

Multi-view SDI Assessment of Kosovo (2007-2010) - Developing a Solid Base to Support SDI Strategy Development

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Abstract

This paper presents the multi-view assessment of SDI status in the Republic of Kosovo performed in 2007 and in 2010. The main objective of this research was to assess the SDI of Kosovo and to define the driving forces needed to support SDI strategy development.

The research assesses the status of SDI implementation of Kosovo using SDI readiness Index (Delgado *et al.*, 2005), INSPIRE State of Play (Vandenbroucke *et al.*, 2008), and Maturity Matrix (Kok and Van Loenen, 2005) as assessment approaches. Each approach treats the assessment of SDIs from a different view and context and so with a different purpose in mind. An SDI readiness survey questionnaire was submitted to the SDI stakeholders in Kosovo in 2007 and 2010. The INSPIRE State of Play was assessed for the 5 countries of Estonia, Lithuania, Latvia, Slovenia and Luxembourg and an attempt to define the State of Play for SDI of Kosovo was also part of the assessment. The last assessment was defining the Maturity Matrix for the SDIs of Slovenia and Kosovo.

This research has led to 6 driving forces selected to support the development strategy of SDI at the national level in Kosovo.

KEYWORDS: SDI, Kosovo, multi-view assessment, Readiness Index, Maturity Matrix.

1. Introduction

The assessment and evaluation of SDI initiatives is difficult due to a number of reasons. Many researchers have tried to assess SDIs (Crompvoets, 2006; Delgado-Fernandez and Crompvoets, 2007; Delgado-Fernandez *et al.*, 2005; Kok and van Loenen, 2005; Masser, 1999; Onsrud, 1998; Rodriguez-Pabon, 2005; Steudler *et al.*, 2004). All these attempts, though useful and valuable, either concentrate on one aspect of SDI, or are bounded by one region, or describe SDI development in only a few particular countries, or are still conceptual in nature.

In order to improve the SDI development of Kosovo, this paper assumes that defining ‘the lessons learnt’ and ‘identification of good practices’ during the implementation of SDIs in other similar countries is needed. This research also explores how to define the driving forces that could support further sustainable development of the SDI of Kosovo. Defining and drawing the comparison between the SDI Readiness Index of Kosovo in 2007 and 2010 and investigating the INSPIRE State of Play programmes of five different European countries (Estonia, Latvia, Lithuania, Slovenia and Luxembourg) supports this research.

1.1 Republic of Kosovo

The Republic of Kosovo has about 2.2 million inhabitants in an area of about 11.000 km². There are 30 municipalities with five of them Serbian dominated and eight as ethnically mixed municipalities. Kosovo shares borders with Serbia to the north and east, the Republic of Macedonia to the south, Albania to the west and Montenegro to the northwest. The largest city and the capital of Kosovo is Prishtina.

Kosovo declared independence on 17 February 2008. Currently, about 80 United Nations states recognize the independence of Kosovo and it has become a member country of the IMF and World Bank as the Republic of Kosovo.

The “new-born” Republic of Kosovo is in an intensive stage of development after the independency declaration in February 2008. The Government has declared its priorities in the comprehensive “Program of the Government of Republic of Kosovo, 2008-2011” and is gradually implementing the Ahtisaari plan including decentralization issues also affecting land administration. One of the Government’s aims is to take steps towards European integration.

1.2 Background of Kosovo’s SDI

The awareness for SDI was extremely low in the first years after the violent conflict in Kosovo. Yet for several early adopters in Kosovo, efficient and transparent spatial information and management was of a special importance for the future of Kosovo. With hasty and technocratic development in Kosovo regarding the Geographic Information System (GIS) and its applications, more and more unsynchronized and

scattered information has been generated. There was a vast amount of datasets stored in different places and in different formats, but awareness of reusing and sharing the information for new applications was very limited. Unfortunately this diversity in information can be still seen in different governmental departments. Standardizing geographical information and sharing is still a big challenge for the sustainable development of SDI in Kosovo.

The Land Administration Policy (LAP) adopted in 2003 was aimed at defining and then implementing a modern land administration framework. The LAP has also suggested outlining the policy for NSDI implementation in Kosovo. The Kosovo Cadastral Agency (KCA) is only one of the stakeholders among others in land administration. Other stakeholders have responsibilities for planning, land use, zoning, building management, utility infrastructure and mining – activities that contribute to effective administration and management of land and immovable property.

An SDI Council was established to lead the all-embracing sector implementation of SDI. In Kosovo, however, it might be more suitable to charge the Inter-Ministerial Land Administration Committee to lead the all-embracing sector implementation of NSDI. The committee could have an advisory role towards the Government and the KCA.

Aerial photo production in accordance with a long-term plan is foreseen during the planning period. Aerial photographs are available for the whole territory of Kosovo (Spring 2009). Production of rather simple topographic vector maps, in addition to the existing cadastral maps, aerial photos and digital terrain model (DTM), is marked as the start of developing a sustainable National Spatial Data Infrastructure for Kosovo in compliance with the EC INSPIRE Directive.

A permanent GPS Network available for users in Kosovo will also be implemented based on the proposal presented in the General Feasibility Study: 'Continuously Operating Reference in Kosovo', (CORN, August 2006).

It is important to mention in this context that the Republic of Kosovo and the Republic of Slovenia have entered into an agreement on cooperation in the field of geodetic activity. An Outline of terms of reference on technical assistance for establishing the Kosovo Spatial Data Infrastructure with support from the Surveying and Mapping Authority of the Republic of Slovenia has already been drafted.

