

UKRAINE
Country Report 2022-2023
#StandWithUkraine

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Introduction

Because of the full-scale invasion of the Russian Federation on the territory of Ukraine, 2022 has undoubtedly become a turning point for the whole country and for the geospatial sphere, in particular.

According to the Resolution of the Cabinet of Ministers of Ukraine "Some Issues of Ensuring the Functioning of Information and Communication Systems, Electronic Communication Systems, Public Electronic Registries under the Conditions of Martial Status" dated 12.03.2022 and the Resolution of the Cabinet of Ministers of Ukraine "Some issues of conducting and functioning of the State Land Cadastre under martial law" as of 07.03.2022, the following state geoportals have been closed for open access:

Public Cadastral Map;

State Geodetic Network Geoportal;

NSDI Pilot Geoportal.

Taking into account the limitation of the use of state budget funds in 2022 and organizational difficulties, part of the national topographic, geodetic and cartographic works, as well as activities on the development of the NSDI pilot geoportal, were suspended or reduced.

But with the help of timely response, effective management and constant support of international partners, the StateGeoCadastre was able to continue the implementation of its tasks and functions, as well as the implementation of planned initiatives.

On June 23, 2022, at the summit in Brussels, the European Council decided to grant the candidate status to Ukraine.

The people of Ukraine have defined their European and Euro-Atlantic path of development long ago and the StateGeoCadastre as one of the central executive bodies is doing everything within its competence to accelerate Ukraine's integration into the European area and implement European standards in its activities.

This report outlines the main achievements and activities of the StateGeoCadastre in the field of geospatial information, topographic and geodetic activities and cadastre for the period 2022 and first half of 2023, as well as plans for the near future, taking into account the main challenge for the country – unprovoked war.

1. The StateGeoCadastrе as a responsible authority that implements the policy in the field of geospatial information

In accordance with the Regulations of the State Service of Ukraine for Geodesy, Cartography and Cadastre approved by the Resolution of the Cabinet of Ministers of Ukraine dated January 14, 2015 №15 (as amended by the Resolution of the Cabinet of Ministers of Ukraine of December 09, 2021, №1302), the StateGeoCadastrе is the central executive body, which activities are directed and coordinated by the Cabinet of Ministers of Ukraine through the Minister of Agrarian Policy and Food and which implements the state policy in the field of National Spatial Data Infrastructure, land relations, land management and in the field of the State Land Cadastre.

The main tasks of the StateGeoCadastrе are:

1) implementation of the state policy in the field of National Spatial Data Infrastructure, topographic, geodetic and cartographic activities, land relations, land management, in the field of the State Land Cadastre, state control over the use and protection of land of all categories and forms of ownership, soil fertility;

2) provision of administrative services in accordance with the law in the relevant field;

3) making proposals for consideration of the Minister of Agrarian Policy and Food of Ukraine to ensure the formation of the state policy in the field of National Spatial Data Infrastructure, topographic-geodesic and cartographic activities, land relations, land management, in the field of the State Land Cadastre, state control over the use and protection of lands of all categories and forms of ownership, soil fertility.

The structure of the central office of the StateGeoCadastrе, as well as its number of employees, the main departments of the StateGeoCadastrе in the regions and subordinate enterprises are shown at Figure 1.

