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# JRC CONFERENCE AND WORKSHOP REPORTS

# Data-driven Economies in Central and Eastern Europe

*Challenges and Perspectives*

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# Introduction

The recently published Communication on "Building a European Data Economy" (COM(2017)9) clearly highlights the increasing importance of data as a driver for growth, innovation and job creation. It is estimated that by year 2020, the value the EU data economy will increase to EUR 643 billion, representing over 3% of the EU GDP. At the same time there is no comparable and quantifiable evidence on the current state and the future perspectives of the data driven economy in the European Union neighbouring countries. It can however safely be assumed that the role of data will be following a similar pattern, and is therefore expected to be contribution to an increasing relative share of GDP. Furthermore, some European neighbouring countries, most notably those in Central and Eastern Europe, are a recognised destination for IT businesses that grow two to three times faster than in their economy of origin.

Within this context, a workshop was co-organized by the World Bank, the UN Economic Commission for Europe (UNECE), the Food and Agriculture Organization of the United Nations (FAO) and the Joint Research Centre of the European Commission (JRC). The workshop took place on 05 September as part of the annual INSPIRE Conference in 2017 (co-organised in Strasbourg and Kehl by France and Germany). The workshop explored the challenges and possibilities related with Data driven economy in Central and Eastern Europe. All the presentation of attendees are available online.[1]

The rapidly emerging spatial data infrastructures (SDI) were used as a use case to have a better insight into the data economy as they address a broad spectrum of topics that relate to the legal, technological and organisational challenges towards the use and reuse of data. Particular emphasis was put on good practices that if re-used and extended, can further foster innovation and intensify growth.

This JRC technical report summarises the outcomes of the WB/UNECE/FAO/JRC workshop. It includes (i) overview of relevant processes on the global and European agenda, (ii) good practices from countries in the target region on the value-added from data that provide indications future policy directions and emerging opportunities.

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[1] Presentations from the WB/UNECE/FAO and JRC workshop:
    https://inspire.ec.europa.eu/conference2017/workshops

# 1. The European data economy. Challenges and perspectives

*Alexander Kotsev, Vlado Cetl, Jean Dusart, Dimitrios Mavridis (European Commission, Joint Research Centre)*

## Introduction

Data is considered as the intangible asset that is playing an increasingly important role in contemporary business development within the digital realm. Not only are the volumes of data bigger than ever, but their sources are also heterogeneous. Data are nowadays produced by many actors, public and private alike, and through multiple channels that include satellite constellations, such as the European Union Copernicus, the Internet of Things (IoT), as well as Citizens. At the same time, the role of the public sector as the primary producer and user of data is challenged by private actors who, by using sophisticated algorithms, are creating value-added products often based on unstructured resources.

The term data economy, defined initially by Newman (2001), encompasses all of those trends and is widely recognised. All of those emerging trends do not diminish the role of the geospatial sector, as most data can still be tied to certain parts of the Earth. Furthermore, the means to geocode data remain highly desired and valued in different application domains ranging from marketing to environmental protection and spatial decision support. At the same time, the rapidly changing data scenery requires a debate on the future of spatial data infrastructures and the geospatial sector in general.

Below we outline several emerging technological trends that are not only challenging the traditional way of handling data but are also creating numerous new opportunities for governments, businesses and citizens alike. Our intention in doing so is not to come up with a comprehensive overview of the technological scenery, but to set the scene in order to better describe relevant developments on the European agenda.

### Satellite data

Satellite platforms are providing image data products with continually improving spatial and temporal resolution. This massive amount of data not only provides a means for a better understanding of different natural and social phenomena on a global scale, but can also be used for the creation of new businesses. Within this context, the EU Copernicus programme is the most ambitious Earth observation programme to date (Aschbacher, 2017).

### Citizen science

Citizens are a no longer passive beneficiary of data created on their behalf by someone else. Instead, they actively participate in both the creation and utilisation of data. Examples include species monitoring (Adriaens, 2015), noise measurement, as well as in shaping decisions based on data in a bottom-up manner. The origin and reliability of these data sources are introducing new challenges into the development of data infrastructures and the data analytics methods that accompany them.

### Internet of Things

Since the opportunity cost of hardware and software is constantly falling, it becomes easier than ever to deploy and connect physical objects through the Internet. It is expected that the number of devices interconnected within the Internet of Things (IoT) will reach 20 billion by 2020 (Swan, 2012). This brings completely new challenges and opportunities for public and private organisations and citizens at large.

### Virtualization and Cloud computing

Cloud computing simplifies and streamlines the process of establishing data infrastructures. Furthermore, the scalability of cloud-based solutions offers multiple gains

while minimising the overall cost for operation and maintenance of data-driven solutions, especially when it is compared to other ICT fixed capital investments. As such, cloud computing is an ideal platform for business experimentation and new start-up ventures, especially in industries where capacity utilisation is more volatile such as those in the new digital economy.

## Building a European data economy

### Data economy and the policy agenda

Considering all of the emerging trends described above, the European Commission, through its Digital Single Market Policy, has taken a number of initiatives to establish the conditions for a successful Data Economy. It all started with the adoption back in 2003 of the legislation to foster the re-use of Open Government data in Member States via the Public Sector Information (PSI) Directive (2003/98/EC)[2]. The Directive established framework rules regarding availability, accessibility and transparency of Open Data in Europe. In addition, it was recommended to have a standard electronic licence for the re-use of Open Data and to have a tool to find the relevant data sets via a list of portal websites. In 2013, the PSI Directive was revised[3] and amendments made to further embed "open by default" principles, with additional provisions on marginal cost-oriented fees, transparency and support to machine-readable and open formats.

Those legislative initiatives had to be complemented by a more coordinated approach for the effective development of the Data Economy. In January 2017, the Commission adopted a Communication[4] on "Building a European Data Economy", accompanied by a Staff Working Document[5], where it looked at the remaining obstacles impeding the full deployment of the data economy: data localisation restrictions, obstacles to the movement of data, legal uncertainty, complexity and lack of trust. It goes without saying that technical issues such as standardisation and interoperability had to be addressed as well, for example through the revision of the European Interoperability Framework or of the priorities of ICT standardisation.

Barriers to the digital flows between Member States need to be addressed and this is the purpose of a recently published proposal on facilitating the flow - and access to - non-personal data across the single market[6]. This regulatory initiative will contribute to lift the unjustified restrictions affecting the movement of data around the EU and reduce the legal uncertainty surrounding the access and sharing of data.

With the increasing importance given by the European Union to the data revolution, additional measures will have to be taken to evaluate the Public Sector Information (PSI) Directive in the coming months and propose possible improvements, including the use of privately held data of public interest.

The development of the data economy in Europe is not only a legislative exercise. The European Commission is leading by example, with the deployment of the EU Open Data Portal. In this portal, the Commission provides access to its datasets. Moreover through the funding of the European Data Portal, a pan-European repository of public sector information open for reuse in the EU.

The recently released report on Open Data in the European Union Neighbourhood[7] flags the benefits of Open Data as an innovative instrument to tackle many of their challenges. The report provides a high-level assessment of the state of play of Open Data in the EU

[2] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:345:0090:0096:en:PDF
[3] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013L0037
[4] http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=41205
[5] http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=41247
[6] http://ec.europa.eu/transparency/regdoc/rep/1/2017/EN/COM-2017-495-F1-EN-MAIN-PART-1.PDF
[7] https://www.europeandataportal.eu/sites/default/files/edp_analytical_report_n7.pdf

Neighbourhood and highlights the achievements as well as the potential room for improvement in the neighbouring countries.

Areas of needed improvement include the setting-up of an Open Data policy and in some countries of Open Data portals, both considered as key pillars for creating value from Open Data. Lack of awareness and availability of data are also seen as barriers to the full deployment of a data economy in the European Neighbourhood. Figures on the benefits of the re-use of Open Data such as the direct market size, the number of jobs created, cost savings and efficiency gains are unfortunately only available for the EU28.

## The 'spatial' data economy of Europe

Spatial data is a critical asset that increases the value of data resources and underpins key parts of the economy. The ranges of activities where spatial data and technology can be applied to enhance the economic return are multiple. Undoubtedly, the main driver of spatial data economy in Europe is the INSPIRE Directive (Infrastructure for Spatial information in Europe). The implementation of the Directive is not yet finalised, however so far it already improved data sharing and interoperability between public authorities for environmental and other policies on European but also on the national level. In the last few years we can see more and more data and services available across EU and beyond.

Following those developments, the private sector is stepping by developing value-adding services on top of the publicly available data. There are already many pieces of evidence in different areas, such as energy efficiency, intelligent transport, agriculture and disaster risk management. The implementation of INSPIRE creates opportunities for new business innovations and sustainable technologies but is also beneficial to policy makers, researchers and citizens at large. That is why INSPIRE has a positive effect on the economy by sustaining economic development and spatially 'enabling' societies and governments. Together with the PSI Directive and Open data initiatives, it creates the conditions for the European 'spatial data economy'.

There are multiple examples regarding the impact of INSPIRE on the European economy. Below we list some of the evidence provided by the EU Member States within the 2016 INSPIRE implementation reports[8].

Belgium

- The convergence of the efforts to maintain (or setup) the SDI's at the different administrative levels of the Belgian state assuring the same structure, quality and availability of geodata, stimulating a number of developments in the geographic information domain and contributed to the production and open distribution of high-quality geographic information.

Czech Republic

- Existence of new jobs due to the fact that spatial data is used more and more in official agendas of public organizations;
- Innovation potential (new services, apps) from availability of standardized services, open data and ICT development;
- Contribution to cross-border and/or EU projects and services.

Estonia

- The implementation of the INSPIRE Directive improves the availability of environmental information and provides better evidence and supports for decision making in combination with other (open data) sources of information;
- Directive inspires the public bodies to cooperate with each other and exchange the best available expertise.

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[8] https://inspire.ec.europa.eu/INSPIRE-in-your-Country. The information is provided 'as is'.

<u>France</u>

- Increasing number of data sets made available online and creation of new services by public administration to serve citizens' needs.

<u>Italy</u>

- The rationalisation of the economic investments and of the operational costs, thanks to the removal of duplications; and the wider use of the public data thanks to the data sharing, standardisation and harmonisation activities required by INSPIRE.

<u>Latvia</u>

- One of the main benefits is the availability and accessibility of geospatial data sets in
  electronic form, which is a fundamental condition for increasing the use of geospatial data in the various sectors of the economy and public administration.

<u>Poland</u>

- The principal benefits identified are the increased use of data by making them accessible and cost savings in the information management by better data integration, better organisational structures and interoperable IT Architectures.

<u>Slovenia</u>

- The transparency and opening of data stimulates the efficiency in the public sector and help with the broadening of digital economy and business development.

<u>Spain</u>

- SDI (IDE) and web services became daily working tools in many public admin, generalised culture of sharing data and information and increasing of open data available in the web.

## The Central and Eastern Europe Region

More than twenty-five years have elapsed since the transition of the CEE region to a market economy. Today, the CEE countries have established the preconditions of a market economy regarding their legal framework and institutional background. However, and although market institutions have already been established, the CEE countries are in various stages of economic development.

The diversity of the region is portrayed in Table 1 below. Central-European countries like Slovenia, the Czech Republic, and the Slovak Republic are exhibiting average performance measures three to four times higher than countries like Ukraine, Georgia and Moldova. After the turbulent historical experience during the past two decades, the process of convergence to Western Europe has delivered tangible results. According to the figures of the year 2016, countries from that region that are Members of the European Union exhibit more than double the income per capita from other, non-EU member countries, on average. The process of convergence is also multifaceted: for countries of this region, membership to the EU is associated with an increase of 14% in the Human Development Index. In such a diverse landscape, fostering a data-driven economy through the capacity of a public open-data infrastructure addresses key concerns of the region regarding growth and development.

| Country | EU | OECD | Gross national income (GNI) per capita (2016) | Human Development Index (HDI) | Time Required to Register Property (days) |
|---|---|---|---|---|---|
| Slovenia | x | x | 28,664 | 0.89 | 50 |
| Czech Republic | x | x | 28,144 | 0.88 | 28 |
| Slovak Republic | x | x | 26,764 | 0.84 | 17 |
| Estonia | x | x | 26,362 | 0.87 | 18 |
| Poland | x | x | 24,117 | 0.86 | 33 |
| Hungary | x | x | 23,394 | 0.84 | 18 |
| Latvia | x | x | 22,589 | 0.83 | 17 |
| Lithuania | x | | 26,006 | 0.85 | 4 |
| Croatia | x | | 20,291 | 0.83 | 62 |
| Romania | x | | 19,428 | 0.80 | 16 |
| Bulgaria | x | | 16,261 | 0.79 | 19 |
| Montenegro | | | 15,410 | 0.81 | 69 |
| Macedonia, FYR | | | 12,405 | 0.75 | 30 |
| Serbia | | | 12,202 | 0.78 | 21 |
| Albania | | | 10,252 | 0.76 | 19 |
| Bosnia & Herzegovina | | | 10,091 | 0.75 | 24 |
| Georgia | | | 8,856 | 0.77 | 1 |
| Ukraine | | | 7,361 | 0.74 | 17 |
| Moldova | | | 5,026 | 0.70 | 8 |

The transition to a market economy has been associated with a broad privatization and structural transformation programme, supervised by international institutions, during which a vast assemblage of vintage capital has been privatised. Similar transformations have taken place in the privatisation of land and agricultural terrains that were formerly owned by large collective organisations under the direct control of the state. During this process of decentralisation of rights to ownership, there have been coordinate efforts to establish cadastral infrastructures so that these rights are assigned to individuals rather than collective entities.

In the economics of development, the establishment of a legal framework safeguarding individual property rights on land is associated with a deepening of the financial development, as it is the precondition of the existence of a mortgage market. Moreover, ensuring individual property rights on capital and terrains is associated with more substantial investment on these individual terrains.