2. SDI Assessment of Kosovo

The research assesses the status of SDI implementation of Kosovo using SDI Readiness Index, INSPIRE State of Play and Maturity Matrix as assessment approaches. A questionnaire-based SDI readiness survey was conducted on the SDI stakeholders in Kosovo in 2007 and 2010. The INSPIRE State of Play is assessed for 5 countries of Estonia, Lithuania, Latvia, Slovenia and Luxembourg and an attempt to define the State of Play for SDI of Kosovo was also part of the assessment. The last assessment was defining the Maturity Matrix for SDIs of Slovenia and Kosovo.

2.1 SDI Readiness Index

The SDI-readiness approach (Delgado, 2005) aims to measure the degree to which a country is prepared to deliver its geographical information to the community. This approach is directed at measuring the following aspects of SDI readiness: organizational, information, access network, human resources and financial resources.

According to Delgado (2005), the SDI Readiness Index can be defined as a composite measurement of the capacity and willingness of countries to use SDIs. The index incorporates organizational, informational, human resources, technological and financial resources factors and the determination of the index value is based on a survey that only authorized experts of a country are able to complete. Most of the factors that are included in the SDI readiness model are qualitative rather than quantitative. A basic seven-tier classification system is used — from Extremely High to Extremely Low.

The SDI Readiness Index approach was applied in Kosovo in two time periods: in Summer 2007, when this research started; and in Summer 2010. In two different time frames, a selected group of ten (10) SDI experts from Kosovo were consulted to give their opinion on the most important variables needed for SDI Readiness assessment Index of SDI in Kosovo. Very few of the experts were part of the private organization that was using GIS but most of them were involved in GIS activities within different government ministries of Kosovo. Most of the participants were of middle management with few from the executive management level.

The 10-question questionnaire is considered to be representative, considering the fact this was a targeted research, and the research results are to be considered valid.

SDI Readiness Index assessment in 2007

The first SDI Readiness Index assessment was held in summer 2007. In this period we have conducted several individual discussions with key experts involved in different activities regarding the SDI developments in Kosovo. The concepts of SDI were not always understood in the same way and there was no priority for SDI at that time. SDI awareness at the level of institutional leadership was at a very low level. At this time

the Kosovo Cadastral Agency had identified the need to begin developing an NSDI for Kosovo.

All the statements have been organized in a database in order to be able to track and identify changes and perform the data calculations needed to quantify the SDI Readiness Index. The selected 10 statements were organized into a 7-cell matrix related to the 7 possible levels of responses according to the questionnaire. For example, for the first organizational factor 'Political vision regarding SDI' a score in the last (seventh) cell means that the respondent's view is that '*No vision exists as well as no intention exists to formulate a vision regarding the importance and development of the national SDI*', while a score in the first cell indicates that there is an '*Extremely high vision regarding the importance and development of the national SDI*' according to the respondent.

At the conclusion the SDI Readiness Index of Kosovo for 2007 was calculated as presented in Table 1 and Figure 1.

Factor	Decision Criteria		SDI Index
Organizational	Political vision regarding SDI	Ov	0,18
Organizational	Institutional leadership	OI	0,15
Organizational	Umbrella legal agreement(s)	Oa	0,21
Informational	Digital cartography availability	Ic	0,33
Informational	Metadata availability	Im	0,22
People	Human Capital	Pc	0,21
People	SDI culture	Ps	0,22
People	Individual leadership	PI	0,15
Access network	Web connectivity	Aw	0,21
Access network	Telecommunication infrastructure	At	0,16
Access network	Geospatial software availability	As	0,27
Access network	Own geoinformatics development	Ad	0,15
Access network	Open source culture	Ao	0,16
Financial Resources	Government central funding	Fg	0,24
Financial Resources	Return on investment	Fr	0,21
Financial Resources	Private sector activity	Fp	0,16

Table 1. 2007 SDI Readiness Index of Kosovo

The score of 0.26 in the range up to a maximum of 1.0 is obviously very low. The determinants in this score are the low values for the organization, human and financial resources factors.

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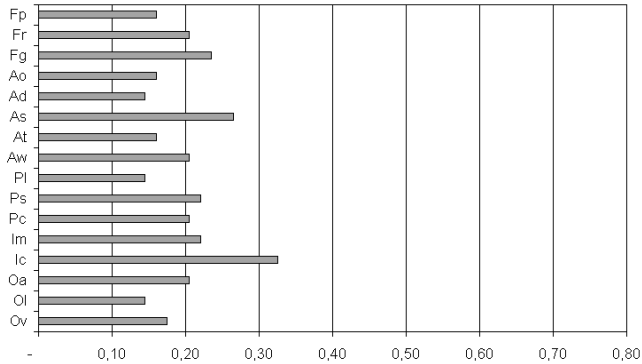


Figure 1. 2007 SDI Readiness Index of Kosovo

This result is at the same time very important for Kosovo seeing that this is the first attempt ever for assessing the SDI of Kosovo. By actively participating in the survey, the key experts demonstrate their interest for SDI initiatives. As a consequence the key experts can now take advantage of the best practices of other SDIs, once they have identified the shortcomings of the Kosovo SDI as disclosed by the 2007 survey.

SDI Readiness Index assessment in 2010

In the summer of 2010 we again measured the SDI Readiness Index for Kosovo. Not all the key experts from the 2007 survey were available for 2010 assessment (seven participated in the 2007 assessment). The questionnaire was sent by email to all participating experts. The same calculation model built earlier is used to calculate the SDI Readiness Index of Kosovo for 2010 as presented in Table 2 and Figure 2.

