



# National SDI Report for Kosovo Kosovo

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National report

The NSDI National Annual Report serves to strengthen ties with SDIs partner countries, increase visibility of the project by providing information to the Project Advisory Committee

**Keywords:**

National report, SDI, annual, parties of concern, PAC.



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**BESTSDI**

BESTSDI – Western Balkans Academic Education  
Evolution and Professional's Sustainable Training for  
Spatial Data Infrastructures

*With the support of the Erasmus+ program:  
Higher Education – International Capacity Building  
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## Content:

<b>1</b>	<b>Introduction</b> .....	Pogreška! Knjižna oznaka nije definirana.
<b>2</b>	<b>Status of SDI in Kosovo</b> .....	<b>5</b>
2.1	NSDI stakeholders.....	5
2.2	Role of Universities in NSDI .....	7
<b>3</b>	<b>Project outcome BESTSDI</b> .....	<b>8</b>
3.1	Products delivered of BESTSDI .....	8
3.2	BESTSDI project SDI curriculum .....	12
<b>4</b>	<b>Conclusions</b> .....	Pogreška! Knjižna oznaka nije definirana.



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## 1 Introduction

The project "Developing Academic Education in the Western Balkans and Sustainable Vocational Training on Spatial Data Infrastructure" - BESTSDI has been accepted to be funded under the ERASMUS + CA2 Capacity Building and Higher Education Program in 2015. The budget of the project is 978,166.66 and is one of the 147 selected projects from 736 applications submitted.

The project is led by the Faculty of Geodesy of the University of Zagreb with the following project partners:

- Catholic University Leuven (B),
- University of Split (HR), Ss.
- University of Kiril and Methodius in Skopje (MK),
- University of Applied Sciences of Bochum (D),
- Polytechnic University of Tirana (AL),
- Agriculture University of Tirana (AL),
- University of Banja Luka (BiH),
- University of Mostar (BiH),
- University of Sarajevo (BiH),
- University of Tuzla (BiH),
- University for Bussines and Technology (XK),
- University of MOntenegro (MN),
- University of Belgrade (RS),
- University of Novi Sad (RS) dhe
- University of Prizren "Ukshin Hoti" (XK)

Associated partners in the project are:

- Associates of Federal Geodesy and Property Matters FBiH (BiH),
- Geodesy Authority and Property Rights of the Republic of Macedonia (BiH) and
- The Cadastral Agency of the Republic of Macedonia (MK).

The purpose of the BESTSDI project is to improve curricula in partner universities through the introduction of the concepts of spatial data infrastructure (EDI) and e-governance, as well as expanding digital concepts in spatial data management and its network infrastructure, followed by standards and qualities. The duration of the project is 3 years starting on 15 October 2016.

The main purpose of this annual national report on Spatial Infrastructure within BESTSDI is to provide information on the activities carried out through the coordination of national tasks within performance package T5.3. This report contains a description of the current state of the Spatial Data Infrastructure (SDI) in the Republic of Kosovo, the spatial data infrastructure in higher education in Kosovo and the analysis of BESTSDI projects. SDI's status considers the legislation, the organizational



aspect (bodies and institutions responsible), the technical organization (web, geo-portal, brochures) regarding the geospatial data infrastructure in Kosovo, key institutions and administrative bodies, business sector, educational institutions and end users. The role of universities in activities related to NSDI is to provide and improve knowledge within national organizations, including governmental and scientific institutions.

The following information is related to the curriculum development through the BESTSDI project support in the universities participating in this project, as well as an analysis of the current situation and the degree of SDI involvement in specific programs.

## 2 SDI Status in Kosovo

The Kosovo Cadastral Agency is the responsible institution in Kosovo for coordinating activities related to the implementation of the NSDI and related standards / qualities. This agency deals with property and cadastre documentation as well as cartographic data including topography and coverage of land . During 2015 AKM has developed a strategy for the development of national infrastructure for spatial information in the Republic of Kosovo (<http://www.kca-ks.org/documents/10179/203035/Strategjia+per+NSDI.pdf/ec08c914-5370-4ab9-b148-418429cd314e>). Regarding NSDI in Kosovo, important support is provided by the European Commission project "INSIRATION - SDI for the Western Balkans". The Directive of the European Parliament (Directive 2007/2 / EC), the directive that has established the European Community's spatial data infrastructure, together with its internal specifications, is a solid and sustainable basis for the creation of the NSDI in the Republic of Kosovo. Establishing the criteria for the establishment of the NSDI in Kosovo started in 2012 and is continuing, several legal and sub-legal acts have been adopted, and the draft law on NSDI has been completed. From the technical point of view, a state geo-portal based on the open source technique was created in Kosovo. NSDI's infrastructure and data services will be determined by the Law on NSDI.

