spatial Database to meet the new requirements of location based services and technologies and the rapidly growing needs of governmental users. The revised spatial database was formatted according to the latest state-of-the-art database standards and is undergoing geometrical and thematic improvements.
An additional governmental initiative is to consolidate and regulate the data regarding the GIS activities in the government.
The paper will elaborate on the above mentioned activities.

1. INTRODUCTION

Governmental agencies and organizations all across the world are making great efforts to improve their Spatial Data Infrastructure (SDI) in local, national, regional and global level (Najar et al., 2007).This diverse range of activities created multiple definitions and different extents of SDI components.
One of the first definitions for National Spatial Data Infrastructure (NSDI) was given by the US Federal Geographic Data Committee as the "technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data" (FGDC, 1994).

A more recent definition was given by the Global Spatial Data infrastructure Association for SDI as "a basis for spatial data discovery, evaluation, and application" that includes the following elements:

- Geographic Data
- Metadata – information about data
- Framework – mechanisms to describe, update and share data
- Services – to help discover and interact with data
- Clearinghouse – tools to distribute data
- Standards – creation and acceptance
- Partnership – to reduce duplication and leverage national technology and skills
- Education and communication – exchange of ideas and knowledge (GSDI, 2006)

The European Community is making great efforts and are working on the implementation of the INSPIRE (Infrastructure for Spatial Information in Europe) Directive (INSPIRE 2010). A list of many other countries and organizations that are working on enhancing NSDIs is given in the Global Spatial Data Infrastructure Association (GSDI, 2010)

The Survey of Israel is the national mapping agency of the State of Israel and has a leading role in the development and maintenance of the Israeli Spatial Data Infrastructure (ISDI).
The ISDI goal is to consolidate governmental activities in collecting, maintaining, displaying and analyzing spatial data to support state activities and improve services to its citizens. Four key elements were identified in the ISDI, these are (Figure 1):

1. Common language is critical for the success of SDI and include the following items:
   - Uniform Reference Coordinate System
   - Metadata Standard and data search and discovery tools
   - Unique Spatial Identifier
   - Standards for spatial data terminology, formats and services (quality, transfer and sharing)
2. Core geospatial data layers
3. A national on-line geo-portal that displays the core geospatial data layers as well as thematic data from public organizations
4. Partnership, coordination and policies, developed for sharing spatial data, services, and knowledge

The following sections provide more details about the current stage of each ISDI element as well as some future plans for its development.

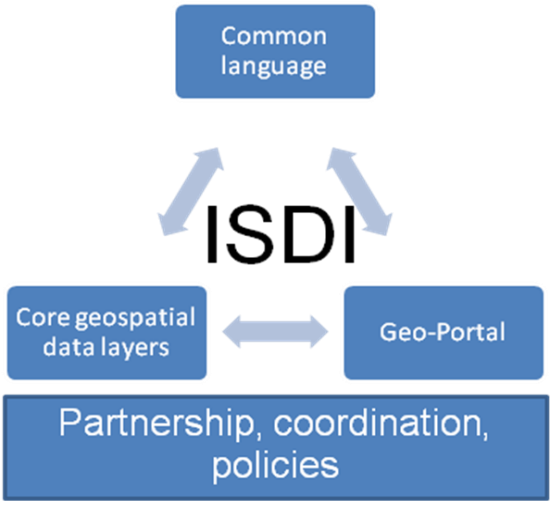

Figure 1: the four elements of the Israeli Spatial Data Infrastructure

2. COMMON LANGUAGE

Critical to the success of the development of SDI is common language which is used by organizations to share the standard terminology

2.1 Uniform Reference Coordinate System

National spatial data infrastructure relies on a strong geodetic infrastructure that provides a uniform and accurate reference coordinate system which is used by all the agencies in the country. The modern geodetic infrastructure in Israel (Israel Grid 2005 -IG05) consists of a four level network (See Figure 2 and refer to Srebro, 2009)

- Level 1: G0 – A network of 19 Active Permanent Stations. Real-time and post processing services are supplied to surveyors with no restrictions, using various models of payment either by subscription or per-use.
- Level 2: G1 – A network of 150 stable (down to 12m deep) control points constructed in cooperation with the Geological Survey of Israel, (GSI) used also for monitoring the geodynamic movements of the earth. These points are measured periodically (every 5 years since 1997) with reference to G0 stations.
- Level 3: G2 – A network of 1,500 control points measured with reference to G0 and G1 stations. These points were measured during the last years and serve actually as a three dimensional network. These points define the formal national geodetic reference system, and are of highest accuracy.
- Level 4: Thousands of control points measured by private surveyors and controlled and certified by the SOI. They are denoted as S1 and S2 points. These points will be considered at lower quality than the first three levels of geodetic points (G0, G1 and G2)..