Factor	Decision Criteria		SDI Index
Organizational	Political vision regarding SDI	Ov	0,24
Organizational	Institutional leadership	OI	0,36
Organizational	Umbrella legal agreement(s)	Oa	0,33
Informational	Digital cartography availability	Ic	0,42
Informational	Metadata availability	Im	0,25
People	Human Capital	Pc	0,36
People	SDI culture	Ps	0,33
People	Individual leadership	PI	0,30
Access network	Web connectivity	Aw	0,27
Access network	Telecommunication infrastructure	At	0,28
Access network	Geospatial software availability	As	0,31
Access network	Own geoinformatics development	Ad	0,18
Access network	Open source culture	Ao	0,16
Financial Resources	Government central funding	Fg	0,36
Financial Resources	Return on investment	Fr	0,30
Financial Resources	Private sector activity	Fp	0,33

Table 2. 2010 SDI Readiness Index of Kosovo

The SDI Readiness Index score of 0.36 is an improvement compared with the 2007 score of 0.26 but still very low. Despite the improvements in the Organizational factors, the Human and Financial Resources factors remain low.

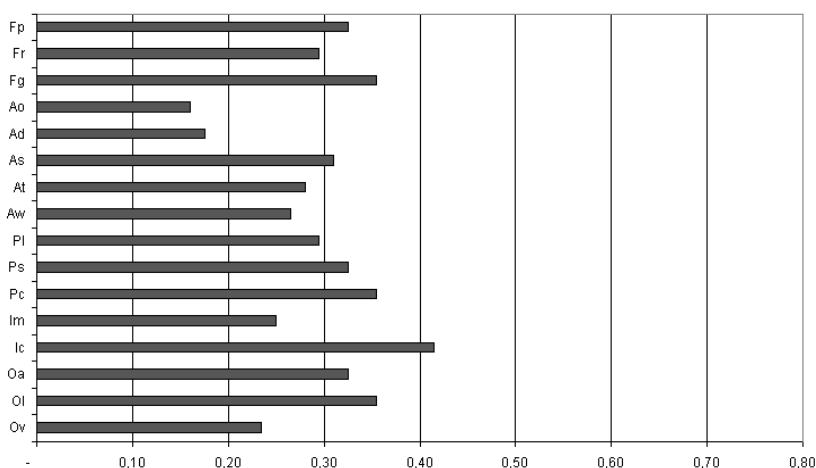


Figure 2. 2010 SDI Readiness Index of Kosovo

The comparison of SDI Readiness Index 2007 and 2010

Based on the data gathered, the following results were obtained.

			SDI R2007	SDI R2010	SDI R-delta
Organizational	Politician vision regarding SDI	Ov	0,18	0,24	0,06
Organizational	Institutional leadership	OI	0,15	0,36	0,21
Organizational	Umbrella legal agreement(s)	Oa	0,21	0,33	0,12
Informational	Digital cartography availability	Ic	0,33	0,42	0,09
Informational	Metadata availability	Im	0,22	0,25	0,03
People	Human Capital	Pc	0,21	0,36	0,15
People	SDI culture	Ps	0,22	0,33	0,11
People	Individual leadership	PI	0,15	0,30	0,15
Access network	Web connectivity	Aw	0,21	0,27	0,06
Access network	Telecommunication infrastructure	At	0,16	0,28	0,12
Access network	Geospatial software availability	As	0,27	0,31	0,05
Access network	Own geoinformatics development	Ad	0,15	0,18	0,03
Access network	Open source culture	Ao	0,16	0,16	-
Financial Resources	Government central funding	Fg	0,24	0,36	0,12
Financial Resources	Return on investment	Fr	0,21	0,30	0,09
Financial Resources	Private sector activity	Fp	0,16	0,33	0,17

Table 3. SDI Readiness Index in Kosovo for 2007 and 2010.

From the Organizational index perspective the Institutional leadership as criteria has the greatest increase (from 0.15 to 0.36) while the political vision regarding SDI (increasing from 0.18 to 0.24) has the smallest increase. An Increase in the People indices is relatively consistent in all decision criteria. The largest increase is for Human capital (from 0.21 to 0.36) and Individual leadership (from 0.15 to 0.30) while for SDI culture (from 0.22 to 0.33) is slightly lower.

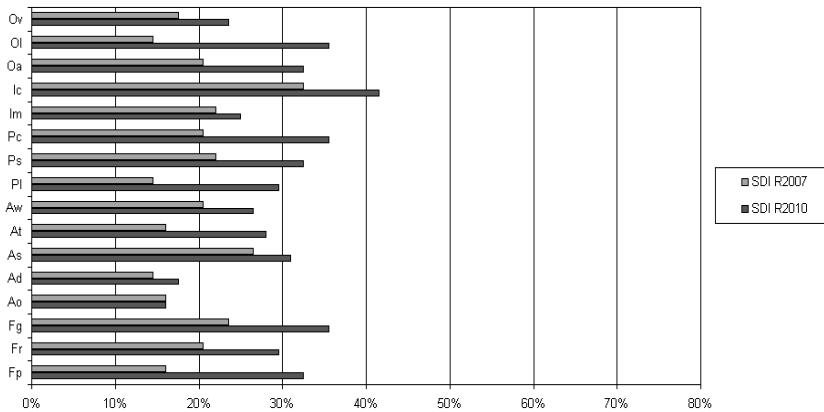


Figure 3. Comparison between decision criteria SDI readiness index in Kosovo for 2007 and 2010.

As these results indicate, there is a large spread of the performance between the different factors. For instance, the technology performance seems to be related to income, as opposed to the organizational factor which has a different outcome regarding income. In the Kosovo SDI it is important to highlight the organizational aspects as a key to the success of its SDI. A stronger organizational and legal framework aims to strengthen the coordination role ensuring a more powerful and sustainable SDI is developed.

