

# Aspect of preliminary activities in the function of supporting NSDI

Sonja DIMOVA, Republic of Macedonia

**Key words:** e-Governance, geospatial data, NSDI, INSPIRE, metadata

## SUMMARY

The successful establishment of the NSDI in the true sense of the word cannot be performed without an adequate strategy, which is the centerfold and represents a type of document i.e. plan specifying the actions to be undertaken in order to achieve the set objectives.

The article elaborates the preliminary activities which were undertaken in the Agency for Real Estate Cadastre (AREC) during 2010 with the objective to enable precise definition of the tasks to be executed during the production of the NSDI strategy and the model of geo-spatial data and standards for AREC. The activities at the beginning were aimed at analyzing the current situation in order to gain different perspectives and to secure enough data which are required for real description of the scope of the NSDI strategy. It is expected that the results from these activities will contribute to the creation of a high-quality strategy which will be synchronized with the European standards and the EU INSPIRE directive (No.2007/2/EC), but still adapted to the national conditions and types of geo-spatial data.

The production of the strategy will contribute also in the raising of the public awareness for the NSDI, the homogenization and the standardization of the inconsistent geospatial information, better coordination during the share of the geo-information within the e-government, fast and simple access to data through the implementation of a governmental NSDI Geo-Portal and use of the data sets for multiple purposes, which will significantly impact the economic development.

# Aspect of preliminary activities in the function of supporting NSDI

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## 1. INTRODUCTION

The Agency for Real Estate Cadastre (AREC) is a independent government institution established for performance of works in service of the establishment and maintenance of the real estate cadastre, management of geodetic cadastre information system as well as for establishment, maintenance and public access to the national spatial data infrastructure NSDI (Law on Real Estate Cadastre 2008). Having in mind the recognizably, the value and the importance of the geospatial information which lay in the basis for the decision making process in the area of the politics, spatial planning, research and implementation and analysis of various projects on national and local level, the need for coordination of the activities related to them is becoming more and more important. Our country has placed a high priority on the integration in the European Union through adoption of the European directives including the INSPIRE directive for establishment of infrastructure of spatial data, so in that sense it would require transposition of the European and national legislative. The Figure 1 is showing the position of the NSDI strategy and the model of spatial data and standards for AREC in Republic of Macedonia.

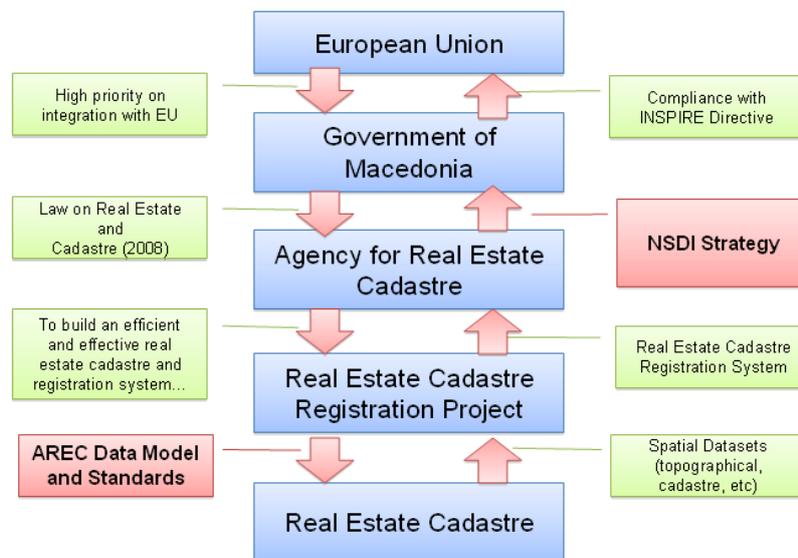


Figure 1. Positioning of the NSDI strategy and the spatial data model and standards for AREC

In a direction to support the production of a NSDI strategy and with the objective to better define the scope of the strategy, AREC has approached towards executing the first step, directed towards analysis of the current situation.

