



Land Governance in an Interconnected World

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The legal component, one of the key segments for NSDI development in Republic of Macedonia

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1. Introduction

According with the legal regulation of Republic of Macedonia, the national spatial data infrastructure (NSDI) is establishing technological, legal and administrative framework for inter-institutional cooperation, which supports the initiatives for e-government and enables the integration of the spatial data from different sources into one network.

The most important element for the development of the NSDI law is the NSDI strategy, which was developed before several years. It comprised 7 components: Define Strategic Mission and Vision, Build Business Case, Define Governance Structures, Legal Framework, Interoperability Infrastructure, Outreach and Capacity Building and NSDI Implementation Roadmap. In our case, the key component for real NSDI development is the legal, because in its framework was developed a draft version of the NSDI law. Macedonian government adopted the strategy in 2012 and established a working group for finalization of the text on NSDI law, which is good base with defined framework. NSDI law of Republic of Macedonia was adopted by parliament in 2014 (<http://nipp.katastar.gov.mk/geoportalCms/wp-content/uploads/2014/09/law-on-NSDI-eng.pdf>).

The Law of the NSDI enables the creation of a legal framework to define the sources of spatial data and access, metadata and services and to define conditions and methods of use and access to data and services. At the same time the law provides for setting up of the administrative unit and technical support of the NSDI within AREC. Also in accordance with Article 29 the Agency for Real Estate Cadastre (AREC) is responsible for establishing, maintaining and providing public access to the NSDI geo-portal, maintenance of metadata services, a registry of metadata and associated trainings. The NSDI law is prepared according to INSPIRE directive 2007/2/EC (<https://inspire.ec.europa.eu/documents/directive-20072ec-european-parliament-and-council-14-march-2007-establishing>).

Adoption of the NSDI law created legal premise for formal implementation of the national spatial data infrastructure in compliance with INSPIRE.

2. NSDI law

The Law on the National Spatial Data Infrastructure adopted by Parliament in February 2014 (Official Gazette of RM no. 38 of 24.02.2014 year) regulates the establishment, organizational structure, maintenance and management of the

National Spatial Data Infrastructure of Republic of Macedonia, as well as services relating to spatial and non spatial data.

The Law of the NSDI enables the creation of a legal framework to define the sources of spatial data and access, metadata and services and to define conditions and methods of use and access to data and services. At the same time the law provides for setting up of the administrative unit and technical support of the NSDI within AREC. Furthermore, under the law AREC acquired the authority for establishing, maintaining and providing public access to the national NSDI geo-portal, maintenance of the service metadata, maintaining the register of metadata and training associated with them.

Thus established legal framework supports initiatives for e-government and creates a unique platform which enables the provision of electronic commercial services for the spatial data over the Internet. In June 2016 the NSDI Law was amended in order the NSDI to incorporate additional two new entities Geological Institute of Republic of Macedonia and the Macedonian Chamber of Commerce. According to the conducted monitoring for 2015, the level of transposition of the mandatory provisions of the European INSPIRE directive in our national jurisdiction - Law of NSDI is 72%. Into the Law of NSDI, are not transposed following articles from the INSPIRE directive:

- Articles 5.2 and 5.4 for metadata,
- Articles 7.1, 7.3, 7.4 and 7.5 for interoperability of spatial data and services and
- For network servicesArticles 11.2 and 11.3.

In order to increase level of compatibility with INSPIRE directive, stipulated articles will be implemented in bylaws which are in this moment on faze of preparation.

This basic legal framework enable:

- Create equal rules relating to the exchange, sharing access to and use of spatial data and services;
- Establish technical interoperability and institutional cooperation;
- Create essential principles and tenets related to metadata of spatial data sets and services through the establishment of standards for metadata (metadata editor);
- Create a clear organizational framework that defines the competent authorities to implement the NSDI and
- Establish a principle of access of spatial data and authorisation to those spatial data that are protected for security reasons, for reasons of national defence or international relations, established by law.

One of the legal documents which enable exchange of data and services is data shearing agreement. Within the working group of institutional and legal issues and capacity building, a draft agreement for the exchange of data sets and services between the entities in the NSDI was made, which is accepted by the NSDI Council and is signed by seven entities in NSDI.

The Agreement in Macedonian language is published and publicly available on the national geo-portal at the following link:

<http://nipp.katastar.gov.mk/geoportalCms/wpcontent/uploads/2016/02/Dogovor-za-razmena-na-prostorni-podatoci.pdf>.