## Conclusion

The contributions assembled in this Report outline a step further in the process of this institutional reform. Section 2 outlines the efforts of the World Bank and the FAO in developing an NSDI scorecard by producing an index that encompasses technical and economic issues of the establishment of a geospatial infrastructure. This diagnostic tool will be used to inform and guide the policy initiatives, and it is a promising avenue for researchers and policymakers that want to interact the development of an NSDI with the attainment of development goals. Section 3 documents the experience of individual countries in the region, with the help of international organisations, NGOs, and national aid programs, notwithstanding the essential contribution of the private sector. Section

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[9] Notes: Data refer to the Central and Eastern Europe (CEE) countries, including Ukraine and excluding the countries that are currently members of the Commonwealth of Independent States (CIS). The columns EU and OECD designate membership to the European Union and the Organization for Economic Cooperation and Development, respectively. Sources: HDI index and GNI per capita figures from the United Nations Development Programme's Human Development Report 2016. The "time required to register property" is measured in days (rounded to the nearest integer), from the World Bank "Doing Business" Project, 2017

3.1 and 3.2 outline such an initiative by the Satellite Applications Catapult with the authorities of the Republic of Serbia, whose efforts will include the establishment of a Centre of Excellence at the intersection of the academic research, public authorities, and other strategic partners.

As a coordination mechanism, the NSDI involves many stakeholders, most notably those that are non-institutional. Section 3.3 outlines the efforts for the establishment of an NSDI in Ukraine, and the active role that the citizen body has played in enhancing the quality of the offered data services. Similarly, Section 3.5 offers an outline of the efforts for the establishment of an NSDI in the Republic of Moldova, where the authorities are willing to push forward towards establishing a comprehensive and centralised metadata service to enrich the information services already offered.

The initiatives and a preliminary socio-economic impact in Albania are outlined in Sections 3.5 and 3.6, respectively. From these contributions, we learn that the European legislative efforts have taken a prominent place in the national legislation, which is yet another effect of the INSPIRE directive indirectly affecting the standards of neighbouring countries of the European periphery. These efforts have benefited from the help of the Norwegian Cadastre Authority "Statens Kartverk," and are expected to have a significant socio-economic impact, particularly in rising industries in the country such as tourism. The estimated benefit cost ratio of 2.25 is a testimony to the development benefits of the establishment of an integrated land management facility in the country.

The contribution in Section 3.8 outlines an impressive initiative in the Republic of Georgia. Land-titling constitutes a form of land ownership regularisation, which in Georgia has been implemented on the blockchain in view of developing a secure digital marketplace for land property. The authorities achieved the build-up of a capacity for smart contracts, which enables the land market to operate in a secure property rights environment and increase the liquidity of land assets. This initiative has been achieved with the help of the Norwegian "Statens Kartverk," as well as the Swedish Mapping, Cadastre, and Land Registration Authority "Lantmateriet." The latter, also with the collaboration of the World Bank, has contributed in the development of a cadastral service in Bosnia and Herzegovina, and Section 3.9 outlines this effort. From the contribution, we learn that the challenges of the development of a cadastre are deeply rooted to the particular historical experience of the country, which exhibits an administrative drawback in terms of the information architecture.

In closing, the development of an NSDI ensures, among other things, the publication and public broadcast of property rights on land and physical capital. Nowadays, this NSDI becomes digitalised and open to use by private and public actors. As such, it constitutes a deepening of the institutional reform that has started some twenty-five years ago, and portrays the advancement of the process of structural transformation towards a new, data-driven economy in Central and Eastern Europe.


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## 2. World Bank and FAO Experience in Creating a Spatial Data Infrastructure Diagnostic Tool. Partnerships for Implementation

*Kathrine Kelm (World Bank); Rumyana Tonchovska (United Nations FAO)*

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. Having access to reliable and up to date geospatial data is not a norm in every country however. In many countries there are little usable geospatial data, and what datasets have been created are often unorganized, duplicated or in forms that cannot easily be accessed. Those countries are often the ones with the highest development needs; the ones desperately trying to deal with poverty, natural disasters, gender inequality and the effects of climate change. These are often the countries where World Bank support is most urgently needed to help to combat those issues.

The effectiveness and efficiency of a country's NSDI will have an impact on its ability to develop, and to address the types of problems and development needs described above. The use of geospatial data has been recognized by the United Nations (UN) as a prerequisite for underpinning the success of the Sustainable Development goals (SDGs) announced in the 2030 Agenda for Sustainable Development in September 2015.

**The impact** made by the increasing use of geospatial data can be seen at all levels. Individuals can use such data in their laptop using Geographic Information System (GIS) software, while organization-wide applications bring efficiency gains and more informed decision-making.

**At the national level** the various legal, institutional, technological, organizational and financial issues involved in building a spatial data infrastructure present a degree of complexity that requires coordination effort and funding in order to provide a coherent framework for data access and sharing. As the costs and benefits have become clearer studies suggest that more than half the countries in the world have some form of National Spatial Data Infrastructure (NSDI) in place or under construction.

**At the global level** the Global Spatial Data Infrastructure (GSDI) initiative involves organizations, agencies, firms, and individuals from around the world, with the primary goals of supporting the establishment and expansion of local, national, and regional (multi- nation) Spatial Data Infrastructures (SDIs) that are globally compatible. Recognising the crucial role that geospatial data can play the United Nations (UN) formed a committee of experts on Global Geospatial Information Management (UN-GGIM) in 2009 to ensure that Member States can work together, share knowledge and support the development of strong geospatial information bases.

**The importance** of geospatial data, and the need to support national NSDI initiatives that exploit those data, is now recognised in many World Bank and FAO projects. NSDI can be seen as a component of a country's land administration system, and can provide users with information relating to addresses, land use, valuation and ownership, for example. WBG support to land administration around the world often takes the form of developing and strengthening a country's cadastre and land register, and this has been seen to have real development impact. Future interventions should ensure that this support to the national land administration is provided in the context of the wider NSDI, working in a "joined-up" way to ensure that data are collected and stored to common standards, distributed and made accessible through web services to users. The current focus in the development community on the 2030 Sustainable Development Goals (SDG) indicators emphasises the need for tools to plan, implement, monitor and evaluate related activities. Governments around the world do not necessarily have a clear picture of their capacity to provide sectorial coordination and an integrated approach to areas such as land administration (for example spatial planning data) that are needed to optimize the activities required to achieve the SDGs.

The World Bank in cooperation with the FAO launched the development of a **SDI Diagnostic Tool and Economic-Business Case Analyses** in December 2016 to assess

the level to which a country's NSDI has developed, and therefore its capacity to address its development needs with geospatial data is what this concept note is about. Initial testing of the scorecard has been completed in 9 countries from Europe, Asia and Africa and is planned for Latin America.

**The objective is producing a NSDI Scorecard** for a country is to be able to produce a quick (1 week) assessment that provides a clear picture of the current status of NSDI development in order to identify missing components, or components that might require strengthening or further development. A scorecard or index is a recognized approach in sustainable development decision-making, with several well know examples already in current uses such as the UN Human-Development Index, Transparency International's Corruption Perceptions Index and the WBG's Doing Business Index. The UN-GGIM is working closely with the statistical community, at national and global levels, to provide inputs into the processes to develop the global indicator framework with the Inter Agency Expert Group on SDG indicators.

**Why it has been developed?** There is a need of a standardized assessment of status and investment needs. Approx. 75% of the World Bank land projects involve IT/NSDI investments ($1+ billion). There is currently no equivalent tool for assessing the development of the individual elements of an NSDI, the maturity of the overall infrastructure, and hence the potential areas requiring strengthening and support.

**What is included?**

I.   *A questionnaire with scores and set of indicators:* 1) Policy and Strategy; 2) Governance arrangements; 3) Legal Framework; 4) Accessibility and Technical Infrastructure; 5) Socio-economic impact; 6) Capacity Development; 7) Use of NSDI / Applications; 8) Core Datasets (from UNGGIM); 9) Thematic datasets: tailor/target datasets linked to a country's priorities

II.  Socio-economic business case: Focus on middle and low income countries
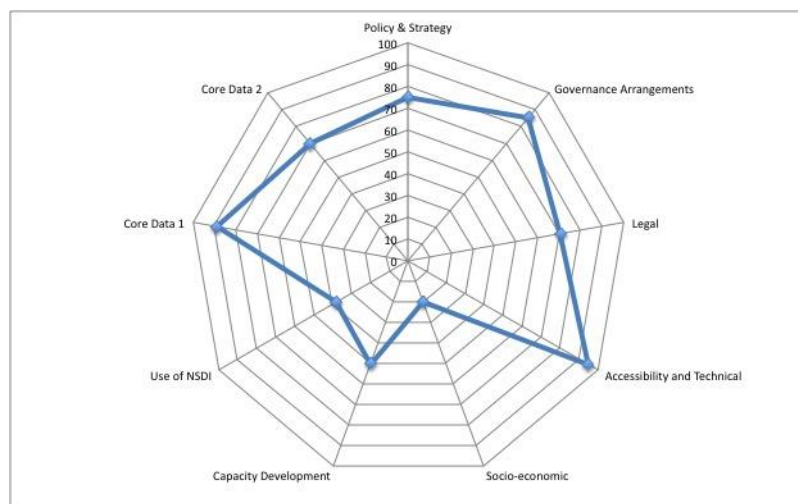


The areas with lower ranking in most of the cases were:

- Capacity Development
- Use of SDI
- Socio-economic analyses

*Figure 1. Summary of the SDI Diagnostic Results from Serbia*

**How it was created?**

- *Desk Research* - what's already been done? What is already being used?

  - The INSPIRE "State of Play" (Leuven University, 2012, etc.)

  - GIS Capability and Maturity Model, URISA (2013)

  - Spatial Data Infrastructure Manual for the Americas (2013)

  - A "NSDI Index" discussion paper (Chandler et al, May 2016)

- A Global Geospatial Industry Outlook (GeoMedia 2017)
- Others
- *Consultations* with UN Agencies, industry experts, including World Bank and FAO; UN-GGIM; Group on Earth Observations; UN Statistics; GSDI; University of Leuven and KU Leuven Public Governance Institute.

**How it has been used?**

- Project Preparation in Moldova and Indonesia: Component Design and investment. Define the Baseline, Targets and Indicators;

- Capacity Building/Developing New Professionals in the NSDI Masters Lecture at University of Glasgow, Scotland. Students questioned the Head of Spatial Information in Local Government using the Diagnostic Tool.

- Technical assistance to the Albanian Government reform and development of a country level action plan;

- As a Global Public Sector Reform Knowledge Product, South-South Exchange Program in Malaysia;

- In Croatia and Serbia it was used to develop a new SDI Strategies;

**Partnerships for implementation**

The World Bank signed an agreement with the UNSD at the UNGGIM Plenary in New York in August 2017 with the main focus on Development of a Geospatial Framework and Assisting countries to prepare and implement Country-level Action Plans by providing: a) Analytical Tools; b) Technical Assistance and c) Financing Options.
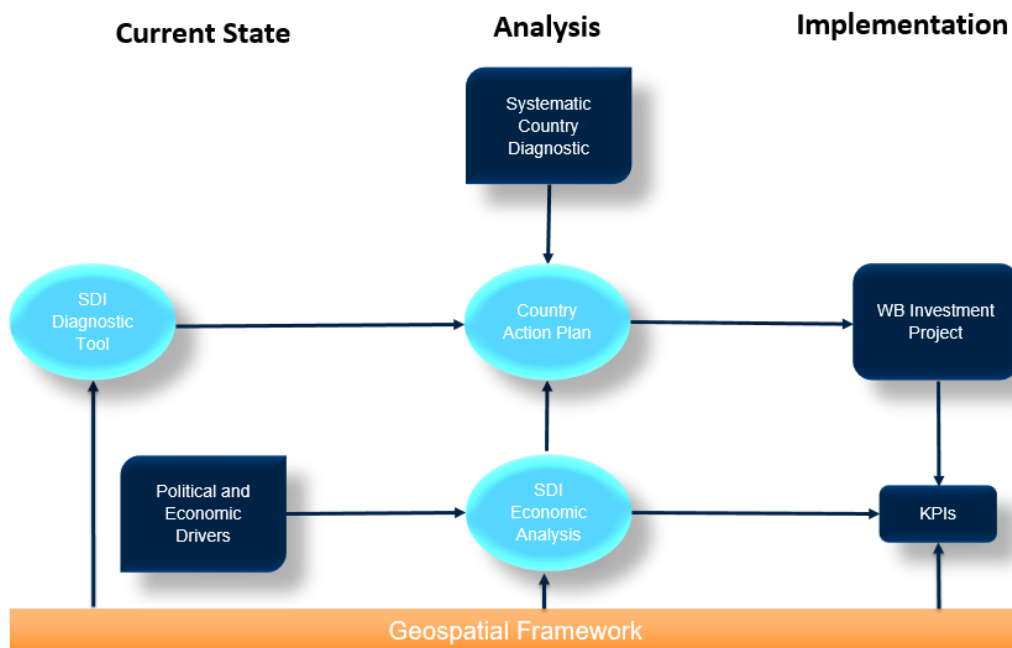


*Figure 2. The Role of the SDI Tool*

As part of the FAO – World Bank Cooperative Agreement, the FAO will continue to provide technical assistance and support to countries to build capacity, share know-how and support establishment of Regional Centres of Excellence for GI Management, continue to develop new innovative applications, based on the use of SDI data and services together with various partners, including Google Earth and EU JRC, helping countries to build up their SDI.

