



Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
WASHINGTON DC, MARCH 20-24, 2017



REPUBLIC OF MOLDOVA: GEOSPATIAL DATA FOR LAND GOVERNANCE

Maria OVDII, Ph. D

Agency for Land Relations and Cadastre of the Republic of Moldova

Maria.ovdii@arfc.gov.md

**Paper prepared for presentation at the
“2017 World Bank Conference on Land and Poverty”
The World Bank – Washington DC, March 20-24, 2017**

Copyright 2017 by author(s). All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies



Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
WASHINGTON DC, MARCH 20-24, 2017



Abstract

The Republic of Moldova is engaged in a far-reaching economic reform program, both in terms of domestic policy and international relations, more particularly with EU. In line with the Partnership and Cooperation Agreement (PCA) between the Republic of Moldova and the EU, the mapping system appears to be an indispensable tool for implementing and enforcing at least four groups of policy issues: fighting the deterioration of the environment, transport, regional development, and tourism. In line with these provisions, the Republic of Moldova has built since 2006 a track record of intense activity to harmonize its laws and regulations with the EU Acquis.

Moldova has initiated the establishment of the NSDI with the support of the Norwegian Government and Norwegian Mapping and Cadastre 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.

Geospatial data is needed in many aspects like in the risk assessment process, for planning and preventing actions, and for emergency operations. National Spatial Data Infrastructure (NSDI) is an indispensable tool to facilitate the possibilities to know what data exists, where to find it, the quality specifications and how to access it. The EU Directive INSPIRE is the driving force for creating an infrastructure for spatial data and to improve and increase data sharing between authorities.

Moldova is currently undertaking a two years project with the objective of implementing INSPIRE based NSDI through EU funded Twinning project in cooperation with Sweden and Croatia. The beneficiary is mainly the Agency of Land Relations and Cadastre (ALRC) which is the governmental authority in charge of property registration, mapping and cadaster. ALRC is the NSDI coordinating public authority in Moldova for implementation of the Infrastructure for Geospatial Data. The project supports Moldova to improve the management of geographical data through the Inspire directive to be ready for the challenges to mitigate the effect of natural disasters.

The overall objective of the EU Twinning project is to increase public investment in the national and local infrastructure and improved business climate, which has been emphasized in the National Development Strategy for the Republic of Moldova for 2020 through improved management of geographical data. The purpose of the project is to improve mapping system in line with EU standards and best international practices of management of geographical data.

Keywords: NSDI, INSPIRE, Geospatial data



Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
WASHINGTON DC, MARCH 20-24, 2017



I. INTRODUCTION

The Republic of Moldova is a landlocked country in Eastern Europe located between Romania to the west and Ukraine to the north, east, and south. The country has a surface area of 33,840 km², and is home to over four million people. The largest part of the nation lies between two rivers, the Dniester and the Prut. The western border of Moldova is formed by the Prut river which joins the Danube before flowing into the Black Sea.

The history of the Land reform in Moldova started soon after the country became independent from the Soviet Union in 1991. To assist the privatisation and development process of registration of newly formatted property units, the National Agency for Geodesy, Mapping and Cadastre was established in 1994. Since that time a comprehensive legal basis for functional cadastral system has been created in Moldova: the Constitution, the Land Code, and the Law on Real Property Cadastre with the respective legal acts, regulations and instructions. The top institution - The Agency for Land Relations and Cadastre (ALRC), implements a unified policy in the land administration on the national level, coordinates all activities related to the cadastre, and is accountable directly to the Government.

Substantial support from the World Bank and other international donor institutions has resulted in: i) establishing and operating a unified property registration system; ii) about 75% properties are registered; iii) developing and implementing a property valuation system for taxation purposes. However, the Agency still is facing the problems and, the first priority task indicated is to create a mapping basis of the Moldavian cadastral system.

Therefore, during the last 10 years (2006-till now) the Norwegian Ministry of Foreign Affairs (NMFA) through Norwegian Mapping and Cadastre Authority Kartverket supported the Agency for Land Relations and Cadastre of Moldova with a following projects:

- Orthophoto maps <http://moldova-map.md>;
- Digital Terrain Model <http://moldova-map.md>;
- CORS system (MoldPOS Net) <http://www.moldpos.md/>;
- Laser Scanning of Flood Risk areas;
- IT System development in cadastre MoldLIS;
- Pilot testing of UAV technology;
- Vector base mapping for the NSDI <http://moldova-map.md> and
- National Geoportal.



Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
WASHINGTON DC, MARCH 20-24, 2017



One major goal of this cooperation is to support Moldova with basic geographic information urgently needed to solve problems connected to property registration, security of tenure, land conflict's resolution, decision making at all levels and good Land Governance.

During the period 2010-2012 the Japan International Cooperation Agency (JICA) supported ALRC for realization of technical assistance project "Creation of 1: 50 000 topographical maps for development of National Spatial Data Infrastructure".

Through the EU Twinning project for the Agency for Land Relations and Cadastre –Organization, Streamlining and Computerization Process in Mapping in the Republic of Moldova (2014-2016) the ALRC initiated the further development of the NSDI of Moldova together with its Twinning partner SWEDESURVEY and State Geodetic Administration of the Republic of Croatia. The EU Twinning Project support has resulted in:

- NSDI Strategy and Law, created in line with the EU INSPIRE requirements;
- Regional and Local level SDI demonstrators, combining a 12 of stakeholders, to show NSDI principles and possibilities;
- A demonstration of network services showing the possibilities for data sharing

Simultaneously, in 2016 Moldova through ALRC benefited for EU DRDSI Pilot project "Data Harmonisation Pilot in Moldova", that will contribute in the creation a worked example of cross-border data harmonisation between the Republic of Moldova and Ukraine for a set of datasets relevant to the EUSDR. This work has focused on harmonizing some of the data holdings belonging to the NMCAs (National Mapping and Cadastral agencies) of Moldova and Ukraine as a cross-border use case in the Danube Region <http://drdsi-pilot.wetransform.to/services.html>.

Although the Republic of Moldova is not a candidate country for EU accession, the INSPIRE mechanism is considered as an appealing instrument for ensuring sound and cost efficient conditions for the management and dissemination of geographic data nationwide and, potentially, across borders. The Moldova through the Agency for Land Relations and Cadastre is the LMO (Legal Mandatory Organization) and National Contact Point (NCP) for the INSPIRE Directive (Infrastructure for Spatial Information in European Community, Directive 2007/2/EC of European Parliament and of the Council) and participated in the development of the following data¹: Coordinate Reference Systems, Geographical Grid Systems, Geographical Names, Administrative Units, Addresses, Cadastral Parcels, Transport Networks, Hydrography and Protected Sites.

¹ <http://inspire.jrc.ec.europa.eu/index.cfm/pageid/42/list/6/id/8759>



II. SPATIAL DATA INFRASTRUCTURE IN MOLDOVA

Geospatial data have played an increasingly important role over the last two decades in supporting effective decision making to address social, environmental and economic issues.

The Agency for Land Relations and Cadastre of Moldova (ALRC) is a public authority carrying out execution, control, supervising, and other functions in the field of land relations, geodesy, mapping, cadastre and GIS activities, and to some extent LIS activities also, *both* of them building up the National Spatial Data Infrastructure (NSDI). The ALRC is a founder of four state enterprises: i) State Enterprise "CADASTRU"; ii) State Enterprise Institute of Geodesy, Engineering Research and Cadastre "INGEOCAD"; iii) State Enterprise Project Institute for Land Management "IPOT" and iv) State Enterprise "Soil Protection and Land Development."

Spatial Data Infrastructures (SDI) are a means to collect, collate and disseminate available spatial data to users at an organizational, local, national, regional and international level. Land and spatial information are infrastructure, with the same rationale and characteristics as roads and communications infrastructure.

The ALRC is the national contact point for the NSDI implementation and it is responsible for establishment, maintains and management the NSDI national geoportal, monitoring and reporting of spatial data infrastructure at all levels.

The ARLC contributes to implementing the provisions of the on-going e- Government Programme that includes:

- Implementing a shared platform across Government to consolidate the existing data centres;
- Transforming Government processes to increase public administration efficiency through the use of Information and Communication Technology;
- Developing electronic services for citizens and businesses; and
- Adopting an e-Governance regulatory framework according to international best practices, including opening governmental data to citizens and businesses.

