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ANALYSIS OF MID-TERM NATIONAL SPATIAL DATA INFRASTRUCTURE STRATEGIES IN THE WESTERN BALKANS

National Spatial Data Infrastructure (NSDI) strategies are key tool for establishment and development of Spatial Data Infrastructure (SDI) on national level. The quality of content and completeness of specific NSDI strategy is therefore essential for efficient development of NSDI. One of the components of the completeness is also representation of all three main NSDI contributing stakeholder groups (government, business and education sector) in strategy with proper addressing of their tasks and needs. It is not seldom that this representation of stakeholder groups in NSDI strategies is not well balanced, affecting the impact capacity of such NSDI strategies.

Another important aspect in NSDI strategies is promotion of SDI concept and services. Based on experience gathered in frame of BESTSDI project, presence of promotional activities in NSDI strategies are subject of analysis and evaluation. Namely, level of awareness about SDI among stakeholders and users has direct impact on efficiency in implementation of SDI among them.

Having in mind that establishment and development of NSDI is presently important activity for National Mapping and Cadaster Authorities (NMCA) in the region of Western Balkans, in this paper analysis of NSDI strategies of Federation of Bosnia and Herzegovina, Croatia and Macedonia is presented pointing out their strengths and weaknesses in regards of mentioned factors.

Keywords: Spatial Data Infrastructure, National SDI, NSDI Strategy, components, BESTSDI project

1. INTRODUCTION

Spatial Data Infrastructure (SDI) is defined as a collection of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data. The SDI provides a basis for spatial data discovery, evaluation, and application for users and

providers within all levels of government, the commercial sector, the non-profit sector, academia and by citizens in general [5]. Establishment of SDI is recognized as important element of development of e-Society, especially e-Government. Therefore, SDI establishment is usually regulated by special legislation, national SDI law.

Those legal acts give rules for establishment, maintenance and development of National SDI (NSDI) while operational implementation of NSDI establishment is arranged through adoption of NSDI strategies. One NSDI strategy, usually for mid-term period of 3 – 5 years, defines goals and describes activities which should enable accomplishment of set goals detecting also necessary institutional, organizational, financial and human resources capacities for execution of defined activities. Well defined and comprehensive NSDI strategy is therefore key document for establishment and development of SDI in specific country.

Related to the level of SDI development, the focus of NSDI strategies is either on establishment of SDI or on further development of SDI in respective country. Regardless to the focus of NSDI strategy, it should cover all aspects of establishment and development of SDI including tasks and needs of all three major contributing stakeholder groups:

- governmental sector (institutions and NSDI bodies) responsible for legal, organizational, financial and strategical aspects of NSDI,
- business sector (companies) as a key provider of SDI services and products to the users and
- educational sector (institutions and companies) ensuring necessary well educated and skilled human capacities for contributing stakeholders and users.

Interaction between those three main SDI stakeholder groups and balanced development are essential for establishment of sustainable and progressing SDI. The level of interaction can be expressed as influence of each stakeholder group on other two groups in predefined areas of contribution. The interaction among stakeholder groups and main areas of contribution are shown if Figure 1.

Main incentive and guidance for balanced development of main stakeholder groups is given through the NSDI strategy, by defining goals, activities and resources covering all

three groups.

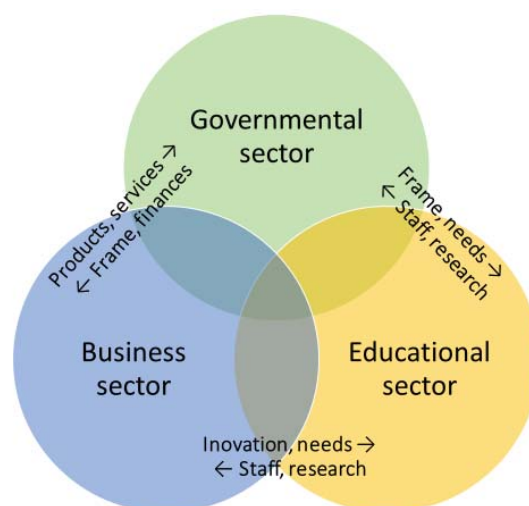


Figure 1. Interaction between main SDI stakeholder groups and their areas of contribution in establishment of NSDI