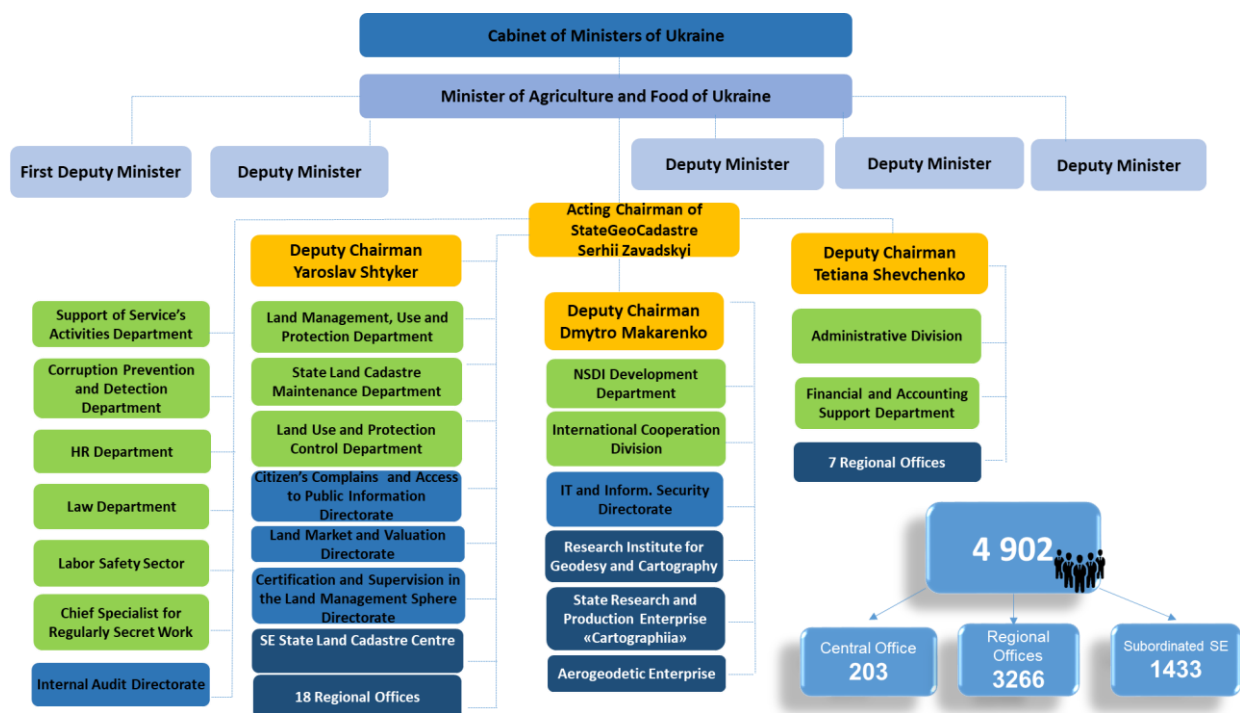


Figure 1. StateGeoCadastrе Structure

The National Economic Strategy of Ukraine for the period up to 2030, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 03.03.2021 №179, determines creation and maintenance of the National Spatial Data Infrastructure as one of the main priorities for the development of the state. This activity includes the creation, updating, processing, storage and use of geospatial data by a wide range of users through direct management of these processes by the StateGeoCadastre.

In accordance with the Decree of the President of Ukraine 266/2022 dated April 21, 2022, the National Council for the Restoration of Ukraine from the consequences of the war developed a plan of measures for the post-war restoration and development of Ukraine. The draft action plan of the working group "New Agrarian Policy" contains paragraph 5.9 "Mapping of the territory of Ukraine and the creation of the National Spatial Data Infrastructure".

2. Development of NSDI in Ukraine

2.1. Implementation of the INSPIRE Directive

Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) was published in the official journal on 25 April 2007 and entered into force on 15 May 2007.

INSPIRE is based on spatial information infrastructures created and supported by Member States of the European Union. The Directive covers 34 spatial data themes required for environmental purposes, with key components defined through relevant technical implementation rules.

In order to ensure compatibility and suitability for the use of spatial data infrastructures of Member States within the Community and in a cross-border context, the Directive requires the adoption of common implementation rules in a number of specific areas (metadata, data specifications, network services, data exchange and services, as well as monitoring and reporting).

On April 13, 2020, the Verkhovna Rada of Ukraine adopted the Law "On National Spatial Data Infrastructure", which came into force on January 1, 2021 and defined the legal and organizational principles of the National Spatial Data Infrastructure creation, functioning and development.

Thus, Ukraine has joined the countries of the European Union, which create and develop spatial data infrastructure in accordance with the EU Directive INSPIRE, which is mandatory for all EU member states.

2.2. Law of Ukraine on NSDI and other regulatory acts in the field of geospatial information

The Law of Ukraine dated 13.04.2020 554-IX "On National Spatial Data Infrastructure" defines legal and organizational principles of creation, functioning and development of National Spatial Data Infrastructure.

The procedure for the functioning of the National Spatial Data Infrastructure, approved by the Cabinet of Ministers of 26 May 2021, №532, defines the organization mechanism of geospatial data and metadata production, updating, processing, storage, publication, visualization, supply and use, other activities related to them, and establishes requirements for the production, updating, processing, storage, supply and use of geospatial data within the national geospatial data infrastructure.

Order of the Ministry of Agrarian Policy and Food of Ukraine dated November 10, 2021, №347, which establishes technical requirements for metadata, specifications, geoinformation services of geoportals:

Technical requirements for metadata for geospatial data and geoinformation services sets of the National Spatial Data Infrastructure approved by the order of the Ministry of Agrarian Policy and Food of Ukraine dated November 10, 2021, № 347, registered in the Ministry of Justice of Ukraine on January 12, 2022 for № 21/37357.

Technical requirements for the specification of the National Spatial Data Infrastructure geospatial data approved by the order of the Ministry of Agrarian Policy and Food of Ukraine dated November 10, 2021, 347, registered in the Ministry of Justice of Ukraine 12 January 2022 for № 22/37358.

Technical requirements for geo-information services of National Spatial Data Infrastructure geoportals approved by the Order of the Ministry of Agrarian Policy and Food of Ukraine dated November 10, 2021, № 347, registered in the Ministry of Justice of Ukraine on January 12, 2022 for № 23/37359.

Technical requirements and methods for ensuring interoperability and compatibility of geospatial data sets and geoinformation services, approved by the Order of the Ministry of Agrarian Policy and Food of Ukraine November 10, 2021, № 347, registered in the Ministry of Justice of Ukraine on January 12, 2022 № 24/37360.

The Law of Ukraine "On the National Spatial Data Infrastructure", Article 36, paragraph 7, g) stipulates that the provisions of the International Organization for Standardization (ISO), Open Geospatial Consortium and INSPIRE data specifications may be applied to regulate activities in the field of geospatial data and metadata use if there are no such technical regulations, national standards or technical specifications.