**What is next?**

- UNGGIM will prepare the Geospatial Framework - 2018

- UNGGIM regional committees will nominate a few countries

- The World Bank will tie in the work with Bank projects, when possible or look for other international donors funds

- Completed Action Plans for 2-3 countries - 2018

- Africa will be a particular focus

- FAO is organizing a 2017 Discovery Day: Technologies contribution to improve tenure governance and deal with the most pressing issues towards achieving 2030 Agenda (FAO HQ - Rome, October 5, 2017). As part of the Discovery Day several round tables with countries form different regions will be organized to discuss the development of 1 year action plans

**Summary**

- SDI analytical toolkit provides quick, efficient and cost effective SDI Diagnostics

- Country Level Action Plans are needed to define priorities and resources needed

- Standardized Socio-economic analysis for middle and low income countries is needed

- Data availability is an issue and non-traditional data collection methods are to be considered

- The results from the pilots shows that the tool provides value to both countries with developed SDI and those, which are just starting

- The lowest ranked areas in the pilots were: a) the government capacity; b) the use of NSDI and c) socio-economic analyses

- Partnerships is key for making it happened!

# 3 Country experiences

## 3.1 Satellite Applications Catapult's experience and transferability to Eastern and Central Europe

*Joana Kamenova (Satellite Applications Catapult, UK)*

**Who:**

The Satellite Applications Catapult[10] (Catapult) is an independent innovation and technology company in the United Kingdom that is not-for-profit. The Catapult was established by the UK Government to foster growth across the economy through the exploitation of space. Under the Government Services Programme[11], we work with local, national and international governments, to help them realise the wide range of benefits gained by using satellite-enabled products and services. Our goal is to create sustainable partnerships with public sector organisations focused on innovation and the integration of satellite applications into everyday service delivery. Looking at fit-for-purpose and user-centred solutions underpinned by sustainable business models is at the heart of our projects.

**Good practice from the UK:**

In the UK, a big part of our activities are focused on delivering the UK Space Agency's Space for Smarter Government Programme[12] (SSGP). Since 2015, SSGP has supported the establishment of the Department for Environment, Food and Rural Affairs (Defra) Earth Observation Centre of Excellence[13] (EO CoE). Through the EO CoE, Defra has started exploring the potential of Earth Observation (EO) data in both policy delivery and operations. The ambitious vision of the EO CoE, captured in their EO Roadmap[14] 2015-2020, is "to ensure satellite data is playing to its full potential in policy development and operations across Defra by 2020." The EO CoE is a virtual centre that enables experts from the multiple executive agencies of the department, as well as other departments and devolved administrations, to explore smart ways of working, share expertise and be at the forefront of innovation.

Among other remotely sensed data, the EO CoE is making extensive use of data from the European Space Agency's Copernicus Programme and in particular Sentinel 1 and 2 satellites. This data is free at the point of use and its analysis-
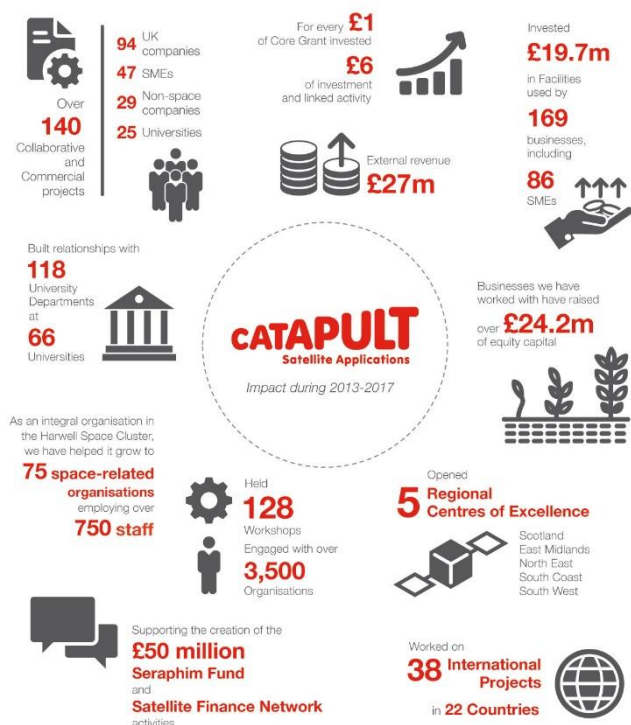


*Figure 3. Satellite Applications Catapult's impact (2013-2017)*

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[10] https://sa.catapult.org.uk/about-us/who-we-are/
[11] https://sa.catapult.org.uk/our-focus/government-services/
[12] http://www.spaceforsmartergovernment.uk/
[13] https://defradigital.blog.gov.uk/2016/05/09/defras-earth-observations-centre-of-excellence-driving-innovation-and-change/
[14] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/488133/defra-earth-obs-roadmap-2015.pdf

ready[15] form is at the core of the EO CoE. The data is acquired and processed once, before being used as a middle layer for multiple applications such as crop monitoring, habitat condition monitoring, water quality, and forest monitoring. Now in its second year, the EO CoE is seeing some of these applications transitioning from feasibility stage to operational state, producing not only internal governmental benefits, but also wider benefits for the UK economy by providing some of the products as open data.

**Transferability to Eastern and Central Europe:**

The main successes of the EO CoE are underpinned by straightforward and robust objectives, namely:

- **Encouraging collaboration** among different executive agencies by providing them with a common delivery and funding mechanism
- **Facilitating innovation** in service development, driven by the use of common datasets (in this case EO)
- **Integrating new data sources** (EO) into existing practices
- **Avoiding duplication** by sharing knowledge and pursuing joint procurements
- **Sound cost/benefits analysis** to provide the basis for a sustainable business model and to justify core government investment.

All of these could be applied to different context in Eastern and Central Europe, but they are also heavily dependent on the user needs in the particular country. These underlying principles will only come to the aid if there is a well-defined and well-understood user need.

An example of how some of these concepts can be applied in other countries can be seen in the example of the Serbian Republic Geodetic Authority (RGA) and the establishment of their CoE for Management of Geospatial Information. In this case, the driver is the acquisition of very high resolution data (rather than the Sentinel data) for buildings feature extraction and utilising the same data for other applications. Through knowledge exchange around sustainable business models existing in the UK, the Serbian RGA designed a high level framework for future implementation (a Roadmap) and a delivery mechanism, which in this case is an internal unit in the RGA with the functions of a CoE to enable innovation.

Even though the RGA's core user need is extracting buildings features for updating the building register, and identifying and registering illegal buildings, the underlying concepts of data sharing, avoiding duplication, encouraging collaboration and integrating new data sources into existing practices, can be clearly distinguished. In the context of Eastern and Central Europe, a big enabler for effectively putting geospatial information at the heart of policy development is the adoption and implementation of the EU INSPIRE Directive and aligning this with developments in Open Data policy, as well as cutting-edge innovation.

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[15] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/488133/defra-earth-obs-roadmap-2015.pdf

## 3.2   Geospatial data in Serbia and their contribution to the data economy

*Jelena Matić Varenica, Borko Drašković and Darko Vučetić (Republic Geodetic Authority of Serbia)*

**Institutional and legal framework**

The accession of the Republic of Serbia to the European Union requires the adaptation of clearly defined standards related to geospatial data. Furthermore, the United Nations Agenda for Sustainable Development adopted in 2015 also outlines 17 goals that Member States should achieve for the benefit of all humankind. It is unquestionable that the implementation of the goals is supported through the application of geospatial data in multiple ways. The Serbian Republic Geodetic Authority (RGA) is a governmental organisation, mandated to perform the state survey, maintain real estate cadastre and manage geospatial data on the national level. Heterogeneous activities related with the establishment and maintenance of geodetic reference systems, real estate and utility cadastres, register of administrative units, geographical names and address registers, topographic mapping and real estate mass valuation are under the jurisdiction of RGA. In addition, the RGA is national Spatial Data Infrastructure coordinator and INSPIRE National Contact Point responsible for the establishment and maintenance of the national geoportal and monitoring and reporting on the INSPIRE Directive implementation.

In 2009 the new Law on State Survey and cadastre (legal basis for NSDI establishment) was adopted, and the initial national Geoportal (www.geosrbija.rs) was put in operation. In 2010-2011 NSDI Bodies (NSDI Council + NSDI working groups: cooperation, legal and technical framework) were established and Metadata (Profile + Editor) implemented. Serbia is reporting on the implementation of SDI since 2012. At the beginning of 2017, Serbian Government adopted a Strategy of Measures and Activities for Increasing of Quality of Services in the Field of Geospatial Data and Registration of Property Rights in Official State Register – Reform Path of Republic Geodetic Authority by 2020 (hereafter: Strategy). The overall objective of the strategy is to support the economic reform of the Government by effective provision of information in the sphere of real-estate and geospatial related activities for the fast, easy and rightful decision-making at all strategic levels. The main aims include the establishment of an efficient system for real-estate registration, improvement of quality, reliability and maintenance of spatial data and services, integration into the e-Government, advancement of NSDI which would improve access to geospatial information and simplify and speed up communication between government, private sector and citizens. As a first step to achieve an effective implementation of planned activities on NSDI advancement, the new Law on NSDI was prepared and is in the process of adoption. A new NSDI Strategy 2017-2021 as well as a NSDI Business model are planned to be adopted by the end of 2017. NSDI technical framework that encompass establishment of network services and application of the INSPIRE implementing rules aiming to reach interoperability by harmonization of spatial data themes under jurisdiction of RGA is planned to be developed till 2019.

**Open issues**

Within the regular activities associated with the NSDI implementation questionnaires were prepared by RGA in 2015 and 2016 in order to identify the needs of the ministries, provincial secretariats, special organizations, agencies, public enterprises, institutes and local self-government units for geoinformation. The collected information was used to further define production policy and use of geoinformation at the national level in order to rationalize costs and increase the utilization of available capacities according to the

principle "produce once - used multiple times". Results of the questionnaires showed that:

- 56% of surveyed authorities use GIS daily in their work, while about 39% use it for specific analyses and reports;
- The biggest obstacle in the use of geoinformation and/or GIS technologies is the lack of data (85%), the lack of qualified staff (61%) and the lack of IT capacities (60%);
- Spatial data are provided mostly from other state authorities without compensation (84%), by own production (61%), procurement through development projects (50%) and at last by purchasing (26%). RGA provides data for most respondents (78%);
- The data are most often distributed physically on medium (76%), while not satisfactory through the Web service (32%);
- In the largest amount data producers use data by themselves (84%), governmental institutions (66%), citizens (65%), whereas the educational institutions and private organizations represent users at the lowest percentage (35%);
- Collection of reference data sets according to the 'Open Data' concept is supported by all respondents (100%) and in high percentage they are interested in co-financing of reference data (63%);
- All respondents believe that it is necessary to have national institution that supports provision and utilisation of data and services on national level and coordinates the development of public sector capacities.

The Republic of Serbia is one of the first countries in the world which has used global SDI diagnostic tool developed by the World Bank and FAO. The diagnostic tool covered eight areas with a defined rating system with the aim of identification of the degree to which the government understands the SDI and to what extent it uses it to support decision-making in line with political priorities but also for identification of potential investment areas for the World Bank and its partners.

Although, the estimated SDI implementation in Serbia reached a total score of 74 (maximum 100), the assessments of individual components showed significant weaknesses referring that: socio-economic impact has never been performed; SDI business model is still not defined; sustainable system of licencing and pricing doesn't exist; involvement of private sector in provision of services based on SDI is insufficient; there is no clear strategy of building capacities within SDI; enhanced engagement of education sector is needed improving the capacities of the public sector; there is no initiative to use SDI benefits in particular areas; and usage of SDI in decision-making by public sector is on a low level.

The result of these analyses point to not only the necessity of providing high-quality geospatial data, but also improving the capacity of the public sector and establishing coordinated cooperation between the public and the private sector. Balanced development and education contribute to the implementation of new solutions, standards and business processes synchronization, leading to more efficient and productive work of the entire public sector.

**The Centre of Excellence for Management of Geospatial Information**

Based on the above described indicators the necessity to develop capacities at all levels of geospatial sector became evident. RGA as the nationally responsible institution is obliged to undertake the initiative and define steps to fully exploit the potential of geospatial data and take advantage of the NSDI. Within this context, the RGA Strategy foresees the first steps towards the establishment of a Centre of Excellence (CoE) for Management of Geospatial Information that would contribute to the following:

- Advancement of NSDI so that high quality geospatial data are made available for use according to defined standards that satisfy public policy requirements;
- Coordinated policy and operational activities in specific economic and social areas and ensuring institutional cooperation at the national, regional and international levels and promotion of Euro-integration in its area of operation;
- Improving of national directives and internal regulations and creation of better business environment for the public and private sector and citizens through the definition of improved working procedures;
- Education of stakeholders at all levels with a focus on the implementation of new technological solutions, research and application demonstrating the possibilities of applying geospatial data and evolving methodologies based on that.

Direct benefits should be reflected through balanced needs and minimal risk and cost exposure of the public sector, coordinated and efficient provision of development, services and data required by the market and economic and social benefits of society with the aim to improve the national quality of life. Benefits also include increased economic productivity, preservation of the environment and natural resources, sustainable urban and rural development and the protection of life and health of citizens and their property from natural and other disasters.

The function of the CoE would be providing optimum solutions for geospatial data managing within the SDI through the implementation of technological innovation, the development of methodologies, training and inter-sectorial cooperation, which would also influence the development of the geo sector as a while encouraging competitiveness.

The complete functionality of the CoE will be achieved by 2020, through the implementation of the following phases:

- Development of a strategic approach in the use of geospatial data at the national level;
- Raising awareness of the importance of using geospatial information and defining the concept of geospatial data managing;
- Establishment of the CoE through: adoption of regulations on organizational and personnel structure, defining the medium-term development plan and establishing of operational capacities;
- Transfer of knowledge to relevant institutions;
- Development of applications and services;
- Embedding of geospatial data into business processes;
- Continuous development, research and introduction of innovations.

