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The Creation of NSDI in Albania and Harmonization of Geospatial Data, Case Study: Geographical Names.

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ABSTRACT
ASIG (State Authority for Geospatial Information) is the institution that administrates, implements, and maintains the National Spatial Data Infrastructure (NSDI). It collects and updates geospatial data from responsible public authorities. For this reason, it is very important for ASIG to implement a methodology for creating, updating and processing this information under the INSPIRE directive. Geographical Names are used extensively when searching or navigating for information on web services (including geoportals), referring thematic information to a location (geocoding), by displaying geographic information. They are considered as reference data or data that provides the geospatial framework for recognizing geographic location in general, by linking and / or showing relevant information in specific thematic fields, such as: geology, environment, addresses, and many others defined in law no. 72/2012. The correct use of geographical Names is a primary aspect of daily communication because they are interlinked with other topics in INSPIRE. The most important process is data reconciliation that involves the shredding of the existing geospatial database according to the database format specified in the standard with the respective topic Geographical Names.
KEYWORDS: *Geospatial Data, Geographical Names, GIS, ASIG, INSPIRE, NSDI*

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I. INTEROPERABILITY OF SPATIAL DATA SETS AND SERVICES

The challenges regarding the lack of availability, quality, organisation, accessibility, and sharing of spatial information are common to a large number of policies and activities and are experienced across the various levels of public authority in Europe. In order to solve these problems it is necessary to take measures of coordination between the users and providers of spatial information. The Directive 2007/2/EC of the European Parliament and of the Council adopted on 14 March 2007 aims at establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) for environmental policies, or policies and activities that have an impact on the environment. INSPIRE is based on the infrastructures for spatial information that are created and maintained by the Member States. To support the establishment of a European infrastructure, Implementing Rules addressing the following components of the infrastructure have been specified: metadata, interoperability of spatial data sets and spatial data services, network services, data and service sharing, and monitoring and reporting procedures.INSPIRE does not require collection of new data. However, after the period specified in the Directive Member States have to make their data available according to the Implementing Rules. Interoperability in INSPIRE means the possibility to combine spatial data and services from different sources across the European Community in a consistent way without involving specific efforts of humans or machines. It is important to note that "interoperability" is understood as providing access to spatial data sets through network services, typically via Internet. Interoperability may be achieved by either changing (harmonising) and storing existing data sets or transforming them via services for publication in the INSPIRE infrastructure. It is expected that users will spend less time and efforts on understanding and integrating data when they build their applications based on data delivered in accordance with INSPIRE. A consolidated model repository, feature concept dictionary, and glossary are being maintained to support the consistent specification development and potential further reuse of specification elements. The consolidated model consists of the harmonised models of the relevant standards from the ISO 19100 series, the INSPIRE Generic Conceptual Model, and the application schemas developed for each spatial data theme. The multilingual INSPIRE Feature Concept Dictionary contains

the definition and description of the INSPIRE themes together with the definition of the spatial object types present in the specification. The INSPIRE Glossary defines all the terms (beyond the spatial object types) necessary for understanding the INSPIRE documentation including the terminology of other components (metadata, network services, data sharing, and monitoring).

GEOGRAPHICAL NAMES

Geographical names are widely used in every-day communication for referring to various natural and man-made objects in the real world. Consequently they are interconnected with other themes in INSPIRE. Administrative units, addresses, elements of hydrography (lakes, rivers etc.), elements of transport networks (airports, bridges etc.) and protected sites are usually referred to by their names.

Geographical names are used extensively when searching for information in web-services (including geoportals), navigating, referencing thematic information to a location (geocoding), visualising geographic information on maps and screens, as well as when processing spatial data sets comprising historical data. Correct usage of geographical names is a principal aspect of everyday communication; consequently the status (official, historical…) linguistic properties (language, spelling, eventual transliteration, etc.) are a prime interest of many users, including press agencies, map publishers, spatial analysts, authorities, etc.