The development of NSDI in Moldova had gets significant progress in recent years, strongly supported by financial and technical support from the Norwegian Government and Norwegian Mapping and Cadastre Agency "Kartverket" (2006 to today), JICA and EU funds.

The assistance from Norway has significantly contributed to improvements of public services. The production of orthophotos, digital terrain model and line maps that aims at providing access to reliable and up-to-date line maps for public and private sector. As a result of this cooperation, there



Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
WASHINGTON DC, MARCH 20-24, 2017



were performed the aerial photography of the national territory and created orthophoto maps that serve as up-to-date cartographic base for national economy branches development. The orthophotos that were produced to date represent an useful cartographic basis for production of cadastral maps and for improving quality in cadastre. A Continually Operating Reference System (CORS) has been in place in Moldova since 2011 and includes 10 permanent GNSS stations situated at 30-60 km intervals and covering the complete territory of the country – 33.000 sq. km. <http://www.moldpos.md>.

The technical assistance from Norway as Orthophoto, Digital Terrain Model, Line Maps, MoldPos GNSS Net, IT in Cadastre MoldLIS and NSDI Geoportal are the indispensable part of National Spatial Data Infrastructure of Moldova and of crucial importance for economic development and sustainable Land Governance in Moldova.

According the NSDI Law in Moldova prescribes 22 public institutions across 6 Ministries and 5 other Agencies/ Authorities and local authorities (most are involved in a demonstration pilot area for EU Twinning project). There are 37 datasets and 17 spatial data services described by metadata on <http://www.geoportalinds.gov.md/geonetwork/srv/eng/catalog.search?node=srv#/metadata/6dec85e8-eb6a-4a49-9688-c83f527bf7a5>.

ALRC is positioned as a national coordinating organization of spatial data use, production, and management. Unfortunately, it is difficult to say that ALRC manages well with other spatial information users on the present use of the spatial data. Multiple agencies are using unauthorized spatial data through mutual data sharing. Accordingly, the credibility of the spatial data becomes much less reliable than ALRC expects. Appropriate distribution system of the spatial data is not constructed between Ministries, even among departments within the same Ministries. It is no doubt that many agencies do not have high expertise in NSDI and do not have the human resources.

As described above, the Government of Moldova has the following difficulties concerning construction of NSDI and its implementation:

- Lack of data sharing among governmental, academic, and the related organizations;
- Lack of function of coordination body for a NSDI;
- Lack of human resources;
- Lack of standards of spatial data;
- Lack of budget for development and/or maintenance of spatial information;
- Lack of communication between private and government sectors on spatial information;
- Inexperience of management and operation of web-services, such as geo-portal
- Lack of Business model.



III. POLICY AND STRATEGY

The Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) has been studied and transposed at the national level by means of a Law on National Spatial Data Infrastructure, as well as a Strategy for developing the National Spatial Data Infrastructure during the years 2017-2027.

The Law nr. 254 for establishment of Spatial Data Infrastructure in the Republic of Moldova has been adopted by the Parliament in November 2016.

Organisational structure is based on the draft law on NSDI on structure where we have situation that ALRC like coordinating organisation and NSDI Board have mixed role in double fields; coordinating Working groups and giving Reports to Government. That structure is shown on Figure 1.

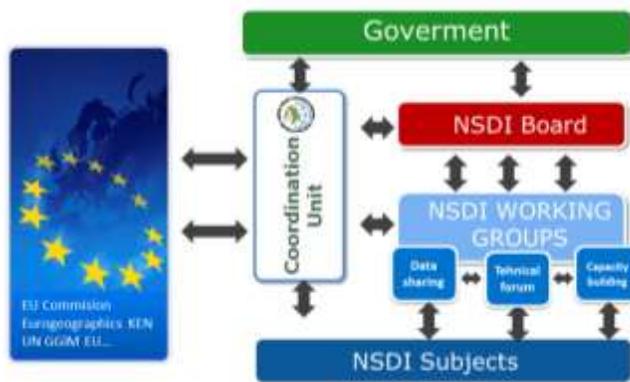


Figure 1: Coordination structure of NSDI

The Strategy for establishment of SDI in Moldova and the mid-term Program for the period 2017-2027 is drafted and it is presented to the Government of Moldova for approve. The aim of Strategy is the establishment of SDI in accordance with the requirements of the EU INSPIRE Directive. By the mid-term program were determined type and scope of activities, the time frame for performance of activities, sources of finding and volume as well as parties responsible for its implementation.