RGA has a strong support from the UN FAO, World Bank and leading research centres (such as UK SA Catapult) in activities related to the establishment of a CoE for Management of Geospatial Information in Serbia by providing know-how, technical knowledge and work on joint innovative projects.


**New data driven applications**

The RGA has an experienced team in using geospatial data and services in support of various government institutions in Serbia in making best use of available data and technologies.

In the past six years the Serbian environment witnessed substantial changes due to the occurrence of several natural disasters (forest fires, droughts, flooding). Due to climate change, a significant number of landslides occurred, many houses were destroyed, agricultural yields reduced, and the amount of toxic/carcinogenic substances has been increased in agricultural products. During the floods in 2014, RGA obtained satellite images of high and very high resolution and generated in a short time Flood and Landslide Maps for the affected areas. Those data provided significant input for reactions during the floods, and have been used extensively for the Recovery Needs Assessment Report done by the World Bank, UN and the Delegation of EU in Serbia. In addition, they

were used for recovery and planning activities and insurance remuneration after the floods. Few years after, those data are still used in many national development projects such as: Upgrading of Water Management System, National Risk assessment, Creation of Landslide Inventory, Resilience in climate changes in transport etc. Moreover, RGA used them to validate the developed methodology for Soil Moisture Index Map that could serve to improve the resilience of agricultural activities to climate changes according to the Country Action Programme for Serbia for 2017 regarding European Integration Facility through IPA II (2014-2020) which beside other, has focus on disaster risk reduction in agriculture.

Under component A: Valuation and property taxation, under the „Real-estate Management Project" supported by the World Bank, in 2016 RGA obtained VHR satellite imagery for the whole territory of Serbia. The imagery was primarily procured for the realisation of activities related to the mass property valuation and monitoring of changes in real-estates under the WB Project. Many information products can be derived from VHR satellite imagery. They can be applied for rapid improvement of the real-estate register and address registry, governmental activities on monitoring of illegal construction, introduction of a new taxation system based on the mass property valuation. In addition, satellite imagery is, together with the other sources of data, used for the establishment of Building register. Through the cooperation with UK Satellite Application Catapult opportunity task was launched for building feature extraction from the satellite imagery. This helps RGA to define an optimal methodology for the creation of a building register. The register contains relevant information on new, demolished and expanded buildings together with the additional information collected by the municipal inspectors on the field (incl. type, size, address, investor). For this purpose, RGA defined an application for the municipalities for the generation of a metadata database regarding decisions on the demolition of illegal buildings. It will be linked to the building register. More than 2 million illegal buildings have been identified based on satellite imagery and field inspection. It was estimated that the direct budget income from the taxes on building legalisation would be more than 200 million euro. In addition, the building register will help to upgrade the official address register, triggering the procedures related to the update of the Real-estate register, establishment of the mass property valuation system and changes in the taxation system thus generating additional income and benefits.

Since 2009, RGA has activated an initial national geoportal http://www.geosrbija.rs/ for discovery and view services for data and metadata. In 2017 a new national geoportal with improved performances was developed. It contains a WebGIS solution suited for online map distribution, data harvesting and simple analysis, editing and collecting of data, digitalization and generation of customised reports. In addition, it can be used as Crowd Sourcing platform, advanced search/indexing, import of external web services, data and media files as well as printing, saving files in different standard formats and generation of embedded maps. It provides two levels of access and use, for the wide users and for professionals. Through administrator tool, users with dedicated permissions can easily set up new clients, defining their content, functionality, user interface and other. The portal has interface similar to a Google solutions in order to be more user oriented toward professional users and citizens. It was published for testing on the 01st of October 2017 and officially launched on 04th of December 2017. In the beginning of September 2017 a Metadata Catalogue Service http://metakatalog.geosrbija.rs/geonetwork/ was published where metadata on INSPIRE themes and other categorized themes data sets can be discovered and downloaded.
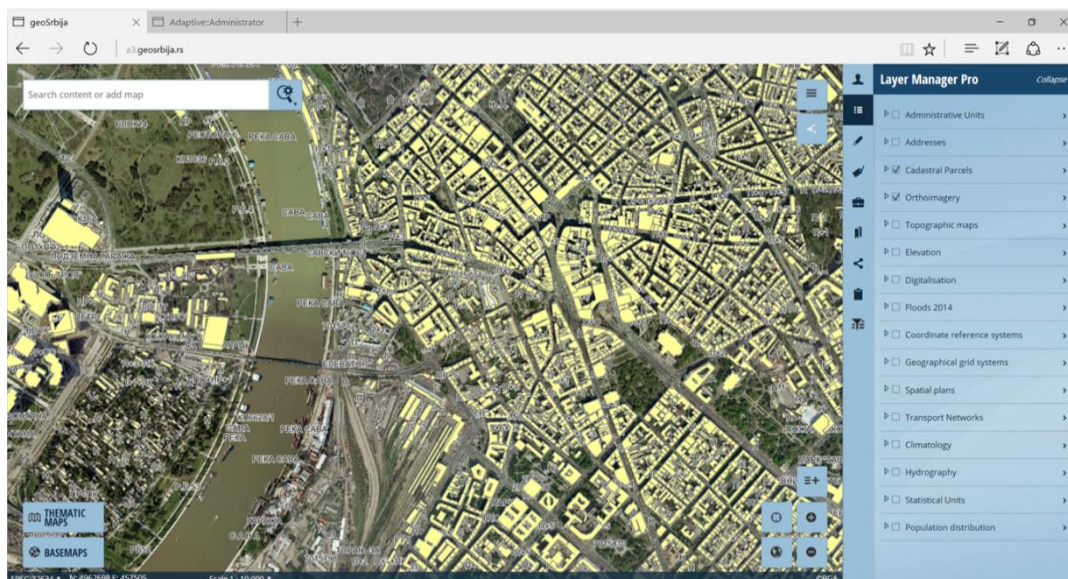
*Figure 4. The new national geoportal - GeoSrbija*

**Open data implementation**

According to the Global Open Data Index for 2014, which measures the openness of data globally, Serbia is 48th out of 97 countries. Although the availability of information of public importance has been regulated since 2004, open data as a new concept is still not introduced. The availability of quality data, governance and exchange within the Government, as well as the general understanding of the policy-making process based on data, have been recognized as a key challenge for the transformation of the Serbian public sector in line with the European administrative space.

The first analysis of openness of governmental data in Serbia was done in 2015 in collaboration with the World Bank, UNDP and Directorate for E-Government (Ministry of Public Administration and Local Self-Government). An Open Data Readiness Assessment (ODRA) document was produced which emphasizes that a wide range of government bodies are willing to move forward with open data as a means to increase government effectiveness and that there is a strong demand from the business community and civil society to decrease the cost of doing business, and to increase transparency in various policy areas. Recommendations from the ODRA include the establishment of a clear leadership and coordination mechanism for implementing the open data program, introduction of open data into the legislative framework, development of a national open data portal and capacity building on IT across the government.

The Serbian Electronic Government Development Strategy 2015 – 2020 recognizes the concept of Open Data. In 2016 a national Open Data portal https://data.gov.rs was established that provides some non-spatial data. At the same time, the importance of Spatial Data and NSDI for Open Data is recognized as well.

In November 2016, the RGA became a member of the Open Data Working Group of the Republic of Serbia and was appointed as responsible for linking the NSDI with the Open Data infrastructure. According to the adopted Strategy 2020, RGA works actively on the implementation of the principles of open data in the field of spatial data on the state level to help improve public services and the availability of spatial data, and to thus accelerate their efficient utilization with the aim to support the economic development. A NSDI Working Group on Open Data is planned to be established by the end of 2017. In the initial phase the intent is to open spatial data which have no legal obstacles for being released, as well as linking the metadata catalogue (NSDI) with the Open Data portal. In the next phase (2017-2018) a validity and feasibility study is planned as well as an open geospatial data impact assessment, an implementation plan and a revenue strategy. They will be presented to the Government and then implemented after approval.

Doubtlessly, the Open Data implementation has to follow changes in the RGA, as well as the development of the NSDI business model.

**Conclusions**

Nowadays geospatial data play an important role in the economic development. Based on a number of studies conducted to determine the verifiable and measurable impact of geospatial data on the economy of a country, it has been concluded that standardized, high-quality and affordable geospatial data can affect GDP growth almost up to 2%. For instance, in Australia, the geospatial information industry and its cumulative impacts are estimated at $ 6.43 billion, which is 0.6% of GDP to $ 12.57 billion or 1.2% of GDP. Another example from Canada shows that geospatial technology generates to Canada's GDP $ 21 billion and around 19,000 jobs in the Canadian economy, contributing by 1.1% to the GDP. In the case of Ireland, a country that has recovered its economy in a very short time and whose GDP growth very fast, it has been found that geospatial data contributes with almost 70 million euro in terms of gross added value to Ireland's economy annually and have an impact on the economy of 126.4 million euros. In the case of the USA, the geospatial data industry generates an annual income of $ 75 billion and employs 500,000 people. Companies that provide geospatial data and services generate jointly $ 1.6 trillion revenue and bring savings of $ 1.4 trillion to the entire USA economy. In addition to the apparent positive impact of geospatial information on GDP, an Australian study showed that the "*constraints on access to data are estimated to have reduced the direct productivity impacts in certain sectors by between 5% and 15%. It is estimated that this could have resulted in GDP and consumption being around 7% lower in 2006-07 (around $0.5 billion) than it might otherwise have been*" (Reference no.6: Executive Summary –Key findings, Cost of inefficient access to data, pg. no.xii).

Within the context described above, for countries in transition where socio-economic benefit assessment on the usage of geospatial data has never been performed or preformed partially focusing on specific topic, it is of great importance to estimate the performed impact analysis in developed countries and countries with similar geospatial sector development status. Focus should be on measurable indicators as well as on descriptive one. International development organisations besides providing support in performing it should also focus on understanding how socio-economic and political factors impact policy change and provide specific advice on how to identify areas of particular concern enabling thus sound policy recommendations.

Governmental institutions often provide vast amount of data that are not even used to create a public policy because the institutions themselves do not have the capacities to properly process and link data at the cross-sectoral level. Based on that decision makers do not have the necessary information to evaluate possible compromise solutions and define adequate policy decisions. The development of national capacities in the geospatial sector, which would ensure the full utilization of available data and services based on which information-based decisions would be made, is a huge challenge. Such an initiative requires leadership, strategy development and political support at a high level through a continuous demonstration of the socio-economic benefits of investing in this sector. Coordination and cooperation between all stakeholders and at all levels remains an important factor in the successful provision of data and services. Therefore, the establishment of the CoE for the Management of Geospatial Information as a coordinator in the realization of the above stated activities would represent a solution and an instrument for a professional 'revolution' within the geospatial sector in Serbia, emphasizing its importance in the world in which the trend for making daily decisions based on reliable spatial information is rapidly increasing.

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## 3.3 SDI, open data and e-Government in Ukraine. Interactions with users and value added applications for citizens and businesses

*Oleksandr Maliuk, Dmytro Makarenko (StateGeoCadastre, Ukraine)*

Historically, the NSDI in Ukraine was established in 2007 with the adoption of the Concept of the National Spatial Data and a draft law by the Cabinet of Ministers of Ukraine (Resolution of the Cabinet dated November 21, 2007 № 1021-p).

This Concept traced designation of NSDI and defined the necessity of creating a separate legislative act – the Law of Ukraine «On National Geospatial Data Infrastructure», though the mentioned concept did not define principles of NSDI establishment and ways of realization of unified state policy in geo-informational sphere.

Despite that the issues of NSDI are included to the Law of Ukraine on Topography, Geodesy and Mapping the necessity of adopting a separate legal act along with a detailed guidelines for NSDI operation and maintenance is still of high priority in Ukraine.

For last 10 years the State Service of Ukraine for Geodesy, Cartography and Cadastre (StateGeoCadastre) or its predecessors as national mapping and cadastral agencies drafted and submitted the NSDI draft law to the Parliament several times for last 10 years (2008-2009, 2011), but due to such reasons as political and economic instability, changing of strategic development goals, etc. it has not been adopted.

In 2017 StateGeoCadastre managed to submit the NSDI draft law to the Cabinet of Ministers of Ukraine for the final revision. It is expected to be adopted in early 2018. Nevertheless, understanding the importance and benefits of NSDI creation and utilization StateGeoCadastre actively initiated implementation of different pilot projects on the NSDI-related issues. Implementation of such projects gave a possibility to gain appropriate experience in work with spatial data, exchange knowledge and best practices in SDI creation and operation. For the resent years the following pilots were implemented:

- «Processing of technological procedures of spatial data integration in frameworks of creating National Geospatial Data Infrastructure in Ukraine» that was implemented for Fastiv town and Fastiv district of Kyiv oblast.
- «Basic data of project Danube and service infrastructure», that was held within framework of European Union for Danube region.
- «Creating of geospatial data infrastructure for the Danube territory through the example of Kiliya region of Odesa Oblast».
- «Creating Spatial Data Infrastructure in Ukraine» (2015-2017) with support of Japan International Cooperation Agency (JICA) for Vinnytsia city and Vinnytsia district.

So, one of the main problems in geospatial information matter in Ukraine is absence of the appropriate legislative base that makes difficult to coordinate and ensure effective cooperation among all geospatial data holders in the country.

StateGeoCadastre as National Mapping and Cadastre authority supervises a number of state topography and mapping enterprises that have capacity for development of GIS applications and e-services.

From the moment of launching the public cadastre map in Ukraine from 1st of January 2013 StateGeoCadastre has been constantly working on improving its operation. Being the biggest cadastral map in Europe it is rather popular among users and one of the most visited web pages in Ukraine. The data are inserted to the system by authorized cadastral registrars all over Ukraine. Average time for registration of land parcel in Ukraine is 40 minutes. In particular in 2016 more than 1 million of land parcels were registered in the system.

