Spatial Data Infrastructure and INSPIRE

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Key Messages

- Sound public policy depends on high-quality information and informed public participation. There is a current explosion in the availability of geographic and spatial information, as well as the tools to use it for diverse public and private purposes. Measures are needed to reduce duplication of data collection and to promote the harmonization, dissemination, and use of spatial data.

- The private sector increasingly utilizes readily available spatial information to create new products by customizing the information, thereby adding value to the basic data at minimal cost.

- Spatial Data Infrastructure (SDI) is defined as a framework of policies, institutional arrangements, technologies, data, and people that enables the sharing and effective usage of geographic information by standardizing formats and protocols for access and interoperability. The goals of SDI are to (i) reduce duplication of efforts among governments, (ii) lower costs related to geographic information while making geographic data more accessible, (iii) increase the benefits of using available spatial data, and (iv) establish key partnerships between states, counties, cities, academia, and the private sector. SDI should be seen as part of wider e-Government initiatives.

What is INSPIRE?

Infrastructure for Spatial Information in the European Community (INSPIRE) is a European Union (EU) Directive that came into force on May 15, 2007, binding EU members to establish a spatial data infrastructure via the Internet that facilitates the sharing of geographic information in a standardized way. INSPIRE addresses technical and nontechnical issues, ranging from standards, organizational and procedural issues, and data policies, to the creation and maintenance of electronic services.

INSPIRE is a legal framework for developing SDI throughout the EU in order to facilitate interoperability, that is, the improvement and sharing of information across various levels of government in all EU countries (see box below). Multiple kinds of spatial data provided by different organizations are used simultaneously and joined as layers in various user applications. Making this information widely accessible enables many industries and public agencies to add value and reduce costs.

A national SDI (NSDI, and for EU candidate and member states, INSPIRE) is a foundation for producing, sharing, and consuming geospatial information, thus improving decision making and service delivery across many sectors. As all types of spatial data depend on the orthophoto maps created and maintained by the cadastre and mapping authorities, more capacity is required within the cadastre agencies.

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1This knowledge brief is part of a series on the land administration and management portfolio in ECA.
The World Bank can support its clients in creating SDI capacities and meeting requirements under INSPIRE by strengthening the IT components of the land administration projects as well as assisting in strategy development.

NSDI requires governments to:

- Designate appropriate structures and mechanisms for coordinating the contributions of all those with an interest in NSDI
- Actively form a national policy for data sharing within the nation, and develop practical tools for this goal (e.g., national geoportal)
- Monitor and report annually on the progress of the implementation to government, civil society, etc.

**Economic Benefits**

NSDI aims to create significant economic and public gains through consolidation of various types of spatial data. Studies in Australia have shown that its SDI has helped to generate a “spatial” industry worth $A 1.4 billion, which in turn generates $A 12.6 billion for the Australian GDP. Studies in the EU estimate that meeting the INSPIRE directive would benefit member states by more than €1 billion per year through efficiency gains alone.\(^2\)

ECA governments are strongly encouraged to understand and benefit from these possibilities. Information provided for easy Internet access will have a significant impact on transparency, service provision, and economic growth.

**Benefits to Citizens**

A number of spatial tools and services are being developed by the private sector based on spatial information provided by the public sector. For example, “Zillow” in the United States (see [http://www.zillow.com/](http://www.zillow.com/)) and “Zoopla” in the United Kingdom (see [http://www.zoopla.co.uk/](http://www.zoopla.co.uk/)) provide spatially enabled services that allow users to (i) identify properties for sale or rent that meet their specific requirements, (ii) obtain an estimated market value, and (iii) select and contact a range of professional and financial services to support their transaction.