Factor		SDI R2007	SDI R2010	SDI R-delta
Organizational	O	0,17	0,30	0,13
Informational	I	0,28	0,34	0,06
People	P	0,19	0,32	0,14
Access network	A	0,43	0,50	0,07
Financial Resources	F	0,20	0,33	0,12
SDI Readiness Index (2010)		0,26	0,36	0,11

Table 4. SDI Readiness Index in Kosovo 2007 and 2010.

This comparison of the SDI Readiness Index of Kosovo over time (Table 4) demonstrates a self-effecting increase. It is clear that the main merit for this increase is the very low SDI Readiness Index score of 0.26 in 2007. As explained earlier, the scope of this research was not to compare the SDI Readiness Index of Kosovo with other countries, but it becomes obvious that the present score of the SDI Readiness Index of 0.36 for 2010 is still very low. We can assume that although the SDI of Kosovo has made considerable progress, there are still many challenges towards an effective implementation of a National SDI in Kosovo.

The increase along the SDI readiness scale signifies considerable progress, but there is room for much more improvement. However, some conclusions can be made at this stage. The largest increase is in the People Factor (from 0.19 to 0.32) and the Organizational Factor (from 0.17 to 0.30) index. The lowest Readiness Index increases are for the Informational Factor (from 0.28 to 0.34) and Access Network Factor (from 0.43 to 0.50) index. This is also due the relatively high score in these two indices in 2007. This is represented in Figure 4.

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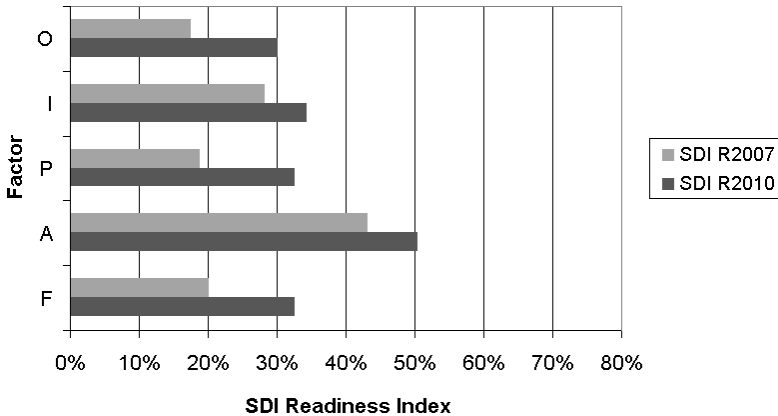


Figure 4. Comparison between factors and SDI readiness index in Kosovo for 2007 and 2010.

Using the SDI Readiness Index we can specify the driving forces towards further implementation of a National SDI for Kosovo. The evolution of SDI readiness of Kosovo from 2007 to 2010 is evident. This period marks the transition from when the government of Kosovo was led by the United Nations Mission in Kosovo (UNMIK) to independence and the democratically chosen Kosovo government. There is a small number of SDI professionals. In addition, there is a lack of relevant legislation, applicable working methodology, relevant standards and proper coordination of their activities as well as enforcement processes.

Although all the formal and fundamental institutional elements of an SDI are present, the SDI organization is still undersized and under-skilled for the challenges it faces. The effective horizontal communication and top-bottom planning approach are still missing in Kosovo. A noticeably huge effort was undertaken in the policy area. Several strategy documents have been produced (most by foreign experts or under their supervision), e.g. the Business Plan 2009-2014 for the Cadastral Agency (KCA) and the Cadastral Sector in Kosovo bringing a comprehensive list of recommendations and actions for the development of the KCA and the Cadastral Sector in Kosovo.

Performance results are less satisfactory in the legislative field. Primary legislation is gradually being adopted by amending the former UNMIK regulations with support from international donors. Whilst this has advanced in the sense that it is approaching European harmonization, the secondary legislation is lagging badly behind. This lag inhibits implementation of modern administrative tools for a countrywide SDI in Kosovo.

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Based on the research of Grus *et al.* (2008) the scores for each case country in the SoP assessment approach are presented as a percentage of the maximum possible score. The motivation for presenting the scores as percentage values is to make the SoP assessment results easily comparable with each other. Furthermore, normalising the results to percentage values makes the results more comprehensible. In this case if a statement of an SDI is in large agreement the maximum score possible is given (100%). For statements in partial agreement 50% is given. No agreement is treated as 0%. Results are presented in Table 6 with the different average scores arranged from highest to lowest.

	2007	I. Organisational issues					II. Legal issues and funding					III. Data					IV. Metadata					V. Access and other services					average									
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		26	27	28	29	30	31	32		
Slovenia	SL				0%	0%	0%	50%	50%	0%	0%			50%						0%	0%															67%
Estonia	EE	50%		0%	0%	0%	50%	0%	50%	50%	0%	50%	50%		50%	50%			50%	0%				0%	100%		50%	0%	0%	0%	0%	0%	50%		58%	
Lithuania	LT			0%	0%	0%		0%	50%		0%	50%	0%	50%	50%	50%		50%	50%			50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%		47%	
Luxembourg	LU	50%	50%	50%	0%	50%	0%	0%	0%	0%	0%	50%	0%	0%	0%	0%		0%	0%			0%	50%	50%	0%	50%	50%	0%	0%	0%	0%	0%	50%		36%	
Latvia	LV	50%	0%	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	50%	50%	0%			50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	50%	34%	
Kosovo	KO	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%	0%	50%	50%	0%					50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	50%	50%	33%	