The INSPIRE data specification on geographical names has been prepared following the participative principle of a consensus building process. The stakeholders, based on their registration as a Spatial Data Interest Community (SDIC) or a Legally Mandated Organisation (LMO), had the opportunity to bring forward user requirements and reference materials, propose experts for the specification development, and to participate in reviewing and testing the data specifications. The Thematic Working Group responsible for the specification development of Geographical names was composed of experts coming from Belgium, Finland, France, Germany, Norway, and Spain. The specification process took place according to the methodology elaborated for INSPIRE respecting the requirements and the recommendation of the INSPIRE Generic Conceptual Model.

In everyday life, the same place can be referred to by several names. In order to reflect this approach the central element of the INSPIRE geographical names data model is the spatial object “named place” that can carry one or more names. The specifications of geographical names can be used for modelling names in any other INSPIRE theme.

Each named place has a unique INSPIRE identifier. It is further characterised by the eventual name(s), geometrical representation and if available, type, local type, indicative scale of usage, and the possibly related spatial objects. The latter helps to preserve consistency between data at different levels of detail. In addition, life-cycle information should be given if available.

Geographical names are proper nouns applied to real world entities. All names related to the same real world entity have to be provided with correct spelling. If available, further properties on the names are given, such as the language, the source and the status16 of the name, the script used, and (when relevant) the transliteration scheme. A specific attribute describes if the name is an endonym or exonym. As part of linguistic information, the pronunciation of the name can be given either using the International Phonetic Alphabet, or linking the URI of a sound file. Interoperability is also supported by a common reference system and provisions for visualisation. For the latter simple rules for default portrayal are given. The typefaces and fonts used for the portrayal of geographical names shall fully and correctly reproduce all the letters and diacritics/accents present in the spellings of the geographical names to be visualised. The main value of the INSPIRE geographical names model is a simple yet flexible structure that allows geographical names to be used as an attribute of a spatial object, either modelled within the geographical names theme or in any other theme of INSPIRE. The possibility of linking more names with the same named places gives the opportunity to integrate minority languages and exonyms, which are an important contribution to European multilingualism. As the specification on INSPIRE geographical names is the result of a detailed analysis of user requirements and involves strong consideration of existing initiatives that go beyond the strictly environmental scope, it is expected that it will also be a solid element of a multi-purpose European spatial data infrastructure. Names of areas, regions, localities, cities, suburbs, towns or settlements, or any geographical or topographical feature of public or historical interest. [Directive 2007/2/EC]

This data specification describes concepts related with geographical names, i.e. proper nouns applied to a natural, man-made or cultural real world entity. The data specification is guided by the multi-language and multi-scriptual situation in Europe: a geographic entity can have different names in one or several languages, and each name can have different spellings, i.e. spellings in different scripts. Because of this multi-language and multi-scriptual context, this specification defines a product that is feature oriented in order to enable to express which different names are used to designate one given place. In other words, the spatial objects defined in this specification are the ‘named places’, and the ‘geographical names’ are seen as information related to a named place. However, the product focuses on the description of names rather than the description of spatial objects: it particularly describes characteristics of names like their language and spellings in different scripts. In some cases

names can be applied as attributes of appropriately modelled spatial objects in other themes defined by INSPIRE. However, often the definition, classification, geometry and other attributes of these objects do not necessary correspond with the respective named places as defined by this data specification, which focuses on the names aspects. Besides, commonly named geographic entities such as elevations, islands or coastal land formations are seldom modelled as spatial objects in other themes, while they are modelled as named places in this specification.

APPLICATION SCHEMA GEOGRAPHICAL NAMES

The core of the *Geographical Names* application schema is described in figure 1 that shows its non-voidable elements.

