

The need to harmonize spatial data for effective cross-border cooperation

Case study: Cross-border zone between Bulgaria and North Macedonia

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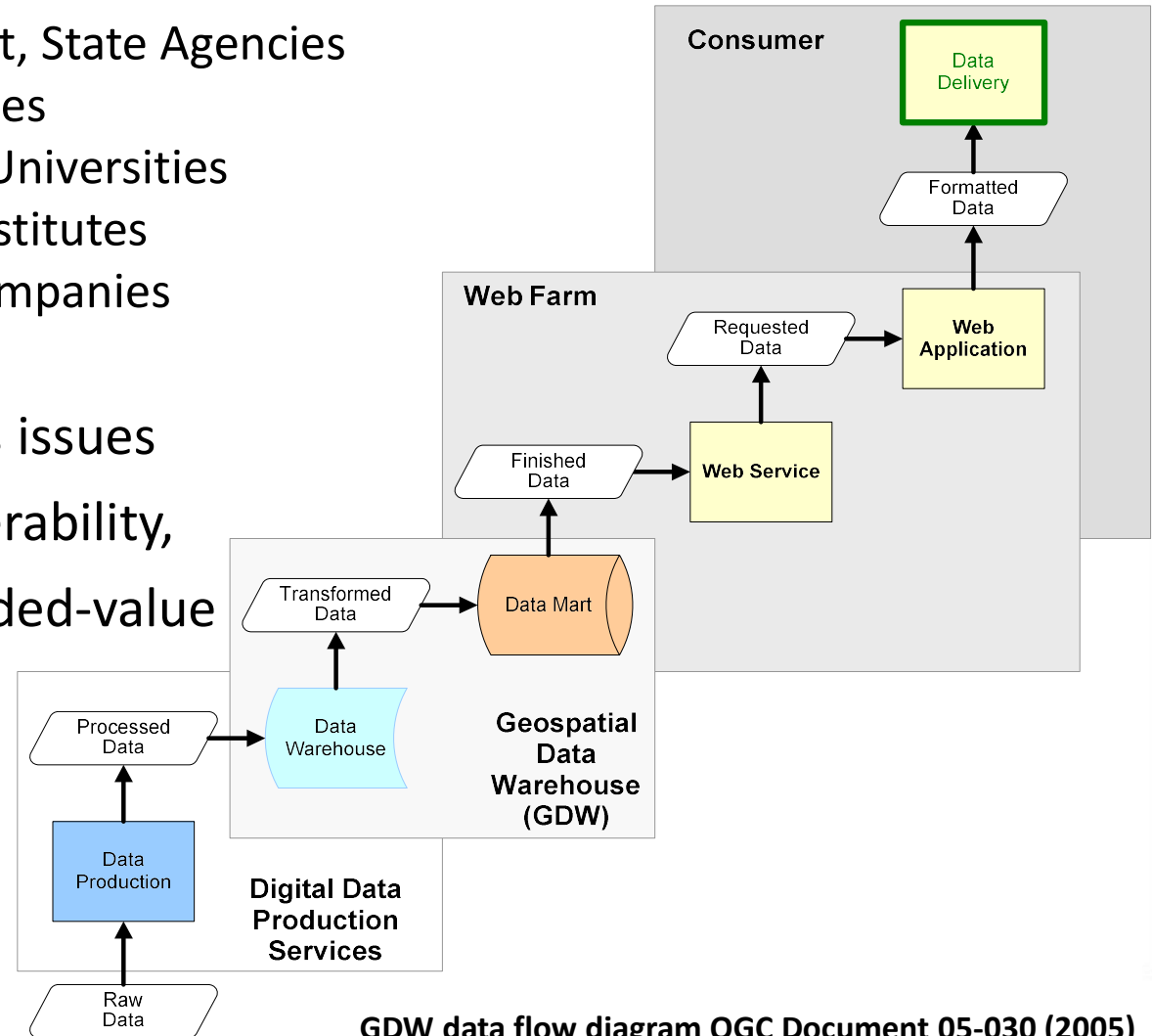
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Presentation outline

- Introduction
- Geospatial data in Bulgaria and North Macedonia
- Qualities of geospatial data
- Spatial datasets harmonization between Bulgaria and RN Macedonia
- Recommendations
- Conclusion

Introduction

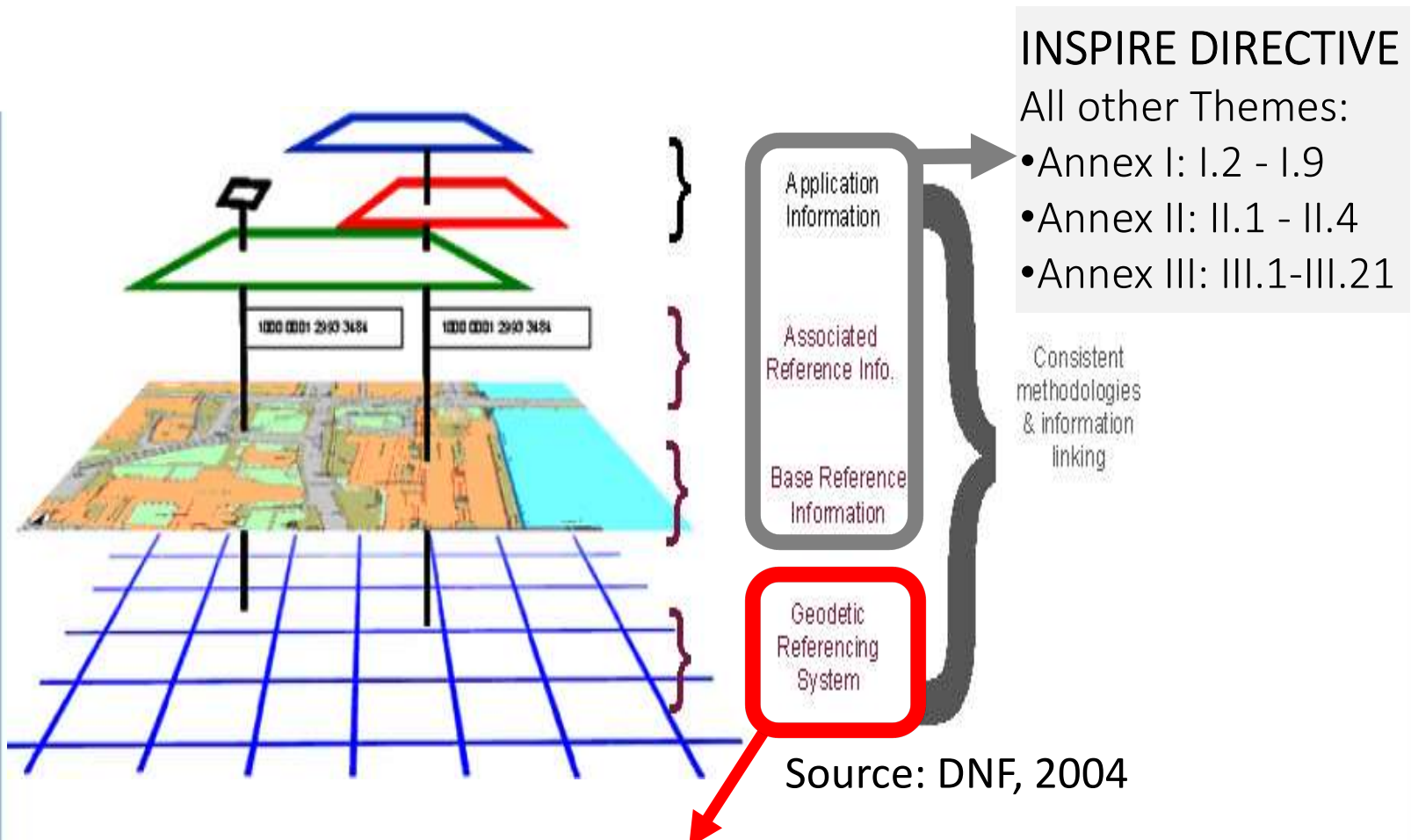
- Geospatial data and information (SDI and INSPIRE Directive)
- Interested actors and their role – producer, provider, customer, end-user
 - ✓ Government, State Agencies
 - ✓ Municipalities
 - ✓ Academia, Universities
 - ✓ Research institutes
 - ✓ Business companies
 - ✓ NGOs, etc.
- Data qualities issues
- Data interoperability, exchange & added-value