## 2. ANALYSIS OF THE CURRENT SITUATION

In order to identify the actual situation in the spatial data infrastructure on a national level, AREC initiated an analysis of the current situation. The analysis included three segments:

- review of the current documents and data in correlation with the NSDI such as legal legislative and the strategic plan;
- consultations with the key stakeholders; and
- review of the results from the NSDI workshops held during 2010

The results that will arise from the analysis will represent a real indicator in which direction the further activities are supposed to be executed, in service of the quantitative and qualitative definition of the terms of reference for the NSDI strategy and the model of geospatial data and standards for AREC (Figure 2).

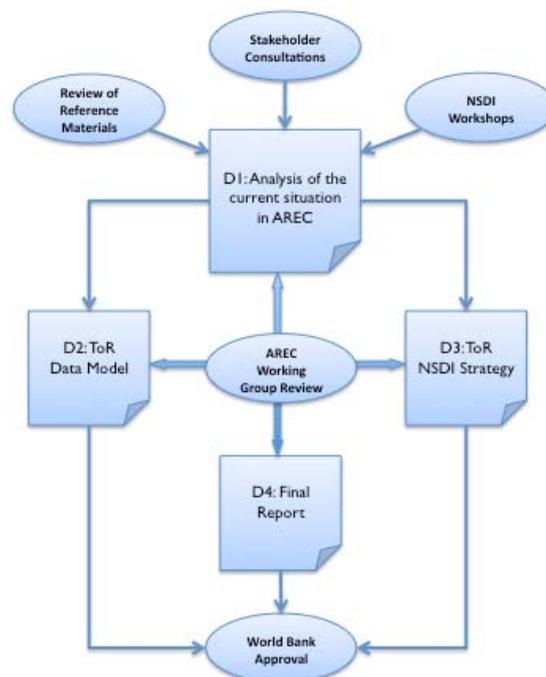


Figure 2. Layout of activities

### 2.1. Review of current documents and data

The first segment of the analysis was aimed towards identifying and review of the legal documents and the sets of geospatial data in correlation with the NSDI.

#### 2.1.1 Review of the current documents

The review of the legal documents related to the NSDI was a research of the two basic documents: the legal framework i.e. the Law on Real Estate Cadastre from 2008 and the AREC Strategic Plan for the period 2009-2013.

The Law defines the scope of the NSDI and it refers to the establishment of:

- content of the metadata,
- sets of spatial data,
- maintenance of spatial data,
- networking technology,
- contracts for share, access to and use of spatial data,
- coordination and Supervision mechanisms, and
- procedures.

In couple of articles from the chapter on NSDI are included the types of data out of which the NSDI will be created, so in sense of the stated, the NSDI will be comprised of spatial data which are administered in electronic form and refer to the entire territory of Macedonia and are under the authorization of:

- bodies of the state administration,
- the local self-government units,
- public enterprises,
- natural persons and legal entities entrusted with the management of spatial data by the authorized bodies, and
- natural persons and legal entities using the data and the services from the NSDI and provide services based on the spatial data.

Part of the NSDI will be the spatial geo-referenced data which refer to (Law on Real estate cadastre, 2008) :

- the Real Estate Cadastre,
- hydrography,
- traffic roads,
- protected zones, national parks and cultural-historic monuments,
- spatial planning,
- protection of the environment,
- geo-referenced statistics data, and
- other.

The finding, the viewing and the use of the spatial data will be enabled by the metadata which will comprise data for:

- spatial data (content description),
- synchronization of the data with the prescribed standards and normative,
- rules for use of data and services which result from them,
- data quality,
- bodies of state administration, local self-government units, public enterprises, state institutions, people responsible for establishment, maintenance, distribution and management of spatial data, and
- data for which the access is limited and the reasons for the limitation.

Besides the presented provisions from the Law on Real Estate Cadastre which regulate the content of the NSDI and the metadata, the Law also stipulates an obligation of AREC to

establish and maintain the public access to metadata on the internet via Geo-Portal, in a way that will enable the NSDI participants to interactively maintain the data. Considering the previously mentioned and in order to improve the legislative in terms of NSDI, it will be required to supplement the Law with new articles which will define and specify the working bodies of the NSDI (the council and the members), their authorizations, the services and the networking.

