

Issues of Creating a Multi-Purpose Land Database on the Example of Vobkent District of Bukhara Region

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Annotation: Today, information on land resources is a key source in ensuring the sustainability of agricultural land relations. The collection of information on land resources by various ministries and agencies, the lack of coordination of the land database shows that the socio-economic management of the regions is not enough to make the right decisions.

Therefore, the rational and effective use of land resources in the socio-economic development of the regions, the application of innovative technologies, integrated accounting of land resources and the free exchange of information and information between users in the use of geographic information systems.

Key words: Land Cadastre, Land Information System, Geo information System, Geo database, Geo data structure, Data models, Satellite Images

Introduction

In recent decades, the tasks of natural and socio-economic systems, their collection and automatic processing of information through mathematical modeling and computer technology have emerged as an independent field of science - "geoinformatics". Geoinformatics has led to the formation and use of land resources through land databases.

According to the United Nations (UN), the Earth Information Database is a tool for making, planning and developing legal, administrative and economic decisions. It emphasizes that it consists of a database that includes spatial information related to the land for a particular area, as well as stages and methods for the regular collection, updating, processing and dissemination of information on land resources [1; Pp. 122-138, 2; P. 44, 3; Pp. 514-529].

According to the International Federation of Surveyors (IFS), the basis of the Earth database is a single phase coordinate database. In this case, the terrestrial database helps to link the phase information with other terrestrial information.

In order to ensure the handling of land management and land cadastre information in the Republic of Belarus, a land database in the form of geographic information systems is provided [4; Pp. 85-92, 5; Pp. 220-224, 6; P. 10, 7; 2-3 -b]. Also, the Land Code of the Republic of Belarus states: The land database of the Republic of Belarus is a database that provides information on the status, distribution and use of land resources in electronic form, including the exchange of information and technology provided by geographic information technology. channels and other automated resources that collect, process, store, and provide information [8; 92 p.].

It should be noted that an important condition for such a multi-purpose land database is that the land plots are geographically connected to the place.

The importance of a multi-purpose land database is the possibility of joint analysis of land plots and related infrastructure, as well as other statistical information.

Description of the research object

Vobkent district of Bukhara region was selected as the object of research. Bukhara region of the Republic of Uzbekistan was founded on January 15, 1938 [9; 761-767-b.]. The territory of Bukhara region is mainly located in the Kyzylkum desert. The south-east is occupied by the Zarafshan valley. It is bordered by Khorezm region and the Republic of Karakalpakstan in the northwest, Navoi region in the north and east, Kashkadarya region in the southeast, and Turkmenistan in the southwest (Figure 1).

Bukhara region consists of 11 districts: Bukhara, Vobkent, Jondor, Kagan, Alat, Peshku, Romitan, Shafirkan, Karavulbozor, Karakul, Gijduvan, 11 cities (Bukhara, Galaosiyoy, Vobkent, Gazli, Kagan, Alat, Romitan, Shafirkan, Karakul, Karavulbozor, Gijduvan), 3 towns (Jondor, Zafarabad, Yangibazar), 121 village assemblies. Bukhara region is located in the natural latitude of about 38° 56'30'' - 41° 30'45'' north latitude and 62° 07'42'' - 65° 23'36'' east. The relief of the territory of Bukhara region, according to most geomorphological features, consists of more complex plains, which are used in planning the implementation of agro-technical measures in agriculture.

Areas of land types belonging to 8 land funds in Bukhara region were analyzed and in the process of research the territory of Vobkent district was selected as a pilot plot. The territory of this district is 1% of the total land area of the region, ie the total land area is 29,158 hectares [10; 68-b.].

The agricultural lands of Bukhara region are mainly used for cotton, grain, fruit, melons, vegetables, horticulture and animal husbandry.