Table 6. Normalized results of 5 case countries and Kosovo SDIs for 2007

As can be derived from Table 6, all case countries have a similar level of SDI development and are developing a truly national SDI. It is also the clear intention for Kosovo to develop a truly national SDI. Only Slovenia and Lithuania have reached a significant level of functionality regarding one or more components of the SDI. In all case countries the officially recognized coordinating body of the SDI is a NDP or a comparable organization. In almost all case countries (besides Luxembourg) the producers and users of spatial data are not involved in the SDI processes because only public sector agencies are participating in the SDI. Furthermore, it is clear with regard to legal issues and funding the ambiguity persists. An example is the case of Estonia which is confusing because on one hand only the public sector is participating in the SDI while according to indicator 9 there exists a true PPP or other co-financing mechanisms between public and private sector bodies. Further, there is still no clear information available on the legal status of the SDI in the respective countries. Some of the legal issues results of the SoP analysis are debatable from the modern SDI perspective. On the other hand, data, metadata and services are quite developed, especially in Slovenia and Estonia. Other countries are working hard in this field. It is clear that standardization is becoming an important aspect for all case countries.

Figure 5 presents the assessment results of the 5 SDIs using the INSPIRE state of play approach.

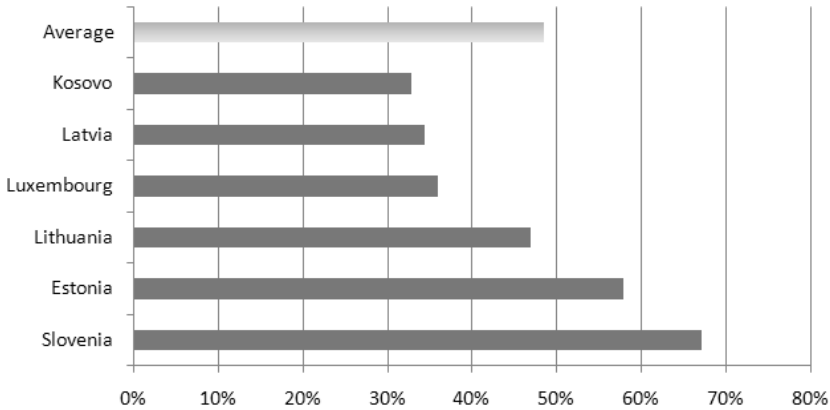


Figure 5. INSPIRE SoP scores per case study (in %)

From the INSPIRE State of Play assessment Slovenia has the highest score of 67% followed by Estonia with 58%. Lithuania scores lower with 47%. Two other countries score lower than the sample average (48%). Luxembourg scores 36% followed by Latvia 34%. The attempted projection of SoP of SDI in Kosovo resulted lowest with 33%.

2.3 Maturity Matrix

The organizational assessment approach is based on research by Kok and van Loenen (2005) on the evaluation of the different stages of development of geographic information infrastructures, when viewed from the organizational perspective. This approach measures the development of SDI for the following aspects: vision, leadership, communication, self-organizing capacity, awareness, financial viability and status of the delivery mechanism. The important point of this approach is the developmental perspective of evaluation as it measures SDI development from an organizational perspective.

The SDI Maturity Matrix consists of four stages of SDI development: *stand alone*, *exchange*, *intermediary*, and *network* stages. In the first network stage different organizations seek to build their own infrastructure. In the network stage, ultimate, most advanced stage, it is commonly understood what an SDI consists of and what its objectives and ideals are. In this idealistic view, leadership, open communication channels and a pro-active geographic information sector have resulted in a capacity that is such that the SDI enjoys broad support at all levels, resulting in sustainable funding for SDI development. (Van Loenen, 2006).

The aim of this research step was to measure and analyze the development of the Kosovo and Slovenia SDIs using the Maturity Matrix method. Subsequently, the above results of SDI developments of Kosovo and Slovenia are projected in an SDI maturity matrix.

Our motivation to choose the SDI of Slovenia is based on the fact that the Republic of Kosovo and the Republic of Slovenia have entered into an agreement on cooperation and technical assistance for establishing the Kosovo SDI. Another aspect is that the Slovenian level of SDI development is a realistic and an achievable aspiration for Kosovo.

SDI Slovenia

The SDI of Slovenia can be classified in between the phases ‘Exchange and Standardization’ and ‘Intermediary’ of the matrix. Especially the components Self-Organising ability and awareness for GII need to be developed further. Maturity Matrix findings are based on a desk research of the literature but mainly on the recent work of Ažman and Petek (2009), Lipej and Modrijan (2010) and SoP reports for Slovenia.

Table 7 summarizes the conclusion for Slovenia presented by defining the stage (★) of Slovenian SDI for each aspect of maturity matrix.

Stage \ Aspect	Stand alone/ initiation	Exchange/ standardization	Intermediary	Network
Vision	Focus on individual organisation	Developed with all stakeholders	Implementation ★	Commonly shared, and frequently reviewed
Leadership	Focus on individual organisation	Questioned	Accepted ★	Respected by all stakeholders; 'champion'
Communication	Focus on individual organisation	Open between public parties	Open between all stakeholders ★	Open and interactive between all
Self-organising ability	Passive problem recognition	Neutral problem recognition ★	Actively helping to solve identified problems	Actively working on innovation
Awareness for GII	Professionals in one organisation: organisational 'SDI'	Professionals of organisations together 'SDI' ★	Awareness at many levels incl. decision making	Commitment at all levels/continuous support in politics and management
Financial sustainability	Limited to projects	Neutral	Guaranteed for certain period ★	Sustainable but frequently reviewed

Table 7. Maturity of the Slovenian SDI

SDI Kosovo

The SDI of Kosovo is in almost all aspects classified within the ‘Stand-alone / Initiation’ stage. The component ‘Communication’ only is somewhat in the ‘Exchange / Standardization’ stage. The Maturity Matrix findings for the present state of SDI in Kosovo are based on desk research of the literature but mainly on the reports “Business plan 2009-2014” and “Development Strategy 2009-2011” for The Kosovo Cadastral Agency and The Cadastral sector in Kosovo. Table 8 summarizes the findings by defining the stage (★) of the Kosovo SDI for each aspect of the Maturity Matrix.