Neglecting tasks and needs some of stakeholder groups brings strategy in disbalance, resulting ultimately in development of SDI in specific country which will not achieve its full potential. Therefore, SDI strategies should be analysed by completeness of their content, but also contextually, do they, and to which extent, cover all three stakeholder groups. Answer on this question can provide clear indication to creators of any SDI strategy what will be impact of the strategy and respectively what should be corrected to achieve expected (maximum) impact.

2. NSDI FRAME AND STRATEGIES IN THE WESTERN BALKANS REGION

In the region of Western Balkans most countries have adopted some form (law or governmental decision) of NSDI legislation, while several countries, like Bosnia and Herzegovina, Croatia and Macedonia, have also developed and adopted their mid-term NSDI strategies in their effort to establish efficient SDI. Because of mentioned relevance of NSDI strategies, it is worth to compare and evaluate existing strategies in the region providing analysis of their content and completeness trying to estimate their possible impact on development of SDI in respective countries.

2.1 BOSNIA AND HERZEGOVINA

Federation Bosnia and Herzegovina (FB&H) started with establishment of SDI, in late 2014

when the Government of (FB&H) passed the Decree of SDI in the FB&H. The key role in the supply of spatial data in FB&H is held by Administration for Geodetic and Property Affairs of the Federation of Bosnia and Herzegovina (FGA). This was recognized by the Government, and the Regulation gave FGA the authority to establish the SDI Geoportal for FB&H [7].

The following year, the Government appointed members of the SDI FB&H Council, which adopted the three-year work plan. One of the Council's priority objectives was the adoption of SDI Strategy for FB&H. The FB&H Government adopted on September 1, 2016, the SDI FB&H Establishment and Maintenance Strategy [4, 11].

Strategy has defined five basic and ten implementation goals. Basic goals are:

- to establish a spatial data service and to organize the spatial data infrastructure of the FB&H,
- enable SDI FB&H users with easy, fast and efficient spatial access,
- improve the basics of good governance,
- to support the economic development of the FB&H,
- provide basic spatial data to support user needs and EU requirements.

The implementation goals are:

- Adoption of the Strategy for establishing and maintaining the spatial data infrastructure of the FB&H by the Government of FB&H.
- Adoption of the Law on Spatial Data Infrastructure of the FB&H.
- Adoption of a 3-year Program for the Establishment of Spatial Data Infrastructure of the FB&H.
- Mobilize bodies and entities of spatial data infrastructure of the FB&H at all levels and include them in the construction of the SDI.
- Adopt implementing acts: standards, specifications, terms and conditions and the other, in accordance with the standards of the INSPIRE Directive the EU.
- Upgrade existing FGA services that are in function of SDI FB&H to ensure the availability of all FGA data and customer

service users with which they will be satisfied (National Geoportal Exchange).

- Establish Registry of SDI Subjects of the FB&H.
- Establish the SDI Metadata Service of the FB&H.
- Streamline SDI FB&H entities, establish partnerships and efficient SDIs.
- Fulfill the basic criteria in the INSPIRE directive for EU accession.

2.2 CROATIA

Republic Croatia started with preparations to establish its NSDI already in year 2001 when first study on EU requirements on Geographical Information Infrastructure for Croatia [3] resulting in Study on development of NSDI [13]. Those studies enabled to introduce NSDI in Croatian legislation in February 2007 as a part of the Law on State Survey and Real-estate Cadaster [8]. With this Law Croatia has adopted most important provisions of EU INSPIRE Directive [10].