GDW data flow diagram OGC Document 05-030 (2005)

A framework to integrate the geospatial information

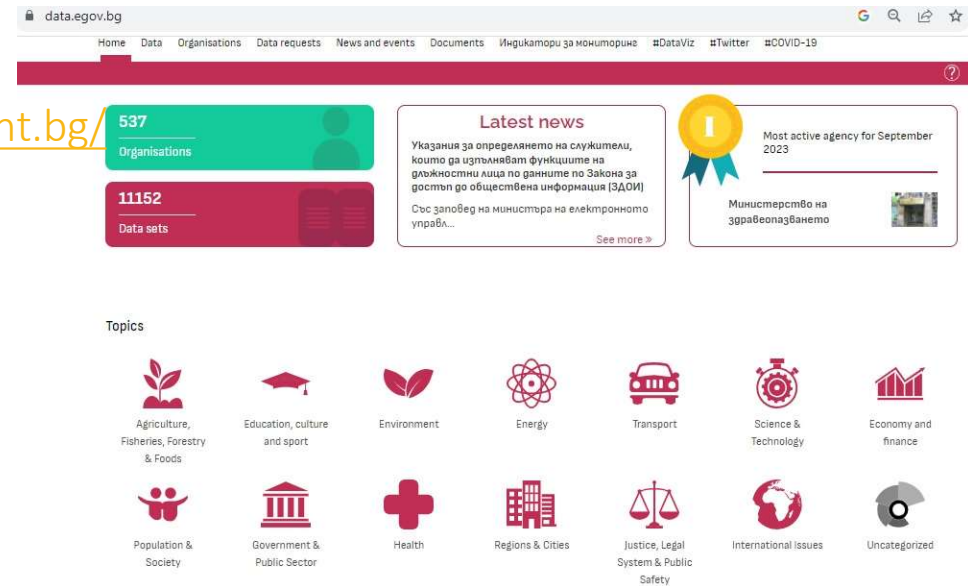
<https://www.eionet.europa.eu/gemet/en/inspire-themes>



- INSPIRE DIRECTIVE: Annex I.1. Coordinate reference systems
- CRS for EU (incl. Bulgaria):
 - ETRS 1989 - for coordinates (x, y, z) and/or (φ , λ), (B, L)
 - EVRS 2007 - for height h or H

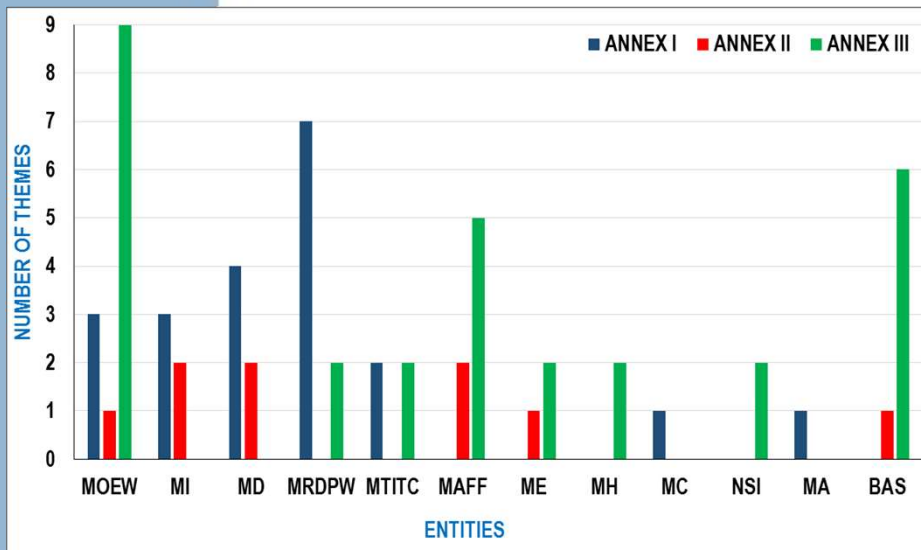
Geospatial data available in Bulgaria

- Creation of digital SD in Bulgaria - since 90s
- Numerous GIS projects
 - ✓ implemented by ministries, municipalities, research institutes, etc.
 - ✓ using the EU and national funds
 - ✓ following the strategy “bottom-up”
- Law on Access to Spatial Data (2010)
- NCP - MTITC, State E-Gov Agency (2016), Ministry of e-Gov (2022)
- National & other geoportals
 - ✓ <https://data.egov.bg/>
 - ✓ <https://kais.cadastre.bg/>
 - ✓ <http://gis.mrrb.government.bg/>
 - ✓ and others



Holders of reference spatial data - INSPIRE

- State e-Gov Agency /2016/; Ministry of e-Governance (2022)
- National Geoportal: <https://inspire.egov.bg/>
- Key stakeholders
 - ✓ Ministries
 - ✓ State Agencies
 - ✓ Municipalities
 - ✓ Research institutes
 - ✓ Others



		INSPIRE	ANNEX I	ANNEX II	ANNEX III
Themes	Entity		9	4	21
MINISTRIES	MOEW	3	1	9	
	MI	3	2		
	MD	4	2		
	MRDPW	7		2	
	MTITC	2		2	
	MAFF		2	5	
	ME		1	2	
	MH			2	
	MC	1			
OTHER	NSI			2	
	MA	1			
	BAS		1	6	
SUM		21	9	30	