2.3. Pilot project on NSDI geoportal creation

In accordance with paragraph 3 of the Resolution of the Cabinet of Ministers of Ukraine of February 12, 2020, 134 "On Amending and Invalidating Certain Resolutions of the Cabinet of Ministers of Ukraine" and the Order of the StateGeoCadastre of 04.12.2020 № 523 "On Approval of the Plan for the Implementation of the National Spatial Data Infrastructure Pilot Project" the State Enterprise "Research Institute of Geodesy and Cartography" (hereinafter – SE "RIGK") during 2020 successfully implemented an innovative pilot project on the National Spatial Data Infrastructure in the pilot territories of Lviv and Kharkiv regions, cities of Lviv, Zhytomyr, Bila Tserkva, Mykolaiv, Mariupol, Poltava. Online integration of the existing fundamental and thematic geospatial data on the pilot

territory, the mechanism of interaction with the urban planning cadastre geoportal and official city councils' geoportals were carried out.

In accordance with paragraph 6 of Part 1 of Article 14, paragraph 5 of Part 2 of Section V Final and transitional provisions, Part 1 of Article 16 of the Law of Ukraine "On National Spatial Data Infrastructure" and taking into account the results of the implementation of the mentioned NSDI pilot project SE "RIGK" was appointed as the administrator of the national geoportal by the Order of the StateGeoCadastre of 28.01.2021 № 47.

According to the provisions of Article 6 of the Law of Ukraine "On National Spatial Data Infrastructure", users' access to geospatial data and metadata is provided through data holders geoportals and the National Spatial Data Infrastructure official website. The central executive body that implements the state policy in the field of National Spatial Data Infrastructure (StateGeoCadastre) provides users access to geospatial data and metadata of the National Spatial Data Infrastructure through the national geoportal.

At the end of May 2021, the geoportal of the NSDI pilot project was launched as a prototype of the national geoportal.

Because of the armed aggression of the Russian Federation and according to the resolution of the Cabinet of Ministers of Ukraine dated March 12, 2022, "Some issues of ensuring the functioning of information and communication systems, electronic communication systems, public electronic registries during martial law", currently the NSDI pilot geoportal operates in closed mode, and users access is carried out through the verification process. As of 25.07.2023, the following number of users have been verified on the geoportal:

- the central executive bodies – 19 (79%);
- regional state administrations – 24 (96%);
- the amalgamated territorial communities – 1073 (75%).

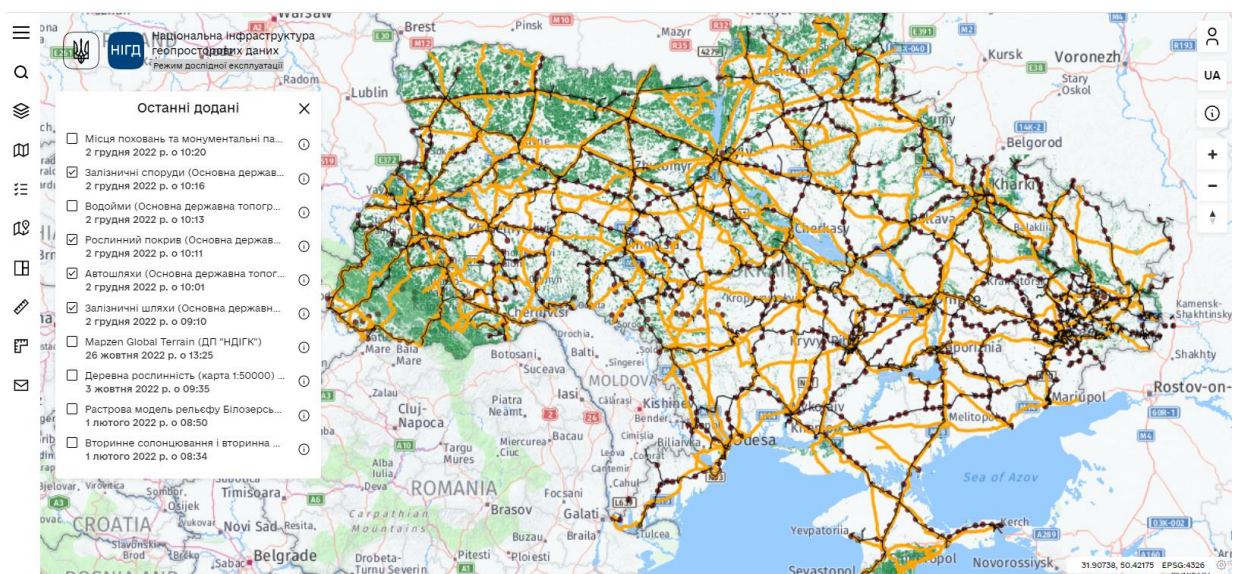


Figure 2.1 Interface of the NSDI geoportal

2.4. Creation of state topographic maps for the territory of Ukraine

According to the Procedure of national topographic and thematic mapping, approved by the Cabinet of Ministers of Ukraine dated September 4, 2013, № 661 (with amendments), national topographic mapping is carried out at scale of 1:10 000, 1:25 000, 1:50 000, 1:100 000, 1:250 000, 1:500 000, and 1:1 000 000. Topographic maps of such scales are state-owned.

Topographic map at a scale of 1:50 000 is the Main state topographic map of Ukraine, and the topographic map at a scale of 1:10 000 is the Basic state topographic map of Ukraine.