The Law on National Spatial Data Infrastructure [9] has been adopted in Croatian parliament in April 2013 in process of becoming member of European Union on July 1st 2013. As a member of European Union Croatia is obliged fully to implement INSPIRE Directive till year 2021. In this context all components of NSDI, like NSDI bodies, national geoportal, interoperability infrastructure, necessary registers and services have been established in past period.

Recently, in September 2017, Croatian government has adopted NSDI Strategy for 2020 and Strategic NSDI Plan for period 2017-2020 [6]. The NSDI Strategy has defined seven strategic goals:

- NSDI and benefits which he brings are well known.
- Spatial data and services are available and satisfy user needs.
- Conditions and fees for use of spatial data are easy understandable.
- NSDI use is arranged by appropriate rules and politics.
- There are enough operational possibilities available for efficient and effective use of NSDI.

- NSDI supports other important politics and programs on national and international level.
- NSDI stakeholders (NSDI subjects and users) cooperate through partnership and other forms of agreement.

2.3 MACEDONIA

Republic of Macedonia adopted its first NSDI strategy in July 2012. [1], even before the Law on NSDI in Republic of Macedonia has been adopted by the Macedonian parliament in February 2014. [12]. Based on mentioned strategy and law, NSDI bodies have been appointed and Agency for Real-estate Cadaster (AREC) entrusted for operational establishment of NSDI components. In accordance to the strategy and decisions of NSDI council AREC has developed national SDI geoportal, national metadata profile and metadata editor and several registers like:

- NSDI dictionary,
- NSDI functional concept dictionary,
- register of NSDI stakeholders,
- register of coordinate systems and
- register of spatial data collections.

The subject of NSDI in Macedonia are obliged to use operational services of developed interoperability infrastructure and provide for their data discovery, view and download services.

Although not obliged by EU INSPIRE directive, all established components of Macedonian SDI are INSPIRE, ISO and OGC compliant.

Following the developments in establishment of Macedonian SDI based on first NSDI strategy AREC has prepared second NSDI strategy in January 2017 [2], which is, due to the change of Government waiting on adoption. This second NSDI strategy, covering period 2017. - 2019., provides critical (SWOT) analysis of present status of Macedonian SDI, defines strategic goals:

- to enrich and modernize national geoportal with updated data and services,
- further develop interoperability infrastructure and
- develop human and technical capacities for production of standardized collections of spatial data and services,

and defines operational activities for achievement of set strategic goals.

3. COMPARATIVE ANALYSIS OF STRATEGIES

The form of NSDI strategies is not strictly defined, but it is well known what are the structural parts of any NSDI strategy. Each NSDI strategy should for introduction provide overview about history of NSDI (situation) and present status of development of NSDI. Second part of strategy includes definition of NSDI mission and vision, and list of strategic goals defined for specific strategy and specific period. It is worth to mention here that definition of mission, vision and strategic goals between strategies can vary very much. The variation itself is not critical so long there is consistency between defined strategic goals and defined operational activities which should ensure acquirement of strategic goals. Third part of each strategy contains definition of operational goals and list of activities foreseen to achieve set goals as well as estimation of financial, technical and human resources necessary to implement the strategy.

Following this structure of NSDI strategy building elements, NSDI strategies recently adopted in Bosnia and Herzegovina and Croatia and proposed second NSDI strategy in Macedonia are analyzed from content point of view, see Table 1.

Table 1. Content comparison of analysed strategies

Content	FB&H	CRO	MAC
Situation overview given	Yes	Yes	Yes
Starting position described	Yes	Yes	Yes
Vision/Mission defined	Yes	Yes	Yes
Strategic goals defined	Yes	Yes	Yes
Operational goals defined	Yes	Yes	Yes
Operational activities and indicators defined	Yes	Yes	Yes
Financial costs estimated	Yes	Yes	Yes

The comparison presented in Table 1 is showing that all three strategies are complete from the content point of view, although there are visible differences in style and way how

specific parts are defined, like strategic goals listed in chapter 2. Those differences are logical, because of different level of establishment and development of NSDI in analysed countries resulting in different priorities and relevance of specific goals. Despite this, there is still room to detect strengths and weaknesses of each strategy.