■INSPIRE datasets

<https://gis.armf.bg/en/Map?isInspire=True>

Spatial data
MTS -
Bulgaria

<https://inspire.egov.bg/>

Inferences for spatial data quality in Bulgaria

- According to SDQ in Bulgaria:
 - ✓ Geospatial databases developed in digital form are:
 - in most cases not subject to common rules
 - are not covered by uniform national information systems.
- The need for serious joint multidisciplinary efforts to:
 - ✓ evaluate available databases and their quality
 - ✓ harmonization of SD in accordance with national and European legislation
- According to establishing NSDI:
 - ✓ Policies, people, advanced technology, criteria, and standards
 - ✓ Need of a National strategy that reflects the interests of all parties, users and suppliers of geospatial data
 - ✓ Indicators to account the INSPIRE implementation

End-users needs: case study analyses

Sociological Survey on the quality of CM&CR in Bulgaria

- The survey is performed by Dr. Ilinka Ivanova (2016)
- Survey is concerted with the AGC, USLM, CGE, CEID
- Three groups were interviewed:
 - ✓ I group: Private geodetic companies (18 questions)
 - 32 questionnaires
 - ✓ II group: Specialized municipal administrations (17 questions)
 - 110 (from 175 municipalities with approved CM&CR)
 - ✓ III group: Citizens (13 questions)
 - from several cities

Таблица 3

№	Въпроси	Отговори (относителен дял, %)	
		Да	Не
1.	В разяснителната кампания при открито производство за изработване на кадастрална карта и кадастрални регистри трябва да участват: а) СГКК; б) СГКК и правоспособното лице; в) СГКК, общината и правоспособното лице.	90% са посочили – - буква „в“ и - 10% буква „б“	
2.	Като собственик на поземлен имот, наясно ли сте защо трябва да означите границите му?	5%	95%
3.	Като собственик на недвижим имот, наясно ли сте защо трябва да представите на фирмата, която изработва кадастрална карта, документа за собственост?	10%	90%
4.	Трябва ли всички дейности, свързани с поземлената регистрация (кадастър, карта на възстановената собственост, специализирани данни за земята и за имотите, ограничения и др.), да бъдат в една административна структура (поземлена администрация)?	70%	30%

Problems identified from I group

- Poor organization in preparing and conducting the awareness campaign in the process of CM and CR production
- Lack of engagement of the property owners due to unawareness of their rights and obligations
- Errors in CM
- Detecting errors in CR
- No current control when creating CM and CR
- The time for field measurements is not is not good enough for quality work of CM
- Administrative structures for CM and CR should be only one administrative structure

Problems identified from II group

- Municipalities (70%) did not mark the boundaries of the municipal ownership on the terrain
- Co-operation between municipalities, AGCC and contractors is rather “poor”, rarely “satisfactory” and exceptionally “good”
- Most of the municipalities state that have a capacity and can serve the citizens with actions related to CM & CR
- Municipalities (95%) state that the exchange between the CIS and the municipal administration have to be on-line
- A representative of the municipalities to participate in the control of CM and CR
- Correct completion of the CM is of utmost importance to the municipalities, but CM are completed of 50-60% in reality

Problems identified from III group

- Citizens are not aware of the CM & CR activities
 - ✓ Not unaware of their rights and obligations during this process
 - ✓ Do not know why the cadastral map is being made and should mark the boundaries of their property
 - ✓ Mistrust the accuracy of boundaries of land properties in the CM and the data entered in the CR
 - ✓ Many of them are convinced that surveyors deliberately reflect the boundaries in CM with errors to have a work
- All land registration, cadaster and land registry activities should be in one institution
- The issuance of real estate sketch should be done also by the municipalities

Inferences from the survey (Ivanova, 2016)

- There are many discrepancies between property boundaries in CM and CR (MRP) and their actual position on the terrain
 - ✓ this leads to the errors in detailed Urban development plans
- Issuing documents with false content (cadastral sketch);
 - ✓ as a consequence of issuing other documents with false content- notary deeds, partition agreements, mortgages, etc.
- Incorrect reflection in cadastral maps of linear objects;
 - ✓ AGCC to become an initiator for the CIS upgrade with specialized data
- Errors in the properties boundaries in CM will have a negative impact on the creation of specialized maps of underground and over ground pipelines and the whole infrastructure

Present state of CM&CR in Bulgaria

- CM&CR cover almost 97% of the territory of Bulgaria

<https://kais.cadastre.bg/en>

- ✓ Detailed information on the stages of production of CM&CR updated every month
- ✓ All services and references are electronically provided
- ✓ Users can visit, get information and monitor the status of their requests

The screenshot shows the KAIS portal website. The header includes the logo of the Republic of Bulgaria and the Geodesy, Cartography and Cadastre Agency. The main navigation menu includes MAP, SERVICES, COMPLAINTS AND OBJECTIONS, CHECK STATUS, and HOW TO... The page title is "Search services". Below the title, there are four service cards: "Application service Cadastre", "Application service Geocartfund", "Application service Qualification", and "Automatically generated reports to services". Each card has a "View services" and "Register Application" link. Below the cards is a "SERVICE LIST" section with a search bar and a table of services.

NAME	TYPE	PROVIDED BY	DETAILS	ORDER
1684.Reference excerpts from the cadastral map	service Cadastre	CCCO	Details	Order
980.Reference excerpt on detailed bounding coordinates of a property	service Cadastre	CCCO	Details	Order
555.Reference excerpt on coordinates of a point belonging to the geodetic work base, with accompanying point	service Cadastre	CCCO	Details	Order

- Upcoming upgrade of Cadastral information system
- ✓ plan to provide online access to historical and project data in the cadastral map
- ✓ users can receive online information about the status of the cadastral map at a selected past time
- ✓ it will be possible to see the current projects for the amendment of cadastral objects

Monitoring & Reporting Dashboard Bulgaria (2022)

<https://inspire.egov.bg/>

■ National INSPIRE Report (2022)

<https://inspire-geoportal.ec.europa.eu/mr2022.htm>



✓ Bulgaria declares values equal or close to 100% for all the indicators on the conformity of datasets and services.

Overview statistics of the harvested metadata

Dataset: **166**

Series: **0**

Services: **37**

Results of evaluation using INSPIRE Reference Validator [↗](#)

Metadata Dataset

Conformant: **62**

NOT Conformant: **104**

[Click to download the test reports of failed records](#)