This standardized agreement for data exchange that will be used by public sector institutions, is composed in order to encourage the efficient collection, processing, exchange and sharing of spatial data. This Agreement is made in a way that enables:

- ✓ Sharing of spatial data and services between parties that have signed the agreement - under protected conditions – to all other participants;
- ✓ Participants to gain the same rights in terms of other participants;
- ✓ Publication of each signed contract on the website of the NSDI in order to inform other participants and
- ✓ Fully taken into account - in adjusted terms - the provisions of the INSPIRE Directive and the implementing rules regarding the application of the Directive on access to spatial data sets and services of the Member States, for the institutions and bodies of the EU.

3. NSDI governance structure

The NSDI law defined the NSDI Governance and NSDI institutional framework. Pursuant to the provisions of the Act, the Governance structure, bodies of NSDI are: four working groups, the NSDI Committee and the NSDI Council. The structure has a pyramidal form with the four working groups on the operational level, and on the top the President of the NSDI Council.

NSDI working groups provide an advisory role, contributing research and expert knowledge, providing advice and recommendation to support the NSDI Council and Committee in their work. In order to make different SDI documents, the working groups are positioned on the operational level. According to the Law on the NSDI four working groups have been formed:

- Working group of institutional and legal issues and capacity building (organization and coordination, legislation, licensing, data sharing, partnerships) established by the NSDI Council with decision number 09-9607 / 1 from 16.06.2015.
- Working group on technological issues (standards, metadata, interoperability, services, information technology, network architecture, application), established by the Council of the NSDI with decision number 09-9608 / 1 of 6.16.2015
- Working group on economic Affairs (development business model, funding options, partnerships, financial sustainability), established by the NSDI Council with decision number 09 -9609 / 1 of 6.15.2015, and
- Working group for public relations and communications (communication between stakeholders, networking, best practice,

capacity building, training and development), established by the NSDI Council with decision number 09-9611 / 1 from 15.06.2015.

The decisions that have established the working groups in addition to the standard provisions contain provisions which stipulate working duties or obligations for each working group individually. In June 2015 the Rules of procedure of the working groups have been approved.

The NSDI Committee is formed after the formation of working groups. According to the law its members are the presidents of the Working Groups and one representative from AREC. The committee meets at least once a month and during the meetings the topics submitted by the Working Groups are discussed, and the topics for the meetings of the NSDI Council. Chairman of the Committee for NSDI is a member of the Council for NSDI.

The NSDI Council which is chaired by the Deputy Prime Minister of the RM is responsible for the economic issues and was established by decision of RM no. 42-3518 / 1 from 23.09.2014 year. In the NSDI council participate representatives from the 20 institutions-NSDI members. The chairman of the NSDI council according to the law is vice president from Macedonian government responsible for economical issued.

According to the Rules of procedure they meet at least twice a year. As of 2015, the NSDI Council has held three regular meetings and reviewed current activities and drawn conclusions.

The results from the work of the governance structure are satisfactory and positive. Specifically noted is the excellent cooperation with the president of the Council and its cabinet, which although having other responsibilities is always present and leads meetings of the NSDI Council. Each session of the NSDI Council is covered by media, so the society has detailed information on the most important activities that are discussed and concluded by the NSDI Council.

Regarding the established management structure, and taking into account that it works well in the current way of working, we do not propose substantial changes to it. Only because of the increasing interest from other entities in the NSDI Council, it is recommended finding a legal solution that would allow without amendments to expand the membership in the Council of the NSDI.

4. National geo-portal

The NSDI creates conditions for raising the level of technical interoperability between institutions and development of e-services for distribution of geospatial data which results in better planning and decision making for the national and public institutions and users. According to the legal provisions (article 29 - NSDI Competences of the Agency for Real Estate Cadastre), AREC is the institution responsible for establishing, maintaining and providing public access to the Geoportal of the NSDI, and is also the national coordinator of activities related to the NSDI. Quality and accuracy of the data is responsibility of the NSDI members which published them.

During 2014 and 2015, AREC developed a software solution for the establishment of a national geo-portal, whose implementation has been finalized in May 2015. Data and services that are published on the national geo-portal can be searched, browsed and downloaded by the users.