There are four Government Decisions currently in draft form (expected to be ready by April 2017) covering metadata, data standards, network services and regulation covering interoperability.



E-Government Strategy

In April 2012, the Government of Moldova joined the Open Government Partnership initiative where it committed to increase public access to information, promote transparency of governance and ensure citizens participation to governance, by using advanced information technologies. One of the tools that ensure Government openness is the open data portal <http://www.date.gov.md> , where all government institutions are able to post data sets.

The e-Government Center is responsible for developing and implementing the e-Government agenda by applying widely the Information and Communication Technology, the institution aims is supporting the reforming the public sector, enhancing the performance of authorities and the transparency of state institutions, increasing the access to information and promoting e-Services, with a view to better meet citizens needs and contribute to the creation of a more accessible Government and increase the country's international competitiveness.

Most of the data available on the Open Data portal are protected by a Law nr. 305 regarding Reusing of Information in Public Sector.



Figure 2. The open data portal <http://www.date.gov.md>

The Open Data portal <http://www.date.gov.md> applies to currently around 944 data sources and around 30 applications (Figure 2).



IV. ACCESSIBILITY & TECHNICAL INFRASTRUCTURE

In 2013 with WB support the Government of Moldova launched its M-Cloud platform. This platform now is operating across all Government Ministries and agencies to deliver eGovernment services to the public. Three MCloud products – MPass (government authentication and access control service), MSign (government digital signature service), and MPay (government electronic payment gateway) provide strong infrastructure support for the further development of eServices <http://egov.md/en> .

Geoportal is a portal which includes the metadata catalogue, containing metadata created by the public entities to describe their data and services. There is a single point of access to geospatial data through the national geoportal, although as previously described this is not fully operational yet; it is still in pilot stage. To display the results of public entities, the ALRC, with the support of Swedish and Croatian experts, has established a provisional geoportal <http://www.geoportalinds.gov.md/> based on open-source solution „GeoNetwork”, and this will be functional until a permanent geoportal is set up within the framework of a Norwegian technical support project.

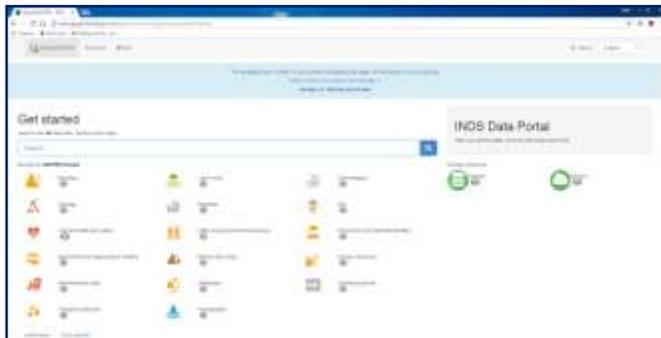


Figure 3. NSDI Geoportal
<http://www.geoportalinds.gov.md>

NSDI geoportal makes it possible to view harmonised spatial data in a unique standard, which enables the interoperability of various datasets from different public entities, such as: dataset „Soils” of S.E. IPOT with datasets „Aerial orthophoto”, „Digital Terrain Model” and „Topographic map 1:50000” of S.E. INGEOCAD (Figure 4).



Figure 4. Spatial data - interoperable via network services



V. SOCIO-ECONOMIC IMPACT

The Republic of Moldova actively participates in programs of cross-border and trans-national cooperation that are financed by EU funds. The cross-border programs involve achieving a balanced socio-economic development of the border areas through the establishment of strong links between the communities on both sides of the border, in order to increase the competitiveness of the economy and an increase of living standards in these areas. Evaluation of socio-economic impact of NSDI usage in Moldova was not done. There is no business plan in place.

VI. CAPACITY DEVELOPMENT

In terms of higher education the Technical University, State Agrarian University, Pedagogical University of Tiraspol, and the Ecological College provide courses in geodesy, topography, mapping, photogrammetry, cadastre, GIS and Remote Sensing.