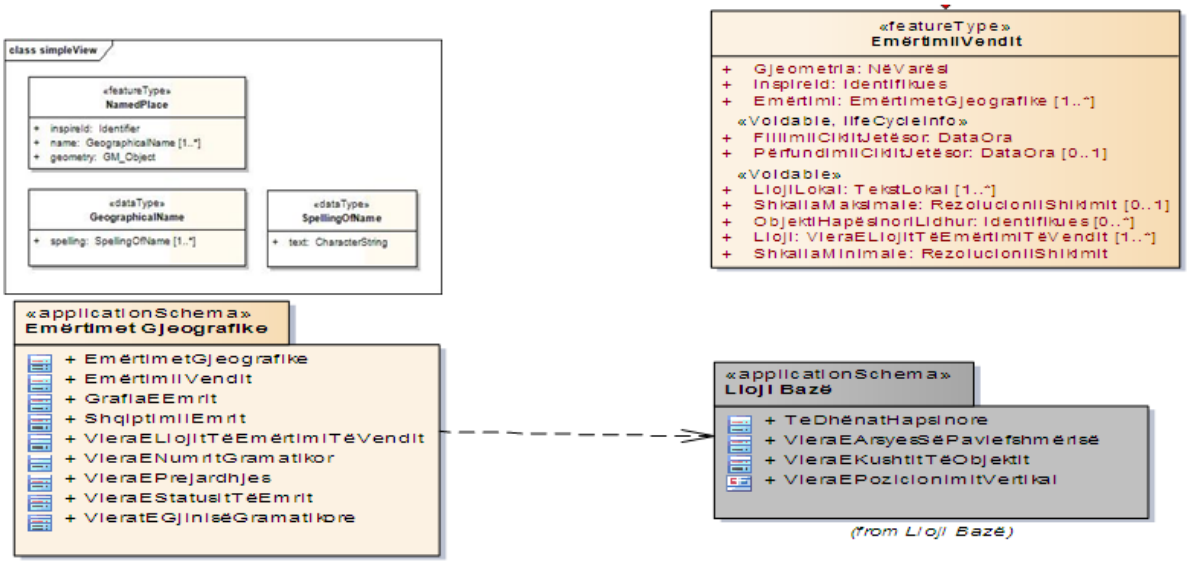


Figure 1,2 – UML class diagram: core of the Geographical Names application schema

The only feature type of the schema is the feature type NamedPlace, representing any real world entity referred to by one or several proper nouns. Each NamedPlace is associated with one or several geographical names, i.e. proper nouns applied to the spatial object, modelled with the data type GeographicalName. The different geographical names of one given spatial object may be for example the names in different languages or in different forms (e.g. complete and short forms of country and administrative unit names. Figure 3, summarizes the Geographical names application schema. More complete and precise definitions of the types and attributes are given in the following sections.

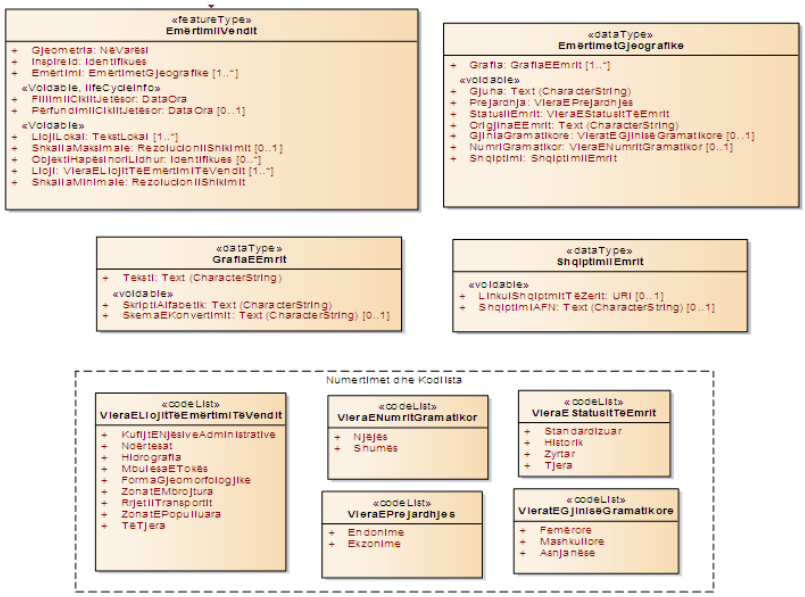


Figure 3 – UML class diagram: Overview of the Geographical Names application schema.

II. RESULTS FROM THE DATA HARMONIZATION PROCESS.

The term "data harmonization" means the conversion of the existing database of geospatial data according to the database format specified in the standard with the respective topic as well as the population of data according to the standard.