In the second reviewed document – the Strategic Plan of the AREC for the period 2009-2013, there is a specific program with defined activities which will be included in the NSDI, which also represent the initiative of AREC to start with the activities in the area of the NSDI.

On the basis of the reviewed documents, one can draw the conclusion that AREC is legally authorized institution for the establishment of the NSDI and the undertaken activities by AREC will have a positive impact and a contribution towards the development of the NSDI in the Republic of Macedonia.

### 2.1.2 Overview of the data sets

For the purpose of identification of the key institutions as well as their data sets which are to be an integral part of the NSDI strategy, AREC initiated a review of the three annexes of the INSPIRE directive, produced during one of the held workshops. The largest part of the data stated in the annexes, especially in the first two annexes are under the authority of AREC, so consequently these data sets had the most of the attention.

For the purpose of collecting, processing, maintaining, use and distribution of the geo-spatial data in AREC, a Geodetic-Cadastral Information System (GCIS) has been established (Law on Real Estate Cadastre 2008). This system comprises the spatial and descriptive data from the real estate cadastre, the basic geodetic works, the real property survey, the topographic maps, the data for illegally built objects and temporary objects. The data from the GCIS by its nature will have a leading role in the establishment of the NSDI and are comprised of the following sets:

- Reference geodetic infrastructure
- Real Estate Cadastre
- Topographic maps, and
- Spatial Units Registry.

Each of the stated sets has its own specific qualitative and quantitative attributes.

In compliance with the legislative, the data sets in the GCIS are administered in paper/analogue and electronic form. The data in electronic form are kept in special computer systems while the data in paper form are kept in special facilities and under specific conditions for the purpose of their permanent protection.

During the definition of the scope of the activities which will be included in the NSDI strategy, one should also consider the attributes of the GCIS data sets with the objective for the same to be standardized and harmonized.

### 2.1.2.1 Reference geodetic infrastructure

The reference geodetic infrastructure represents the reference basis (the geodetic points), which is being used during the production of all types of graphic layouts i.e. maps. The information on the geodetic datum and the state cartographic projection are shown in Table 1.

*Table 1: State geodetic datum and cartographic projection*

<i>Element</i>	<i>Characteristics</i>
<i>Horizontal datum</i>	Hermannskogel
<i>Ellipsoid</i>	Bessel 1841
<i>Cartographic projection</i>	Gauss-Krüger projection
<i>Coordinate system</i>	Y- axis, projection of the equator, X-axis, projection of the meridian $\lambda = 21^\circ$
<i>Vertical datum</i>	Ortometric heights in relation to the mareograph in Trst
<i>Realization</i>	Trigonometric network and leveling network

This set includes the data referring to: GNSS passive and active network, the classic geodetic networks (trigonometric, polygon and leveling) and the gravimetric network.