The Agency for Land Relations and Cadastre had opportunity to develop and upgrade of its technical and human capacities in the past decade through many development projects where it has opportunity to cooperate with WB in frame of implementation of first cadastre Project in Moldova, the Joint Research Centre (JRC) of European Commission in frame of Danube Reference Data and Services Infrastructure (DRDSI) and Norwegian Mapping and Cadastre Authority Kartverket.

EU Twinning project provided NSDI related training over the last two years for 12 state institutions.

The current national capacities for establishment of NSDI are not sufficient within responsible public authorities. The development of capacity building in NSDI it is needed at all levels.

Partnership between central, local, academia and private sectors are critical to ensure the success of NSDI. The Agency for Land Relations and Cadastre as co-ordinator of NSDI will be able to:

- make agreements on behalf of the public authorities;
- manage access on behalf of the public authorities;
- deliver data and services on behalf of the public authorities.



VII. USE OF NSDI

The ALRC is a member of European Associations of National Mapping and Cadastre Authorities EuroGeographics and contribute to establishing European Spatial data Infrastructure. The ALRC participate in implementation of pan-European Projects as EuroRegionalMap 1:250 000, EuroGlobal Map 1:1 000 000 and European Location Framework (ELF). The objective of the Project is to deliver a pan-European cloud platform and web services to build on the existing work of the INSPIRE Directive and enable access to harmonised data in cross border applications. At the end of the project ELF moves into a transition phase to further develop ELF into an operational service <http://www.elfproject.eu/> .

The Joint Research Centre (JRC) of the European Commission with the support of scientific partners of the Danube countries launched project 2013 to develop a Danube Reference Data and Services Infrastructure (DRDSI). DRDSI project supports establishing of the local node for metadata and services dissemination. The metadata catalogue for unlocked data sets is developed via the pilot project on Data Harmonization with the Ukraine <http://drdsi-pilot.wetransform.to/services.html>.

Several examples of “best practices” related to data sharing in Moldova have been observed. There are, for instance, data exchange between ALRC and Ministry of Transport and Road Infrastructure as well as with the forest Agency “MOLDSILVA”, that exemplifies how data sharing between different organisations in Moldova already adhere to the principles of INSPIRE, and the development of national spatial data infrastructures.

Metadata is not well developed, though. Few organisations have described their data sets in a manner that allows for users to find and assess its suitability for use. In case metadata is available, it is primarily meant for internal use and doesn’t adhere to any national or international guidelines.

VIII. DATA

The ALRC as the public authority in the field of mapping and cadastre is a leading provider of geospatial data in Moldova. Also ALRC is active member on international organisations related to geodesy, mapping and cadastre such as EUREF, EUPOS and EuroGeographics.

The ALRC distributes geospatial data via traditional media (CD, external hard discs), but also via web services WMS or WFS.



Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
WASHINGTON DC, MARCH 20-24, 2017



The initial key Core/or Reference Data was developed with existing registers of the ALRC which are published on the ALRC portals, with content open for public access through view services <http://www.moldova-map.md> and <http://www.geoportal.md/>. The portals is used by a number of stakeholders including ministries, state institutions, academia, universities, local and regional government, private companies, ONG and individuals.

Also there is a portal of S.E. Cadastru <http://www.cadastru.md/> with digital cadastral maps and Orthophoto.

There are available the following reference data in Moldova:

- Orthoimagery, new national coverage was completed in December 2016 with Norwegian support. It is available from the national geoportal;
- Elevation / Heights, national coverage came with the Orthoimagery at the end of 2016 and is published on the geoportal;
- Administrative Units/Boundaries,
- Addresses, full national coverage is expected by the end of 2017;
- Cadastral Parcels, available via the geoportal, password protected. Full national coverage of public and private parcels will be available by the end of future WB project;
- Basic Topographic data base 1: 50 000 scale consisting Buildings, Hydrography, Transport Network, Land Cover and Relief;
- National Base Map 1: 5000 (20% of the territory of Moldova), will be completed with Norwegian support in the period 2017-2018.

Geographical Names is currently lacking and has been identified as a priority requirement.

The quality monitoring of surface waters, air, and biodiversity is conducted by a number of institutions subordinated to the Ministry of Environment: The State Hydrometeorological Service (SHS), the “Apele Moldovei” Agency, the State Ecologic Inspectorate (SEI), and others.