Topographic plans at scale 1: 500, 1: 1 000, 1: 2 000 and 1: 5 000 refer to special topographic and geodetic activities and are created at the expense of local budgets.

The state topographic map at scale of 1:10 000 is the cartographic basis for the development of the National Spatial Data Infrastructure, the maintenance of the State Land Cadastre, other state cadasters provided by the current legislation of Ukraine, and the state address register.

In accordance with paragraph 12 of the Procedure for the functioning of the National Spatial Data Infrastructure, approved by the Cabinet of Ministers of Ukraine on May 26, 2021, the national geoportal provides users access to sets of fundamental geospatial data at scale 1:10 000 and 1:50 000 and thematic geospatial data on geospatial objects of national importance and metadata on geospatial data and services as part of the National Spatial Data Infrastructure.

The main characteristics of the topographic map at scale of 1:10 000 is accuracy, reliability, clarity, and relevance of displayed geospatial information on certain areas of the terrain.

In previous years, the StateGeoCadastre (in 2019) has already conducted aerial survey of the territory of the state in order to create digital orthophotoplans of 1:10 000 scale, a digital terrain model and create (update) the basic state topographic map at 1:10 000 scale on a part of the territory of Ukraine.

Because of the armed aggression of the Russian Federation against Ukraine, a ban on the use of airspace over the entire territory of Ukraine was launched, which makes it impossible to carry out aerial surveys of the territory of Ukraine by both manned and unmanned aerial vehicles until the end of the martial law. Thus, for the period of martial law in Ukraine, in case of launching and carrying out works on the creation (updating) maps of different scales, it is possible to use only high-resolution space imagery materials (optimal resolution – up to 40 cm/pixel, which is the basis for creating orthophotoplans and digital maps).

In accordance with the Agreement for the implementation of the project "Maps to Promote Good Land Governance", concluded between the StateGeoCadastre and the Norwegian Mapping Authority (Kartverket) of 28.02.2018, during 2018–2021 the Main state topographic map at scale of 1:50 000 for the part of territory of Ukraine was created.

The implementation of this project is a demonstration of the possibility to organize topographic activities in a large scope with the involvement of experts in the field of topographic, geodetic and cartographic activities. Within the framework of this

project a topographic database for the territory of Ukraine also was created (updated). The work was carried out in three stages:

Stage 1: Creation (update) of sheets of digital topographic maps at scale 1:50 000.

Stage 2: Formation of seamless Main state topographic map in the topographical database.

Stage 3: Publication of the Main state topographic map on the NSDI geoportal, available to all users.

At the end of the activities, updated modern digital topographic maps and created topographic database for the whole territory of Ukraine were transferred to the Armed Forces of Ukraine.

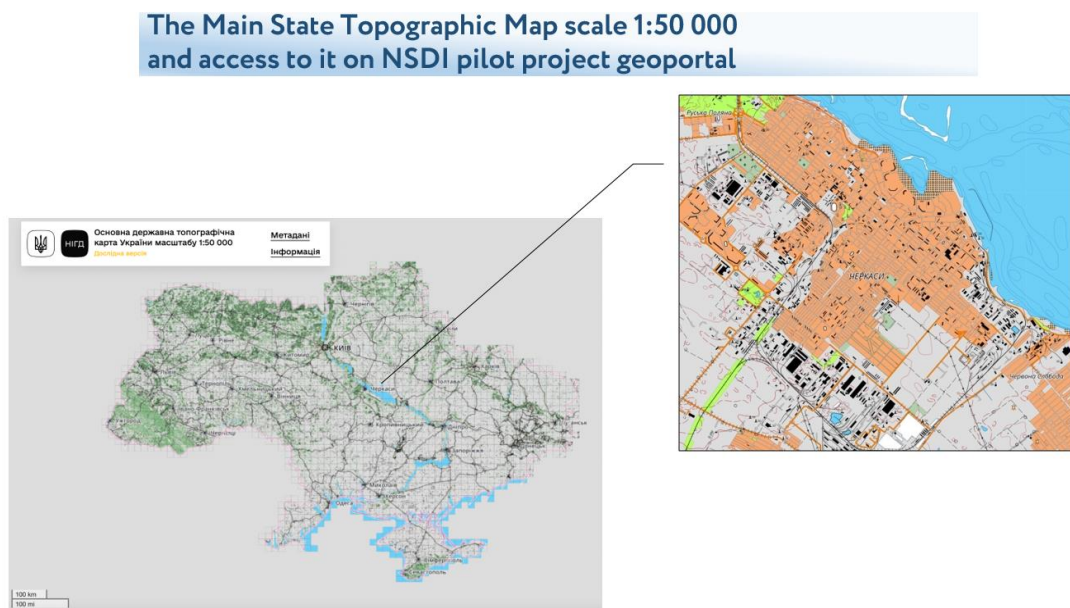


Fig. 2.4.2 The main state topographic map at scale 1:50 000

2.5. Creation of the State Cartographic and Geodetic Fund of Ukraine (StateCartGeoFund) geoportal

In 2022, the StateGeoCadaastre has launched the pilot phase of the State Cartographic and Geodetic Fund of Ukraine geoportal. The creation of the StateCartGeoFund was launched by the StateGeoCadaastre for interaction with the developers of topographic-geodetic, cartographic materials and remote sensing data, created by certified surveyors, in order to transfer materials and data to the StateCartGeoFund. The StateCartGeoFund geoinformation system operates in the pilot mode.