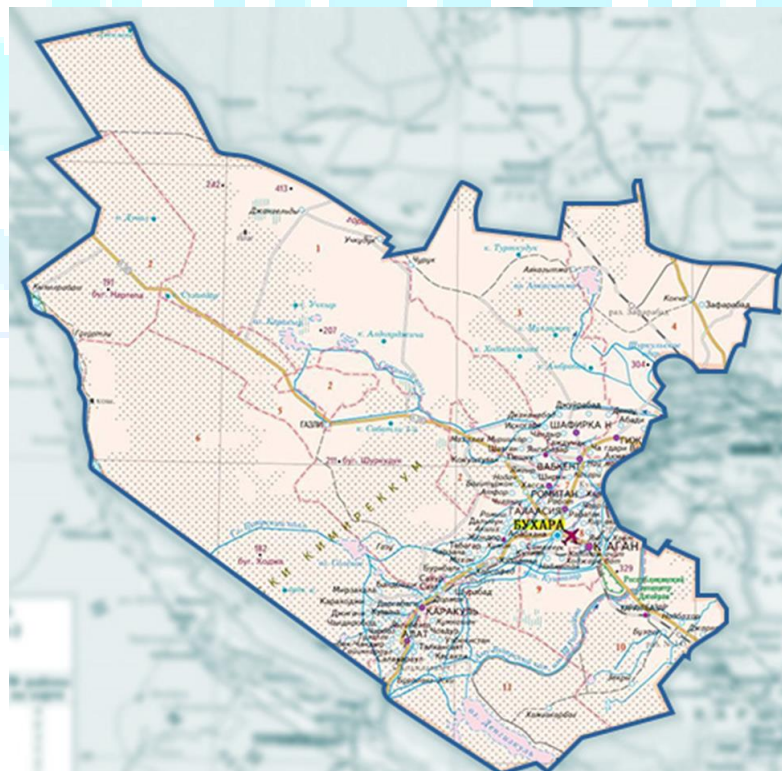


Figure 1. Map of Bukhara region ¹

¹ Agency for Foreign Investment under the Ministry of Investment and Foreign Trade of the Republic of Uzbekistan: <https://invest.gov.uz/ru/regional-map/buharskaya-oblast/> (20.12.2021)

According to agricultural land types, as of January 1, 2020, the total irrigated land is 274,855 hectares, arable land 200,084 hectares, perennial forests 20,876 hectares, gray lands 6,977 hectares, pastures and hayfields 2,558,089 hectares [10; 37-b.].

Using satellite imagery, a schematic view of the location of the selected pilot site from Bukhara region and a three-dimensional map of the region were created. At the same time, it was found that the relief of the region, consisting of relatively flat plains, is 1-2.5%. These maps used 12.5 m high-resolution radar satellite images from Japan's ALOS PALSAR satellite. The satellite images were processed using the ArcGIS Image Analyst and ArcGIS Spatial Analyst applications (Figure 2).