Metadata Services

Conformant: **19**

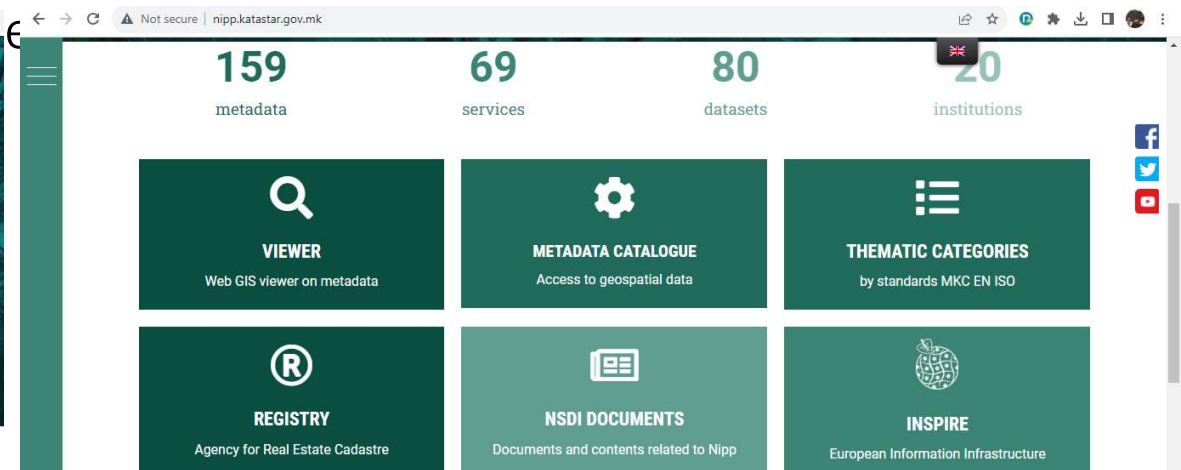
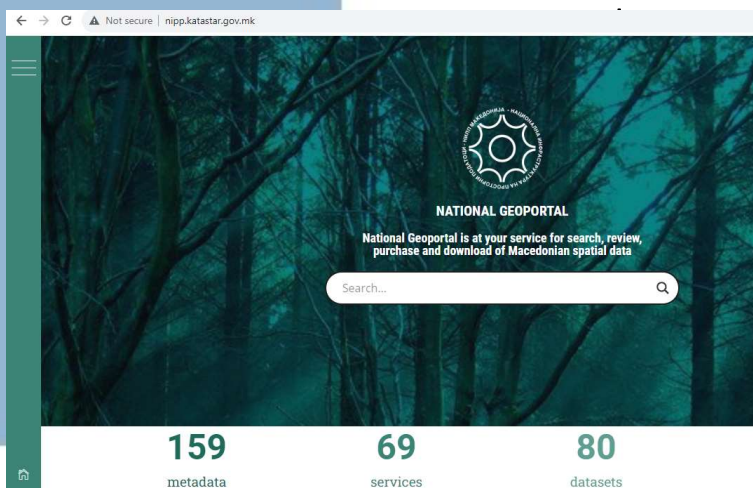
NOT Conformant: **18**

[Click to download the test reports of failed records](#)

country	MDi1.1	MDi1.2	DSi2	DSi2.1	DSi2.2	DSi2.3	NSi2	NSi2.1	NSi2.2	NSi4	NSi4.1	NSi4.2	NSi4.3	N
AT	99%	99%	86%	88%	98%	70%	60%	61%	97%	97%	100%	96%	98%	
BE	95%	63%	73%	96%	71%	71%	79%	93%	80%	92%	83%	93%	91%	
BG	37%	51%	96%	100%	100%	98%	34%	46%	34%	0%	0%	0%	0%	
CH	0%	0%	2%	7%	0%	0%	0%	2%	0%	0%	0%	0%	0%	
CY	0%	0%	2%	0%	25%	0%	81%	93%	88%	0%	#N/A	0%	0%	

Geospatial data available in North Macedonia

- Creation of digital SD in the Republic of North Macedonia - since 2007 with Strategic Plan of AREC 2007-2011
- Numerous GIS projects implemented by ministries, municipalities, research institutes and universities, NGOs, private companies and other institutions using the EU and national funds and following the strategy “bottom-up”
- Law on Real Estate Cadaster - 2008
- Law on National Spatial Data Infrastructure (24.02.2014); amendments (03.06.2016, 21.06.2023)
- National Contact Point – AREC, nipp@katastar.gov.mk



NSDI Working Groups

<https://nipp2.katastar.gov.mk:5001/nipp2/en/clenovi-rabotni-grupi>

- Working group on economic issues
- Working group on institutional and legal issues and capacity building
- Public relations and communications working group
- Technology working group (standards, metadata, services, etc.)

The screenshot shows the KATACTAP web application interface for generating cadastral maps. The browser address bar displays the URL: <https://oss.katastar.gov.mk/OSSP/faces/public/customMaps/katastarskiPlan.xhtml#>. The page title is "AGENCY FOR REAL ESTATE CADASTRE".

The interface includes a sidebar with navigation options: Cadastral Products, Infrastructure objects, Administrative Borders, Cartographic products, Control Points, Services, and Metadata Catalogue. The main content area is titled "CADASTRAL MAPS" and contains the following sections:

- 1. Select format**: Options for SHP and GML.
- 2. Select means of selection**: Options for Pan, Select polygon, Upload file (SHP,GML), and Select municipality.
- 3. Buy Now**: Displays the area (0.0 ha), product name (Cadastral maps (working original)), and digital product type (414.0 * 0.0 + 250.0 MKD).

A warning message states: "The maximum number of parcels which can be selected with visualization is 500. If this number is exceeded, the total number of features can be downloaded without the options for visualization." The interface also shows dropdown menus for "Cad. department:" and "Cad. municipality:". A "Scale = 1 : 1M" indicator is visible at the bottom right of the map area.

Holders of spatial data in North Macedonia

<https://nipp2.katastar.gov.mk:5003/geonipp/#re3gistryPanel>

- Agency for Real Estate Cadaster – 140 layers
- Crisis Management Center – 9 layers
- Ministry of Agriculture, Forestry and Water Economy - 7 layers
- Ministry of Internal Affairs – 4 layers
- Spatial planning agency – 4 layers
- Geological Institute of the Republic of North Macedonia - 1 layer (example)
- Ministry of Interior – 1 layer

The screenshot shows a search interface for geology data. The search term 'geology' is entered in the top bar. The results section displays one item: 'Gravimetric map of the Republic of North Macedonia (Bouguet anomalies) 1 : 500 000'. The item is dated '2023-06-05' and is attributed to the 'Agency for Real Estate Cadastre'. Below the title, there are links for 'Metadata' and 'Add to Map'. A dropdown menu is open under 'Add to Map', showing options for 'HTML WMS', 'XML WMS', and 'JSON WMS'. A blue arrow points from the '1 item' text in the results header down to the search results area.

NSDI Catalogue & Map viewer

<https://nipp2.katastar.gov.mk:5003/geonipp/#searchPanel>

The screenshot shows the search results page of the NSDI Catalogue. The browser address bar displays nipp2.katastar.gov.mk:5003/geonipp/#searchPanel. The navigation bar includes 'Home', 'Catalogue', 'Reviewer', and 'Registries'. A search bar is located at the top left. On the left side, there are filter categories: Map (Any, Intersects, Within), Content type, Topic category, Dataset themes, Publication date, Format distribution, Authorised institution, Price, and Keywords. The main area shows a list of results under the heading 'Results' with 'By Title' sorting and '159 items' displayed. The first three results are: 1. 'Fire Weather Index' (2019-12-18 Crisis Management Center) with a fire icon. 2. 'Administrative units of the Republic of Macedonia, INSPIRE' (2019-12-29 Agency for Real Estate Cadastre) with a map icon. 3. 'Digital elevation model of the terrain of the Republic of Macedonia - contour line' (2019-12-17 Agency for Real Estate Cadastre) with a contour line icon. Each result includes a 'Metadata' link and an 'Add to Map' button.