From 24.02.2022 until the end of martial law State Research and Production Enterprise "Cartografiia" as the administrator of the StateCartGeoFund decided to restrict access to data stored in the StateCartGeoFund. Users must undergo the registration and verification procedure for the official use of the StateCartGeoFund.

Acceptance of geodetic, topographic and cartographic materials (topographic plans and maps of the scale from 1:500 to 1:1 000 000), hydrographic, aero materials

to the StateCartGeoFund will be carried out through the geographic information system.

The functioning of the StateCartGeoFund in electronic form is an important step towards full digitalization: all materials will be accepted through the personal account, which will allow:

- a) to provide the State with validated topographic-geodetic and cartographic data;
- b) to provide state bodies, executive authorities and local self-government bodies with standardized topographic, geodetic and cartographic data;
- c) save budget funds will help avoid duplication when creating such materials.

2.6. Creation of Ukrainian Permanent Network of Global Navigation Satellite Systems (as of 30.01.2023)

Within the framework of the project on creation Ukrainian Permanent Network of Global Navigation Satellite Systems (hereinafter – UPM GNSS), as part of the State Geodesic Network, currently the StateGeoCadastre within its authority and in accordance with its competence organized the implementation of measures to restore the work of the GNSS network stations throughout Ukraine (except temporarily occupied territories).

SE "RIGK" as the geodetic database bank administrator constantly provides technical advice on the installation and restoration of the basic GNSS reference stations.

SE "RIGK" performs activities on maintaining the functioning of the GNSS UPM stations, which are on its balance and administers all stations, as well as communication with representatives of the owners of these stations on the ground. Computational work is also performed to monitor the stability of the stations' position.

2.7. Geoportal of the State Geodetic Network (SGN)

SGN Geoportal was developed by SE "RIGK". Services of SGN geoportal provide via online mode:

access to information about the State Geodetic Reference System of Coordinates USC-2000 and passports of regional local coordinate systems formed from the USC-2000 coordinate system,

familiarization with the location of geodetic points in a certain area;

obtaining certificates of technical characteristics of geodetic points;

the ability to select from the list of items in order to place an order to obtain accurate coordinates in the prescribed manner;

performing coordinate operations of coordinates transformation from various coordinate systems to others;

providing feedback from users for more information about the item, including the status of the item, ways of accessing it, photos of its location, etc.

SGN Geoportal supports the formation and visualization of electronic cards with the following composition:

electronic topographic maps in a scale of 1:100 000;

information about geodetic points of the State geodetic network of 1-4 classes;

levels of I and II classes;
 information about linear-angular constructions of geodetic networks of 1-4 classes;
 drawing trapezoids of topographic map sheets;
 boundaries of administrative-territorial units of Ukraine;
 Geoportal contains a geodetic calculator, which provides coordinates transformation in SK-42, SK-63, USK-2000, WGS-84 systems. Also, Geoportal contains descriptions of all types of State geodetic reference coordinate system and files in .prj format for use in geoinformation systems. Figure 2.7 shows examples of the SGN geoportal interface.