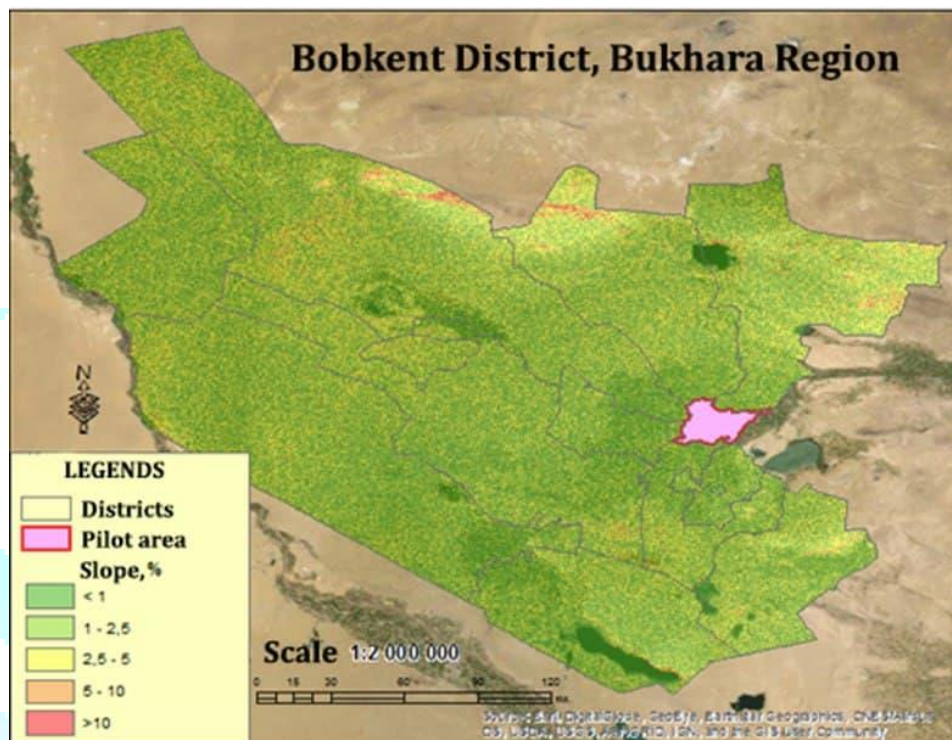


Figure 2. Schematic view of the selected area in the mathematical model of the landscape map of Bukhara region.

Multi-purpose land database and digital cadastral mapping technologies

The first scientific views on cadastral maps and plans, which form the cartographic basis of the multi-purpose land database, describe the cadastral maps in the monograph "Geoinformation database and technology" by domestic scientists (Safarov E. Yu., Musaev IM, Abdurahimov HA) : "Cadastral map □ is a type of product obtained during the cadastral work on land inventory and cadastral mapping, which is a cartographic component of the basis of land cadastre information" [11; 93-100-b.].

In the Regulation "On the procedure for maintaining the State Land Cadastre", approved by the Cabinet of Ministers of the Republic of Uzbekistan No. 389 of 2021, one of the important components of the state cadastre in the registration, assessment and state registration of land is the compilation of cadastral maps [12]. Today, all types of cadastral maps are created in digital form. Digital cadastral maps created in ArcGIS are implemented in the form of a database. Cadastral maps, including digital land cadastral maps, consist of stages of preparation, input, editing, storage and output, depending on the type of information and the application of means of production (computer, scanner, etc.) (Figure 3).