### 2.1 NSDI's Stakeholders

Apart from KCA, the main stakeholders of NSDI in Kosovo are: the Ministry of Agriculture, Forestry and Rural Development (MAFRD), the Independent Commission for Mines and Minerals (ICMM), the Ministry of Environment and Spatial Planning (MESP), the Kosovo Agency for Statistics Kosovo (KAS) etc. These institutions are using appropriate IT standards in the field of spatial data, but they lack coordination and data interoperability. There is a link between central government bodies and municipalities where the flow of data between them is based on closed circulars without standards and similar quality..

With the implementation of the IKIH Strategy will benefit stakeholders in the whole economy:



Citizens will benefit through the provision of better services. It will be much easier to answer the question 'where' and so will understand the question "why"?

Public Sector / Government - service providers will share information beyond the partnerships in providing commonly targeted services that are more effectively targeted, for e.g. the fight against crime, disorder and emergency planning.

Public Sector / Government - policy makers will have access to all relevant information to support the development of evidence-based and monitoring policies. Policies will be better targeted by knowing the characteristics of the recipient and the location ', for e.g. use of low-grade agricultural land for housing, assessment of road construction, etc..

Public Sector / Government - Information suppliers are expected to produce geospatial information that is sustainable and consistent with accepted standards allowing unification of information without delay. Proper licensing arrangements will increase the use of their information. The information will be collected once and will be used many times.

The third sector, composed of non-governmental organizations and other non-for-profit organizations, will be able to partner more efficiently and effectively with the provision of services through the exchange of more information.

The private sector will be able to complement the public sector more effectively in creating geospatial information and services related to the added value using definitive information frameworks and standards.

## 2.2 Feedback, comments and suggestions of stakeholders

### Public Sector:

- Ministry of Spatial planning
- Ministry of Agriculture and Forestry
- Independent Commission of Mines and Minerals
- Municipality of Prishtina
- Municipality of Klina

### Feedback:

- Ministry of Spatial planning
- Ministry of Agriculture and Forestry
- Independent Commission of Mines and Minerals

### Comment and recommendations:

- Institutions are aware for establishing SDI in their institutions;
- Institutions are interested and contributed on NSDI of Kosova;
- INSPIRE directive, OGC glossary and SDICOOBOOK are available in Albanian language;
- Additional input from universities is necessary for better SDI environment in Kosovo

### Private Sector:

- Geo&Land LLC, Prishtine



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- Geo-Kos, Gjilan
- Consult Engineering, Kacanik

**Feedback received:**

- Geo&Land LLC, Prishtine
- Geo-Kos, Gjilan
- Consult Engineering, Kacanik

**Comment and recommendations:**

- Companies have full capacities and knowledge for developing SDI for institutions;
- Less of SDI projects for governmental and local authorities;
- FOSS is main platform for projects related to SDI.

### 2.3 Role of Universities in NSDI

The University's main activities related to NSDI in Kosovo are focused on the Department of Geodesy, Faculty of Civil Engineering and Architecture at the University of Prishtina (DGUP). Other departments dealing with SDI in Kosovo are the University of Prizren and the University of Business and Technology. The role of the university in the development and implementation of NSDI lies in the exchange of technologies between universities between various actors and students. The contribution of University staff is also obvious to the development and drafting of laws and regulations in order to be approved by assemblies or governmental bodies.

In fact, the role of universities in the development of geospatial data infrastructure in Kosovo is essential. Considering that staff education in local and central institutions lack the relevant knowledge and skills, universities should also offer eventual curriculum change adapting to SDI needs in Kosovo. Curricula in universities need to be tailored to the needs of the country and the broad marketplace.

In view of this, it is recommended that relevant country institutions provide more cooperation to universities, respectively relevant faculties in projects related to the NSDI.

In general, university curricula do not contain a sufficient number of cases as well as learning topics that are important for SDI development and implementation. Their improvement (which is a BESTSDI project goal) should be conducive to conditions for launching new research projects and intensive collaboration of universities with the public and private sector in this area. By improving curricula with subjects from the SDI area, the education process would be more appropriate and in line with market needs; consequently, persons completing relevant studies or training will be more prepared for the challenges of applying new technologies to geoinformation, standardization in the field of work and management of geospatial data through the application of concepts that define the spatial data infrastructure.