2.2 Metadata

In 2009 Israel has adopted a modified version of the ISO 19115 Metadata standard. The modifications included the requirement for database field descriptions and the addition of more elements to limit the distribution of the data (censorship and classification). The work on the Israeli metadata standard was carried out by SOI and the metadata sub-committee of the inter-agency committee for GIS. Following the adoption, work has begun to develop software tools for metadata file creation and on-line program to enable efficient search and discovery of metadata information. The metadata software is integrated with the geo-portal to allow advanced search capabilities that utilize a graphical user interface. The software development is near completion and a beta site was already published for selected users.

In addition to the adoption of the standard and development of software tools, SOI and the inter-agency committee for GIS established the metadata team. The team tasks are: to promote the creation of metadata information within the governmental and public sectors, to educate and train the various organizations about the value of metadata and about the use of the software tools, to reduce duplications and inconsistencies in governmental data collection efforts, to perform quality control on the information in the metadata systems, and to manage the metadata system (see Figure 3).

SOI and the inter-agency committee for GIS seek to get further support for these activities from the government in the form of an official Israel government order to create a Metadata file in any spatial data transaction.

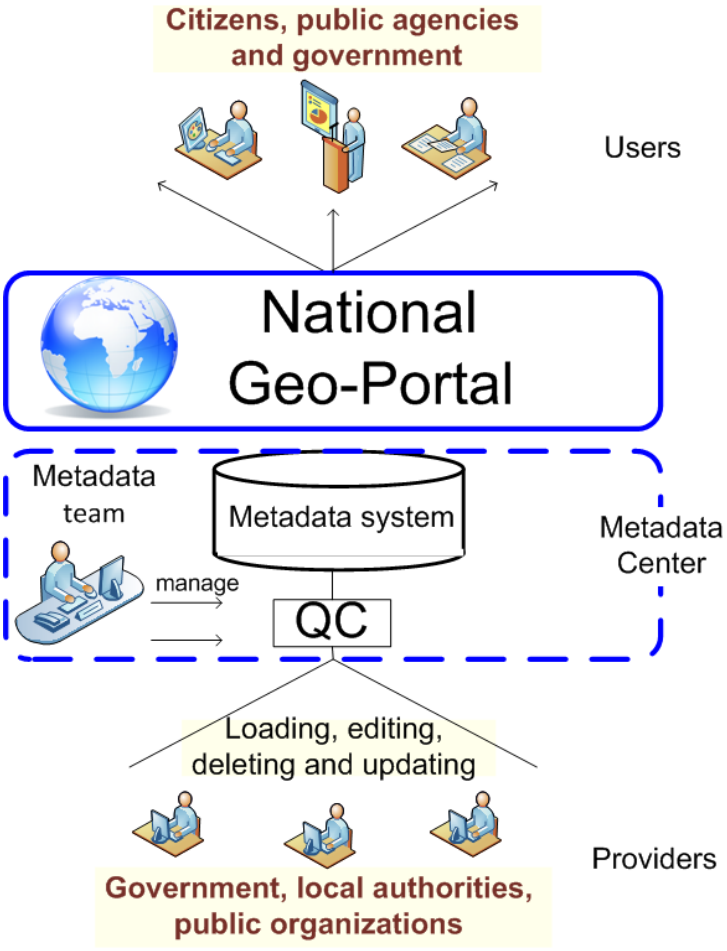

Figure 3: Functional schema of the metadata center

Figure 2: The first three levels of the Israeli geodetic infrastructure

2.3 Unique Spatial Identifier

The concept of a unique identifier for every record of information is inherent in the application of databases and was developed in the early days of relational databases where the term primary key was used (Codd, 1970).

The same concept of a primary key was used by SOI in the development of the Israeli NSDB during the early 90's and every record in the database got a unique primary key to identify it. Nevertheless, relying on the Database Management System (DBMS) identifier alone proved to be problematic both from a technical and a conceptual point of view. Technically, the DBMS unique key was unstable and changed with major initializations of the system. Moreover different spatial operations such as split or copy created duplications. These technical problems necessitate SOI to develop a stable and supervised method to create and maintain the uniqueness of a primary key termed as a Unique Spatial Identifier.