Stage \ Aspect	Stand alone/ initiation	Exchange/ standardization	Intermediary	Network
Vision	Focus on individual organisation ★	Developed with all stakeholders	Implementation	Commonly shared, and frequently reviewed
Leadership	Focus on individual organisation ★	Questioned	Accepted	Respected by all stakeholders; ‘champion’
Communication	Focus on individual organisation	Open between public parties ★	Open between all stakeholders	Open and interactive between all
Self-organising ability	Passive problem recognition ★	Neutral problem recognition	Actively helping to solve identified problems	Actively working on innovation
Awareness for GI	Professionals in one organisation: organisational ‘SDI’ ★	Professionals of organisations together: SDI	Awareness at many levels incl. decision making	Commitment at all levels/continuous support in politics and management
Financial sustainability	Limited to projects ★	Neutral	Guaranteed for certain period	Sustainable but frequently reviewed

Table 8. Maturity of the Kosovo SDI

For the purpose of being able to combine the results with other assessment methods in this research we have translated the four stages of the organizational approach into percentage values (%) (see also Grus *et al.*, 2010, p.87). The scores indicate respectively the following stages: stand-alone (25%), exchange (50%), intermediary (75%) and network (100%). The gap between the SDI developments in Slovenia and Kosovo are clearly shown in Figure 6.

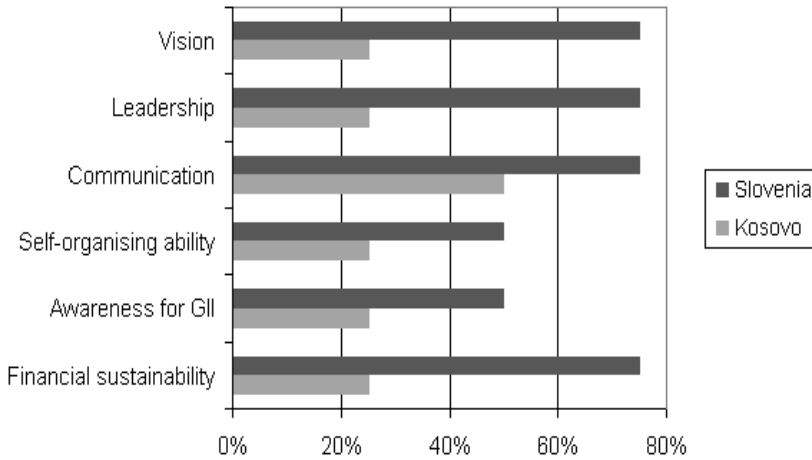


Figure 6. Maturity Matrix approach scores for Slovenia and Kosovo (in %)

Most significant gap occurs in Vision, Leadership and Financial sustainability in which the SDI of Kosovo requires a large leap from stage 1 (stand alone) to stage 3 (Intermediary). The reason for this lies, most likely, in the lack of common vision, undefined leadership and inadequate budgeting processes. The traditional human resource management is also of big influence. On the other hand the gap between the SDIs of Kosovo and Slovenia is slightly smaller in Communication (stage 2 to 3), Self-organizing ability and Awareness for GII aspect (stage 1 to 2).

The results of the Maturity Matrix prove that improving the Kosovo’s SDI is totally necessary and justifiable. In other words, preservation of the current state of the SDI of Kosovo is not acceptable, not from organizational perspective nor from financial sustainability. It is important to accentuate that there are no identical SDIs in the world, and it is impossible to replicate a model from one country to another. Kosovo, considering its uniqueness, social needs and the present SDI development stage, needs to develop its own model of the SDI. But the SDI of Kosovo can follow the development trend of the SDI of Slovenia to be geared up to meet all challenges and future needs in line with INSPIRE directives. Improvement of the existing SDI of Kosovo is to be treated as a public project of permanent character, in which before defining the particular activities and resources at all levels, an efficient improvement strategy should be created. Of greater importance is that Kosovo should build such a strategy by itself.

3. Discussion of the Results

By applying the multi-view assessment framework we sought an objective overview of the present stage of SDI development in Kosovo and to test its applicability to assess SDIs. In this chapter we present the assessment results by using the three assessment approaches mentioned before: SDI Readiness Index, State of Play and Organizational Maturity Matrix. The special concentration is given to the Organizational aspects of SDI Readiness and SoP.

By synchronized use of the three assessment approaches we expected to create a much broader and more comprehensive picture of the Kosovo SDI. In that way the assessment is more objective because we are not limited to one view on an SDI. Furthermore converging on the Organizational aspects of multiple assessment approaches allows easier identification of the important driving forces that require more attention than others. Table 9 and Figure 7 presents the final results of the application of the multi-view SDI assessment of Kosovo.

Assessment approach	Kosovo
SDI Readiness Index	36%
SDI Readiness Index - Organisational	30%
INSPIRE SoP	33%
INSPIRE SoP - Organisational Issues	50%
Maturity Matrix (average)	29%

Table 9. Multi-view approach scores for SDI of Kosovo (in %)

It is interesting to notice that the average scores of different assessment approaches are in relatively balanced. The higher score is that of the SDI Readiness Index (36%) while the lowest score is of Maturity Matrix (29%). The average score of the multi-view assessment for SDI of Kosovo is 33%.