## 3 Projects outcome of BESTSDI

The BESTSDI project aims to raise awareness of the importance of SDI. Project activities aim to create greater representation in the subject curricula in all educational institutions, which in some cases are users of spatial data. The project aims to disseminate the experience and the new results in order to create added value and increase the impact of the final results. Within the project activities is the dissemination of the best practices to learn about SDI, and already developed, the experience in introducing newly created courses and training courses for professionals in the context of lifelong learning. So far, activities have been carried out which are mainly related to the target environment of the SDI development participants. Through the project are provided facilities for the modernized curriculum implementation in partner universities, with the aim of adequately implementing theoretical and practical teaching at the academic level in the framework of study at partner universities. The project will also create a memorandum of understanding among its partners in order to create a formal framework for future exchange, as well as the harmonization of curricula and teaching materials. Exchange of students and staff will be promoted through project activities information on activities carried out by partner missions.

### 3.1 Outputs delivered of BESTSDI

Within the project activities, systematic analyzes of the current situation in partner countries were conducted, starting with the academy for business entities that expressed the need for staff with sufficient knowledge of the SDI. Based on these researches, future activities have been raised and included in the project outcome. For this purpose, 6 studies were conducted, and 17 documents were submitted which were the basis for the realization of the predetermined project objectives. For the purpose of informing about project activities, two types of e-newsletters have been created and distributed. For the purpose of internal information, 12 numbers of electronic newspapers "BESTSDI Info" have been distributed in 200 e-mail addresses, while for the purpose of informing the general public are made 2 volumes of electronic newspapers "BESTSDI Newsletter" which have been distributed to more than 2000 e-mail addresses. In the framework of cooperation with contact points for the development of an SDI, as well as all participants in SDI development in partner countries, through the project were established national reports for 2017 for Albania, Bosnia and Herzegovina, Kosovo, Montenegro and Serbia in terms of SDI. These reports provide an overview of the current situation and provide some basic recommendations for future action by the academic community. The project has developed a project programme that is distinguished for those who gain basic knowledge of SDI, advanced SDI course, and TNA and specific topics related to SDI. During the second year of project implementation, materials for the topics will be available through the aforementioned modules (Table 1).

**Table 1. Tailoring the project curricula**

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Modul	Tema
Module 1. SDI concepts and principles	The usage of spatial data in different application domains: examples of spatial data (sets) and applications;
Module 1. SDI concepts and principles	Existing barriers to access and use spatial data: non-harmonisation, licensing and pricing, restricted use, ...;
Module 5. SDI Assessment and Quality Issues	Quality and Experience of a Service: how well does a service work from a user perspective (the way it is organised and can be used, portrayal, ...) and from a technological perspective, i.e. against standards or specifications (availability, capacity and performance);
Module 2. SDI at Work	Introducing the publish-search/find-bind paradigm by using single points of access (portals) to distributed data and services;
Module 9. SDI Application Development	Different approaches and different steps in applications development: the need to start with a well thought and good design;
Module 9. SDI Application Development	Methods for requirements analysis in GI including the definition of work processes and data flows, functional and non-functional requirements;
Module 9. SDI Application Development	The design of usable user interfaces to support the many interactions in the work process: using mock-ups to create a first visual outline of the intended interfaces;
Module 2. SDI at Work	The role of metadata in SDI, the different types of metadata (discovery, evaluation and usage) and the standards they are built upon (ISO 19115, ISO 19119 and ISO 19139);
Module 3 SDI Data Modelling and Data Harmonization	Comparing existing data sets or data models against specifications;
Module 3 SDI Data Modelling and Data Harmonization	Methods and steps for data transformation and the definition of syntactic and semantic transformation rules;
Module 5. SDI Assessment and Quality Issues	Overview of tools and environments to perform testing and validation;
Module 7. Technological Trends	SDI to improve sharing and exchanging data, but taking into account sensitive information by using secure access mechanisms and protection of (spatial) features.
Module 9. SDI Application Development	Some examples and exercises to identify use cases given a pre-defined work process for different actors;
Module 9. SDI Application Development	Methods for mapping and describing business/work processes to identify the activities, the actors and interactions that take place, and the role of data and geographic information in those processes in particular;
Module 9. SDI Application Development	What are and how do Agile development methods work, such as Scrum: the interactive approach through the organisation of sprints;
Module 1. SDI concepts and principles	Different types of SDI and different models: hierarchical or network based, connecting distributed resources;
Module 1. SDI concepts and principles	Different components of SDI: data, metadata, access mechanisms, standards, people and organisations, institutional and legal aspects ...;
Module 2. SDI at Work	How to evaluate whether a data set or a service is of the required quality and is fit for purpose (fit for intended use);
Module 3 SDI Data Modelling and Data Harmonization	Reading and using the UML conceptual modelling language (including how to read application schema’s);
Module 3 SDI Data Modelling and Data Harmonization	Modelling our universe of discourse: spatial, temporal and other aspects;
Module 4. SDI Access	Fundamentals on how the WWW works, the technology stack and