In 2016 the public cadastre map was visited by about 7.9 million of unique users. It is obvious that some mistakes in cadastral data are identified. Thus during 2016 we were notified by the users about 10.9 thousands of mistakes, which are proceeded by the relevant specialists from StateGeoCadastre and technical staff from the cadastre administrator.

Supporting the e-government approach and open data policy StateGeoCadastre achieved a significant progress in development and introducing e-services with the cadastral data. For example starting from 2015 personal data of the land parcels' owners became open. This information may be accessed via the personal e-cabinet after identification with BankID or digital signature. It should be noted that in the 1st day after launching this service more than 200 000 requests were received. In 2016 in total about 3.9 million of requests for personal data were processed.

StateGeoCadastre also started connecting state notary officers to the State Land Cadastre System that facilitates a lot their work and has slightly simplified the procedures. For the moment 432 notary officers are connected.

In 2015 we also launched e-service that enable citizens to obtain the extracts from Cadastre system about the land plot and land evaluation reference online in any Office for administrative services all over the country.
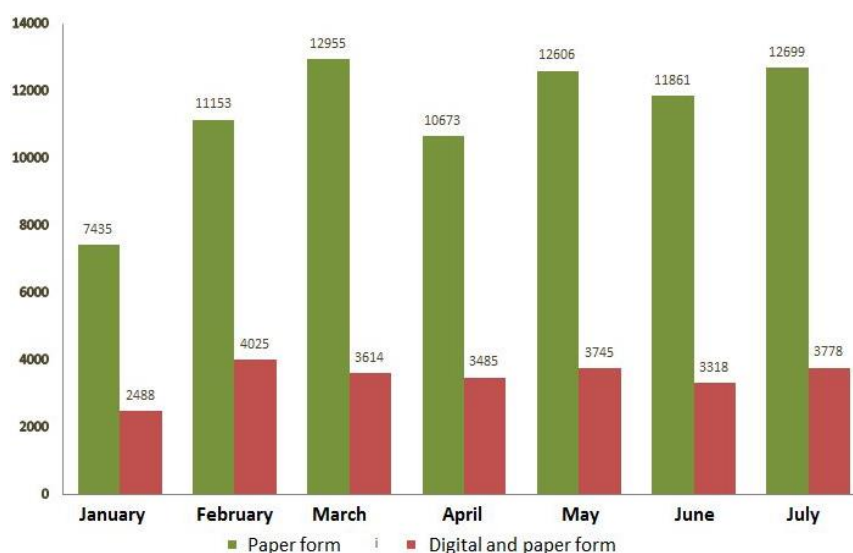


*Figure 5. Usage of the StateGeoCadastre e-service in 2017*

Apart from open data and e-government initiatives StateGeoCadastre together with its enterprises is working within the geospatial data domain. For example, the INSPIRE principles were considered, along with ISO standard 19100: Geographic information/geomantic, technical specifications Open Geospatial Consortium, and open source tools within the development of heterogeneous geospatial applications.

By using such technics we managed to develop several resources that may be considered as a best practice from Ukraine:

- Geoportal of administrative and territorial units of Ukraine (http://atu.minregion.gov.ua) with the software that enable to create, fulfil and maintain data and metadata on administrative composition of the country with access though the Internet. Maps in scale 1:100 000 are used for Geoportal.

- Geoportal of State geodetic network of Ukraine (http://dgm.gki.com.ua) that is a source of informational support for utilization of State geodetic reference system of coordinates USC-2000 for topographic and geodetic activities, mapping and state land cadastre.

- Informational and analytical system "Management of property complex of Kyiv territorial unit" (https://gis.kievcity.gov.ua) is the complex system that is used by local authority for increasing capacity of decision making for the use of property complex. This is used for integration of existing municipal informational systems and for creation of Kyiv united geospatial data portal.

- Platform for monitoring of social economic consequence of the conflict and displacement in the East of Ukraine (http://portal.mtot.gov.ua/) is a public geo-informational source that enables to conduct implementation monitoring of State Program for Restoration and Peace building in the East of Ukraine and international investments in the East of Ukraine.

- Geoportal of open data for Lviv city (https://map.city-adm.lviv.ua/) enables community to access to the city general plan, zoning schemes, city buildings passports, sex and gender distribution of inhabitants, crime map, historical maps and other important information. For the moment there are 46 informational layers, 11 thematic maps and 120 thousands objects and records.

- Public geoportal of city building cadastre of Lviv oblast (http://loda.cadastre.com.ua/ua/) accumulates information from city building cadastre and foresees the possibility for harmonized work of oblast and regional level specialists. It is a chance to work in united information environment and give opportunity to speed up the actualization data from oblast and regional level.

Despite rather bureaucratic law-making process in the country the initiatives for data economy are being actively developed from 2011. Starting from 2015 the Open Data Portal in Ukraine was launched by State Agency for E-Government, where data from all central and regional authorities are available for browsing and downloading.

Moreover, currently in Ukraine a lot of sectoral geoportals are being developed by different state authorities in Ukraine and other organizations as well. For example:

- Data concerning State border that provides detailed information on type, category and location of Border Inspection Posts are located on the portal of State Border Guard Service of Ukraine (http://dpsu.gov.ua/ua/map/)

- Data on defined places for landfill in Ukraine can be found on the portal of Ministry of ecology and natural resources of Ukraine (https://ecomapa.gov.ua/)

- Data on automobile roads of Ukraine (State agency of automobile roads of Ukraine) can be obtained from interactive map of automobile roads of Ukraine (http://ukravtodor.gov.ua/)

Such activities in different spheres are evidence of high demand for information from users in Ukraine. This is considered to be a signal for the government, business and society to make a joint contribution to the establishment of an effective and operational National Spatial Data Infrastructure in Ukraine. Taking into account the complexity of this issue, a comprehensive support from international organizations in technical projects, trainings, joint workshops and investigation of best practices worldwide will be highly appreciated and valuable for Ukraine.

### 3.4 The private sector perspective on SDI and open data developments in the former Yugoslav Republic of Macedonia.

*Luka Jovičić (GDi Skopje)*

**National context**

#### (i) Institutional and legal framework

The evolution of the INSPIRE Directive implementation together with parallel technological and data usage developments raised geospatial projects utilisation and feasibility, creating confidence of users about the underlying available data from various sources and platforms in various formats. In such a constellation that the INSPRIE Directive set, open data availability shows constant growth and serves as a business driver. The private sector already contributes through software platforms and distributed GIS environments based on the EU requirements. In the former Yugoslav Republic of Macedonia, ESRI with its ArcGIS platform dominates this area.

The country as an EU candidate already transposed the INSPIRE Directive into the Law on National Spatial Data Infrastructure, while the open data initiative is formalised through the Law on Public Sector Data Use. Both were put into force in February 2014.

The Law on National Spatial Data Infrastructure covers domains and activities on metadata, interoperability of spatial datasets and services, web services, data exchange, governing of the NSDI and general clauses. Basically, the Law transposes EU INSPIRE Directive, defining the spatial data themes from the INSPIRE Annexes, describing the NSDI organisational structure and identifying the stakeholders and milestones for implementation. Complete synchronisation of the NSDI with the INSPIRE Directive requirements is set for the end of the 2019. Administrative and technical coordinator of the Law implementation is the Agency for the Real Estate Cadastre (AREC). The Law recognises 19 more stakeholders which are all governmental institutions of various levels. Currently, there are 74 web services published and documented within the metadata catalogue on the national geoportal – nipp.katastar.gov.mk

The Law on Public Sector Data Use legally mandates public sector data availability and openness, taking in regard limitations for sensitive data, metadata scope, open data central register – data portal structure and functionality and up-to-date data status regulation. Governmental institution in charge of implementation of the Law is the Ministry of Information Society and Administration. Concepts covered by the Law follow the EU Digital Single Market Open Data Policy. There are currently 25 institutions contributing with the 154 active datasets on the national open data portal – www.otvorenipodatoci.gov.mk

Apart from the legal obligations and formal inclusion of number of the governmental institutions, during the whole period of implementation awareness rising programs are held, national and regional collaboration projects are conveyed and technological infrastructure is being developed. Yet, the two initiatives currently are not related in technical level.

#### (ii) open Issues and existing problems in the country that your example is solving

The results of open data and SDI framework evolution are created institutional willingness, as well as legal and technological means for data opening, exchange and usage. There are formal national coordinators, but also a wide spectrum of sector and institutions formally contributing with the published data and services according to EU requirements. The downside of the process is that the large number of data lack the qualitative aspect. In this context age, partiality and reusability of the data are the biggest drawbacks of the openness concepts development. This state is also confirmed

by the EU commission open data portal and the Report on EU neighbouring countries from June 2017.

**Good practices**

In light of the current NSDI and open data initiative development, the INSPIRE Directive is seen as the hard-structured top-down approach, which succeeded to induce significant feedback in form of the institutional engagement, geospatial projects raise, geoportals development and fostered data needs on the national market. In the former Yugoslav Republic of Macedonia it resulted in continual but slow publishing of the INSPIRE compliant data and much more intensive institutional standards compliant open data publishing. Important outcomes are inter-institutional and public usage of the governmental data.

This trend is also noticeable in EU and world-wide and currently is tackled by the orientation on the secure data sharing with various stakeholders, in platform independent way and accessible from any place and device. ESRI ArcGIS offers platform that satisfies these requirements through the concepts of ArcGIS for INSPIRE, ArcGIS Online and ArcGIS Hub. These foster interactive work and contribution on spatial data usage and decision making according to EU regulative and stakeholders needs. GDi Group as the central European company covers this area with complementary software solutions known as the GDi Ensemble for Smart Communities.
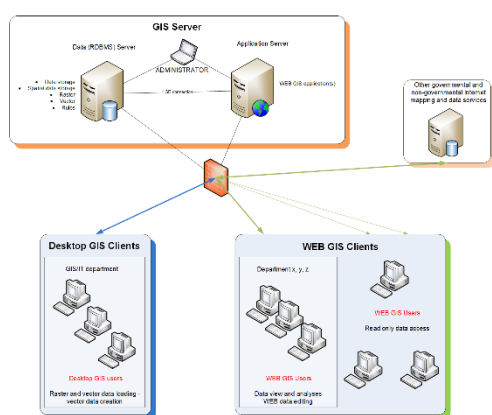


*Figure 6. National geoportal structure*

GDi provided technical implementation of the national geoportal based on the Law on NSDI and underlying INSPIRE Directive.

Another example of the successful open data usage, platforms integration and needs driven application is the disaster management application developed during the flooding in the Skopje area in August 2016. Namely, EU Copernicus emergency management service provided raw satellite data on the area before and after the flooding and processed vector data on key spatial objects in the flooded area. Data was post-processed by the GDi team and published through the AREC portal as web services overlaid with the infrastructural data in the area that become available within the 2 days from the disaster.

*Figure 7* shows combined Copernicus data with the mapped layers provided by the GDi and the AREC existing web services on their web geoportal.

There are other initiatives on national level that focus more on the open data usage and accessibility issues like citizens initiatives. These are good examples and the indicator of the open data initiative evolving. Yet, they lack components like structured metadata, INSPIRE Directive



Figure 7. Open data integration among different stakeholders

driven standardised process approach or reusability in open data initiative sense, being project focused and thus in need for further support. One example is citizens' initiative on public space quality improvement by documenting issues in the field and organising
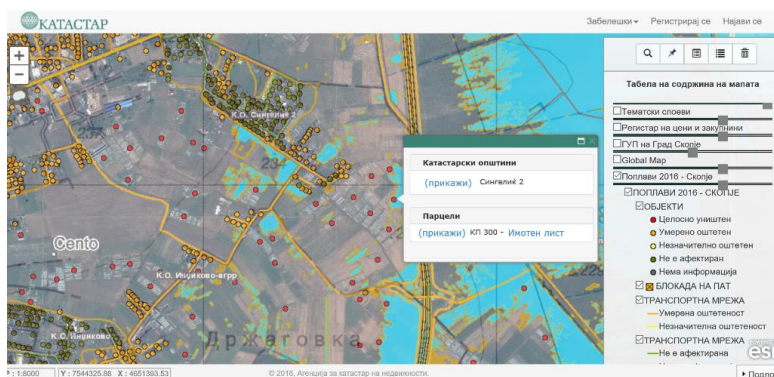
volunteered actions in resolving the issues. Activities and results are available at [www.error501.mk](www.error501.mk)

**Discussion**

### (i) Data economy

Observing the open data and SDI situation regarding the legal framework and market reaction, the conclusion is that the formal and technical requirements for utilising the open data are set. Yet, there is low data usage and applications development in comparison to the potential. Main reasons are tackled in the analysis of the national context of the open data.

One solution is seen in developing best case scenarios that automatize and add value to the current workflows of the inter-institutional collaboration that are being still performed in traditional manner.

Further, INSPIRE Directive implementation at the stakeholder level ought to be more intuitive and straightforward process for data managers to publish and use the data.

### (ii) Focus on the reusability/transferability of the results in other countries

Shown implemented examples of the open data utilisation and SDI are the result of the developed geoportals on the software platform that supports metadata and data publication as services in interoperable manner. Following the example of a national geoportal similar approach is implemented in Montenegro and in Bosnia and Herzegovina as part of their NSDI development process. Namely, ESRI platform and GDi Ensemble for Smart Communities used modular approach in web GIS applications development, thus enabling transferable and further upgradeable systems.

### (iii) Expectations from the international organizations (FAO/WB/UNECE/EC)

Having the results of analysis of the constellation regarding the SDI and open data is the first step towards cooperation with the international organisations. Thus, models and tools for SDI development and Open Data Maturity assessment are expected to be available as the indicators for further initiatives.