![Figure 1](http://www.zoopla.co.uk/)

Source: [http://www.zoopla.co.uk/](http://www.zoopla.co.uk/)

As a public sector example, one of the most advanced and participatory e-planning portals is Denmark’s “Plansystem” ([see http://plansystemdk.dk](http://plansystemdk.dk)), which provides public access to all statutory land use plans, such as municipal and development plans, both adopted and proposed. Once the citizen has identified the development plan of interest, the system provides direct access to an electronic copy and can display and generate a list of all properties (cadastral parcel numbers) impacted by the plan. The e-planning portal also enables citizens to provide direct feedback on proposed development plans during the statutory eight-week consultation period and determine what planning constraints apply when preparing to build or extend their homes.

**Going Forward**

With the aim of improving the quality of services to citizens, ECA countries are requesting help in three key areas in the field of land administration and management:

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- **Improving services and reducing corruption through e-Government initiatives**: submitting forms online for automatic processing allows for greater transparency and access.
- **Developing the e-cadastre**: ECA countries may require technical assistance in uploading digital cadastre data.
- **Meeting the INSPIRE Directive’s terms**: examples of assistance include infrastructure, technical assistance, human capital, training, strategy development, etc.

SDI in ECA Countries

Several ECA countries have already begun the implementation of their own NSDI. Many are still in the inception phases, and the work completed is often part of larger government programs that involves other donors. However, SDI legal/regulatory base implementation has commenced in Croatia, FYR Macedonia, Moldova, Serbia, and Turkey, and has also been planned in Kosovo and Montenegro. SDI coordination mechanisms are established in Albania, Croatia, Moldova, Serbia, and Turkey, and planned in Montenegro, FYR Macedonia, and Kosovo. SDI strategies are developed in Serbia and Turkey, and planned in Croatia, FYR Macedonia, and Montenegro. Geoportals have been implemented in Croatia, Serbia, Montenegro, Turkey, and Moldova, and are planned in FYR Macedonia.

**Albania**: The Albanian Geoinformation Board, established in 2004, and the Military Geographic Institute started work on the development of a National Geographic Information System (NGIS) in collaboration with various ministries, municipalities, institutes, and organizations. Currently the Ministry of Innovation and ICT is responsible for the implementation of the Albanian SDI. The amended **Law on Geodesy and Cartography** defines the NGIS as a state register of standardized databases holding information about objects on and below the Earth’s surface in the whole country. It also defines their location as well as procedures and methods for systematic data collection, updating, processing, and accessing.

**Croatia**: The Government of Croatia has requested World Bank support to build an NSDI. The **Law on Cadastre** defines the NSDI in line with the EU INSPIRE Directive, and establishes three levels of SDI management structure: a council, NSDI committee, and several working groups. The State Geodetic Authority (SGA) (the national mapping authority) serves as the coordination body. The SGA geoportal has been implemented.

**FYR Macedonia**: The government of FYR Macedonia has also requested Bank support to develop an NSDI strategy and legal framework. The government is also seeking training to build capacity for NSDI implementation, and to develop and implement a government geoportal, both in compliance with INSPIRE. The **Law on Real Estate Cadastre** authorizes the National Cadastre Agency to establish and maintain public access to the NSDI.

**Moldova**: Moldova has initiated the establishment of its NSDI with the support of the Norwegian Mapping Authority. The project aims to support the development of e-Governance by providing access to reliable and up-to-date geographical information for governmental institutions at all levels, the private sector, and the public. Analysis of national needs for graphic data has been completed and an NSDI act is being developed to transpose INSPIRE into national law.

**Russia**: Russia is taking steps to create an SDI. The Russian Federation agency responsible for registration, cadastre, and mapping – Rosreestr – included an NSDI in its Information and Communication Technology Strategy for 2010–12, which is part of the Russian Federation e-Government strategy. NSDI implementation is progressing and the geoportal is operational with view and download services. Metadata have been developed and published, based on International Organization for Standardization (ISO) standards. The progress of Rosreestr in ICT development has been recognized nationally and internationally and Rosreestr has received several prestigious awards.