### 2.1.2.2 Real Estate Cadastre

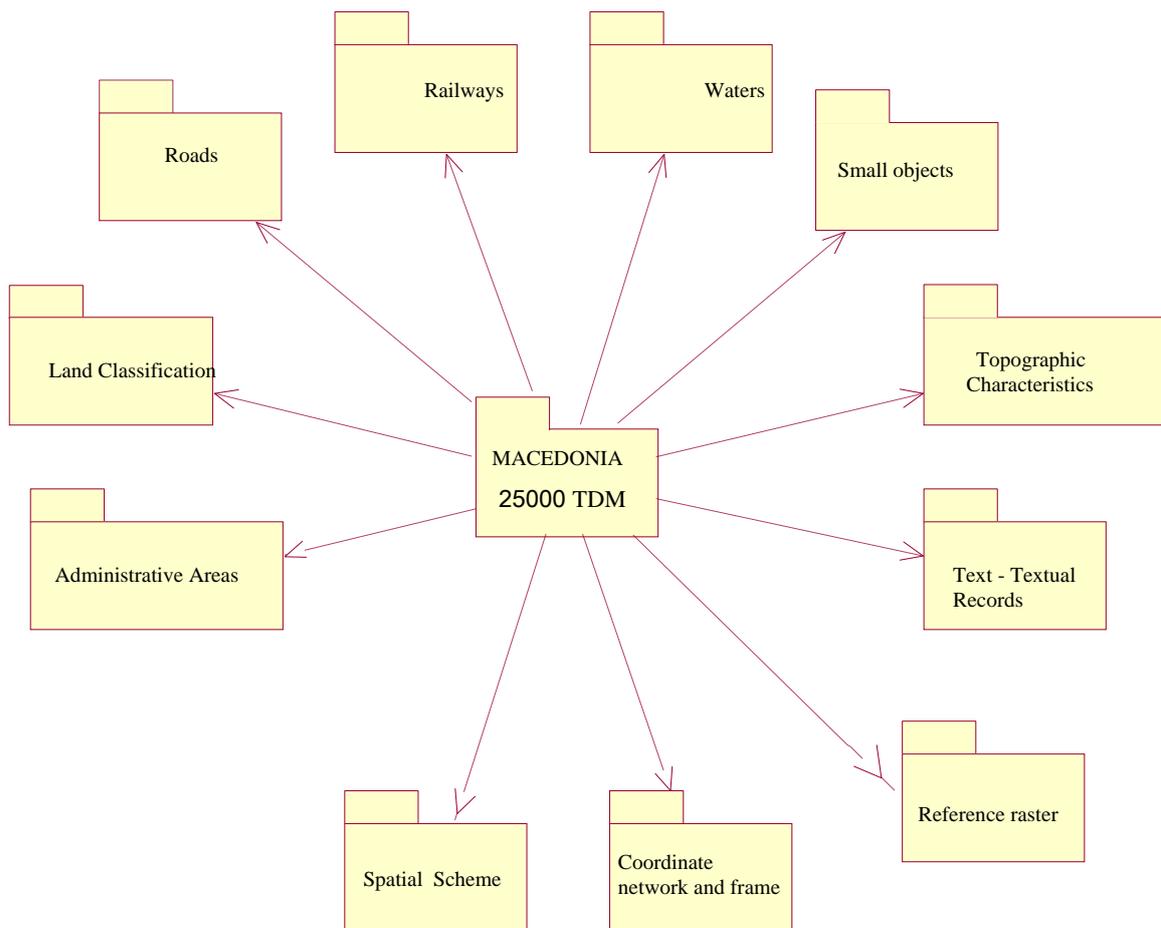
The real estate cadastre is a public book in which are registered the real property rights and other real rights, the real property data as well as other real rights whose registration is stipulated by law. The real estate cadastre data are comprised in the electronic database i.e. cadastre registry book and on the cadastre maps (Dimova, 2010). The real estate cadastre data represent one connected unit, and in compliance to the legislative for the real estate cadastre, they can be structured as:

- spatial data** i.e. coordinates of detail points which define the real property (parcels, buildings and separate parts of buildings) within the state reference system; and
- descriptive data** i.e. data used to describe the attributes and characteristics of the real properties (name of the real property right holder, address, the right over the property, number of the property, the property's address, manner of use, area and similar). Every descriptive data is connected with its adequate spatial data.

The spatial data are presented only in the cadastre maps, while the descriptive data (alpha numeric) can be contained also on the cadastre maps and in the cadastre registry book. The cadastre maps are produced in scale of 1:500, 1:1000, 1:2500 and 1:5000 in service of establishment and maintenance of the real estate cadastre. Only for around 30% of the stated area, the data from the cadastre plans exist in digital form. Having in mind the fact that the digital form is a condition for participation of the data in the NSDI, the cadastre plans need to be digitized.