According to the sanitary legislation, the Ministry of Health has also some responsibilities for quality of drinking water, surface waters and air in urban areas.

Currently, there does not exist a consolidated system for bioenergy monitoring; there are several institutions that manage this area and the information gathered is limited and sporadic, which creates a fragmented and incomplete image on the state and preservation of bioenergy in the country.

The datasets of National Bureau of Statistics of Moldova could also be found in the ALRC Register of data and service resources, but they are not spatial datasets and would not appear to be in the scope of INSPIRE.



The representatives of the Ministry of Environment and the National Bureau of Statistics of Moldova are members of UNECE (United Nations Economic Commission for Europe). Presently, 11 data sets for ENPI-SEIS are available in UNECE's Guidelines. The 11 data sets include the basic content necessary for the initial implementation of SEIS. Details about each of the 11 data sets can be found in UNECE's Guidelines (http://www.unece.org/env/europe/monitoring/landr_en.html).

There are many thematic datasets that are available via the e-Government Open Data portal <http://www.date.gov.md>.

IX. CONCLUSIONS AND WAY FORWARD

Based on the interviews undertaken, it has become clear that Moldova is relatively well situated when it comes to the development of the national spatial data infrastructure. Data sharing is already established between several organisations, with ALRC in the lead as the custodian of several fundamental datasets such as orthophotos, administrative boundaries, elevation data, etc. ALRC also provides this data including base maps in different scales, through web-based services, which are extensible used by other agencies.

Moldova is lacking a national metadata catalogue. It is very difficult for a user to find data in Moldova. Metadata available should be accessible through **the national geoportal** which enables a user of spatial data to search and find datasets needed for a particular application. Today, not all organisations are aware of what datasets are available within other organisations.

Human resources are lacking. Several of the more developed systems in Moldova are administered by only a limited number of persons, in some cases there is only one person who can maintain a system. This is a great risk as if something happens to that person; the whole system will stop functioning. There is also lack of competence within several organisations as related to the use of GIS in general.

Frameworks that regulate the ownership and responsibility of the systems that contain data are requested. Currently, many systems are put up because a need for more efficient handling of data within an organisation arises. The systems are not formally the responsibility of the organisations developing and maintaining the systems.



Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
WASHINGTON DC, MARCH 20-24, 2017



Formal agreements as related to the exchange of data seem to be incomplete (have gaps). It appears that data may be exchanged on slightly different conditions, depending on organisation.

No licensing conditions apply, or at least are followed. Data that only can be acquired for a fee from one organisation may be acquired free of charge from another organisation, yet the data source is the same.

In Moldova, many geospatial datasets exist which could provide the basis as a contribution to pan-European needs for selected data themes and components, as shown by the examples above, where many can be seen as relating well to the INSPIRE annexes, although some themes are still missing.

Capacity development to make best use of available data and services is big task ahead.

Land Governance is essential to the sustainable development vision, and especially for the successful maintenance and application of spatial data infrastructure. Legal, institutional and technological reforms need to be closely coordinated. Institutional structures within central government, central-local government partnerships as well as networks between government - private sectors and government-community sectors need to be examined for coherence with legal and technological infrastructures.

References

- Grant, D., 1999, Spatial Data Infrastructures: The Vision for the Future and the Role of Government in underpinning Future Land Administration Systems. In *Proceedings of International Conference on Land Tenure and Cadastral Infrastructures for Sustainable Development*, (Melbourne, Australia: United Nations and International Federation of Surveyors), pp. 94-109.

- ECA knowledge brief: Spatial Data Infrastructure and INSPIRE,

Rumyana Tonchovska, Victoria Stanley and Samantha De Martino, World Bank
http://web.worldbank.org/archive/website01419/WEB/0_C-112.HTM

- Data Infrastructure in Support of Macro-Regional Development-Experiences and Lessons Learned from the Danube Region

Dusart Jean, Kotsev Alexander, Smith Robin, Cetl Vlado, Tarsall Brooke, Divjak Dragan,
JRC Scientific and Technical Research Report

<https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/data-infrastructure-support-macro-regional-development-experiences-and-lessons-learned>