The screenshot shows the map viewer interface of the NSDI Catalogue. The browser address bar displays nipp2.katastar.gov.mk:5003/geonipp/#mapPanel. The navigation bar is the same as in the search results page. The interface features a search bar at the top with the text 'Find address or plac...'. On the left, there is a 'Metadata Search' panel with a search input field and a list of search results. The results include: 1. 'Railway network of the Republic of ...' (December 3, 2021). 2. 'Orthophoto of the Republic of Nort...' (December 13, 2021). 3. 'Orthophoto of the Republic of Nort...' (May 22, 2023). 4. 'Road network of the Republic of Ma...' (December 3, 2021). The main map area displays a satellite-style map of a region with black contour lines overlaid. The map includes a scale bar at the bottom showing coordinates and a scale of 1:1000000. A 'Sign In' button is visible in the top right corner.

Holders of reference spatial data - INSPIRE

- Thematic categories of NSDI of North Macedonia
<http://nipp.katastar.gov.mk>

nipp.katastar.gov.mk

 coordinate ref. systems	 geographical grid systems	 geographical names	 administrative units
 addresses	 cadastral parcels	 transport networks	 hydrography
 protected sites	 elevation	 land cover	 orthoimagery
 geology	 statistical units	 buildings	 soil
 land use	 human health and safety	 utility and gov. services	 environmental monitoring fac.
 production and industrial fac.	 agricultural and aquaculture fac.	 population dist. and demography	 regulation zones & reporting units
 natural risk zones	 atmospheric conditions	 meteorological geographical feat.	 bio-geographical regions
 habitats and biotopes	 species distribution	 energy resources	 mineral resources

Holders of spatial data in North Macedonia

Themes of spatial data collections

<http://nipp.katastar.gov.mk>



THEMES OF SPATIAL DATA COLLECTIONS

▶ coordinate reference systems	▶ orthoimagery	-
▶ geographical grid systems	▶ geology	-
▶ geographical names	▶ statistical units	▶ population distribution and demography
▶ administrative units	▶ buildings	▶ area management / restriction / regulation zones & reporting units
▶ addresses	▶ soil	▶ natural risk zones
▶ cadastral parcels	▶ land use	▶ atmospheric conditions
▶ transport networks	▶ human health and safety	▶ meteorological geographical features
▶ hydrography	▶ utility and gov. services	▶ bio-geographical regions
▶ protected sites	▶ environmental monitoring facilities	▶ habitats and biotopes
▶ elevation	▶ production and industrial facilities	▶ species distribution
▶ land cover	▶ agricultural and aquaculture facilities	▶ energy resources
		▶ mineral resources

Geospatial data changes

- Data transformation
 - ✓ Geometry
 - ✓ Semantic
- Requirements for data
 - ✓ FAIR principles
 - ✓ measurement level
 - ✓ Map scale
 - ✓ Topological information
- Requirements of users
 - ✓ Data governance
 - ✓ Stages of transformation
 - ✓ High EU level
 - ✓ National level
 - ✓ Governmental institutions
 - ✓ Keeping up to date level of:
 - Consistency
 - Conformity
 - Integrity – positional uncertainty location

Qualities of geospatial data

- Components of data quality - spatial, temporal, and thematic
 - ✓ Accuracy
 - ✓ Precision or resolution
 - ✓ Consistency
 - ✓ Completeness
- Data quality standards
 - ✓ SDQ standards USA-SDTS (1992), ICA (1995), CEN/TC287 (1998), ISO/TC211I (2002)
 - ✓ Meta-data standards: accepted in the USA in 1998 and by ISO in 2003
 - Lineage
 - Positional accuracy
 - Attribute accuracy
 - Logical consistency
 - Completeness
 - Semantic accuracy
 - Purpose of usage
 - Constraints
 - Temporal quality
 - Variation in quality
 - Meta-quality, etc.

Spatial Data harmonization - different approaches

- Preliminary evaluation of the Data quality – QA/QC of raw data
- Joint geospatial data harmonization and mutual exchange
 - ✓ Transformation and conversation into internationally agreed standards and nomenclatures – using open source technology
 - Use upper-level standards – OGS, ISO/TC 211
 - INSPIRE Reference Validator
(<https://inspire.ec.europa.eu/validator/home/index.html>)
 - ✓ Joint harmonization and transformation between two governmental responsible institutions following national standards
 - ✓ Separate harmonization following convinced procedure and flow chart of activities – after than comparative analysis of data from both countries and check of transformed data

Bulgaria

EU member state

<https://epsg.io/7801>

North Macedonia

Candidate EU member state

<https://epsg.io/6204>

▪ Coordinate reference system

✓ ETRS (1989), EVRS 2007

✓ Hermanskogel

▪ Geographical grid systems

✓ EPSG:7801

✓ EPSG: 6204

✓ BGS2005 / CCS2005

✓ Macedonia State Coordinate System

✓ Datum: BGS 2005

✓ MGI 1901

✓ Ellipsoid: GRS 1980

✓ Ellipsoid: Bessel 1841

✓ Prime meridian: Greenwich

✓ Prime meridian: Greenwich

✓ Data source: EPSG

✓ Data source:EPSG

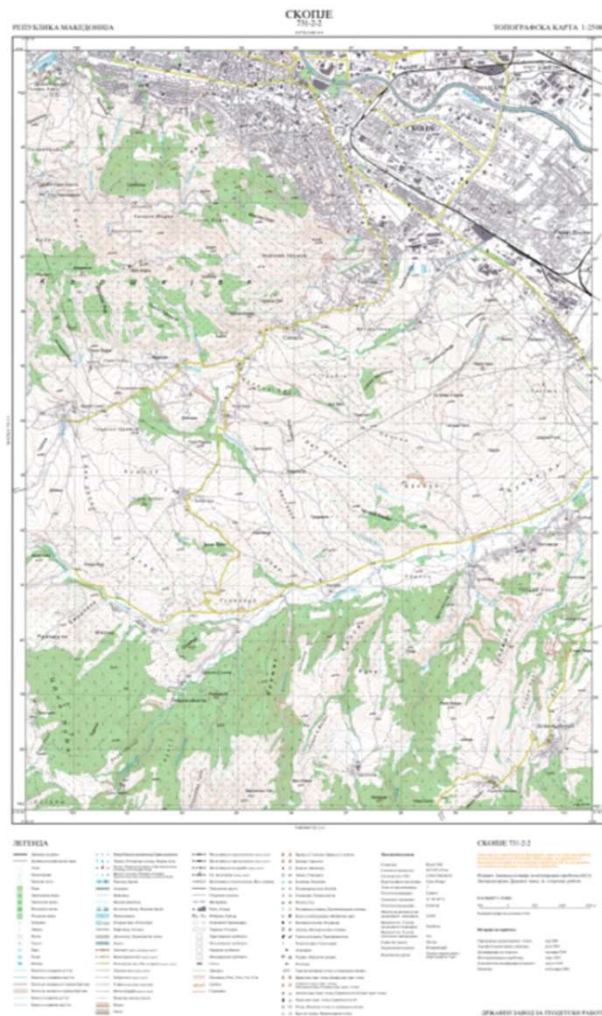
✓ Info source: AGCC (2016)