Presented state in the market indicate the need for overcoming the gap between the available and required public data and applications. Finally, more systematic approach in national and especially institutional capacity building focused on various industrial sectors is fundamental need for further progressing of the SDI and open data initiative.

### (iv) Perspectives for the way forward

Current data market position in the former Yugoslav Republic of Macedonia can be described as presence of the regulatory acts and formally assigned subjects, with spatial data and services usage in development. Market orientation is thus on a low level. Knowing that the infrastructure for open data and SDI implementation exists, there is large potential for business development. The way forward is seen as moving SDI towards open data initiative, with approach to the INSPIRE Directive implementation in more provider- and user-friendly manner.

Such approach would consider clustering open data producers regarding maturity on: legal ground, institutional engagement in the field, technical competences and open data availability. Further, on this basis it would be possible to cluster the needs and offer concrete solutions for the identified clusters. Final step would be monitoring and growth fostering measures that would be based on the identified clusters progress.

## 3.5   SDI and Open data developments in Moldova

*Maria Ovdii, Ivan Danii, Lucia Cușnir, Pavel Ivancenco, Dumitru Cotovici, Tamara Rudenco (Agency for Land Relations and Cadastre of the Republic of Moldova)*

**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 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), various agencies have supported  the Agency for Land Relations and Cadastre of Moldova in basic geographic information, security of tenure, land conflict's resolution, decision making at all levels and good Governance. One can cite the Norwegian Ministry of Foreign Affairs (NMFA) through Norwegian Mapping and Cadastre Authority – Kartverket, the Japan International Cooperation Agency (JICA), Swedesurvey and State Geodetic Administration of the Republic of Croatia through the EU Twinning instrument.

In particular, the support provided through the EU Twinning instrument has resulted in:

- The publication of a NSDI Strategy and Law, created in line with the EU INSPIRE requirements;
- The organization of regional and local level SDI demonstrations to show NSDI principles and possibilities and how network services can allow data sharing.

Although the Republic of Moldova is not a candidate country for EU accession, the INSPIRE principles and legal instruments are considered as appealing instruments for ensuring sound and cost efficient conditions for the management and dissemination of geographic data nationwide and, potentially, across borders.

**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, all of them contributing to the setting-up of the National Spatial Data Infrastructure (NSDI). The ALRC is the national contact point for the NSDI implementation and it is responsible for establishment, maintaining and management of the NSDI national geoportal, monitoring and reporting of spatial data infrastructure at all levels.

The ARLC contributes to implementation of the provisions of the on-going e-Government Programme that includes implementation of a shared platform across Government to consolidate the existing data centres, the transformation of the Government processes to increase public administration efficiency through the use of Information and Communication Technology, development of the electronic services for citizens and business and adoption of an e-Governance regulatory framework according to best international practices, including open governmental data for citizens and business. The e-Government Centre is responsible for developing and implementing the e-Government agenda

The development of NSDI in Moldova achieved a significant progress in recent years, thanks to the support from the Norwegian Government and Norwegian Mapping and Cadastre Agency "*Kartverket*", JICA and EU funds. So far, there are 37 datasets and 17 spatial data services described via metadata on the National Geoportal[16].

ALRC is positioned as a national coordinating organization of spatial data use, production, and management. Unfortunately, it is difficult to say that ALRC cooperates well with other spatial information users. 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. An appropriate sharing system of spatial does not exist between Ministries, even among departments within the same Ministries. It is no doubt that many agencies do not have a high expertise in NSDI and do not have 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.

**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 No. 254 for the establishment of Spatial Data Infrastructure in the Republic of Moldova has been adopted by the Parliament in November 2016. The Strategy for establishment of SDI in Moldova and the mid-term Program for the period 2017-2027 has been drafted and it is currently presented to the Government of Moldova for approval.

**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 share data sets. Most of the data available on the Open Data portal are protected by a

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[16] http://www.geoportalinds.gov.md/geonetwork/srv/eng/catalog.search?node=srv#/metadata/____6dec85e8-eb6a-4a49-9688-c83f527bf7a5

Law No. 305 regarding Reusing of Information in Public Sector. The Open Data portal currently includes around 944 data sources and around 30 applications (Figure 8).
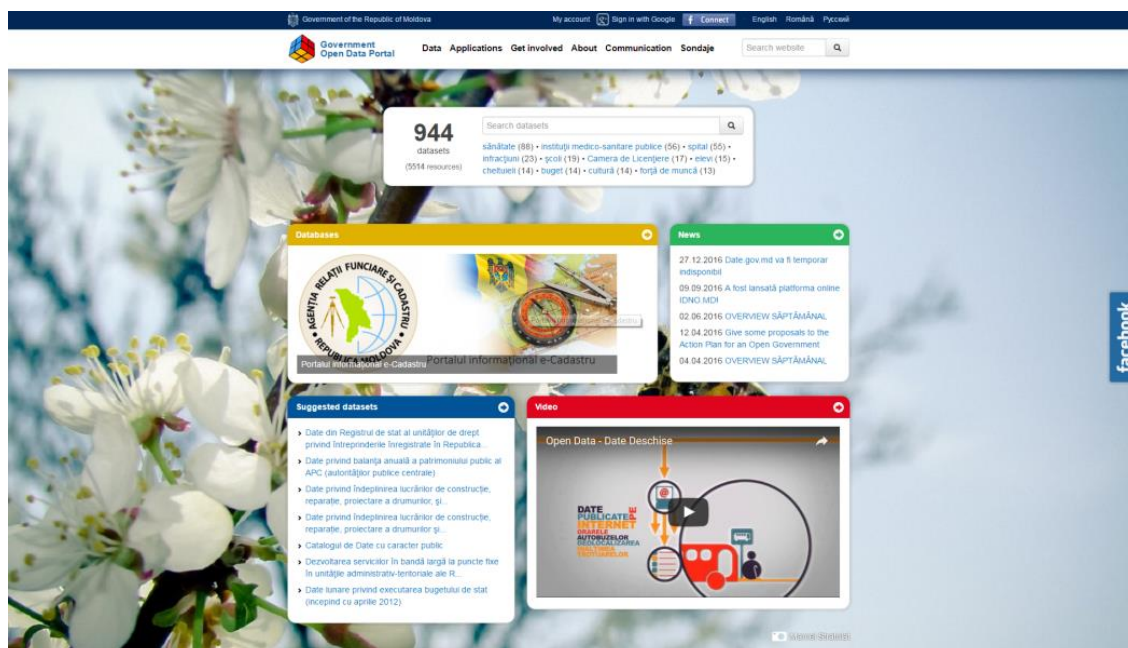


*Figure 8. The open data portal http://www.date.gov.md*

**Accessibility and technical infrastructure**

In 2013, with the World Bank's support, the Government of Moldova launched the M-Cloud platform. This platform now is operating across all Government Ministries and agencies to deliver e-Government services to the public[17].

Our **Geoportal** is a web-portal which includes the metadata catalogue, containing metadata created by public entities to describe their own data and services. There is a single point of access to geospatial data through the national geoportal, although as previously described, it is not fully operational yet. A provisional version based on open-source is available on: http://www.geoportalnds.gov.md/ (Figure 8. The open data portal http://www.date.gov.md).

**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 achievement of 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 to increase the living standards in these areas. Being in its initial phase, the evaluation of the socio-economic impacts of NSDI usage in Moldova has not been conducted yet.

**Capacity development**

As regards 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.

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[17] http://egov.md/en

The Agency for Land Relations and Cadastre had opportunity to develop and upgrade its technical and human capacities in the past decade through many development projects where it has opportunity to cooperate with the World Bank, the Joint Research Centre (JRC) of the European Commission and the Norwegian Mapping and Cadastre Authority Kartverket. EU Twinning projects offered additional NSDI related trainings. Existing national capacities of the responsible public authorities for establishment of NSDI are not yet sufficient. Partnership between central, local, academia and private sectors are critical to ensure the success of NSDI.

## 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, such as EuroRegionalMap, EuroGlobalMap and the European Location Framework (ELF).

Several examples of "best practices" related to data sharing in Moldova have been developed over the past years. There are, for instance, the pilot project on Data Harmonization with the Ukraine[18] supported by the JRC, or the 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.

Metadata are not sufficiently developed, though, few organisations have described their data sets in a manner that allows users to find and assess their suitability for use. In case metadata are available, they are primarily meant for internal use and do not adhere to any national or international guidelines.

## 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. The portals is used by a number of stakeholders including ministries, state institutions, academia, universities, local and regional government, private companies, ONG and individuals.

## Conclusions and way forward

Moldova is relatively well positioned when it comes to the development of the national spatial data infrastructure and Open data. Data sharing is already established between several organisations, with ALRC in the lead as the custodian of several fundamental datasets such as orthophoto, administrative boundaries, elevation data, etc. ALRC also provides this data including base maps in different scales, through web-based services, which are widely used by other agencies. However the country is still suffering from the absence of a national centralized metadata catalogue. It remains very difficult for a user to find data in Moldova.

Human resources are limited. Several 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. There is also lack of competence within several organisations as related to the use of geospatial technologies in general.

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[18] http://drdsi-pilot.wetransform.to/services.html

There is a need for a consolidated frameworks regulating the ownership and responsibility of the systems that contain data. Formal agreements related to the exchange of data seem to be still incomplete. It appears that data may be exchanged on slightly different conditions, depending on organisations. 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.

E-Governance and Open data are 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.

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## 3.6 SDI and open data development in Albania

*Elira Zaka, Lorenc Cala (State Authority for Geospatial Information of Albania)*

The approach implemented by the Government of Albania institutions/agencies on the process of designing and planning interventions/measures to be implemented in several areas of policies is informed by the EU and other international best practice and innovation, in order to understand and learn from the practices and experiences that other countries have successfully developed/implemented.

Participation in the workshop on "Data driven Economy in Central and Eastern Europe. Challenges and Perspectives" and the topics discussed and shared will enable us to increase knowledge/expertise and learn from other experiences.

**General National Legal and Institutional Background**
The Government of Albania is strongly committed in supporting and promoting digital initiatives in providing a modernised, transparent, open and more efficient governance, and enhance sound evidence-based policy-making. Our efforts in this regard, aim in developing inter-institutional interaction frameworks including information and data-sharing in alignment with European legal and institutional framework.

The six medium term priorities of the Government of Albania settled in the National Strategy for Development and Integration (NSDI 2015-2020) include issues on ensuring innovative, citizen-centred good governance; enhancing innovation and competitiveness and; sustainable and integrated management of resources such as land and water.

An important element that the Government of Albania is trying to address through the e-government and citizen-centric service, is the development of standards and inter-institutional interaction frameworks in relation to accessibility and exchange and free flow of information and data. The Government of Albania is trying to develop an integrated governmental service delivery approach to ensure accessibility, transparency, increase quality, efficiency and timeliness and in the same time reduce bureaucracy burden and fight corruption. Examples of the interventions/measures taken by the Government of Albania include, the establishment of the Agency for the Delivery of Integrated Services Albania (ADISA one stop shop: http://www.adisa.gov.al/en); National Agency for Information Society (AKSHI) providing centralized online services through ICT and communication between governmental institutions and the citizens through the e-Albania portal (https://e-albania.al); the establishment of the National Business Centre (QKB: http://www.qkr.gov.al) with the purpose to facilitate procedures for the registration and licensing of businesses through the connection and exchange of data with various institutions and electronic data bases of public institutions. In such regard, it will offer various services online., expansion of Gov Net infrastructure, e-taxes, e-procurement, e-customs, and e-patents); the State Authority for Geospatial Information (ASIG http://asig.gov.al/english) for establishment and functioning of national infrastructure geospatial data in the Republic of Albania, offering access to geospatial data through the national Geoportal (https://geoportal.asig.gov.al) and expansion of the Gov Net infrastructure, e-taxes, e-procurement, e-customs, and e-patents.

The National Cross-cutting Strategy "Digital Agenda of Albania 2015-2020", among others important elements of the information society, e-government and citizen-centric

service, addresses issues of the Infrastructure for Geospatial information. The Geographical Information (GI) and the geo spatial data service are an important part of e-Government of Albania.

In the framework of the integrated resources management approach developed by Government of Albania, the Land management, (one of the six national key priorities), is going to be addressed through a significant programme on Integrated Land Management (ILMP). The integrated management system that Government of Albania is going to develop will establish comprehensive policy and legal framework and an information and data framework with the creation a set of 'key registers' across government to provide interaction, sharing, accessibility and support decision-making.

## Spatial data infrastructure and open data

### a) Institutional and legal framework.

Established in 2013, the State Geospatial Information Authority (ASIG) is a policy and decision-maker, coordinator, and supervisory authority for the issues related to geo-information (GI) and its delivery in Albania, functioning according to the Law No. 72/2012 dated 28.06.2012.

The Law No. 72/2012 date 28.06.2012 "On the organization and operation of the national infrastructure of geospatial information in the Republic of Albania", which align to Directive 2007/2/EC of the European Parliament and the Council, INSPIRE has harmonized the Albanian and European legislation in the field of geo-information and has established the institutional and legal framework for the NSDI in Albania.

The Albanian Geospatial Information Infrastructure is the infrastructure that includes the national authorities responsible for geospatial data, metadata, geospatial data sets and geospatial data services, network services and technologies, exchange agreements, access and use, and coordination mechanisms monitoring, processes and procedures, created, put in place or made available in accordance with this law.

The national authorities responsible for geospatial information are the State Geospatial Information Authority (ASIG), the Geospatial Information Board (BIG) and the public authorities responsible for collecting, processing and updating geospatial information, according to the legislation in force. The ASIG implements national policy on the national geospatial information infrastructure by implementing the Inspire Directive standards and its implementing regulations for metadata, interoperability and network services.

