Geoportal visualization of state cadastre objects: (a case study from Uzbekistan)

A Inamov*, Sh Sattorov, A Dadabayev, and A Narziyev

"Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University, Kari-Niyazi str. 39, Tashkent, Uzbekistan, 100000

*E-mail: an.inomov@yandex.com

Abstract. The Cadastre Agency under the State Tax Committee of the Republic of Uzbekistan (State Geodetic Inspection) is responsible for processing the state cadastre data of geodesy and cartography, which are part of the state cadastres, and visualizing the information in the geodata database. The State Cadastre of Geodesy and Cartography has a total of 115,616 objects in the Republic of Uzbekistan, of which 111,838 are included in the geodata database. Taking into account the transparency of this information and the fact that it is not widely used by young researchers in scientific research. During this research, proposals were developed to visualize the state cadastre of geodesy and cartography in the geoportal. During the research, world experience was studied and considered on the example of the Russian Federation, which was homogeneous in terms of systematization of geodetic and cartographic data. The created and recommended geoportal had sections on zone, column, row and nomenclature, and the zone section had rows 10N, 11N, 12N and 13N. Accordingly, the topographic map of the zones was provided with space and cartographic bases.

Keywords: Cadastre, cartography, coordinate system, geovisualization, geoportal, Uzbekistan

1. Introduction

According to the Gaussian-Kruger projection of the Soviet states during the former USSR, Pulkova 1942 year with the help of the coordinate system carried out geodesik and cartographic research [1-3]. As a result of the spread of the former USSR, the Russian Federation Pulkova abandoned the system of coordinates 1942, and Pulkova developed the system of coordinates 1995, and today it is already using this system [3].

System organizations of the Republic of Uzbekistan still use the Pulkova 1942 coordinate system. The organization of geodetic and cartographic works in the Russian Federation, as well as the use of an open data portal for young researchers (Figure 1) [4, 5].
Figure 1. Open data portal in the field of geodesy and cartography of the Russian Federation.

The site “nav.lom.name/maps_scan/” covers the entire landmass of the earth, formed in the form of nomenclature from the northern to the southern part of the globe [5, 6]. The nomenclature is mainly geovisualized on a scale of 1: 1,000,000 to 1: 100,000 (Figure 2).

Figure 2. Geovisualization of nomenclatures in scale.

Sources formed on the basis of nomenclature contain topographic maps, ie topographic maps, and it can be seen that most topographic maps are old [7, 8]. For example, we can see that the topographic map of the K-42-92 nomenclature was created in 1986 on the basis of 1979 research (Figure 3).
Of course, it can be seen that the use of these resources, along with the creation of some facilities for researchers in geodesy and cartography, created the basis for students and masters to gain in-depth knowledge in the field of geodesy and cartography [9, 10]. Therefore, it should be noted that our main goal is to create a wide range of opportunities for researchers in the field of geodesy and cartography, as well as an open database for undergraduate and graduate students [11].

2. Materials and methods
In this research, Chinoz district of Tashkent province (Uzbekistan) was selected as a study site, where all experiments were undertaken using satellite images as well as data from the portal created by Russia.

Unlike the open database on the site "nav.lom.name/maps_scan/" created by scientists of the Russian Federation. This research was aimed at forming and geovisualizing not only the topographic basis, but also space images in the nomenclature of the territory of the Republic of Uzbekistan [1, 2, 5]. The result was a wide range of opportunities for researchers studying in higher education and conducting research, as well as the open digitization of the state cadastre of geodesy and cartography on the geoportal [6, 8]. Taking into account the fact that the Republic of Uzbekistan is located in a total of 4 columns (40, 41, 42 and 43) and 3 rows (J, K and L), L-40, L-41, K-40, K-41. We were required to define the nomenclatures K-42, K-43, J-41, and J-42 (Figure 4).

Figure 3. 1:10,000 scale topographic map of K-42-92 nomenclature.
In Figure 4 we can see that according to the nomenclature, the entire territory of the Republic of Uzbekistan lies in a total of 8 tropes on a scale of 1: 1,000,000 [2, 3]. In terms of other scales, the number of tropes of the occupied territories of the Republic of Uzbekistan is as follows:

21 trapezoids at a scale of 1:500,000;
112 trapezoids on a scale of 1:200,000;
381 trapezoids on a scale of 100,000

As a result of the tropetes identified above, the researcher determined the number of the trapezoids in the intersection of zones and rows in Table 1 below.

Table 1. Number of locations in the tropics of the territory of the Republic of Uzbekistan

| # | Zone 10N (column 40) | Total |
|---|----------------------|-------|
|   | 1:1 000 000 | 1:500 000 | 1:200 000 | 1:100 000 |
| L-row | 1 | 2 | 11 | 37 | 51 |
| K-row | 1 | 4 | 16 | 58 | 79 |
| J-row | 0 | 0 | 0 | 0 | 0 |
| Total | 2 | 6 | 27 | 95 | 130 |

| # | Zone 11N (column 41) | Total |
|---|----------------------|-------|
|   | 1:1 000 000 | 1:500 000 | 1:200 000 | 1:100 000 |
| L-row | 1 | 1 | 3 | 6 | 11 |
It is recommended to carry out visualization work in the geoportal in the section of the state cadastre of geodesy and cartography on the number of tropets identified in the section of zones and rows (Table 1).