The strength of NSDI strategy of Federation of Bosnia and Herzegovina is in the fact that strategy recognized short-, mid- and long-term strategic goals providing well-structured stepwise approach. The weakness of this strategy is lack of risk analysis (like SWOT or similar) and lack of definition of resources (human, technical and financial) necessary for execution of operational activities.

The strength of Croatian NSDI strategy is in extensive chapter on study of costs and benefits and given indicators of expected advance for each strategic goal. As a weakness of this strategy lack of risk analysis (like SWOT or similar) and lack of resources (human, technical and financial) for execution of operational activities can be indicated.

Proposed second Macedonian NSDI strategy includes detailed risk (SWOT) analysis what represents its strength. As weakness of this strategy, like in case of Federation of Bosnia and Herzegovina and Croatia, lack of definition of resources (human, technical and financial) necessary for execution of operational activities, as well as indicators of expected advance can be seen as weakness.

Second analysis is looking for completeness of analysed strategies from the perspective of main contributing stakeholder groups. As discussed in chapter 1, to achieve proper interaction among those stakeholder groups and full potential of strategy it is necessary in NSDI strategy to cover tasks and needs of all those three groups. For purpose of this analysis list of goals and activities is defined and their coverage in observed strategies analysed, see Table 2. Additionally, promotional activities are added as separate category to this analysis, as input for discussion in chapter 4.

The results presented in Table 2 are showing that all three strategies are mainly focused on tasks and needs of governmental sector. This is partly acceptable, because activities for which governmental sector (NSDI bodies and institutions) is responsible are first in sequence of execution for establishment of NSDI. At the same time, lack of goals and operational

activities which are covering needs and tasks of business and educational sector can results in disbalanced development of NSDI and serious gaps in implementation of strategy (slow development of business sector and lack of skilled professionals). Another problem which is occurring in such situation is that there is not enough incentive from business sector towards users, resulting with slugged interest of user community for use of SDI products and services. This gap in not possible to catch up with additional engagement of governmental sector towards users, since the way of approach and methods are different.

Table 2. Completeness of strategies considered from perspective of main stakeholder groups

Goals and activities covered	FB&H	CRO	MAC
Legal and organisational	Yes	Yes	Yes
Technical	Yes	Yes	Yes
Financial	Yes	Yes	Yes
Dissemination of use	Yes	Yes	Yes
Commercial exploitation plan	No	No	No
Creation of business environment	No	No	No
Ensuring human capacities	No	No	No
Support for academic sector	No	Yes	No
Promotion	No	No	No

Similar situation is with ensuring human capacities. The main difference to engagement of business sector lies in the fact that with import of proper measures business sector can in relatively short time achieve results, while ensuring well educated and skilled human capacities requires longer period. This means that lack of measures in NSDI strategies which are focused on human capacities can result in long lasting structural problems in development of NSDI.

4. USER AWARENES ABOUT NSDI

Even the best NSDI strategy covering tasks and needs of all three contributing stakeholder groups may fail if users are not aware about NSDI or have insufficient knowledge what SDI stands for and what are the benefits of NSDI. NMCA's responsible for establishment of NSDI in Bosnia and Herzegovina, Croatia and Macedonia are well aware of this fact, and

they have undertaken number of promotion activities. They published leaflets and brochures, organized conferences and workshops, produced video clips, etc. Those activities doubtlessly achieved results among users which participated in them. Since SDI users are numerous, resulting in fact that promotion activities are costly and demand lot of human capacities, the challenge for NMCA's is to define target groups to be addressed assuming that those target groups cover significant number of users.