**Serbia**: The leading agency for creating an NSDI in Serbia is the Republic Geodetic Authority. NSDI implementation is supported by the Norwegian Mapping Authority. A good start has been made with changes in the **Law on State Survey and Cadastre**, setting up an NSDI, its content, and related bodies, as well as a national geoportal. The government has developed and approved the Spatial Data Infrastructure Strategy of Serbia 2010-2012, and a proposal for transformation to the European Terrestrial Reference System 1989 (ETRS89) has also been developed. The work on the initial geoportal and the metadata is underway. An NSDI council has been established, as well as several working groups. The national cadastre agency is the NSDI coordination body.

**Turkey**: The responsible institution for NSDI implementation in Turkey is the National Mapping Authority. Two studies on the establishment of an NSDI, emphasizing core data, technical standards, metadata services, and institutional and legal frameworks, were completed, and an NSDI strategy prepared. The development of standards for geographic data, and a nationwide geographic information infrastructure to enable public institutions and organizations to supply that data to the common infrastructure, are underway.
New Western Balkans Regional SDI Project: A regional SDI project proposal has been prepared by the cadastre authorities of Albania, Bosnia and Herzegovina, Croatia, Kosovo, FYR Macedonia, Montenegro, and Serbia, and has been approved for financing by the European Commission (EC) under the 2011 Instrument for Pre-Accession Assistance (IPA) Multi-Beneficiary Programme. The project is to increase institutional capacities for SDI development in the countries involved (in accordance with the INSPIRE guidelines and other EU legislation), specifically focusing on capacity to collect, process, exchange, and create available spatial data, thus better preparing these countries for EU membership.

Key Recommendations

- **Coordination at all levels.** The political level is of key importance, as it must provide the priorities and direction, and make the financial commitment. Collaboration with the private sector is also crucial.
- **Sufficient ICT systems, infrastructure, and human capacity.** For the implementation of an NSDI, not only adequate infrastructure and ICT systems are needed, but also suitable institutional and human capacity.
- **Good data availability and quality.** Creation of digital data in various strategic sectors and data conversion where digital data does not exist are key factors for success. Geodetic networks and coordinate systems should be open for public and private use. National standards for digital data can ensure data quality.
- **Financial sustainability.** The coordination can work only if the necessary financial resources are available.
- **Payment policy.** The main principal is that the spatial data needed for good governance should be available under conditions that do not restrict its extensive use. However, government authorities or private surveyors in some countries have to provide their data via self-financing.

Conclusions

Spatial Data Infrastructure (SDI) plays a key role in avoiding unnecessary duplication of data collection and assisting and promoting the harmonization, dissemination, and use of data. SDI improves quality, reduces costs, makes geographic data more accessible, and establishes partnerships between key entities, thereby increasing data availability.

No two NSDIs are identical anywhere in the world. It is important that each country develop its own strategy at the national level, studying experiences of countries with an advanced NSDI. For the creation of an NSDI, four conditions are important from an organizational perspective: leadership, vision, communication channels, and coordination.

- In order to implement NSDI, the institution/authority responsible for adopting standards and monitoring institutions needs to be established. The first task of the committee will be to develop an NSDI strategy.
- In order for online services to work satisfactorily for multiple users simultaneously, accepted IT and Web standards need to be followed. To this end, there are a series of ISO standards focused on different components of the SDI infrastructure.
- Harmonization of technical solutions, exchange formats, and data content is important, as is the need to stimulate national organizations to develop commonly agreed and durable data models and classification systems.
- Achieving interoperability of data within a theme, between themes, for different applications, and at different resolutions will require basic transformation services to be in place, including coordinate transformations, generalization, and edge-matching.

The EU’s INSPIRE Directive for establishing European SDI is a unique example of a legislative, “regional” approach to developing an SDI. In a time when data are abundant, better data organization and data harmonization are needed. SDI plays a key role in this process, focusing on actions that promote interoperability and make data available when it is most needed.

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