Conceptually, the goal of these efforts is to create a spatial identifier (SID) which will be recognized by all levels as a fundamental component for spatial data revision, integration, and analysis with the possibility of historical examination.

The technical details as well as some applications of the SID are described in Felus, Srebro and Tal (2010).

2.4 Standardization

Standards are important component of ISDI. The Technology and Standards team of the inter-agency committee for GIS performed a comprehensive study to analyze ISO/TC211 standards with respect to the needs and priorities of the State of Israel. The team has recommended that quality standards (i.e., ISO 19113 and ISO 19114) will be the first priority for adaptation in the next year.

While it seems essential for the team to develop or adopt a spatial data transfer standard, a survey of the different agencies showed that commercial standards such as the ESRI Shape file format are adequate and satisfy for the basic needs of the Israeli spatial data market.

The Technology and Standards team is analyzing and studying major developments within the government with respect to software and computational tools and so far all the new acquisitions have been of tools that comply with the OGC and ISO service and data interoperability standards.

3. CORE GEOSPATIAL DATA LAYERS

The Israel national spatial database (NSDB) was developed by the SOI in the early 1990s (Peled and Adler, 1993) and consists of the basic data layers defined as a national infrastructure. Ten layers are part of the NSDB as follows:

1. Geodetic Control
2. Transportation (Roads, Rail)
3. Buildings (structures and address)
4. Hydrography
5. Land cover
6. Elevation (hypsography)
7. Orthoimagery
8. Cadastral Information
9. Marine Information
10. Administrative boundaries

The first nine layers were created and are maintained by SOI. The layer of administrative boundaries was developed and

maintained jointly by the Ministry of Interior and SOI. Layers are exchange using commercial GIS software formats (e.g., shape files, geodatabases, dxf) following the recommendation of the inter-agency committee for GIS.

Recent development in technology and users needs necessitates major changes in the content and structure of the framework data layers. These changes include:

1. Change in the transportation datasets to meet the requirements of Geographic Data Files (GDF) standard, referred to as GDF version 4.0 (ISO 14825:2004).
2. Adjustments of the land cover data to meet international standards such as the Food and Agriculture Organization of the United Nations specifications (FAO, 2009 or the work of ISO/CD 19144-2).
3. Modifications of the database structured according to modern principles and latest computer format (ArcSDE geodatabases in ST-Geometry data type which is OGC/ISO 13249-3 compliant)
4. Changes in the Nautical Information to integrate it with the land based topographic layers.
5. New national orthophoto layer specification of a 0.25 meter resolution and higher accuracy.

These changes will make the NDSB better suited for modern applications and will make it a true framework data on which users can add or attach their own added value thematic data.

4. NATIONAL GEO-PORTAL

The Israeli National Geo-Portal was described in Srebro (2006, 2009). It is a national site that displays the framework along with 120 more layers of governmental data in a user-friendly environment. The Geo-portal has been upgraded recently and new capabilities were added to it including:

1. Support user generated content namely allow users to post and manage selected content within a personal zone
2. Function to interface with the geo-portal (APIs) and retrieve maps and services using international OGC compliant standards (WMS)
3. A simple wizard like user interface (see Figure 4)
4. Faster data retrieval and processing abilities (caching)
5. Support of mobile devices and cell phones
6. Advanced spatial querying tools and processing functions
7. Real –time link to public transportation data from the Ministry of Transportation

A new version of the Israeli geo-portal which is underdevelopment will include:

- Support for download of data following an approval process or purchasing
- Technological abilities for historical images and data analysis
- Support for seamless communication and geographic search and exploration of alpha-numeric governmental data as will be explained in the next section.

5. PARTNERSHIP, COORDINATION, AND POLICIES

5.1 Partnership and coordination through the inter-agency committee for GIS

For many years SOI has recognized the need to build relationship and partnership among organizations to support the continuing development of the ISDI. This has led to the establishment of the inter-agency committee for GIS in the 90's which was formed from delegates of 44 governmental and public agencies. The inter-agency committee for GIS is managed by the Director General of the SOI and is composed of six teams: the Coordination team, projects and data collection team, Emergency preparedness team, Metadata team, technologies and standards team, and data sharing team (see Figure 5)

The initial objectives of the committee were to promote the efficient use of Geographic Information Systems in the national level through data and knowledge sharing, standards working procedure development. Since 2005 the work of this committee started to be more intensive and was broadened also to include the development of a geo-portal and lately a GIS and IT integration team was formed to support the activities of the committee in this important field.
SOI with the Committee are now seeking to expand their partnership with additional public organizations (e.g. the Israel Postal Company) and most importantly with local authorities (e.g., cities, villages). These partnerships will broaden the spectrum of applications for the ISDI and strengthen it.