The ASIG has developed and maintained the National Geoportal which is a "door" that allows professional users, and interested public, to view and access in a very simple way geospatial data and Web services available by various Government institutions. The Geoportal is a very important step in the framework of the Open Governance (OGP), which basically has the policy of open data to citizens, providing transparency and assuring quality. The Geoportal established is also a necessary step in the establishment of geospatial Data Infrastructure (NSDI), a Government priority that brings Albania closer to the European Digital Agenda.

The National Geoportal is in the initial phase of its structuring, performing a harmonization of geospatial data in order for them to be as complete, accurate and up to

date. ASIG informs the users for the verification and confirmation of the data quality from the Geoportal with the relevant institutions, in order to have a final information as accurate and safe.

The Immovable Property Registration Office (IPRO) is one of the main beneficiaries of the National Geo-Portal. From the network services offered by this geo-portal are improved and are currently being corrected, borders of over 2.2 billion cadastral parcels from the use of orthophotos.

The planning and development of urban and rural areas has been and remains one of the priorities of the Albanian government in improving the infrastructure. Local Government and Territory Planning Agency are the main beneficiaries of geo-information network services provided by geoportal, which has served to increase the quality of their product according to relevant themes.

Currently, this geoportal offers 67 online services of various geoinformation topics, services that enable citizens and institutions to access online information, without the need to draft multiple papers and receive a response from the relevant institution.

### b) The National Spatial Data Infrastructure (NSDI) in Albania

ASIG has developed a strategy/business strategic plan for the period 2015-2020, that will orient decision-making on the division of the responsibilities and information sharing in the relation to the NSDI.

The National Spatial Data Infrastructure (NSDI) represents an integrated geospatial data system, enabling users to identify and access spatial information acquired from different sources, from local, via national to global level, in a comprehensive manner. ASIG in collaboration with Norway Cadastre Authority "Statens Kartverk" have started initial activity to establish spatial data infrastructure in Albania in compliance with the European initiatives and trends. Support is based on the best practice in Norway on creating and development of Digital Norway.

The aim of the strategy/strategic business plan, is to establish an infrastructure, providing support to a high-quality and stable environmental development, coupled with economic growth, through efficient services, fulfilling the needs and demands of the public and private sectors, as well as citizens at large. The strategy presents a framework within which detailed policies can develop to ensure wide use of geoinformation to avoid duplicated effort and reduce administrative burden.

Different actors are working together on the execution of the strategy by setting up performance indicators. The effectiveness of the strategy implementation will depend on the continuing involvement of a wide group of partners in geospatial sector.

ASIG is committed to taking the lead in developing the strategy and associated implementation plan. Key roles of ASIG are leadership, develop and promote common infrastructure through truly collaborative approach among all other interested parties.

One of the major interventions considered by the ILMP is the revision and implementation of the Strategy (business plan) for Albanian NSDI to include priority ILMP datasets in specific geographical areas.

**Mid-term objectives of ASIG**

- Construction of the integrated geo-information system, which defines the functions, structural organization and their interaction.
- Programming the work and its processes, establishment and implementation of policies, rules, procedures and work instructions for basic elements of geo-information system.
- Production and delivery of geo-information basic products, while ensuring efficient access to geoinformation.
- Ensuring continuous maintenance and improvement of the integrated system and geo-information.

## 3.7 Socioeconomic Assessment for Investment in an Integrated Land Management Program (ILMP) in Albania

*Andrew Coote (ConsultingWhere. UK), Aanchal Anand (World Bank)*

This paper provides a summary the preparation of a provisional business case for a proposed €47 million (US$50 million) investment in an Integrated Land Management Program (ILMP) in Albania. The Program aims to improve property rights and land management, reduce the current constraints on access to land and lead to the creation of a strong land market as the underpinning to a modern economy. It requires underpinning information infrastructure of which geospatial data is the main component, often referred to as a National Spatial Data Infrastructure (NSDI).

Overall, the Program seeks to deliver:

- Reformed institutional / legal and policy frameworks – currently there are many agencies with overlapping responsibilities in different parts of the land sector;
- Multi-purpose cadastre – the official register of the quantity, boundary, value, and ownership of real estate and its use in urban and rural areas for many purposes; and
- Electronic access to full, integrated location (geospatial) information through internet services to the public and private sectors and individuals.

Based on these benefits, the Program is expected to lead to the efficient, equitable and optimal utilization and management of Albania's land resources. This, in turn, would have a positive impact on many parts of the Albanian economy, including:

- Private sector investment – particularly tourism, land market and infrastructure development;
- Public sector efficiency – of institutions responsible for land administration, property taxation, civil emergencies, spatial planning, transport and agriculture;
- Citizens – through increased efficiency in road navigation and improved interactions with the public sector in respect to land transactions.

The opportunity, within the scope of the ILMP, to take a wider view of the economic case for this investment, in order to help address difficulties of economic analysis for similar programmes elsewhere in the developing world, was recognised at an early stage. Globally, over 75% of the World Bank Land and Geospatial Unit's (GSULN) portfolio includes investments in NSDIs, IT systems, and digital service delivery and data management.

An extensive literature review was undertaken at the start of the project. It found a number of World Bank economic studies closely parallel to the objectives of the proposed program in other domains such as meteorology and water management, and a number of comprehensive studies in the developed world of the economic value of geospatial data. However, there appeared to be little relating to the developing world, with an inference that lack of data was a major impediment to those attempts that had been made.

Through an intensive series of missions to Albania, including interviews with close to 100 people from more than 25 separate organisations, the team were able to estimate benefits using a mix of traditional methods, such as case studies and benefits transfer but also conducted some experimental work using non-traditional, innovative quantitative approaches like the use of big data from social media.

*Table 2. Quantified benefits of the Albanian SDI*

| | IMPACT | EVIDENCE | METHODOLOGY |
|---|---|---|---|
| 1 | National geospatial data sharing | ASIG cost estimates and usage assessment | Multiplier effect of information sharing |
| 2 | Reduced land-related court case costs | Court Case records<br><br>Survey of Legal Professionals | Average court case cost x reduced case volumes |
| 3 | Reduced Loss and Damage from Better Flood Prediction | Post-disaster Study (PDNA) | Expert judgement (4% improvement) from improved Digital Terrain Models |
| 4 | Property Tax Collection | Expert interviews and tax revenue records | Predictions of increased revenues from Municipalities |
| 5 | Cost savings in infrastructure development | Project costs from published reports and expert interviews | Potential saved costs of surveys and design for recent projects |
| 6 | Land Market Growth | Regional Studies plus interviews with subject matter experts | National Accounts and Benefits Transfer |
| 7 | Improved road navigation | Global Study | Benefits Transfer |
| 8 | Improved Government Efficiency | Interviews | Predicted time savings per employee |

The quantitative results of the study were assessed using cost-benefit analysis. The period of the analysis is 12 years (5 years of investment followed by 7 years of operation) and a discount rate of 12%.

**The analysis results in a Net Present Value (NPV) of €62m million and a benefit-cost ratio (BCR) of 2.25, indicating the economic viability of the project.** The Internal Rate of Return (IRR) is 49%. This IRR represents a significantly better return than a relevant comparison Economic Rate of Return (ERR) in Albania which are currently 5-15% depending on risk and length of loan.

**The study concludes that the policy advice is that this is viable investment.**

Additional non-market benefits were identified under the following heading:

- European Union Accession – overirding political objective of the Government
- Reduced Number of Property-related Court Cases – improving confidence in the justice system
- Affordable Housing – through better planning and aiding social cohesion

A series of next steps are identified:

Genericize the Methodology – to enable the methodology to be applied more widely across the developing world

Integrate into the WB-UNSD NSDI Toolkit – supporting a major initiative between the United Nations and World Bank on Global Geospatial Information Management (GGIM).

Enhance the Economic Analysis using Computable General Equilibrium (CGE) Modeling – enabling the results to be expressed in terms of macroeconomic parameters such as GDP.

- Further Work on Social Media sources and Big Data Analytic Tools – to leverage these rich data sources particularly where statisitcal and other economic data is not available.

## 3.8 SDI developments in Georgia. The use of blockchain for serving citizens and businesses

*Mari Khardziani (National Agency of Public Registry of Georgia)*

The National Agency of Public Registry (NAPR) under Ministry of Justice of Georgia[19] is a government authority operating real property, address and other registries. In addition the Agency is responsible for geodesy, cartography and spatial information. It has an important role and takes the lead for other public institutions in the development of NSDI in Georgia. That is why, since 2013[20] it is the NSDI Coordinator.

Currently, NAPR is implementing various large-scale nationwide projects, including:

- Use of Blockchain in Land Titling System,
- State Project of Land registration,
- Development of NSDI,
- Creation of Unified E-Registry of Addresses,
- National Navigation System.

The vast majority of these projects are spatial data related. In addition, NAPR was one of the first authorities to introduce e-governance principles and its successful reforms resulted in the creation of a customer-oriented, corruption-free, transparent and efficient registration systems recognized by various international ranking, e.g. WB Doing Business[21], and in development of a strong IT infrastructure.

NAPR, as a leading authority in Georgia in terms of introduction of new technologies, got interested in Blockchain technology, as this high-tech solution of the 21st century can guarantee security of a system, provide protection and transparency of a transaction leading to improvement of a public service delivery.

A blockchain is a decentralized and distributed digital ledger, where records cannot be altered without the alteration of all subsequent blocks and the collusion of the network[22]. Unlike ordinary databases, the records are not kept in one particular place, but in tens of thousands of computers around the world. All computers in the network automatically block any attempt of suspicious manipulation in particular data. Therefore, it is protected from cyber-attacks as well as physical destruction.

In order to provide additional security to the existing registration system, NAPR decided to integrate Blockchain technology in registration services.

The first phase started in 2016 in cooperation with the BitFury Group[23], encompassing development of the pilot project on using Blockchain technology in immovable property registration system[24] as well as technical and other preparatory works for launching the project, which were successfully completed.

For introduction of Blockchain technology, a new add-on system has been developed. Since February 20, 2017, after having secure digital signatures for land titles, the documents are anchored to the Bitcoin Blockchain Network. Blockchain had the risk of being confusing – being such a new technology and because NAPR adopted it so early,

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[19] https://napr.gov.ge/
[20] Governmental Resolution No. 262 on Creation of Governmental Commission on Establishment and Development of National Spatial Data Infrastructure in Georgia, dated October 9, 2013 https://matsne.gov.ge/ka/document/view/2044006
[21] http://www.doingbusiness.org/data/exploreeconomies/georgia

[22] Armstrong, S. (7 November 2016) - "Move over Bitcoin, the blockchain is only just getting started" https://www.wired.co.uk/article/unlock-the-blockchain

[23] http://bitfury.com/
[24] https://www.forbes.com/sites/laurashin/2016/04/21/republic-of-georgia-to-pilot-land-titling-on-blockchain-with-economist-hernando-de-soto-bitfury/#64eac01144da

we had to explain the technology in a clear way to people who had never heard of it before.

NAPR and BitFury signed a new memorandum of understanding on February 7, 2017, marking a second phase of the pilot[25]. It envisages the introduction of "smart contracts", which should address the following issues:

- Treat the financial risks associated with registration of property when selling/buying property;
- Reduce the possibilities of wrongful manipulation/fraud with immovable property.

The Blockchain-based solution, together with the solid software infrastructure and well-functioning e-system for land administration, makes the existing immovable property registration system even more secure and transparent.

Since 2007 NAPR has actively been working with development of the production, maintenance and use of geospatial data. In addition to having cadastral data and orthophotos, it started working on creation of BaseMap, development of interactive and online maps and got involved in other international projects/products. NAPR is providing data to EuroGeographics, Google Maps, TomTom, etc.

It is also noteworthy that cadastral online map has been available for anyone since 2008 and, generally, NAPR for always ardent supporter for openness of the data.

Later on, due to successful reforms and involvement in spatial data related processes, its institutional capacity has been broadened and since 2011 it is responsible for geodesy and cartography, since 2012 – addresses and since 2013 – for spatial data, including coordinating NSDI. NAPR has carried out the vast majority of the preliminary works, which led to the adoption of the Governmental Resolution in October, 2013[26] and establishment of the Governmental Commission on creation and development of NSDI.

This resolution provided for the institutional arrangement of the NSDI. On the policy and decision making level – the Governmental Commission operates, composing of the representatives (Deputy Minister level) from all Ministries plus the representative from the National Statistics Office of Georgia. The Secretariat was established from the representatives of the key Ministries in spatial-related activities and 6 working groups have been created: PR, legal, Licensing and Business Model, GIS, IT and Education. There are involved not only participants from the state institutions, but also from education and academia, private sector, and other stakeholders in the WGs. NAPR was assigned the role of National Coordinator for NSDI and is also heading Secretariat.

The development, establishment and maintenance of an efficient national SDI imply coordinated and active work on many legal, financial, organizational and technical issues.

The long-term vision for NSDI is: "As easy as possible for as many as possible to find, understand and use spatial data". To achieve the vision the following strategic goals are defined:

- SG1: The benefits from the NSDI are well known
- SG2: The provision of geographic information is directed by appropriate legislation
- SG3: Conditions and fees for use of geographic information are simple and uniform
- SG4: Geographic information and services are described in an easy and user friendly way

[25] https://www.forbes.com/sites/laurashin/2016/04/21/republic-of-georgia-to-pilot-land-titling-on-blockchain-with-economist-hernando-de-soto-bitfury/#64eac01144da
[26] Governmental Resolution No. 262 on Creation of Governmental Commission on Establishment and Development of National Spatial Data Infrastructure in Georgia, dated October 9, 2013 https://matsne.gov.ge/ka/document/view/2044006

- SG5: Production of fundamental geographic information is prioritised in an optimal way and it is easy to combine data from different sources
- SG6: Services are easy accessible and are meeting the user needs
- SG7: The NSDI of Georgia is well coordinated
- SG8: We have good competence for using, establishing and maintaining the infrastructure
- SG9: The NSDI of Georgia support other important policies at national and international levels

Based on these strategic goals more clearly defined objectives and activities are set up and action plan is developed for the coming years. Currently, NSDI Development Strategy along with the Action Plan for 2017-2018 is the document guiding the NSDI related activities.