The National Geo-portal is functioning as a shared web platform on which members of the NSDI can create and publish metadata for their spatial data and their Web services. The geo-portal as a modern web solution enables publishing, searching and using of geo-spatial data from the NSDI members: 17 Government institutions, the City of Skopje, Macedonian Chamber of Commerce and the Association of Macedonian Chambers of Commerce. The NSDI members may establish and maintain their own geo-portals, but the national geo-portal has been able to collect (harvest) all records of metadata in order to function as a central geo-portal (<http://nipp.katastar.gov.mk/>).

4.1. Spatial data and services

Spatial data and services are the essence of the national geo-portal. The themes of the collections of spatial data that are part of the NSDI are defined in Article 5 of the Law of NSDI, while services related to them - network services are defined in Article 9. Access to data and services are provided through a national geo-portal. Information published on the Geoportal NSDI should have high quality and should be maintained and updated when needed. For the spatial data under the jurisdiction of two or more data providers of the NSDI, joint action and harmonization of data will need to be undertaken according to the INSPIRE Directive. The NSDI entities should assign responsibility for each topic of the collections of the spatial data.

Published data on the national geo-portal is interoperable from a technical, semantical and business perspective. A significant factor that will affect their use is the quality of the data. This means precision, accuracy, spatial, semantic and temporal consistency and resolution, distribution, format, method of keeping and maintaining the degree of quality control etc.

Spatial data and services that are published on the Geoportal NSDI are listed in the section on national geo-portal.

The Macedonian NSDI will indirectly affect the quality of the data. It will result in continuous improvement of their quality and interoperability to meet the 'fit for purpose', which will lead to greater sharing and frequent use of the data.

It is essential that all spatial data sets and services in Macedonia are shown in the right location - a defined state coordinate reference system and mapping projection, so the combined data sets will be adequately adjusted and interoperable. To achieve interoperability between the datasets, information on these parameters should be accurately included in the metadata for data. The Coordinate reference system used in Macedonia is registered in the database of EPSG, and is identified by EPSG code 6316.

Using this Coordinate reference system is formalized and the parameters for the definition of the coordinate reference system are available at the following link <http://www.epsg-registry.org/export.htm?wkt=urn:ogc:def:crs:EPSG::6316>.

For efficient operation of the Macedonian SDI, NSDI members are required during the development of the spatial data sets and services to use the coordinate reference system EPSG 6316 and its defined parameters.

AREC has published data on the national geo-portal that are produced according to national and INSPIRE standards including:

- State border,
- Border of Local Self-Government,

- Border settlements,
- Digital terrain model,
- Geographical names and
- Hydrographic network.

For those datasets Web services are available to search, preview and download. To download the data, a tariff of the data provider of the NSDI has to be paid and this is realized through e-payment.

Besides AREC, also other data and services have been published on the national geoportal:

- The Ministry of Environment and Physical Planning: information/data on national parks,
- State Statistic Office: data for statistical regions and age structure of the population by statistical regions and
- The Center for crisis management: map with dryness of the forest, map index of fires and data endpoints for wildfire.

The National geoportal is working on the policy of "linked data". This concept is based on the use of identifiers, standardized and defined as an array of characters. It identifies an abstract or physical resource.

The institutions (NSDI members) that publish data on the national geo-portal, as principles to be used in the preparation, maintenance / updating and publication of data are recommended:

- Data to be suitable for the purpose for which it was made,
- Data to be collected once, and allow their multiple use,
- The data is updated, according to prescribed norms,
- The data to be standardized,
- Data is geo-referenced in the state coordinate reference system EPSG 6316,
- Data is easy to find and metadata for them are published,
- Clear conditions for use of the data which are stated into metadata and
- Data to comply with European standards - INSPIRE Directive.

Applying the above principles combined to the application of new technologies (Spatial databases-DB, GIS software, automation of processes, etc.) will lead to the preparation of updated geospatial data through the national geo-portal that will be available to all users at all times.

Once data is updated also the metadata should be updated to be consistent with the new data set.

Data providers of the NSDI national geo-portal will publish the latest versions of the spatial data that they have available. It is planned that the number of published collections of spatial data should increase by two collections a year.

The above principles will ensure the continuity of the maintenance of the data of the geo-portal, which will have benefits for the whole of society, especially in case of emergencies such as the natural disasters where the diligence of data is crucial.

In order to support the development of the NSDI a short questionnaire was sent to all NSDI members, to make an inventory prior to be able to assess the different

knowledge capacity on SDI. Not every member returned in the questionnaire, but from 10 stakeholders we received their response. Resultants of the questionnaire are presented on the next table.