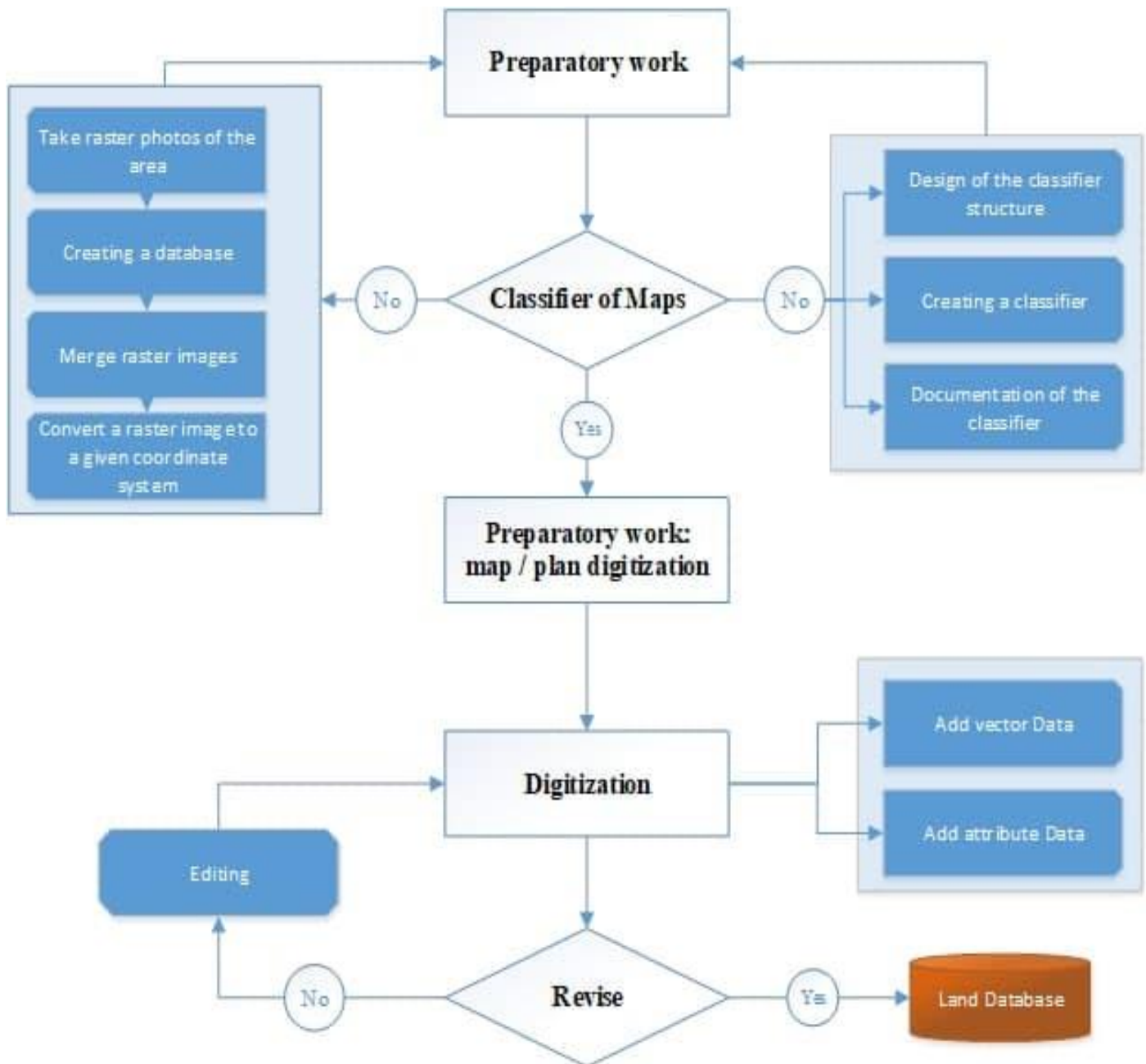


Figure 3. Schematic of the technological process of compiling digital land cadastral maps and plans.

Cadastral plan of the land plot on the lands of the settlement. On a scale of 1: 500 - 1: 2000, rural and forest lands. It is created on a scale of 1: 5000 - 1: 10000.

Methods of forming a multi-purpose land database

The basis of the research method is comparative-geographical, analytical, generalization of information, creation of the structure of the land database based on geoinformation systems, spatial analysis and modeling methods.

The research was conducted at the State Research and Design Institute "Uzdaverloyiha" in 2019-2021.

The coordinates of the study area (Vobkent district of Bukhara region) - geographical location were obtained using the program "Google Earth Pro". 220-245 m above sea level. located at an altitude of 40°01'30" north latitude and 64°31'00" east longitude.

The research was carried out in the stages of field surveillance, cartographic and camera work, and M.Law and A.Collins's "Getting to know ArcGIS Desktop" [13; 856-b], M.H.Pricening's "Mastering ArcGIS" [14; 619], D. Danko, W. Kresse, "Springer Handbook of Geographic Information" [15; p. 1132] and H. Nasser's "Learning ArcGIS Geodatabases" [16; P. 158] on the methods and spatial database creation of G.B. Hall, K.W. Yeung Albert «Spatial Database Systems: Design, Implementation and Project Management» [17; 555] and Avezbaev S., Avezbaev O.S. Based on the scientific and practical recommendations in the textbook "Geomatabase and Architecture".