There have been carried out important activities for NSDI establishment, such as:
- Pilot project implemented in a local municipality (city Gori) consisting of municipality capacity building and spatial data production components;
- National Metadata Profile developed;
- Categorization of spatial data themes of the NSDI has been carried out;
- NSDI Draft law elaborated;
- NSDI communication strategy developed, NSDI brochure published and informational web-page in place;
- Education strategy developed;
- Spatial Data Product Specification (DPS) Standard developed, etc.

The most important activities that are underway are development of:
- NSDI Geoportal;
- NSDI licensing model regulating the access and use of the spatial data and e-services;
- Long-term strategy for sharing the spatial data and geoportal.

Georgia lacks experience and expertise for SDI development and the needed international consultancy or other support is available through international donor-funded projects, for instance, within the EU projects; Sida-funded project that is implemented by Lantmateriet, the Swedish Mapping, Cadastre and Land Registration Authority; Norwegian Government funded project that is implemented by the Norwegian Mapping Agency (Statens Kartverk), supporting us with aerial imagery and orthophotos, etc.

Considering the geographical, political and cultural connections with Europe, the European experience of the NSDI development are considered most relevant within the Georgian context. As a consequence, the good practices of European NSDI developments have been serving as model for the Georgian NSDI development.

The INSPIRE Directive has been a driving force not only in the development of the European Spatial Data Infrastructure, but also for the development of many National SDI's. From the very start of the NSDI development, it's been decided that the INSPIRE specifications and guidelines would be used as basis for the Georgian NSDI.

Having a working infrastructure with INSPIRE compliant services would not only take Georgia a significant step toward EU-integration process, it would also be a basis for a strengthened, more efficient and non-corrupt public administration. This will enable Georgia to share spatial information with the EU-member countries – between public administrations. Furthermore, the availability of spatial data has proven having a positive effect on private companies enabling spatial data related services.

In spite of 'right' developments, there are still many issues hindering fast development of NSDI. In 2016 the NSDI Readiness Index survey[27] had been conducted in about 20 government authorities and the following weaknesses were identified[28]:

- Low availability of financial resources
- Low human capital, SDI culture, organizational barriers. Majority of national or local authorities have strong need to strengthen their NSDI capabilities.
- Low technological infrastructure
- Low digital cartography availability

The development of NSDI is a cooperation project, result of a joint effort and not a one-man show, NAPR facilitates and promotes involvement of all key stakeholders in the NSDI development process. However, in spite of the numerous efforts from NAPR side though meetings, presentations and other measures, the benefits of the spatial data still are not fully acknowledged by many ministries. Therefore, strong support is needed at the highest political level for speeding up the development process and achieving NSDI goals. One supportive measure to convince decision makers about the importance to invest in geospatial matters, could be to conduct cost/benefit analysis for emphasizing the value and benefits of SDI.

For promoting NSDI development, NAPR is trying to associate the SDI to other national programs where geospatial management could be crucial (e.g., information society, disaster management, land administration, etc.).

The example is the project that was launched in February, 2016. It is the project on creation of the National Navigation System. The project is led by the Spatial Information Division under the Geodesy and Geoinformation Department of NAPR. This project is highly supported by the Government of Georgia.
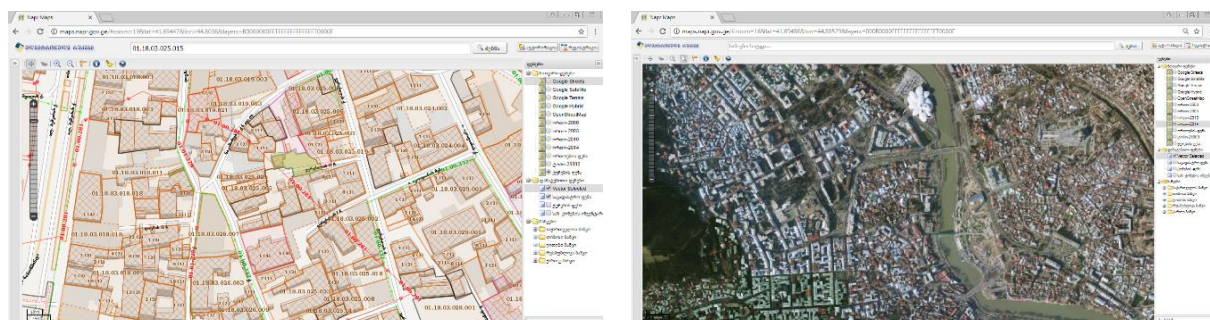


*Figure 9. Access to NAPR Data http://maps.napr.gov.ge*

Generally, it is one of the conspicuous characteristics of NAPR that it is fully public and open agency, which promotes transparency and open data strategy. NAPR as an organization is customer-oriented and the ultimate end of all activities is to provide the users with the services they need. In development of the NSDI, NAPR follows the same principle.

Although the development of geoportal is somewhat slow and the process is still underway due to insufficient human resources, NAPR is already providing its users with the data that are open and accessible through its official website as well as through a dedicated website www.maps.napr.gov.ge (www.maps.reestri.gov.ge). This is the website where all geographic data available at NAPR are public along with the land titling information. The website is widely used throughout Georgia. Further streamlining and

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[27] Delgado-Fernandez T, Lance K, Buck M and Onsrud H, 2005. Assessing an SDI readiness index. Proceedings from the Pharaohs to Geoinformatics, FIG Working Week 2005 and 8th InternationalConference on Global Spatial Data Infrastructure, April 2005, Egypt, Cairo
https://www.fig.net/resources/proceedings/fig_proceedings/cairo/papers/ts_36/ts36_03_delgado_etal.pdf
[28] NSDI Readiness Index 2016 (August, 2016). Report GEL2-2-07-T, prepared within Sida-financed "Confidence in Georgia" Project BIL/DEV-16/2015

improvement of the website is underway. It would be desirable that it is also available in English, but this issue still concerns availability of resources.

What the Georgian SDI development shows is that even in the conditions of little financial and human resources, little interest from majority of stakeholders, when the vision is clear and when the developments are right, the progress is achievable and tangible.

The resources, both financial and human, are main barriers to the development. Another problematic issue is lack of accurate, up-to-date, harmonized essential digital geographic data sets. The international organizations have the capacity and expertise to fill these gaps (at least partly) and facilitate SDI developments in countries.

If the international organizations are explaining more clearly what possibilities they can provide and would also help the counterpart organizations to assure the high-level policy makers in the importance and urgency of NSDI, these will be very supportive for NAPR.

The capacity building aspect is also critical for NAPR. It will strengthen its role as the National Coordinator of NSDI to successfully lead the process and share the knowledge to other institutions. Sharing the experience of other countries is very important as well and in this context to ensure reusability and transferability of the results of the similar projects of the other countries to Georgia will be beneficial.

International community can also be helpful for overcoming organizational barriers and strengthen low human capital and SDI culture through encouraging international capacity building projects, for instance, from GSDI or other international institution with authority in the topic.

## 3.9 Private sector perspective on SDI and Open data developments in Bosnia and Herzegovina

*Nedim Hadžiosmanović and Slobodanka Ključanin (Bosnia and Herzegovina)*

**Introduction**

SDI (Spatial Data Infrastructure) and Open Data are relatively new terms in Bosnia and Herzegovina. According to the "Open data readiness assessment in the Federation of Bosnia and Herzegovina" report published by Transparency International[i], neither the government nor the private sector is yet fully aware of the concepts behind these terms. Many institutions in Bosnia and Herzegovina (BA) are still not aware that Bosnia and Herzegovina became 65th member of the Open Government Partnership (OGP) initiative on 24th September 2014, and thus accepted the obligation to take a series of specific measures in order to implement the OGP. Public in general is also unaware of the potential benefits of Open Data and there are not many requests for such data recorded.

This section summarizes the experiences gained through implementing four projects:

- KATASTAR.ba[29] – The unique software for all cadastral business processes deployed in 79 municipalities in Federation Bosnia and Herzegovina (BA-BIH) with a centralized data centre,
- E-SERVICES[30] – A pilot project providing the first government e-Services to the citizens of BA,
- RCN[31] – Real estate price register for BA-BIH and Republic Srpska (BA-SRP),
- Address register for BA-BIH and BA-SRP.

**National Context**

The basic principles of state legal and political organization of Bosnia and Herzegovina (BA) were established by the General Framework Agreement for Peace in Bosnia and Herzegovina, initiated in Dayton (USA) on 21st November 1995 and signed in Paris on 14th December 1995. Considering its organization BA is a democratic country consisting of two entities, the Federation of Bosnia and Herzegovina (BA-BIH) and the Republic Srpska (BA-SRP), and one administrative district, the Brčko District (BA-BRC).

The BA-BIH and BA-SRP are the entities with their own constitutions, which must be in compliance with the Constitution of BA. The entities have a high level of autonomy and are responsible for controlling many of the primary functions of the government bodies such as providing health care services, education, transport, police and other emergency services along with the infrastructure maintenance. Such decentralization of the government and relative autonomy of two entities and the BA-BRC must be taken into account when developing the open data initiative since the data owned by the public administration are held at these different government levels.

The BA-BIH is an entity of ten cantons (which are further administratively divided into 80 municipalities or cities). The legislative authority is made up of the Parliament of the Federation of BA, which consists of the House of Representatives and the House of Peoples. The executive power is exercised by the President and two Vice-Presidents of the Federation of BA, and the Government of the Federation of BA. The BA-SRP consists of 64 municipalities.

The biggest challenge of establishing a SDI or Open Data initiative in BA is its complex national context because most of the data is produced on the municipal level and in some

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[29] http://katastar.ba/

[30] http://www.fgu.com.ba/en/newse-reader/final-conference-of-the-project-implementation-of-joint-services-for-e-service.html

[31] http://www.cilap-project.org/TemplateStandard.aspx?pageID=1311#.WfHcfWiCyUk

cases there is no higher level institution that has authority or jurisdiction like in the case of the Address System, which plays a crucial role in an SDI.

**Good practice**

The private sector should be a driving force behind the SDI and Open Data initiative as it could greatly benefit from both. Unfortunately, only finding out what data is produced at which administrative level takes effort. For example, one would have to contact more than 140 municipalities to get data about addresses and house numbers for the whole territory of BA.

Some institutions in both entities have identified this problem and are working hard on its solution. One example is the Federal Geodetic Administration (FGA) which managed to implement KATASTAR.ba – the first IT system to be used by all of the municipalities in the BA-BIH. Before KATASTAR.ba, each municipality had its own way of managing their data. There were approximately 25-30 different software solutions and methods used to manage the same data. The unification of data maintenance and business logic enabled the BA-BIH to publish a centralized cadastral registry which is available to everyone (http://katastar.ba) and which covers the entire BA-BIH.

The FGA is a small institution employing 20-25 full time employees and 10-15 project based and in the case of KATASTAR.ba they had jurisdiction and authority to implement this system as they can force the cadastral offices (which are under the municipality jurisdiction) to comply with some rules. Still it was a difficult process and at first many cadastral offices strongly argued against such a system.

After the successful implementation of KATASTAR.ba the FGA gained strong ties with the Municipalities by helping them get better equipment and education thus creating a fertile ground for future projects. At the time of writing this document the FGA is implementing three crucial systems over which it either doesn't have jurisdiction or authority or a very disputable one at most:

- eSERVICES – A pilot project providing the first government e-Services to the citizens of BA
- RCN – Real estate price register
- Address register[32].

The FGA is doing this by signing agreements with every municipality for the implementation of a specific system and following the best practices gained through KATASTAR.ba implementation. The agreement states that in exchange for providing the system, the municipality will supply the FGA with data at the central location so it can be disseminated and published. Although the FGA is a very small institution with a low level of support by its own government, it is actively supported by the World Bank, the Swedish Landmateriet, Norwegian Staten Kraftwerk and other similar organizations through multiple projects like CILAP[33], IMPULS[34], RERP[35] which have played a key role in its success.

In BA-SRP entity, the GARS (Republic Administration for Geodetic and Property Affairs) acts in a similar way and both institutions cooperate on implementing the same projects. It is important to note that although these institutions have almost the same functions they abide by two different legal frameworks. The main difference is in jurisdiction as the GARS has jurisdiction over local cadastral and land registry offices and in the Federation, municipalities have jurisdiction over cadastral offices and the land registry offices are under court jurisdiction.

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[32] http://www.cilap-project.org/TemplateStandard.aspx?pageID=1310#.WfHcvWiCyUk
[33] http://www.cilap-project.org/
[34] http://www.lantmateriet.se/IMPULS
[35] http://www.fgu.com.ba/bs/novosti-pregled/projekt-registracije-nekretnina.html

Although the FGA provides all of its data to the public, it still does not provide Open Data, as the structured data download services have to be paid for. However, it is the first institution in BA that provides free structured data to all other government institutions while also providing free cadastral data to the public from 79 municipalities with weekly updates. It is a great milestone in the country's roadmap to Open Data.

**Conclusion**

In both entities there are laws and regulations regarding data sharing that institutions in their respective entity must adhere to. These regulations are set up to ensure transparency as well as privacy protection which, in terms of Open Data, represent two opposite sides and try to answer the question of what data must be shared, and what data should not be shared. Between these two sides is a non-regulated grey area in which the institutions should, proactively, share their data and at least try to make it as reusable as possible by sharing the data in its original, editable form.

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## JRC Mission

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