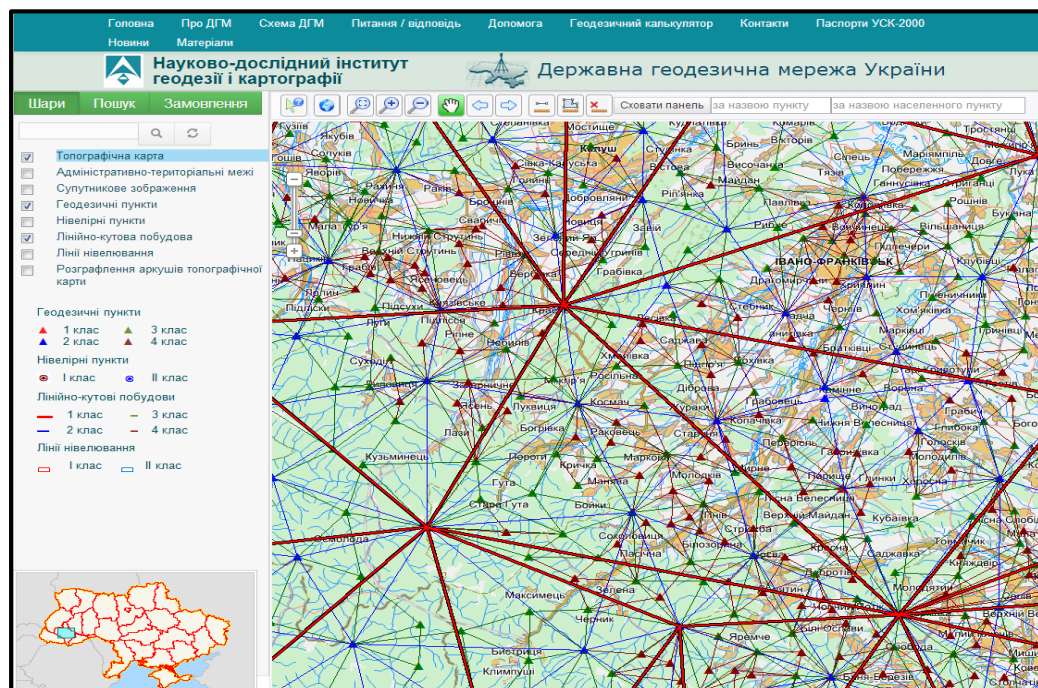


Fig. 2.3 State Geodetic Network scheme on SGN geoportal

3. State Land Cadastre and Modernization of the Automated System of the State Land Cadastre

3.1. Functioning of the State Land Cadastre

The State Land Cadastre began operating in Ukraine on January 1, 2013 (as a result of the joint project with the World Bank) and became the largest digital cadastral system in Europe.

In general, during the period of operation of the State Land Cadastre, information was entered into the system, in particular, about:

land within the territories of administrative-territorial units and land within the territorial communities territories with a total area of more than 3 112,10 thousand hectares (10 245 settlements and one territorial community);

1 179 restrictions on the use of land with a total area of 486,87 thousand hectares;

24 416 035 land plots with a total area of 43 224,03 hectares;

776 274,76 km of the state border of Ukraine.

In addition, more than 11 thousand users were granted access to the information of the State Land Cadastre, including 5 433 notaries, 2 518 certified land surveyors, 1 254 state authorities, 1 043 administrative service centers and local self-government bodies.

At present, information interaction of the State Land Cadastre with the city-planning cadastre, cadastre of other natural resources and other information systems, which holders are the central office of the National Security and Defense Council of Ukraine, the Ministry of Justice, the Ministry of Agrarian Policy, the Ministry of Infrastructure, the National Agency on Corruption Prevention, the State Tax Service and other state authorities of Ukraine, has been provided.

Now the State Land Cadastre provides, first of all, the realization of the rights of owners and land users of land plots, regulation of land relations and land management, organization of rational use and protection of land, implementation of land management, control over the use and protection of land, etc.

The Resolution of the Cabinet of Ministers of Ukraine dated May 07, 2022 № 564 "Some issues of maintaining and functioning of the State Land Cadastre under martial law" establishes the peculiarities of entering into the State Land Cadastre information (changes to it) on the objects of the State Land Cadastre and the use of such information, in particular through access to the State Land Cadastre, disclosure of information of the State Land Cadastre, in particular through the Public Cadastre Map, which is part of the State Land Cadastre software, under the conditions of martial law in Ukraine and within one month from the date of its termination or cancellation.

3.2. Protocol of information interaction between SLC and NSDI pilot geoportal information systems

The administrator of the State Land Cadastre and Public Cadastre Map is the state enterprise "State Land Cadastre Center".

On April 6, 2023, the protocol of information interaction between the State Land Cadastre and the National Spatial Data Infrastructure pilot geoportal information systems was signed.

With the help of an application public software interface SE "SLC Center" provides SE "RIGK" access to the information of the State Land Cadastre on land plots and access to cartographic layers of the Public Cadastre Map of Ukraine in the form of relevant services without attributive information. Also, SE "SLC Center" provides experts connection of SE "RIGK" to the Public Cadastral Map of Ukraine for information, in particular on restrictions in the use of land, the State Border of Ukraine, the administrative-territorial structure, and soils.

3.3. Modernization of the automated system the State Land Cadastre with the support of the World Bank

With the assistance of the project "Supporting Transparent Land Governance in Ukraine", implemented by the World Bank and the EU from May to December 2022, a technical assessment of the IT infrastructure and software of the automated system of the SLC was held.

According to the conclusions of the independent assessment for the further effective operation of the State Land Cadastre and to meet the needs of the country for high-quality geo- and cartographic data, there is a need of SLC modernization and the development management processes institutional transformation, system control and monitoring, strengthening cybersecurity and data protection, etc.

On March 29, 2023, the StateGeoCadastre established a Working Group to determine the plan for the improvement and modernization of the automated system of the State Land Cadastre (with the support of the World Bank project) in order to restore the critical components of the SLC and maintain its performance; to create a transformation project of AS SLC in accordance with the new Terms of Reference, which is developed with the support of the World Bank; to ensure data storage in the process of transformation and unification in the new system; to develop and implement the modernized AS SLC system without disturbing the continuity of processes of the StateGeoCadastre.

These tasks today under the conditions of wartime are quite acute, because reliable work and preservation of information of the State Land Cadastre are extremely important for guaranteeing the rights to land for citizens and businesses, since paper archives of documentation in the temporarily occupied territories are highly likely lost, as well as in areas where active hostilities took place. Therefore, being aware of all the responsibility for data storage, the StateGeoCadastre, with the support of international partners, works to ensure the implementation of the project for the transformation of AS SLC at a highly qualified level.

4. International cooperation in the field of geospatial information

4.1. Implementation of the international technical assistance project with JICA

Within the framework of the Agreement on Technical Cooperation and Grant Assistance between the Government of Ukraine represented by the State Service of Ukraine for Geodesy, Cartography and Cadastre and the Government of Japan represented by the Japan International Cooperation Agency (JICA) on July 22, 2022, the implementation of the Capacity Development Project for Utilizing the National Spatial Data Infrastructure in Ukraine was launched. The project is a continuation of the previous successful project with JICA "Creation of NSDI in Ukraine", which lasted during the period 2015–2018.