### 2.1.2.3 Topographic maps

The data comprised in the new topographic maps in scale 1:25000 are organized in a topographic data model as an organized summary of data which provides efficient use, processing, presentation and safekeeping of cartographic information. The creation of the conceptual model is performed with application of object modeling due to its adaptability towards complex structures as well as due to its compatibility with the world standards. The conceptual model of the topographic data for scale of 1:25000 (Dimova,S., 2007) includes organization of the data and manner of their presentation, and is produced in compliance to the theory for object based modeling and the standard for object orientation modeling ISO 19100 (figure 3).



*Figure 3. Conceptual scheme for the topographic data model in scale of 1:25000, produced with application of UML*

Besides the produced new digital topographic maps in scale of 1:25000, there is also a digital map in scale of 1:1.000.000 in standard digital form, as part of the global world map. The topographic maps in other scales are in analogue form and their content has not been updated for more than 30 years. These maps are scanned and geo-referenced.

#### 2.1.2.4 Spatial Unit's Registry

The spatial unit's registry includes the following spatial units: static areas, cadastre municipalities, populated area, local self-government units and census areas. For each spatial unit, in the registry are recorded data for: the name, the sole identification number (code), the graphic layout of the borders, other data related to the spatial unit as well as the changes that occurred and relate to the spatial unit. The most important use of this registry is the support to the census of the population and the agricultural land (Dimova 2010).

### 2.2 Consultations with key stakeholders

In order to have a more comprehensive review of the requests of the key stakeholders, as well as to define the manner of exchange and share of the data among the stakeholders as well as their understanding of the NSDI, AREC organized meetings with the key institutions, participated by 14 stakeholders. Figure 4 (Vowles,G., 2010) shows the current status and the manner in which the data are shared .

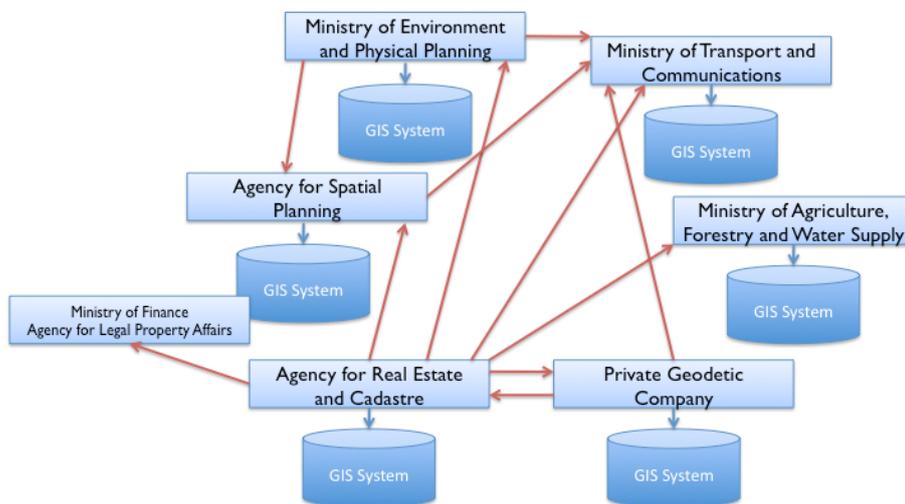


Figure 4. Layout of the current manner of data share

### 2.3. Results from the NSDI workshops

The results from the three held workshops have shown that there is an interest for establishment of an NSDI among the key stakeholders, but without an established national strategy and without allocated financial resources, it is practically impossible to even consider this idea.

During the workshops, some of the more important discussions were on:

- the need for standardization of the spatial data on national level and production of metadata,
- defining the intellectual property of the data,
- defining the manner of data share among the stakeholders via licenses, and

-the need of raising the NSDI at the highest governmental/ministerial level in order to secure political support required for successful execution of all activities.

### 3. NSDI DESIGN

Starting from the emphasized need for production of an adequate NSDI strategy, during the second half of 2010 AREC started defining the scope of the NSDI strategy. The results from the analysis described in point 2 had a positive contribution towards an optimal dimensioning of the NSDI Strategy.