5.2 Strengthening IT and GIS integration

It is a well known fact that more than 80 percent of the governmental transactions are related to location. Nevertheless only a small fraction of the standard information systems and governmental databases are linked with GIS. While discussing the various venues of development of the ISDI it had became evident that there is a need for better integration of spatial databases and GIS with standard information systems and organization databases.
Craglia et al. (2008) noted that modern information systems will use geography to organize and index databases (with spatial reference) as well as computational tools to represent the data graphically.
Recognition of this important concept has instigated idea to develop a National Land Information Center (NLIC) which will combine information (with spatial reference) from different governmental agencies and present it in one on-line site.
The system will support decision making in all levels with respect to land transaction and development. It will enable data search across many platforms and databases using spatial queries and functions.
Figure 6 depicts the key information that will be integrated in the NLIC.

The first step of the NLIC is planned to be developed this year including a Topographic and Cadastre Information Center which will integrate all the data sources and databases of the Survey of Israel. This step is budgeted for this year as presented in Figure 7.

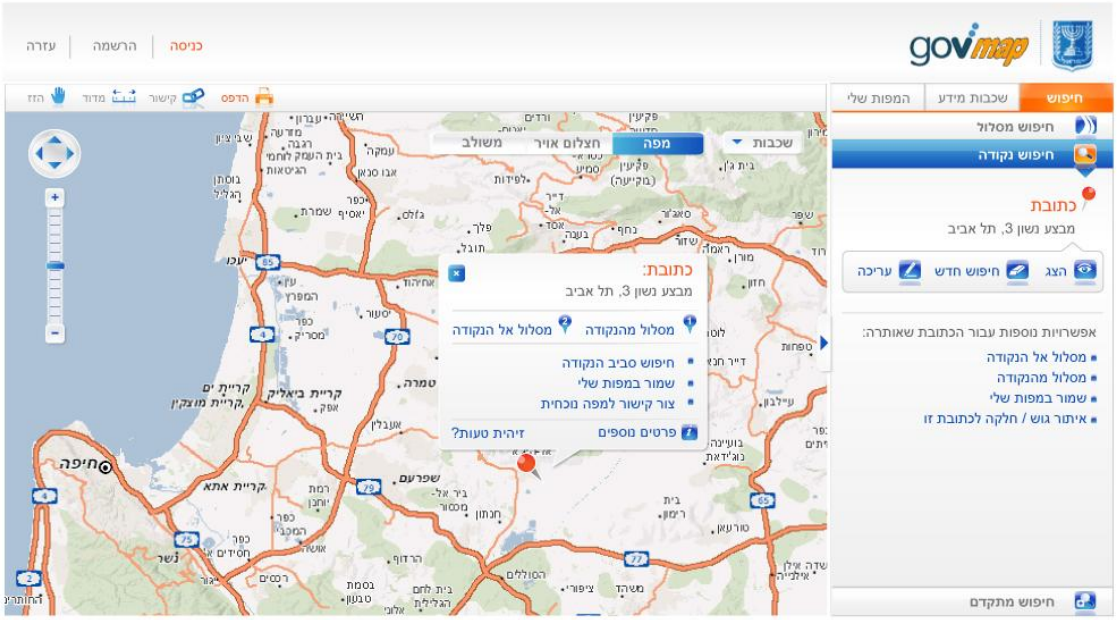

Figure 4: the new geo-portal user interface

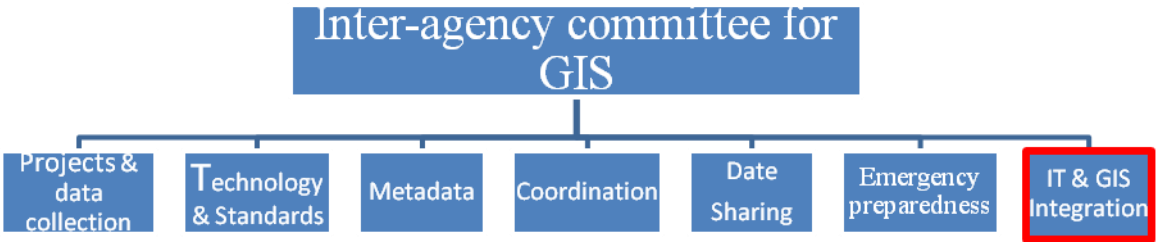

Figure 5: Organizational structure of the Israeli inter-agency committee for GIS with the new team for IT and GIS integration.