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	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro	beginner Advanced Pro															
Data collection and preparation	✓	✓	✓	y	✓	✓	✓	✓		✓				4	4	2														
Metadata creation	✓	✓	✓		✓	✓	✓	✓	✓		✓			7	1	1														
Knowledge of spatial standards	✓	✓	✓		✓	✓	✓	✓		✓				5	4	0														
Web and map server experience	✓	✓	✓		✓	✓	✓	✓			✓			6	2	0														
Database Management	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓		3	3	3														
Spatial data visualisations (digital maps)	✓	✓	✓		✓	✓	✓	✓			✓			2	5	1														
Data transformation (ETL)	✓	y	✓	✓	✓	✓	✓	✓		✓				6	3	0														
Testing & monitoring (quality of services)	✓	✓	✓	✓	✓	✓	✓	✓		✓				6	2	0														
	3	4	2	0	8	0	7	1	1	3	5	0	7	1	0	4	4	0	7	0	1	4	0	0	4	1	3	39	24	7

4.2. Metadata

For creating metadata in the national geo-portal a metadata editor is implemented that is compatible with the national profile of metadata. The Editor is available for all stakeholders in the NSDI and they can create metadata for their data and services in Macedonian and English language (<http://nipp.katastar.gov.mk/geoportal/catalog/main/home.page>).

Metadata on the geo-portal is created according to the following principles:

1. Metadata is generated according to the ISO/INSPIRE standards using the national metadata profile,
2. Metadata are published in the metadata catalogue to which users may have access and the Catalogue enables users to find, evaluate and how to access the dataset or service,
3. All members of the NSDI must create metadata for spatial data sets and services in their jurisdiction, and make sure that metadata is up to date,
4. NSDI data providers have two ways of publishing metadata on the national geo-portal:
 - Setting records of metadata in the central catalogue of metadata deployed on the national geo-portal and
 - Publishing of metadata in their local service for discovery data and services (local catalogue) which was often observed in central service detection of the Macedonian national geo-portal, and placed them on the national geo-portal through the protocol for harvesting.

Metadata on the national geo-portal can offer users:

- To discover/find the spatial data sets and services,
- To determine whether the collection of spatial data can be used, for what purpose, and to determine which restrictions apply,
- To determine how to gain access to the collection of spatial data or services,
- To sufficiently understand the essence of the collection of spatial data, and decide whether it is suitable for the purpose and
- To detect the quality of the spatial data collection.

4.3. Registers

The NSDI geo-portal includes a series of items that require clear functional descriptions and the ability to call via unique identifiers, such as the topics of spatial data, coding sheets, application schemes or search services. The register would provide means for assignment of a unique identifier for the items, their labels, definitions and descriptions (in different languages). On the national geo-portal five registers are established:

- INSPIRE dictionary,
- INSPIRE dictionary functional concept,
- Register of NSDI members,
- Register of coordinate systems and
- Register of datasets.

The registers of all interested parties are available on the national geo-portal at the following link:

(<http://nipp.katastar.gov.mk/geoportal/catalog/registries/registries.page>)

5. Conclusion

Unlike a few years ago when Macedonia started implementing the NSDI from scratch, numerous initiatives have already been implemented and visible as part of the mosaic called NSDI in the period 2012-2017. Looking back, we proudly point out the successful implementation of the most important steps in the establishment of the NSDI like:

- adopted Law on National Spatial Data Infrastructure of the Republic of Macedonia,
- established governance structure-bodies of the NSDI and
- Established national NSDI geo-portal.

Taking into account the above, Republic of Macedonia joined the countries around the world that recognize the importance of spatial location or spatial data (geographical information). NSDI members expect that the established NSDI will

monitor the confirmed favorable economic and social effects in countries where it already operates to achieve the ratio between costs and benefits of 1:4 in the forthcoming period. However, is importantly the NSDI allows:

- Better quality decision-making and spatial planning as well as implementation of policies related to spatial data,
- Further development of web services for institutions, professional users and citizens,
- Data and services for rapid response in case of emergencies and
- Proactive regional cooperation and joining the pan-European SDI's that are developed as part of the INSPIRE initiative of the European Union.

6. References

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[4] Law for NSDI of Republic of Macedonia, Official Gazette of R.M no. 38/2014 and 106/16, (<http://nipp.katastar.gov.mk/geoportalCms/wp-content/uploads/2014/09/law-on-NSDI-eng.pdf>);

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