✓ Info source: AREC (2019)

Map design of TM 1:25,000

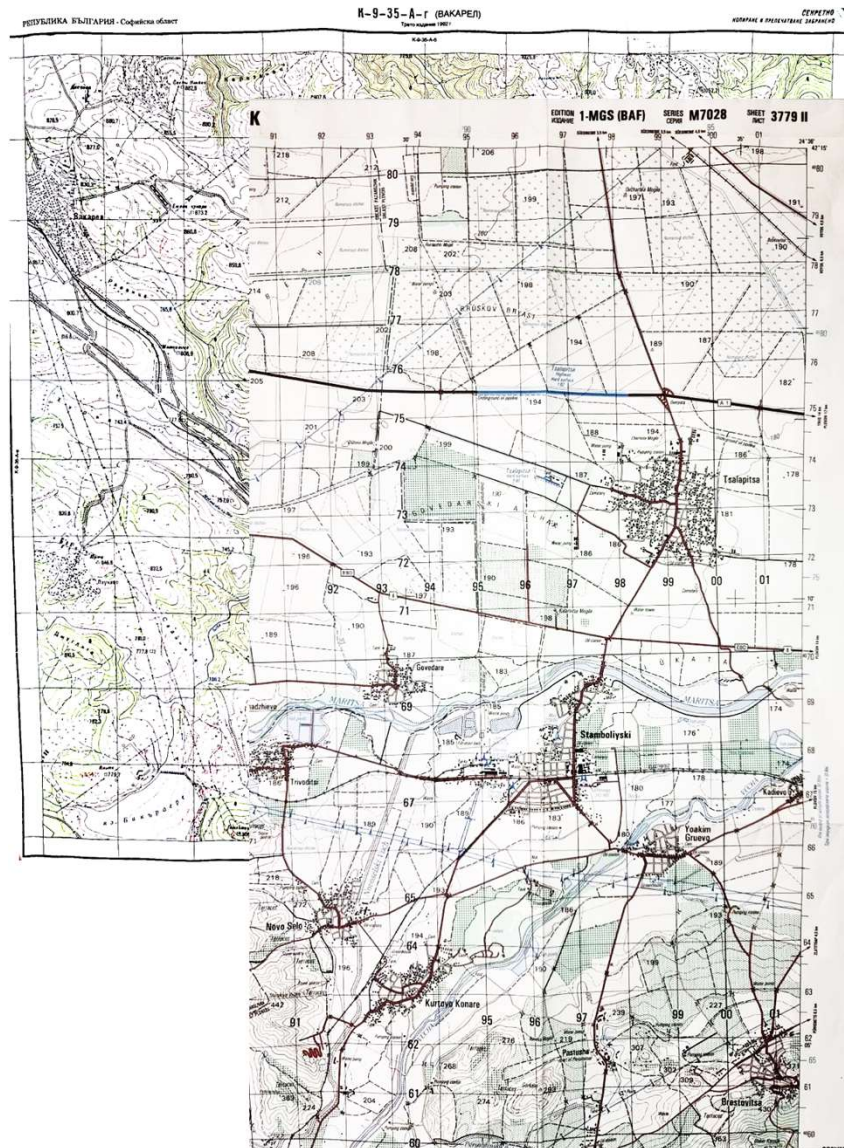
North Macedonia

<https://eurogeographics.org/app/uploads/2018/04/Picture3-575x900.png>



Bulgaria

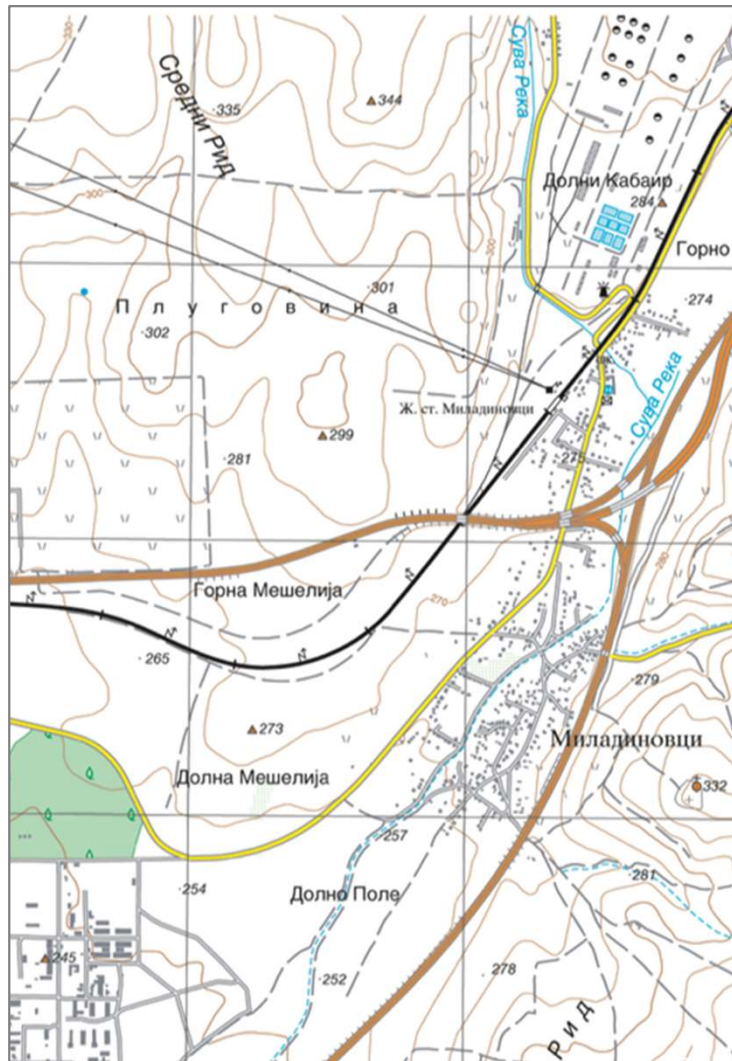
<https://gis.armf.bg/bg/Services>



Case study:
Topographic
maps in scale
1:25,000

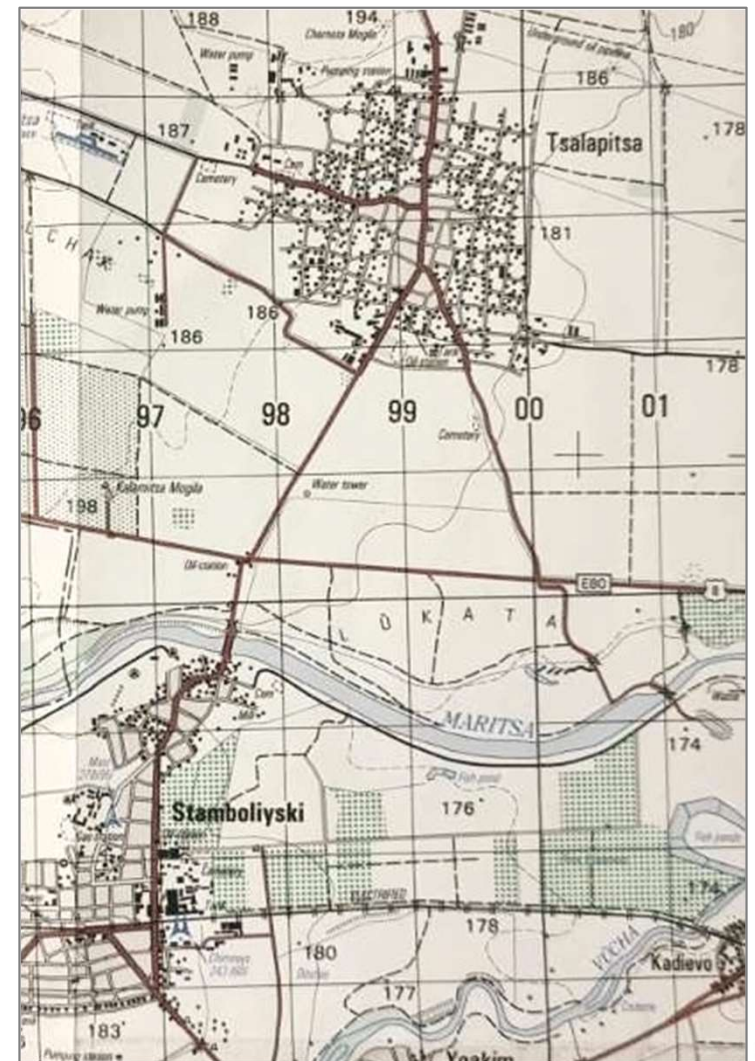
Map design of TM 1:25,000 North Macedonia

<https://eurogeographics.org/app/uploads/2018/04/Picture3-575x900.png>



Bulgaria

<https://gis.armf.bg/bg/Services>



Case study:
Topographic
maps in scale
1:25,000

Map symbols of TM 1:25,000 North Macedonia

LEGEND

	State Boundary		Spring, Mineral Spring, Water Flow		Single Track Railway (Tunnel, Bridge)		Church with 2 Domes, Church with 1 Dome
	National Park Boundary		Water Tap, Water Reservoir, Water Tank Tower		Double Track Railway (Tunnel, Bridge)		Mosque, Synagogue
	Grapes		Pool, Hydro Power Station, Sewage Works		Railway Under Construction (Tunnel, Bridge)		Chapel, Monastery
	Orchard		Water Gate, Pump Station, Water Works		Electrical Railway (Tunnel, Bridge)		Castle, School
	Rice Field		Waterfall, Barrage		Narrow Track Railway, Railway Station		Hospital, Municipality Office
	Park		Aqueduct		Abandoned Railway		Mountaineering House, Cabin
	Deciduous Forest		Water Pipe Line		Railway Siding		Monument, Memorial Panel
	Coniferous Forest		Water Pipe Line Underground		Cableway		Post Office, Court
	Mixed Forest		Concrete Dam, Filled Dam		House, Building		Police Office, Fire Station
	Planted Forest		Jetty		Factory, Hangar		Observation tower, Factory Chimney
	Shrub		Lake Embankment, River Embankment		Ruins, Green House		Petrol Station, Tank
	Meadow		Oil Pipe Line, Gas Pipe Line		Fortress, Stadium		Antenna, Meteorological Station
	Sands		Power Line, Belt Conveyer		Christian Cemetery		Thermal Power Station, Transformer
	Peat		Retaining Wall		Muslim Cemetery		Isolated Tree, Group of Trees
	Marsh		Highway (Tunnel, Toll Road Gate, Bridge)		Jewish Cemetery		Airport
	Lake		Main Road (Tunnel, Bridge)		Memorial Cemetery		Mine, Abandoned Mine
	Fish Pond		Regional Road, Connecting Road (Tunnel, Bridge)		Silo		Cave
	Stream Under 5m		Local Road (Tunnel, Bridge)		Row of Trees		Trigonometric Point
	Stream Over 5m		Unpaved Road (Tunnel, Bridge)		Contour Line 50m, 10m, 5m, 2.5m		Church as Trig Point, Mosque as Trig Point
	Creek with Cliff in Mountain		Street (Tunnel, Bridge)		Cliff		Synagogue as Trig Point, Meteorological Observatory as Trig Point