#### 3.1. Objectives and scope of the NSDI Strategy

The objectives of the NSDI Strategy are set in a way to enable transformation of the current manner of geo-spatial data share (Figure 4). The strategy should enable overcoming the deficiencies of the different GIS systems as well as establishment of a new modern system of integrated and harmonized infrastructure for data share in line with the world trends, which will support the national, social and economic development within the e-government. The strategy has set seven objectives which are presented in the following Table 2.

*Table 2:*

<b>Objective</b>	<b>From Current State</b>	<b>To Future State</b>
Clarity of purpose	Different perspectives and understandings of the purpose of the NSDI	A unified strategic mission and vision for the NSDI which will engage stakeholders and realize mutual benefits
Business case	Undefined social and political value or benefit of the NSDI to individual stakeholders	A clear business case that articulates the mutual and individual benefit to stakeholders. A well articulated business and funding model which enables effective partnering with clear costs and benefits
Governance structures	No formally constituted body for the management and coordination of the NSDI	A defined governance structure with balanced representation necessary to gain political engagement, coordinate collaborative activities and engage with the private sector.
Legal framework	Outline legislation for the creation of the NSDI	A defined legal framework which clarifies roles and responsibilities with a clear framework enabling data sharing

Interoperability infrastructure	Data can be difficult to find, get hold of and use because it is in different formats and often provided under different terms and conditions	A harmonized and standard based infrastructure which makes it easier to find, access and reuse spatial data in a more efficient and effective way
Capacity building	Limited awareness or knowledge of the benefits of enhanced interoperability and transparency. Limited technical capacity for the implementation of NSDIs	Improved knowledge, awareness and engagement of all stakeholders and a growing sense of collaboration and working together for mutual benefit
Roadmap	Currently there is no clear roadmap defining what need to be done, by whom and by when to implement the NSDI	A defined Implementation roadmap with outline programme plan, defined roles and responsibilities with effective measures for performance monitoring and risk management

For each objective separately, AREC has defined the quantities of the deliveries and the time frame in which the objectives need to be reached. Each of the deliveries will have its own impact and contribution in the completion of the NSDI Strategy. The scope of the work and the work flows of the NSDI Strategy are shown in Figure 5 below (Vowles,G., 2010).