In promotion activities undertaken by NMCS in analyzed countries focus of promotion activities was mainly on ministries and governmental agencies, geodetic and geoinformatic professional society, public enterprises and local and regional governments. This results in fact that many other professions were not in, or were weakly included in promotion activities and have limited knowledge about SDI and NSDI activities in their countries concerning not only users but also stakeholders from business and education sector.

Being aware of this fact, consortium of universities from Belgium (Catholic University Leuven), Croatia (University of Zagreb and University Split), Germany (University of Applied Sciences Bochum) and Macedonia (University of Ss. Cyril and Methodius in Skopje) were awarded to execute Erasmus+ Capacity Building in field of Higher Education project "Western Balkans Academic Education Evolution and Professional's Sustainable Training for Spatial Data Infrastructures" – BESTSDI. Beneficiaries of this project are 15 faculties from Albania, Bosnia and Herzegovina, Kosovo, Montenegro and Serbia which should introduce or improve their study programs with curriculum and courses on SDI.

Those beneficiary faculties are covering bright spectrum of study programs: geodesy and geoinformation, technical professions (civil engineering, architecture, geology and mining, IT) and other non-technical professions (agriculture, forestry, philosophy). In the preparatory phase of BESTSDI project, survey has been conducted about the status of SDI at beneficiary faculties.

Results in table 3 are showing that high education institutions, except those which provide study programs on geodesy and geoinformatics, have limited awareness about SDI and are not involved in NSDI activities. The fact that non-geodetic faculties lecture about GIS and use of spatial data for different applications without connecting it with SDI as

a platform for this course is directly opposite to basic concept of SDI. Since this situation can also be copied on respective business sectors it is clear that majority of professions are not well included in NSDI activities. This fact decreases the potential impact of NSDI strategies and positive effects of SDI implementation on society.

Table 3. Level of awareness about SDI at the beneficiary faculties of BESTSDI project

Group of faculties by study program	Level of awareness about SDI
Geodesy and geoinformation (4)	High
Technical studies (5)	Medium to low
Non-technical studies (6)	Low
	Level of involvement in NSDI activities
Geodesy and geoinformation (4)	High
Technical studies (5)	Low
Non-technical studies (6)	Low

This is the reason why BESTSDI project has spread it focus on bright spectrum of study programs trying to broaden the SDI education to other professions aiming that future professionals coming out from those faculties are educated about SDI and in parallel raising awareness about SDI and NSDI activities among academic staff and their students. Being aware that spreading knowledge and awareness about SDI can't be based on one project, there is need for continuous and broaden systematic promotion of SDI what will directly support implementation of NSDI strategy and effects which will be achieved through it.

5. CONCLUSION

Relevance of NSDI strategies for establishment and implementation of SDI in respective countries is recognized and confirmed in this research. The analysis of NSDI strategies recently adopted in Bosnia and Herzegovina and Croatia, and proposed in Macedonia showed that they are well structured and comprehensive, but also that there is space for their improvement. The analysis is also showing that strategies are focused mainly on tasks of governmental sectors, while tasks of business and education

sector are mentioned in strategy goals but without defining operational activities and resources necessary for implementation of those tasks.

The importance of continuous promotion of SDI and need to systematically broaden this promotion to bright spectrum of professions including business and educational stakeholder groups has been elaborated on example of high education institutions, showing that lack of systematic promotion is directly influencing results which can be achieved through implementation of NSDI strategy.

Therefore, well balanced NSDI strategy priorities and defined activities regarding major stakeholder groups, including also promotional activities, should ensure achievement of better results during strategy implementation.

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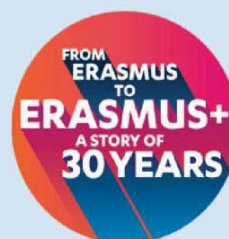


WESTERN BALKANS ACADEMIC EDUCATION EVOLUTION AND PROFESSIONAL'S SUSTAINABLE TRAINING FOR SPATIAL DATA INFRASTRUCTURES

BEST SDI



Funded by the
Erasmus+ Programme
of the European Union



START: 2016 END: 2019