	Creek with Cliff in Flatland		Road Under Construction (Tunnel, Bridge)		Steep Slope		Antenna as Trig Point, Border Pillar as Trig Point
	Canal Under 5m		Footpath (Bridge)				Chimney as Trig Point, Border Pillar
	Canal Over 5m		Road Embankment				Bench Mark, Spot Height
			Road Cutting				Control Point without Stone Marker, Photo Control Point

Case study:
Topographic
maps in scale
1:25,000

Map symbols of TM 1:25,000 Bulgaria

Case study:
Topographic
maps in scale
1:25,000

LEGEND

POPULATED PLACES

Densely built-up areas — Гъсто застроени райони

Sparsely to moderately built-up areas — Рядко и средно застроени райони

ROADS

All weather, hard surface highway — Всесезонни с твърда настилка

two or more lanes wide — макистрала

one lane wide — две или повече ленти

All weather, loose or light surface — Всесезонни с нетвърда настилка

two or more lanes wide — две или повече ленти

one lane wide — една лента

Fair or dry weather, loose surface — Прокорими в сухо време без настилка

Track — Коларски път

Trail; Footpath — Пътка за тов. животни; Пътка

Underpin — Подпорна стена

Route marker: International; National; Secondary — Номер на път: Международен; Национален; Второстепенен

RAILROADS

Single track — Единичен

Double track — Двойни

Normal gauge 1.44 m — Нормална или ширококолейна

Narrow gauge 1.0 m — Тесноколейна

Station; Turntable — Жл гар; Жл обръщало

Rope-way; Conveyor belt; Ski lift — Въввечна линия; Транспортна лента; Лифт (Ски-слек)

BRIDGES

Highway bridge — Мостове

Bridge — Мост на макистрала

Footbridge — Мост на път

Tunnel — Мост за пешеходни

BOUNDARIES

International — ГРАНИЦИ

First order administrative boundary (OBLASTI) — Международни граници от първи клас (ОБЛАСТИ)

ЛЕГЕНДА

Building; School; Hospital — Постройка; Училище; Болница

Church; Mosque; Chapel — Църква; Джамия; Параклис

Radio mast; Substation; Chimney — Радиомачта; Ел. подстанция; Комин

Mine: Active; Abandoned — Мина: Активна; Изоставена

Horizontal control point — Триангулационна точка

Spot elevation, normal — Кота, нормална

Spot elevation, highest on sheet — Кота, най-висока на картата лист

Dam: Masonry; Earthen — Язовирни стени; Масивни; Землени

OBSTRUCTIONS

Elevation of obstruction top above sea level — Височина на препятствието над морското ниво

Elevation of obstruction top above ground level — Височина на препятствието над земята

High tension power line — Електропроводи високо напрежение

Rocks — Скали

Levee; Sand — Дига; Пясъци

STREAMS

Less than 18m wide — по-тесна от 18м.