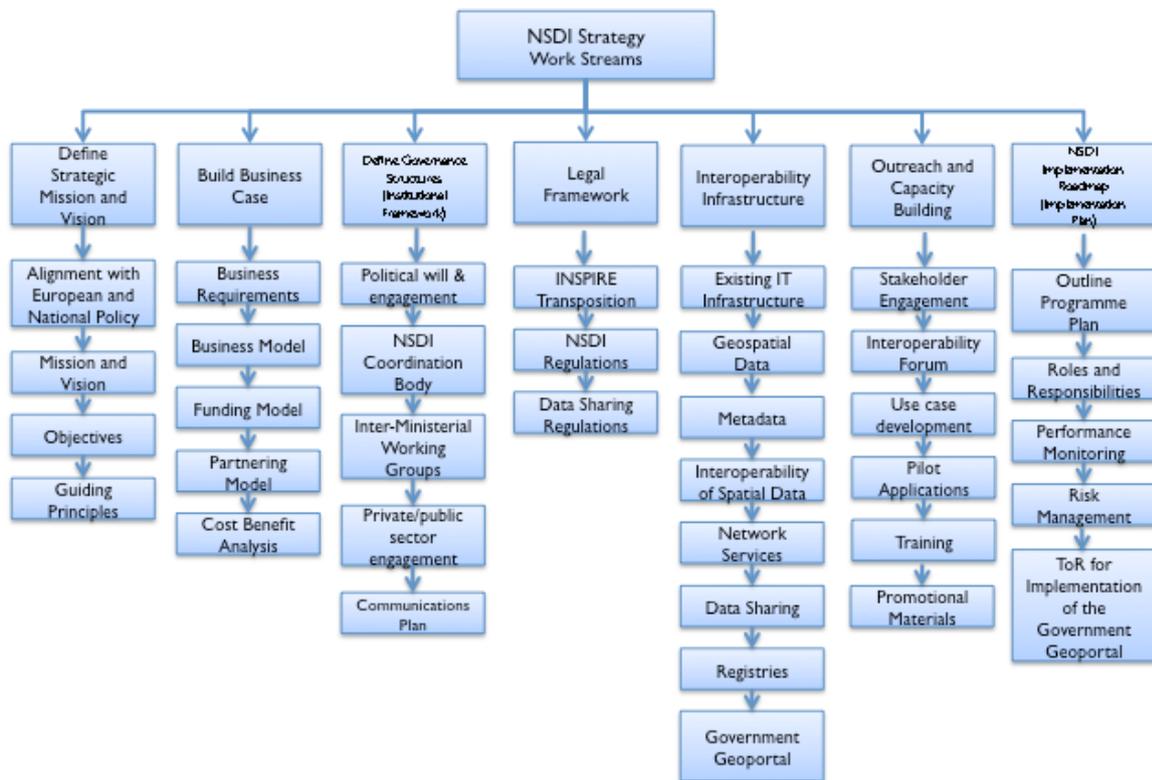


Figure 5. Scope and work flows of the NSDI Strategy

The production of the NSDI is expected to be completed in a period of 18 months, followed by implementation of the strategy according to the implementation plan. The expected status of the NSDI after the implementation of the strategy is shown in Figure 6 (Vowles,G., 2010) below.



Figure 6. Expected future status of the NSDI

### 3.2. Geo-spatial data model and standards for AREC

In order to enhance the use of the INSPIRE directive, in parallel with the production of the NSDI Strategy, AREC has planned activities aimed at establishment of a new standardized model for publishing of geo-spatial data, harmonized with the stated directive.

The model will have the objective to enable share of AREC geo-spatial data in Republic of Macedonia, but also outside its borders, through the use of interoperability standards. The activities which will be included in the model will be:

- define the AREC Framework Data and Standard,
- define the AREC Data Model for the publication of spatial data,
- prove the AREC Data Model using a data migration pilot and transform,
- build internal capacity to maintain the AREC, and
- define the roadmap and rules for the Implementation of Web GIS.

The following figure 7 (Vowles,G., 2010) shows the work that needs to be done in order to

design the spatial data model.