Within the framework of the project, digital topographic maps at a scale of 1:25 000 were created for a part of the territory of Ukraine (104 nomenclature sheets).

All work related to the creation of digital topographic maps was carried out using the vectorization method. The main source data for the digital topographic maps were satellite imagery from 2021–2022 and orthophoto maps at a scale of 1:10 000.

Japanese experts also produced topographic maps at a scale of 1:10 000 for three Ukrainian cities.

4.2. Cooperation with USAID

With the support of the USAID Agricultural and Rural Development Program (AGRO), a group of consultants developed a draft Terms of Reference for the creation of NSDI national geoportal. On the basis of the approved Terms of Reference, the StateGeoCadastré plans during 2023 to take measures for the development and implementation of the NSDI national geoportal, which will allow state authorities and local self-government bodies, territorial communities, businesses and citizens to access current geospatial data regardless of their departmental origin and use them to de-bureaucratize and improve the efficiency of territory and resource management with the help of appropriate electronic services.

With the support of the USAID Agricultural and Rural Development Program in March and April 2023, the training course "Basics of interoperable geospatial data for the NSDI development creation" was held, which was attended by more than 400 representatives of central and territorial authorities, state enterprises, institutions and organizations, whose activities are related to geospatial data. During the training course, participants considered regulatory support, institutional principles and architecture of NSDI, technology and rules of geospatial data modeling, development of specifications for geospatial data sets, and methodology for preparing and registering metadata at the national geoportal.

Such training is an important stage in the development of NSDI, because the acquired knowledge will allow geospatial data holders to ensure the filling of the NSDI geoportal with high-quality and modern data.

4.3. Ukraine IGIF

In August 2018, during the 8th meeting of the UN Committee of Experts on Global Geospatial Information Management, Part 1 of the IGIF "Overarching Strategic Framework" was approved, Part 2 "Implementation Guide" was adopted in 2020 and Part 3 "Country-level Action Plans" was supported in 2022.

In November 2020, the StateGeoCadastré, with the support of the Dutch Kadaster, organized a series of webinars to familiarize stakeholders with the strategic pathways Data, Standards, Communication and Engagement.

In the period from 2021 to 2022, the StateGeoCadastré, together with the Norwegian Mapping Authority (Kartverket), implemented the Integrated Geospatial Information Framework (IGIF) within the framework of the international technical assistance project "Maps to Support Good Land Governance in Ukraine". The Norwegian side engaged ConsultingWhere, an international company, to implement the project, which provided consulting support for the creation of an action plan in accordance with the IGIF.

In accordance with the IGIF Implementation Methodology developed by the World Bank Group, international experts conducted interviews with data holders, analyzed the stage of NSDI development in Ukraine and generated reports: the Baseline Report, the Geospatial Alignment to Policy Drivers (GAPD), and the Socio-Economic Impact Assessment.

The Baseline Report was conducted in May 2021. With the participation of a wide range of stakeholders, the current status of all nine IGIF Strategic Pathways was studied and presented in the report. Ukraine's key strengths were highlighted in the Policy and Legal area, as the adoption and entry into force of the Law of Ukraine "On NSDI" is a major achievement and a springboard for further progress. The strong innovation culture that is currently supported by the Ministry of Digital Transformation of Ukraine at the national level is also a promising vector that should be utilized by the geospatial community. Weaknesses mainly include incomplete governance mechanisms, lack of a sustainable business model for the necessary infrastructure development, underdeveloped public-private partnerships, and a lack of a communication strategy.

In July 2021, a Geospatial Alignment to Policy Drivers (GAPD) was developed. The report identifies, in particular, the main sectors of Ukraine that can benefit from the use of the IGIF: 1) integration into the European Union; 2) land reform; 3) digital transformation; 4) decentralization; 5) infrastructure development (including transport); 6) energy; 7) environment; 8) healthcare; 9) education, science and innovation; 10) culture and tourism; 11) defense and intelligence.

In February 2022, the Socio-Economic Impact Assessment was completed to quantify costs and benefits, develop a financial model, and analyze other studies and regional sectoral reports from other countries. During the socio-economic analysis, the experts faced a number of challenges, including incomplete and unverifiable data, as well as institutions not providing sound financial data and lack of trust in how the information would be used. Based on the results of the Assessment, recommendations for Ukraine for a 5-year period to improve the NSDI functioning were developed, namely

- Harmonization of geospatial data exchange protocols to reduce costly duplication of data, improve quality and consistency;

- Creation of a unified national georeferenced street address database;

- Improving the network of continuously operating reference stations (CORS) through cooperation with public and private sector network operators;

- Completion of the State Land Cadastre;

- Identification and implementation of a sustainable business model for NSDI based on a long-term budgetary calculation that supports the necessary investments;

- Creation of a scalable national geoportal providing online access to basic geospatial data through web browsing and APIs;

- Digitization and quality improvement for additional basic geospatial datasets, especially taking into account the UN Sustainable Development Goals;

- Adoption of international data specifications for core datasets and creation of national profiles where necessary;

- Developing the geospatial ecosystem through more effective partnerships with a wide range of users, especially in the commercial sector;

- Support innovation in the development of new applications using geospatial data;

- Upgrading the skills of state institutions, including but not limited to the StateGeoCadastre, to ensure more effective leadership and coordination;

Raising the profile of the NSDI through a broad-based communications strategy, emphasizing its role in digital transformation and the positive impact it brings to many sectors of the economy.