In this case, we have the existing geographic names for hydrography, toponyms, reliefs and administrative units that we should adapt according to the standard database with the subject: Geographical Names. The working procedure for database alignment and data population is implemented in the ArcMap Desktop program as follows (the case of geographic denominations for villages and cities.

Database harmonization.

In this method we will work on geodatabase "Geographical Names.gdb" (1) built according to the Geographical Names Standard. The template database contains:

- Shapefile “Adm3_Bashkia_Tiranë” (2), which represents the geographical area on which we will work (serving as orientation),
- Shapefile “Emërtimet Gjeografike” (4), geometry and attributes of which are built according to the standard and,
- Shapefile which contains the geographical denominations for the relief “EmërtimetReliev_PërHarmonizim” (3) (or one of the typologies that contains the geographic denominations)

The above data should be opened in the software ArcMap and the following procedures should be followed for data harmonization:

1- In the left pane of the "Table of Contents" screen, right-click on the shapefile "EmërtimeReliev" (3), which we want to harmonize and choose the "Open attribute table" option from which we note that the attribute "STRING" contains the relief denominations.

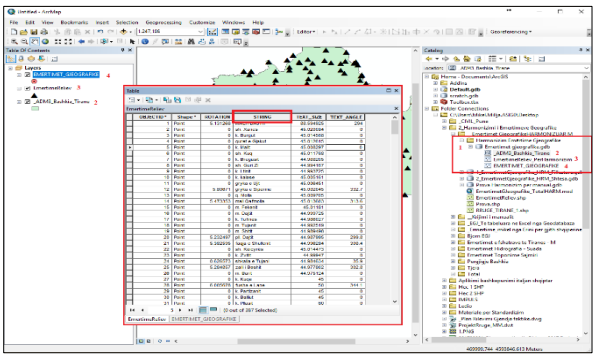
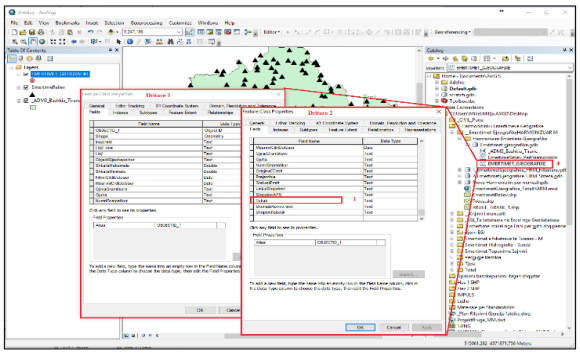



Figure. 4.a; Figure. 4.b

2- In the right pane of "ArcCatalog" screen, right-click on the shapefile " EMERTIMET_GJEOGRAFIKE ", which is built according the standard and choose the "Properties" option. In the open window, we select the field “Fields” from which we point out that the attribute "Text" is the attribute that will be associated with the attribute of the relief denomination "STRING".

3- After identifying the attributes that are related to each other, right-click on the shapefile " EMERTIMET_GJEOGRAFIKE " and select the "Load" (2) and "Load data" (3) option. In the window that opens (4) click on the "Next" button.

4-

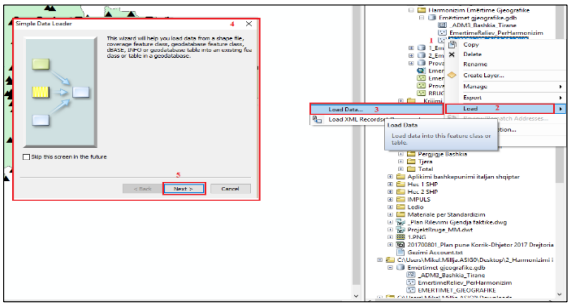
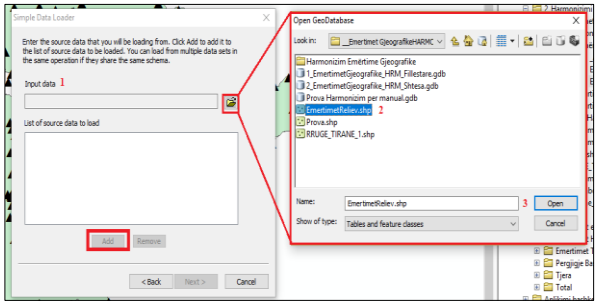



Figure 5.a; Figure 5.b

5- In the new opened window, in the "Input data" box (1) we need to select the shapefile that we want to harmonize "EmertimeReliev" (2) and give it "Open" and finally "Add" (5). In the following window (6) click on the "Next" button.