The following work was carried out in the field:

1. Territorial monitoring - 6372 land types belonging to 8 land categories were registered in the field;
2. Data collection - statistical information on 643 land users, including 482 farms, 89 dehqan farms, 7 limited liability companies and 65 other agricultural producers, 19 agricultural maps of the region and other socio-economic data. statistical information was studied;
3. The information collected in the field is summarized in Microsoft Office suite programs.

According to the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated April 23, 2018 No 299 "On measures to further improve the procedure for demarcation of administrative-territorial units, inventory of land resources and geobotanical research in pastures and hayfields" The creation of digital maps was carried out by the State Research and Design Institute "Uzdaveroylha" and its Bukhara branch in 2018-2020 with the participation of the author.

The process of creating a state land cadastre database on agricultural lands in a single database of state cadastres was analyzed by the author and its technological model was developed (Figure 4).

Cartographic works study topographic and rotational agricultural maps compiled on agricultural lands before (in previous years). Existing changes are mapped using camera and field decoding methods.

Maps are digitized using special vectorizer or geoinformation system software. The state land cadastre database for agricultural lands has been created in the ArcGIS program. Soil assessment maps, normative value of arable land and information on agricultural producers and users of other agricultural lands are summarized. In doing so, digital maps and tables created in other formats are converted to ArcGIS application formats. The conformity of the symbols to the specified scale is checked.

Database of agricultural land in Vobkent district of Bukhara region on the basis of the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated April 23, 2018 No 299 "On measures to further improve the procedure for demarcation of administrative-territorial units, inventory of land resources and geobotanical research in pastures and hayfields" created.