Mechanisms	protocols used, its basic operations and the importance of URI’s, URL’s and URN’s;
Module 5. SDI Assessment and Quality Issues	The difference between QA of spatial data production and data products (in terms of accuracy, completeness ...) and QA of SDI components;
Module 5. SDI Assessment and Quality Issues	The difference between QA and conformity/compliancy with standards and specifications in the context of SDI;
Module 6. Non-technological Developments	Overview of different license and business models for the distribution of spatial data (including the Creative Commons framework);
Module 6. Non-technological Developments	The Open Data movement and the application of Open Data principles in the context of SDI in different countries of Europe;
Module 7. Technological Trends	Overview of the major developments and trends as defined by UN-GGIM and OGC (with focus on technological trends);
Module 7. Technological Trends	3D/4D geospatial data: space and time including the provision of examples on: moving objects in space (eye-tracking), agent-based modelling (indoor/outdoor); augmented reality (looking to the past and into the future); etc.
Module 8. SDI for Thematic Applications	Analysis of differences and commonalities between different data sets and identification of specific challenges to link/integrate them;
Module 8. SDI for Thematic Applications	Visit to and exploration of specific platforms and tools: small assignments to access and use the available information/data.
Module 9. SDI Application Development	What are Application Programming Interfaces (API’s) and what are geospatial API’s: examples of how they are used in the context of SDI;
Module 9. SDI Application Development	Zooming in on different geospatial API’s such as OpenLayers, OpenStreetMap, Leaflet, etc. Smaller exercises to use these environment to carry out simple GIS tasks.
Module 3 SDI Data Modelling and Data Harmonization	Data harmonisation and semantic interoperability;
Module 3 SDI Data Modelling and Data Harmonization	The role of ontologies and vocabularies;
Module 2. SDI at Work	The role of catalogues and catalogue services, and the concept of harvesting catalogues;
Module 5. SDI Assessment and Quality Issues	Detailed QA and quality control issues related to metadata and catalogues: problems and issues that might occur, including examples and how to solve them;
Module 6. Non-technological Developments	Authoritative spatial data and official registries and/versus volunteered geographic information and crowdsourcing.
Module 8. SDI for Thematic Applications	Overview of relevant European Directives and national legislation in the thematic (and related) fields;
Module 3 SDI Data Modelling and Data Harmonization	Explaining and analysing examples of product specifications and INSPIRE data specifications in particular (examples to be chosen depending on the field of interest);
Module 6. Non-technological Developments	Geospatial data and their integration with other data/information for different applications;
Module 1. SDI concepts and principles	Main geospatial standards, the standardisation process and relevant standardisation bodies;
Module 5. SDI Assessment and Quality Issues	Methods for testing and validating harmonized data against data specifications including examples;
Module 7. Technological Trends	The influence of huge amounts of data on the way we work (big data): cloud computing; workflow and provenance; big data analytics; big data coming from social networks/media; etc.