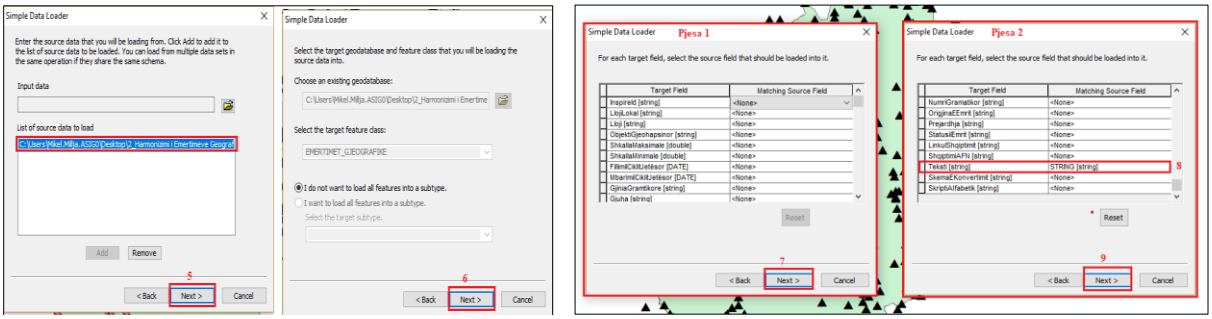
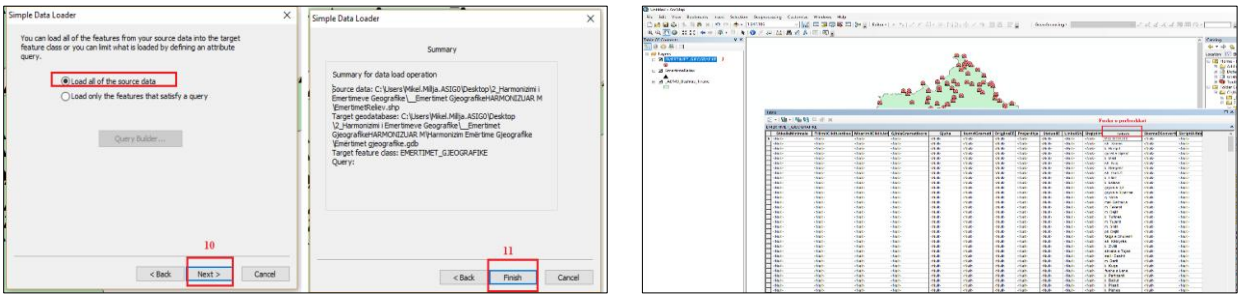


Figure 6.a, Figure 6..b

6- The window that opens next gives us the opportunity to make the geometric connection between the two shapefiles and also link the attributes between them. Thus, the "Text" attribute in the "Taget Field" column corresponds to the "STRING" attribute in the "Matching Source Field" column. Once we have defined the attributes to be linked to the following windows, click on the "Next" (9, 10) and "Finish" (11) buttons.



7- At the end, we check the results by opening the shapefile attributes "EMËRTIMET GJEOGRAFIKE" (1)

At this stage, the shapefile "EMËRTIMET_GJEOGRAFIKE " contains all the shapefile elements "EmertimeReliev" and its attributes are according the the standard format, but are not populated.

III. CONCLUSIONS.

- "Data Harmonization" means the conversion of the existing database of geospatial data according to the database format specified in the standard with the respective topic as well as the population of data according to the standard.
- Unification of the steps and procedures undertaken for collecting, processing and updating of the geospatial data on the topic "Geographic Denominations".
- Creating the necessary expertise to populate geographic denominations data across the territory of the Republic of Albania.

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