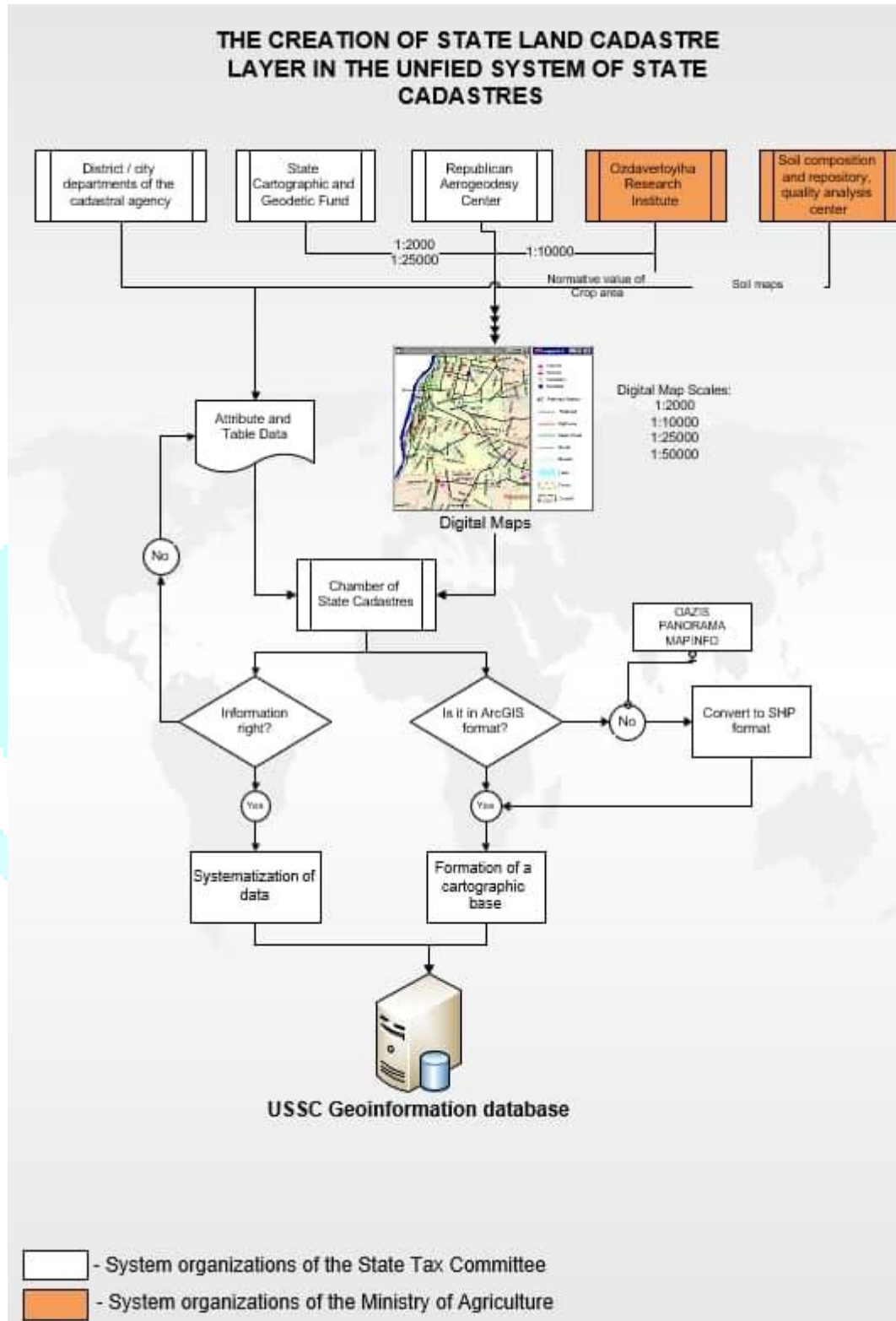


Figure 4. Model of creating a state land cadastre map on the basis of a single state cadastre.

Based on the account of land types and areas of land users in the contour section and the account of the calculation of land types and areas in the contour section, the agricultural land database is formed by farms (array). The above information does not allow to create a district land database.

All 19 land databases in the district are created in ArcGIS CIS format. Array boundaries are not compared to adjacent array boundaries. The number of layers in the arrays varies from 35 to 61 layers. The names of the layers are written in Uzbek, Russian and English and are not standardized.

Development of an improved model of a multi-purpose land database

It should be noted that today many textbooks, scientific and practical articles only reveal the general aspects of the problem, for example, the creation and maintenance of the state land cadastre [A.R. Babajanov et al. 2008; I.Ikhlosov, D.Rizaeva, 2019] or the creation of land information systems [A.S.Chertovitsky, 2010].

Based on the above analysis and information collected on the experimental plot of land database modeling, as well as the study of the activities of the State Research and Design Institute "Uzdaverloyiha" and its regional divisions, an improved model of land database was developed (Figure 5).

First, the structure of the boundaries of administrative-territorial units on the territory of the land plot was developed on the basis of the materials of demarcation of administrative-territorial units and inventory of land resources in Vobkent district of Bukhara region.

(Figure 6).

At the same time, regional and republican, district / city, rural citizens' assemblies (RCCs), aul citizens' assemblies (RCCs) and mahalla citizens' assemblies (MFCs) and massif layers were created in the structure of landfills, as well as boundaries of administrative-territorial units and MFYs and arrays in linear structure. . The interconnection of each layer was interconnected by internal and external key columns. That is, external users will be able to get the interconnection of layers without having to search the internal database of the land database.

In the multi-purpose land database, attribute information columns describing and informing the object in the structural layers of the landfill have been added. In the line structural layer, attribute columns indicating the name of the object type have been added.

In the model of land and land use, the boundaries of land users, land contours, land cover, crop placement, soil quality assessment, district (city) economic zone, soil cross-section layers and their attribute domains and sub-spatial object subtypes were developed. At the same time, interdependencies of each thematic layer were created.