The results of the analysis were used to develop a plan for the implementation of NSDI and implement measures that will stimulate the development of the geospatial ecosystem in Ukraine and economic growth.

4.4. Signing of the Memorandum with EUROGI

On November 18, 2022, Memorandum of Cooperation was signed between the State Service of Ukraine for Geodesy, Cartography and Cadastre and the European Umbrella Organization for Geographic Information (EUROGI) (EUROGI is also a member of UN-GGIM).

The purpose of this document is to develop cooperation in the field of geographical information and the development of the national infrastructure of geospatial data of Ukraine, as well as adaptation of legislation to the provisions of the European Union (EU) law and its implementation in the context of granting Ukraine the status of a candidate for EU membership, cooperation in the field of geographical information and development of NSDI in favor of both organizations, which provides, in particular, the exchange of knowledge and experience, as well as promoting the creation of opportunities for establishing appropriate links.

In particular, within the framework of cooperation, three students of Kyiv National University of Construction and Architecture had an opportunity to study at the University of Salzburg PLUS (geoinformatics) for the period of the first half of 2023 (Erasmus+ program).

4.5. Experience exchange and capacity building in the field of NSDI

The State Service of Ukraine for Geodesy, Cartography and Cadastre promotes bilateral cooperation with relevant government agencies of foreign countries, international and non-governmental organizations involved in geospatial data, and organizes activities to exchange experience with international partners in the field of geospatial data.

In June 2023, as part of the cooperation between the StateGeoCadastre and the Geospatial Commission of the UK, an online seminar was held for representatives of executive authorities and other holders responsible for creating and updating geospatial data sets and metadata. The event was attended by a total of about 90 participants from the Ukrainian side. During the seminar, members of the UK Geospatial Commission shared their experience in implementing the UK geospatial strategy, as well as the specifics of cooperation between the UK public and private sectors in the field of geospatial information.

The StateGeoCadastre has established cooperation with the Ministry of Natural Resources of Canada in the field of National Spatial Data Infrastructure and standardization in the sphere of geospatial information. The StateGeoCadastre,

together with the State Enterprise "Research Institute of Geodesy and Cartography" and the Canadian company CAE Inc. developed a project proposal for geoinformation analysis and modeling of the consequences of the man-made disaster at the Kakhovka HPP, as well as forecasting the flood zone in case of damage to other hydraulic structures.

In addition, the project proposal prepared by the StateGeoCadaastre of TAIEX "Development and Operation of NSDI in accordance with the INSPIRE Directive" was approved by the European Commission and an expert mission is planned for October 2023.

4.6. Membership in international organizations

In accordance with the Resolution of the Cabinet of Ministers of 13 September 2002, №1371 "On the procedure for the participation of central executive authorities in the activities of international organizations", the StateGeoCadaastre is responsible for fulfilling the obligations arising from the membership of Ukraine in the following international organizations:

United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM);

United Nations Group of Experts on Geographical Names (UN-GEGN);

The UNECE Committee on Urban Development, Housing and Land Management;

EuroGeographics;

International Cartographic Association (ICA).

On November 21, 2019, during the Plenary Meeting of the Permanent Committee on Cadastre of the European Union, members of the Committee unanimously voted for granting Ukraine, represented by the State Service of Ukraine for Geodesy, Cartography and Cadastre, the right of membership as an observer.

In addition, on December 8, 2022, the StateGeoCadaastre acquired associate membership in the Open Geospatial Consortium (OGC) with the support of the Natural Resources Canada.

Also during the General Assembly of the Council of European Geodetic Surveyors, held on May 12–13, 2023 in Oradea (Romania), the CLGE Board unanimously approved the membership of the StateGeoCadaastre in the Council of European Geodetic Surveyors.

Summary

2021–2022 can be considered as a growth period of the geospatial sphere in Ukraine, because then the Ukrainian geospatial community was experiencing the historical moment of digitalization. A large number of specialists, scientific organizations and public representatives in this area were involved in the creation of modern geoinformation technologies, which contributed to saving budgetary funds and development of territories, strengthening public control over the activities of state bodies and increasing public confidence in the government.

On May 10, 2022, the Geospatial World Leadership Awards jury unanimously decided to award the State Service of Ukraine for Geodesy, Cartography and Cadastre with the award "National Geospatial Agency of the Year" for exemplary service to the state. The event was held within the framework of the World Geospatial Forum in Amsterdam (the Kingdom of the Netherlands).

The award "National Geospatial Agency of the Year" is a joint award of the Ukrainian geospatial community, all specialists, scientists, public organizations representatives in the field of development and implementation of geospatial data in Ukraine, which were involved in the NSDI creation and development, and who, despite the war and challenges of martial law, continue their work at a difficult time for the country.