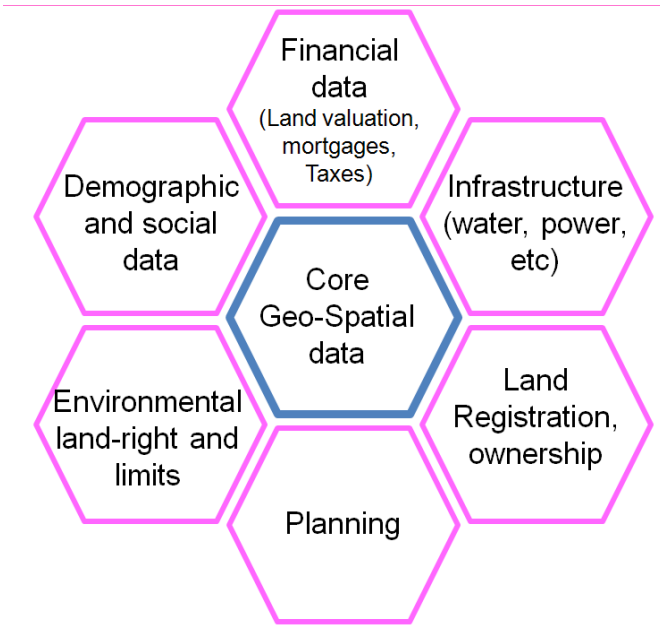

Figure 6: Information which will be integrated in the National Land Information Center

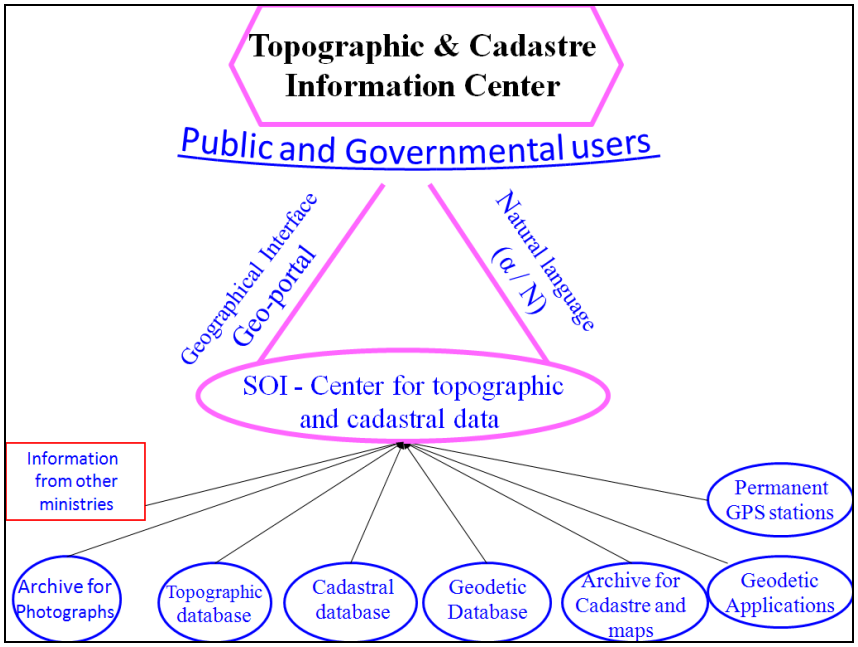

Figure 7: The first step in the development of the NLIC is the topographic and cadastre information center which will provide a complete e-access to SOI data

6. CONCLUSIONS

This article elaborates on the current activities regarding the Israeli Spatial Data Infrastructure. Two major achievements reflect the collaboration in the governmental geo-spatial community; these include the development of the geo-portal and the adaptation of the metadata standard. Additional activities promote data sharing within this community.
Further advancement in the ISDI depends on the success of three initiatives which are currently taken care of on the governmental level. One of these is the initiative of a creation of a National Land Information Center which will serve as a comprehensive portal for any kind of information related to land. A decision on this initiative should be taken by the government. Another initiative refers to free distribution of geospatial data in the government and strict regulation of geospatial data acquisition and management in the government. The third important step forward depends on the ability to integrate geospatial data in the IT environment and in the local government activities.

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