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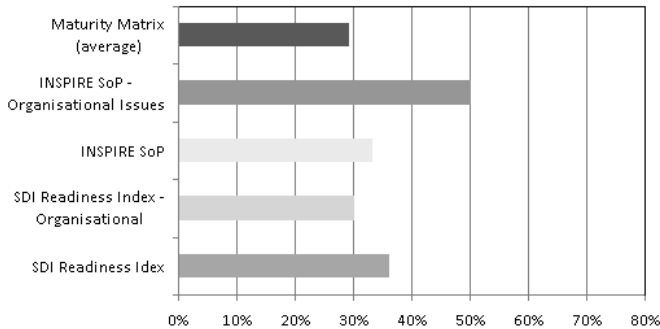


Figure 7. Multi-view approach scores for SDI of Kosovo (in %)

If we direct our attention to the organizational aspects of each approach one can see that the SDI of Kosovo scores higher in the organizational aspects of SoP (50%) than in the total score of SoP (33%). In the case of the SDI Readiness Index, it is the opposite result where Organizational aspects scored lower (30%) than the total Readiness Index (36%).

To ensure the future development of the SDI in Kosovo it is obvious that almost all Organizational aspects of SDI have to be improved. Therefore the driving forces should be to support this improvement.

3.1 The Driving Forces of SDI in Kosovo

The analysis and comparison of the SDI of Kosovo and the case study countries provide insight into the driving forces behind the SDI development of Kosovo. In this research step the differences and similarities between the initiatives and the driving forces behind the initiatives have become apparent. A compilation and combination of the issues has led to 6 driving forces selected for the purpose of sustainable development of SDI at the national level in Kosovo. These 6 driving forces have been chosen due to their particular relevance to local conditions in Kosovo and the perceived contribution of each driving force in developing a solid base to support SDI strategy development of Kosovo. Driving forces for future improvement of SDI of Kosovo could be: *SDI Awareness, Political Support, Coordination & Cooperation, Financing certainty, Communicate the benefits and Appointment of the SDI champion.*

As shown in Figure 8 each of 6 defined driving forces are aiming at a particular aspect of Organizational development of SDI in Kosovo.

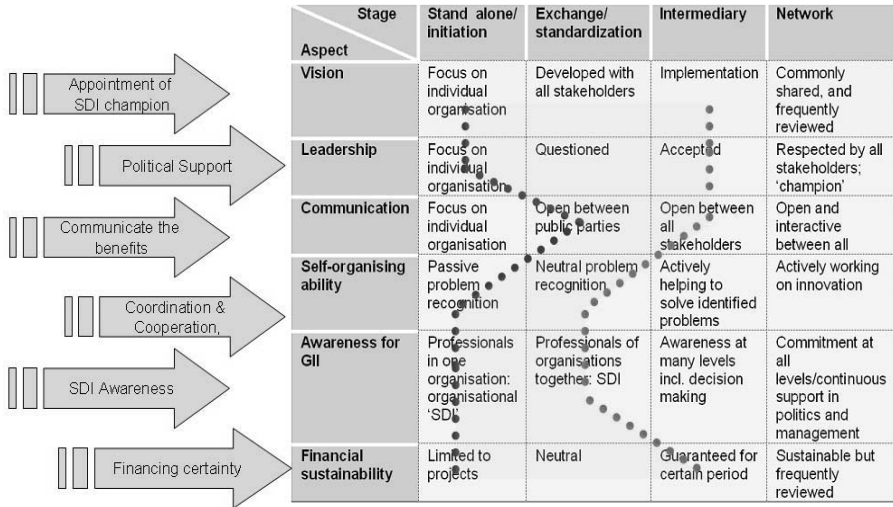


Figure 8. Driving forces projected in the Maturity Matrix (Red - Maturity of Slovenian SDI, Blue - Maturity of Kosovo SDI)

Results of the Maturity Matrix assessment of the Slovenia and Kosovo SDIs clearly identify the gap in SDI development of Kosovo. The most significant gaps occur in Vision, Leadership and Financial sustainability in which the Kosovo SDI should achieve its greatest improvement from stage 1 (stand alone) to stage 3 (Intermediary).

3.2 Prioritizing the Driving Forces of Kosovo.

Based on this research the driving forces are prioritized in a logical order seeking to eliminate the largest gaps between the SDI development of Kosovo and Slovenia. Figure 9 could be seen as a roadmap for the future sustainable development of the Kosovo SDI.

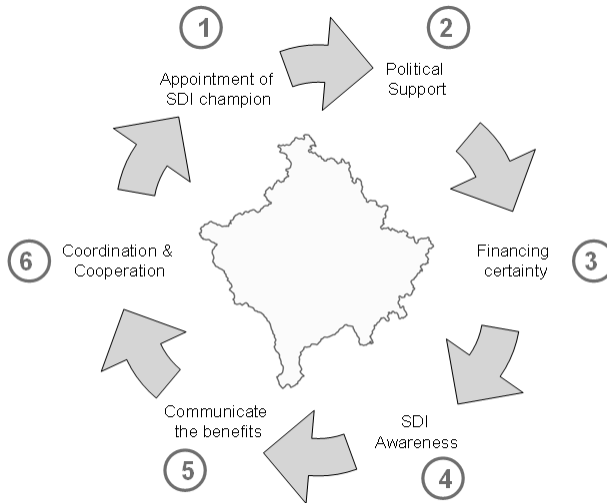


Figure 9. Prioritizing the driving forces of Kosovo.

The driving forces presented in this chapter serves as a proper foundation for creating a vision and a national strategy for Kosovo’s SDI enhancement. First, an SDI champion has to be appointed and then political support needs to be established. After the financing certainty has been guaranteed, the SDI awareness will be improved. After communicating the benefits, the coordination & cooperation will be seen as the next logical step.