3. Results and discussion

In the course of the research, the State Cadastre of Geodesy and Cartography initially carried out work on the formation of tropets on a scale of 1: 1,000,000 and their topographic basis, and in the next stages formed the trapezoids of nomenclature on a scale of 1: 500,000, 1: 200,000 and 1: 100,000 (Figure 5).

![Figure 5. Geoportal of the State Cadastre of Geodesy and Cartography (Uzbekistan)](http://www.gqk.uz)
The created and recommended geoportal had sections on zone, column, row and nomenclature, and the zone section had rows 10N, 11N, 12N and 13N. Accordingly, the topographic map of the zones was provided with space and cartographic bases. In the column and row section, the data of rows J, K and L, as well as columns 40, 41, 42 and 43 in the section of the tropics located in the Republic of Uzbekistan were entered. However, the nomenclature section contained the following nomenclatures formed on the basis of columns 40, 41, 42 and 43 of rows J, K and L:

- J-40, J-41;
- K-40, K-41, K-42, K-43;
- L-41, L-42.

This nomenclature section also has topographic, spatial, and map-based bases, which can be changed by selecting the appropriate source (Figure 6).

![Geoportal of the State Cadastre of Geodesy and Cartography (Uzbekistan)](http://www.gkgk.uz)

In the maintenance and formation of the state cadastre of geodesy and cartography in the Republic of Uzbekistan, geovisualization not only in the geodata but also in the geoportal serves to create ample opportunities for researchers conducting research in the Republic of Uzbekistan and increase the reliability of scientific innovations. At the same time, it allows organizations engaged in geodetic and cartographic activities in the Republic of Uzbekistan to quickly obtain reliable data of high accuracy.

4. Conclusions
1. A method for equalizing data errors based on GIS technology has been developed;
2. Scientific research on the location of geodetic networks using satellite imagery was conducted, consequently, methods were also improved;
3. The method of geospatial database formation and vector layer visualization has been improved;
4. Methods of geo-spatial linking and digitization of objects in the geospatial database have been developed;
5. The method of creating a geoportal with open data on the state cadastre of geodesy and cartography was recommended.

References
[1] Oymatov R and Safayev S 2021 Creation of a complex electronic map of agriculture and agro-geo databases using GIS techniques E3S Web of Conferences 258 02017
[2] Khidirov S, Oymatov R, Norkulov B, Musulmanov F, Rayimova I and Raimova I 2021 Exploration of the hydraulic structure of the water supply facilities operation mode and flow E3S Web of Conferences 264 01033
[3] Bazarov D, Umarov S, Oymatov R, Uljaev F, Rayimov K and Raimova I 2021 Hydraulic parameters in the area of the main dam intake structure of the river E3S Web of Conferences 264 01034
[4] Egamberdiev S, Khomurotov M, Berdiev E, Ochilov T, Oymatov R and Abdurakhmonov Z 2021 Determination of substrate composition, light, and temperature for interior plant growth E3S Web of Conferences 284 03015
[5] Abdurakhmonov S, Abdurahmanov I, Murodova D, Pardaboyev A, Mirjalolov N and Djurayev A 2020 Development of demographic mapping method based on GIS technologies InterCarto. InterGIS 26(1) 319-328
[6] Mamatkulov Z, Rashidov J, Eshchanova G, Berdiev M and Abdurakhmonov Z 2020 Visualization and analysing the state of hydrotechnical construction via geospatial methods (on the example of Kharshi pumping stations cascade) IOP Conference Series: Earth and Environmental Science 614(1) 012086
[7] Aslanov I, Mukhtorov U, Mahsudov R, Makhmudova U, Alimova S, Djurayeva L and Ibragimov O 2021 Applying remote sensing techniques to monitor green areas in Tashkent Uzbekistan E3S Web of Conferences 258 02005
[8] Jumanov A, Khasanov S, Tabayev A, Goziev G, Uzbekov U and Malikov E 2020 Land suitability assessment for grapevines via laser level in water-scarce regions of Uzbekistan (in the case of Kashkadarya province IOP Conference Series: Earth and Environmental Science 614(1) 012150
[9] Shodmonova G, Islamov U, Abdisamatov O, Khikmatullaev S, Kholiyorov U and Khamraeva S 2020 Numerical solution of nonlinear integro-differential equations IOP Conference Series: Materials Science and Engineering 896(1) 012117
[10] Kuziev U, Khikmatullaev S, Abdullaeva S, Xoliyorov U and Nosurullayev K 2021 Analysis of the effect of fertilizer on tree development by remote sensing and technology of giving liquid organic fertilizer to tree root system in intensive gardens E3S Web of Conferences 258 02007
[11] Karimova K, Khikmatullaev S, Kholiyorov U, Mirjalalov N, Islamov U and Juraeva F 2020 Vertical nonlinear oscillations of viscoelastic systems with multiple degrees of freedom IOP Conference Series: Materials Science and Engineering 896(1) 012118