Module 7. Technological Trends	New ways to publish and use geospatial data on the web by making use of semantic web technology such as linked data: examples and small exercises on usage and implementation;
Module 4. SDI Access Mechanisms	Architecture patterns and overview of the Service Oriented Architectures used in most SDI’s, based on at least three tiers: data, applications (clients) and services;
Module 3 SDI Data Modelling and Data Harmonization	Encoding mechanisms and data exchange formats (including XML, GML and RDF);
Module 4. SDI Access Mechanisms	OGC web service interfaces for accessing, discover, download, visualize, process ... geospatial data;
Module 4. SDI Access Mechanisms	Detailed explanation and discussion on how WMS, WFS and CSW work, including examples from INSPIRE;
Module 6. Non-technological Developments	E-Government processes and the location enablement their G2C, G2B and G2G interactions;
Module 6. Non-technological Developments	Analysis of typical e-Government processes and modelling them using the BPMN (standard) language;
Module 3 SDI Data Modelling and Data Harmonization	Data quality and validation of transformed data.
Module 4. SDI Access Mechanisms	Exercises to set-up different type of OGC web services such as WMS/WMTS, WFS, CSW.
Module 8. SDI for Thematic Applications	Approaches to make the linking and integration of disparate data resources from the same application field including some exercises;
Module 2. SDI at Work	Providing examples of good geoportals and open data portals and discuss the characteristics of good portals (rich content, multiple providers, ...).
Module 5. SDI Assessment and Quality Issues	What is Quality Assurance in the context of SDI’s and how does the quality control process work?
Module 5. SDI Assessment and Quality Issues	Introducing aspects related to value, cost/benefits and performance management in the context of SDI’s.
Module 3 SDI Data Modelling and Data Harmonization	ISO 19100 series of standards: reference model, spatial schema, temporal schema, rules for application schema, portrayal, data product specification, ...;
Module 4. SDI Access Mechanisms	Web services: what are they; what can they do; how do they work and what are different types of web services;
Module 4. SDI Access Mechanisms	Overview of support of OGC web services in popular GIS software;
Module 6. Non-technological Developments	How to share spatial data to a maximum degree, while protecting sensitive information (such as personal information);
Module 8. SDI for Thematic Applications	Identification of specific metadata initiatives and specifications, and different ways to handle and describe the metadata;
Module 8. SDI for Thematic Applications	Analysing metadata records and comparing them with basic discovery metadata collected in SDI catalogues;
Module 2. SDI at Work	Provide examples and ‘simple’ exercises to search for specific data sets and services, to correctly evaluate the content of the metadata record and to bind the data in a GIS desktop or other application;
Module 1. SDI concepts and principles	Examples of existing SDI’s, their evolution over time and comparison worldwide.
Module 5. SDI Assessment and Quality Issues	SDI assessments: different methods to compare and benchmark SDI implementations;
Module 7. Technological Trends	Major programmes to support better and more data, more accessible and



Trends	easy to use: Copernicus and GNSS, Galileo, ...
Module 1. SDI concepts and principles	SDI’s as answer to resolve those barriers: facilitating access, stimulating sharing and optimizing use;
Module 5. SDI Assessment and Quality Issues	Exercise to explore different SDI’s and evaluate them based on one or more methods and to compare results;
Module 7. Technological Trends	New ways of data acquisition and new data sources: UAV’s; Image-based Mobile Mapping, Laser scanning, Crowd Sourcing and VGI; etc.
Module 3 SDI Data Modelling and Data Harmonization	Difference between conceptual, logical and physical data models;
Module 4. SDI Access Mechanisms	Discussing the need for elaborating a good strategy for service implementation: how to implement portrayal, how to organise layers (in case of WMS); potential issues of performance; ...
Module 6. Non-technological Developments	Detailed overview and comparison of relevant European (and national) legislation with regard to GI and other public sector information: INSPIRE, PSI, Aarhus & Access, ...;
Module 8. SDI for Thematic Applications	Overview and analysis of specific spatial data models and comparison with the relevant INSPIRE specifications: examples of existing data sets;

### 3.2 BESTSDI project SDI curriculum

Within the project BESTSDI, a comprehensive curriculum structure has been developed that addresses the needs of the consortium as a whole and which should cover the needs for education of all participants in SDI development. As a consequence, the curriculum has been harmonized between different participants (Table 2)

**Table 2. Tailoring project curricula**

The core content of SDI selected for existing curricula	Faculty of Geodesy		Other faculties		total
	answers	Percentage (%)	Answers	Percentage (%)	Percentage (%)
SDI concepts	7	100	5	50	<b>70</b>
SDI in action	6	86	3	30	<b>53</b>
Modelling data	7	100	7	70	<b>82</b>
Introduction into data	6	86	6	60	<b>70</b>
SDI evaluation	5	71	4	40	<b>53</b>

The basis for creating a new curriculum was the preliminary analysis of metadata for existing curricula, modules and courses in partner institutions, existing teaching materials and individual requirements of partner institutions. Therefore, the structure is as follows: basic curriculum (curricula that all partners want to offer) (Figure 1.)