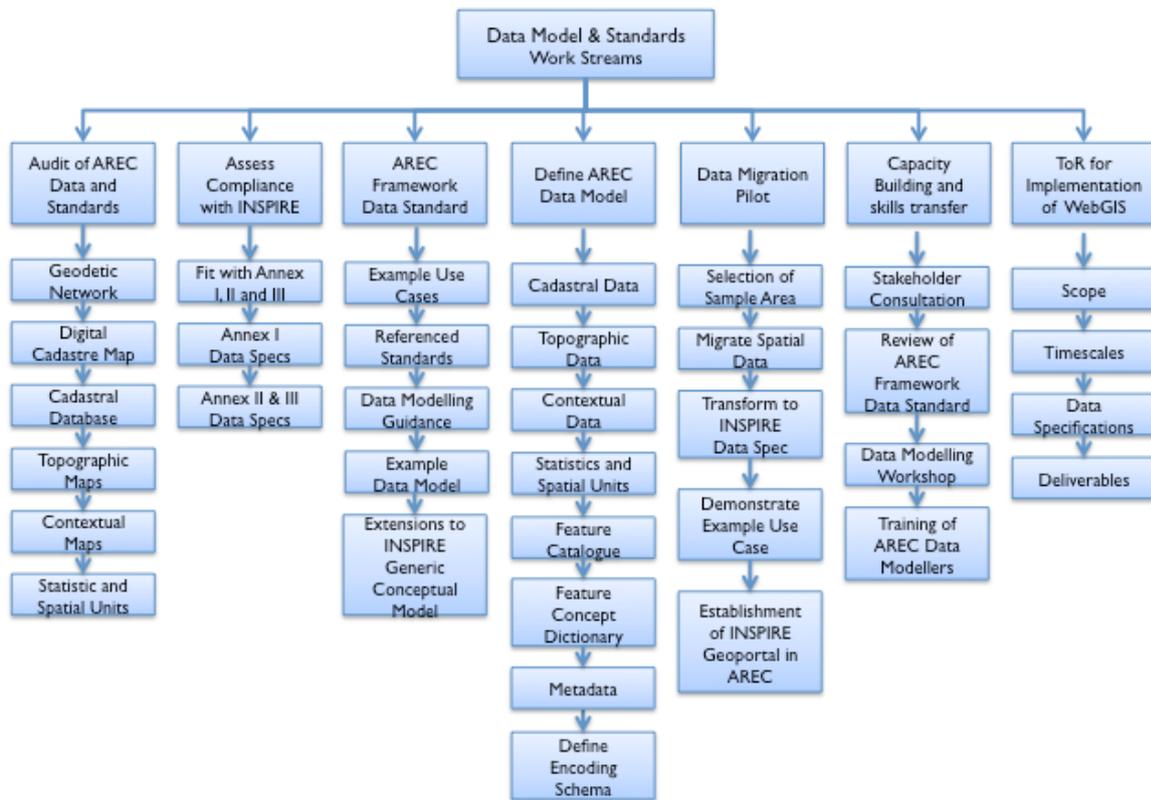


Figure 7. Scope of work for the data model and standards

With a successful implementation of such defined model, AREC will be the first institution in Republic of Macedonia to develop its own standardized model of geospatial data within the NSDI. In that way, AREC will be able assist the development of the models for the other interested stakeholders/institutions within the NSDI.

#### 4. CONCLUSION

Following the trends in the area of geospatial information on the path towards establishment of the NSDI, in 2010, AREC undertook significant activities which had the objective to support the development of the NSDI Strategy. These activities have resulted in the production of documents defining the scope of the work tasks for the NSDI Strategy and the spatial data model and standards for AREC.

In the coming period, AREC expects to execute the terms of reference stated in the documents i.e. to produce a national strategy for spatial data infrastructure and a spatial data model and standards for AREC. In compliance with the planned time required for execution of the activities, the first activity planned to be implemented is the geo-spatial data model and

standards for AREC through establishment of a standardized Geo-Portal, in compliance with the European standards and the INSPIRE directive. At the same time, AREC will initiate the activities for the production of the NSDI Strategy followed by its implementation.

The result of all activities would be the establishment of a government NSDI Geo-Portal on a national level, which will enable fast and simple access to spatial data, share of data on local, national and regional level, better transparency and cooperation among the NSDI members, economic development and creating a possibility for multi-purpose use of the data.

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- Vowles,G., 2010, ToR for selection of Consultant Company for developing of AREC data model and standards for NSDI, Real estate cadastre and registration Project, Skopje

## BIOGRAPHICAL NOTES

Academic experience:

Graduate engineer of geodesy , Faculty of civil engineering, Beograd, Republic of Serbia, Mr. Sc, geographical sciences-thematic cartography, Faculty of natural sciences and mathematics, Skopje, Republic of Macedonia

PhD, Technical Sciences, Ss. Cyril and Methodius University, Faculty of Civil engineering, Skopje, Republic of Macedonia

Current position: senior advisor for geodetic works

Practical experience: cadastre, surveying, photogrammetry, mapping, production of digital topographic maps, project manager.

Activities in international relations  
FIG, Commission 7 Macedonian delegate 2006 year

## CONTACTS

Dimova Sonja  
Senior advisor for geodetic works  
Agency for real estate cadastre  
Trifun Hadzi Janev 4  
1000 Skopje  
REPUBLIC OF MACEDONIA  
Tel: ++389 2 3171945  
Fax: ++389 2 3171668  
E-mail: [sonja.dimova@katastar.gov.mk](mailto:sonja.dimova@katastar.gov.mk)  
[dimovasonja@yahoo.com](mailto:dimovasonja@yahoo.com)

Web site: [www.katastar.gov.mk](http://www.katastar.gov.mk)