4. Recommendations

To contribute to the improvement of a solid base to support SDI strategy development of Kosovo we have formulated the following recommendations:

- The SDI of Kosovo must not be developed in haste, but a clear vision is needed, which is to be based on organizational, human and financial resources.
- Stimulate the natural individual leadership in person of GIS Champion wherever it could be appreciated.
- It is recommended that politicians be encouraged to take an active role in all committees involved in establishing and steering the development of the Kosovo’s SDI.
- Encourage international capacity building projects, for instance, from SDI or other international institutions with authority in the topic.
- To coordinate with national organizations in raising awareness at the political level through the dissemination of use-cases and pilot projects that have a

direct relation to political top priorities such as environment and e-government. It is recommended organizing the Strategic Coordination to support the development of National SDIs and to ensure that policies and actions at the European level are consistent with the development of the SDI in Kosovo.

- Creation of an independent multidisciplinary body is to be considered, which would be independent of the government policy, and on the other hand represent the interests of a wider community of users and citizens of Kosovo.
- The vision for the future development of SDI should be clearly expressed and widely communicated
- Improvement of the existing SDI of Kosovo is to be treated as a public project of permanent character, in which before defining the particular activities and resources in all levels, an efficient improvement strategy should be created. Of greater importance is that Kosovo should build such a strategy by itself.
- The introduction of SDI in Kosovo will take many years. A step-by-step approach is, therefore, suggested for the implementation of the SDI.
- The users should be engaged as far as possible in the future development and implementation of the SDI in Kosovo and to base the work on user requirements.
- Conduct cost/benefit analysis emphasizing the merits of SDI to convince decision makers about the importance of investing in geospatial matters.

5. Lessons Learned

- The research showed that the three different SDIs assessment tools are useful to assess SDIs in transition countries, such as Kosovo. Additional research should provide evidence which assessment tool might be used best in which specific country.
- In this respect we should note that the three assessment methods appear to have many organizational aspects in common. Further research may develop from these three independently developed methods a fourth method which incorporates the common elements in the existing assessment tools.

References

- Anderson, B., (2008), Business plan 2009-2014 and Development Strategy 2009-2011 for The Kosovo Cadastral Agency and The Cadastral sector in Kosovo.
- Ažman, I., Petek, T., (2009), Spatial Data Infrastructure at the Surveying and Mapping Authority in Slovenia, 3rd INSPIRE conference. Netherlands
- Bačić, Ž., (2009), Process of Transition and SDI: Interaction, effects and the role of the NMCA.

Multi-view SDI Assessment of Kosovo (2007-2010) – Developing a Solid Base to Support SDI Strategy Development

- Craglia, M. and Campagna, M., (2009), Advanced regional spatial data infrastructures in Europe. Luxembourg: Office for official publications of the European Communities.
- Crompvoets, J., Bregt, A., Rajabifard, A., Williamson, I., (2004), Assessing the worldwide developments of National Spatial Data Clearing House, In International Journal of Geoinformation Science, Vol 18, no. 7, pp 665-669 London, Taylor & Francis.
- Delgado (2005), Assessing an SDI Readiness Index, In FIG Working Week, 2005, and GSDI-8, From Pharaohs' to Geoinformatics, Cairo, Egypt. April 16-21 2005.
- Eelderink, L., (2006), Towards key variables to assess National Spatial Data Infrastructures (NSDI) in developing countries. GIMA, MSc thesis, ITC, Enschede, the Netherlands May, 2006.
- Fernández, T. D., Lance, K., Buck, M. and Onsrud, H. (2006), Assessing an SDI readiness index, From Pharaohs to Geoinformatics. FIG Working Week 2005 and GSDI-8, April 16-21 2005, Cairo, Egypt.
- Grus, L., Crompvoets, J., and Bregt, A., (2007), Multi-view SDI Assessment Framework. In International Journal of Spatial Data Infrastructures Research, pp 33-53..
- INSPIRE STATE OF PLAY REPORT, (2007), Homepage of Infrastructure for Spatial Information in Europe.
- Kok, B. and van Loenen, B. , (2005), How to assess the success of National Spatial Data Infrastructures? Computers, Environment and Urban Systems 29: 699-717.
- Lipej, B. and Modrijan, D., (2010), NSDI IN THE CONTEXT OF INSPIRE – SLOVENIA'S STATE OF THE ART AND PRIVATE SECTOR CHALLENGES, International Conference SDI 2010 – Skopje; 15-17.09.2010.
- Masser, I., (2006), What's special about SDI related research? International Journal of Spatial Data Infrastructures Research, 1: 14-23.
- Nobert, D., (2008), SDI Cookbook, Wiki version, September 2010,
- Nushi, B., (2010), Multi-view SDI assessment of Kosovo - Developing a solid base to support SDI strategy development". GIMA, MSc thesis, TU Delft, The Netherlands November, 2010.
- UN (2005), UN Global E-government Readiness Report 2005: From E-government to E-Inclusion, UN e-government survey 2005.
- UN (2008), UN Global E-government Readiness Report 2008: From E-government to E-Inclusion, UN e-government survey 2008.
- Van Loenen, B. and van Rij, E., (2008), Assessment of Spatial Data Infrastructures from an organizational perspective, in A multi-view framework to assess spatial data infrastructures. Melbourne: University of Melbourne. pp. 173-192.

Van Loenen, B., (2006), Developing geographic information infrastructures; The role of information policies. Dissertation.

Vandenbroucke, D. and Janssen, K., (2008), Spatial Data Infrastructures in Europe: State of Play 2007. Leuven, Belgium.