## Main structure: initial / basic

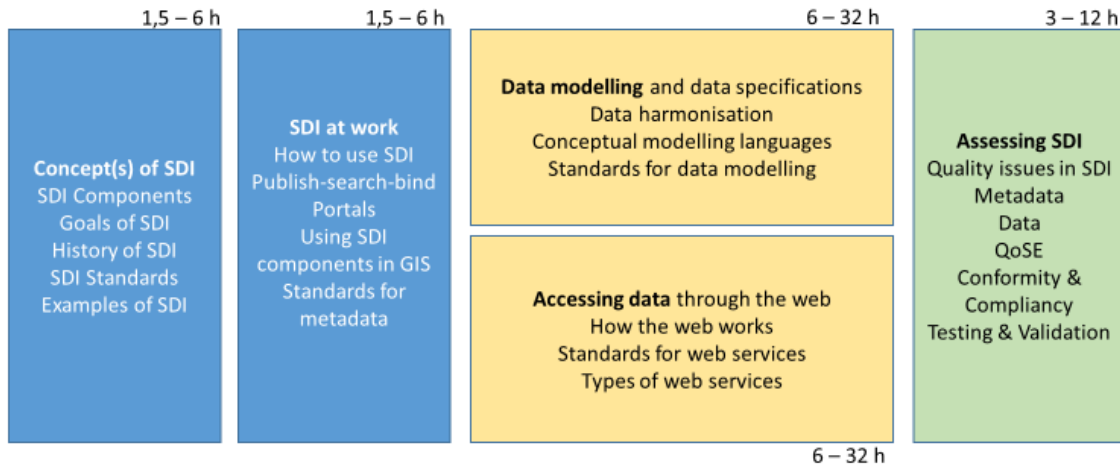


Figure 1 Basic structure of the curriculum

In addition to the base, the core structure of the advanced curriculum SDI has been drafted, which mainly refers to the part of geodetic faculties and will be studied (Figure 2).

## Main structure: advanced

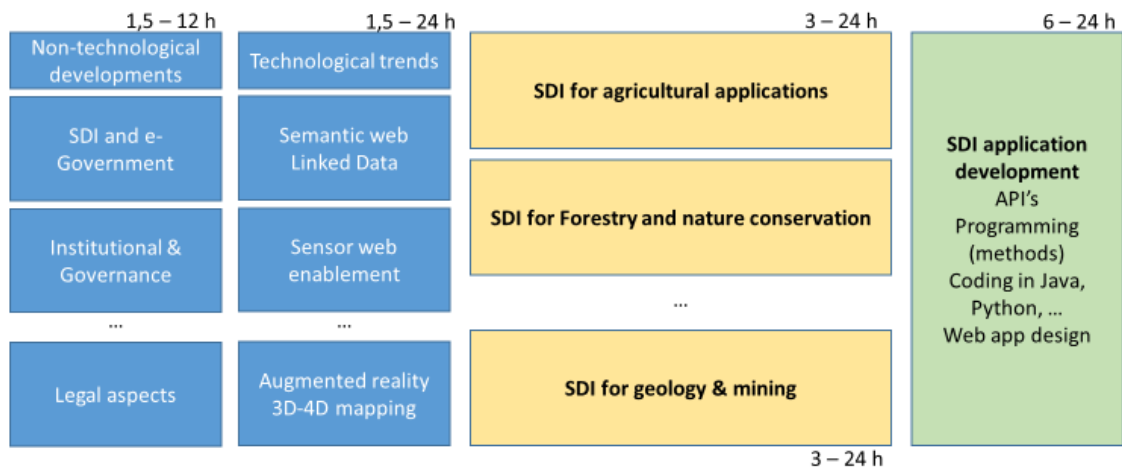


Figure 2 Advanced curriculum structure

In addition to the basic and advanced curricula, materials for curricula of innovative SDI themes and SDI curriculum specific topics have been created.



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## 4 Conclusions

Within this report are presented basic information on the state of SDI in Kosovo and in relation to the requirements and achievements of the BESTSDI project. The role of the University in NSDI is related to its educational and academic developments, ie the presence of NSDI in current study programs.

Initially, the report presents the status of NSDI in Kosovo, from the aspect of inclusion of the institutions in its implementation, with the indication that the NQA is in charge of coordination of activities and its implementation. At present, the country's institutions are ready to prepare the draft law for NSDI. Whereas, from the technical point of view, a state geoportal is currently being developed, which contains a significant number of data accessible to the public.

From a university perspective, their role in developing data infrastructure should be essential. Among the important conclusions is that universities in Kosovo should give a greater focus on curriculum improvements, always in line with SDI needs in Kosovo.

Considering that staff education in local and central institutions lack relevant knowledge and skills, universities should also offer eventual curriculum change tailoring to SDI needs in Kosovo. It is also important to have a greater cooperation of responsible institutions and Universities.