18m to 30m wide — ширина от 18м. до 30м.

over 30m wide — ширина над 30м.

Spring; Well — Извор; Кладенец

VEGETATION

Trees along road — Дървета покрай път

Woodland — Гора

Scrub — Храсти

Orchard — Овощна градина

Vineyard — Лозя

Cemetery — Гробница

**Case study:
Topographic
maps in scale
1:25,000**

Data format of TM 1:25,000

Bulgaria

Vector data: ArcGIS ESRI Coverage

Raster data: GeoTIFF

Spatial resolution: 0.5m

Sheet: 5' of latitude by 7'30" of longitude (10 km x 9 km)

Nomenclature: K-34-47-Г-a(б,в,г)

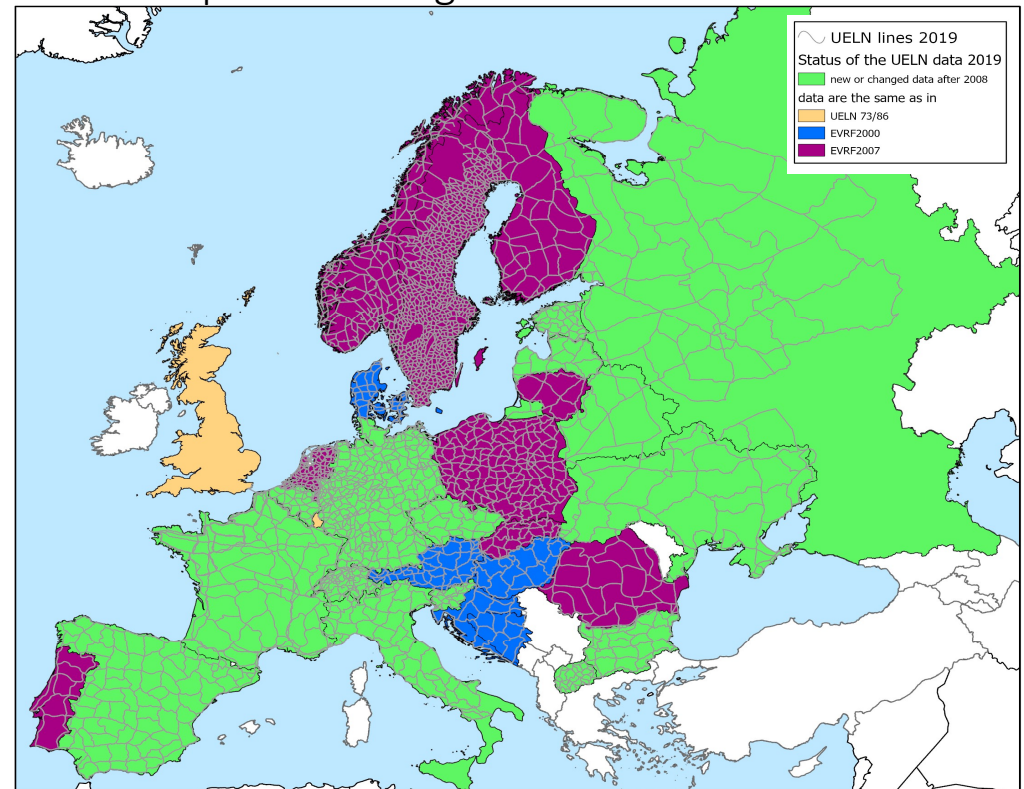
North Macedonia

https://www.katastar.gov.mk/wp-content/uploads/tk/specifikacija_tk25.pdf

- Vector data: ArcGIS ESRI Coverage
- Raster data: GeoTIFF
- Spatial resolution: 0.5m
- Sheet: 7'30" by 7'30"

**INTERREG
Program
2021 – 2027
Bulgaria North
Macedonia**

- Implemented project until now
- ✓ missing projects related to the spatial data harmonization
- ✓ Three cross-border leveling lines have been measured and the state leveling networks of Bulgaria and the Republic of Macedonia are connected.
- ✓ Through the network of the RS Macedonia is aligned in the European vertical reference system in 2019.
- ✓ The precise leveling measurements are initialized by the Real Estate Cadaster Agency of the Republic of North Macedonia and Agency for Geodetic Cartography and Cadaster of the Republic of Bulgaria.



Where to start?

- To explore the good experience of cross-border cooperation on a European scale - INSPIRE KNOWLEDGE BASE
- Stakeholders to be more active both in looking for opportunities to finance activities and to create capacity
- To follow international standards, INSPIRE recommendations <https://wikis.ec.europa.eu/display/InspireMIG/INSPIRE+work+programme+2021-24>
- Drafting and provision of a cross-border spatial management protocol that supports the implementation of the cross-border data harmonization process
 - ✓ to formulate common goals and responsibilities of all parties involved
 - ✓ to determine a framework for the implementation and duration of the agreement
 - ✓ to regulate commitments and rights for all participating parties regarding the harmonization, exchange, use and maintenance of data
 - ✓ to coordinate access rights to harmonized territorial data in border areas
 - ✓ to settle the issue of sustainable maintenance, management and monitoring of the data harmonization process
 - ✓ joint cross-border training courses and exchange of good practices
 - ✓ - discussing topics of mutual interest regarding geospatial data, information, instructions for using transboundary spatial data, etc.

Recommendations

- Issues to resolve
 - ✓ Metadata records with XML (ISO 19139) encoding errors – failed to be indexed by the GeoNetwork
 - ✓ To include INSPIRE metadata records in national catalogues
 - ✓ To correctly provide services serving thousands of data sets

- Issues to resolve on a national level
 - ✓ to ensure compliance of national data according to the requirements of the INSPIRE directive
 - ✓ Bulgaria effectively uses the INSPIRE Reference Validator and achieved some improvements in all indicators compared to 2021, but not substantial
 - ✓ North Macedonia - information on the EU INSPIRE portal from 2021 is missing and needs to be added

Recommendations & Conclusion

- Creating SD with high quality: ones obtained – many usage
- Observe the international standards (ISO, OGC, ICA, etc.)
- Using a standard approach to assessing SDQ
- Perform regular SDQ control
- Maintaining communication between the different actors involved in creating, managing, updating, using and sharing of SD, incl. through SDI geo-portals
- Validating data, metadata or services by common INSPIRE validator Ver. 1.0.0
- Using SDI Diagnostic Tool (Kelm et al. , 2017)

Thank you for your attention!

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