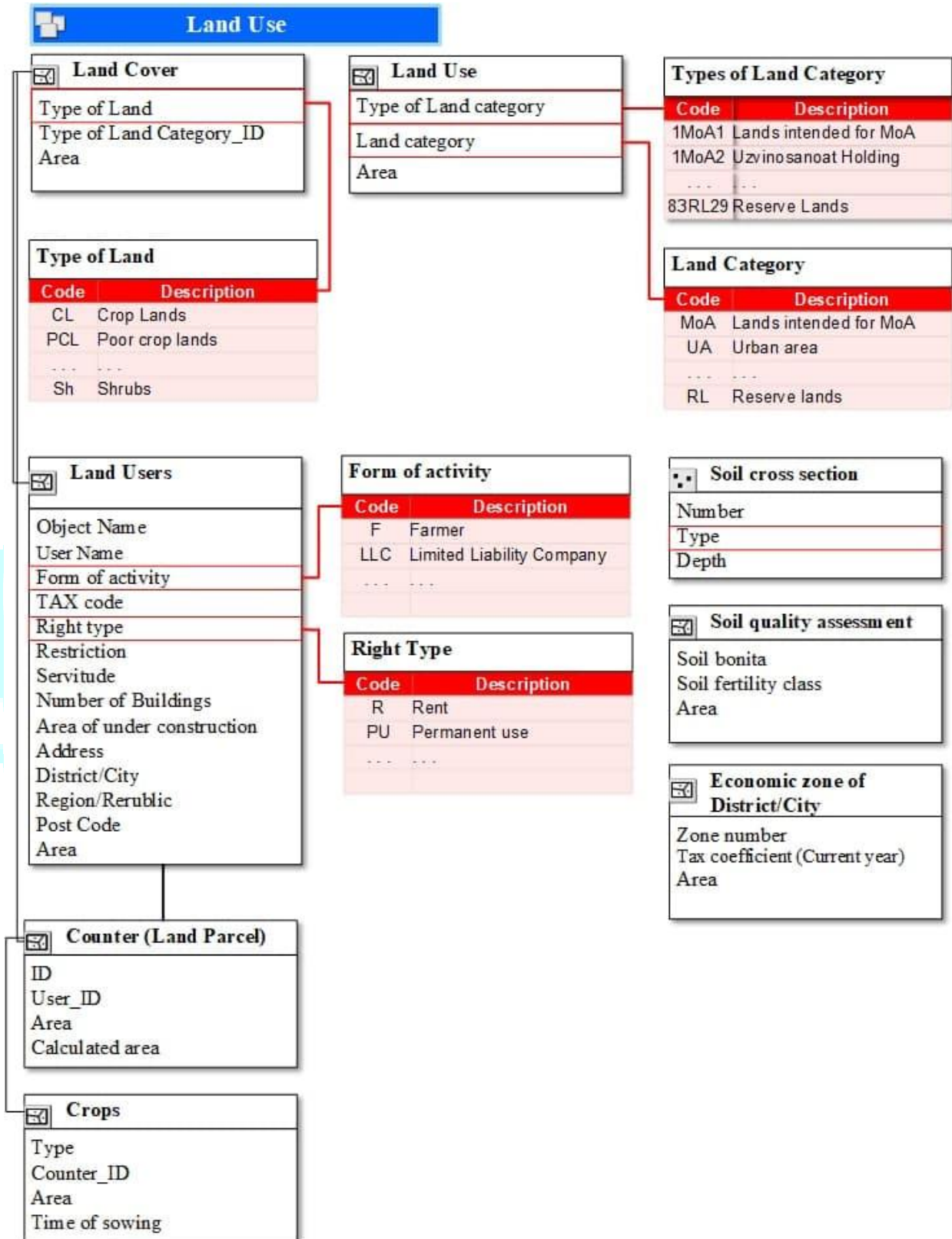


Figure 5. Land and land use structure and attribute domain.

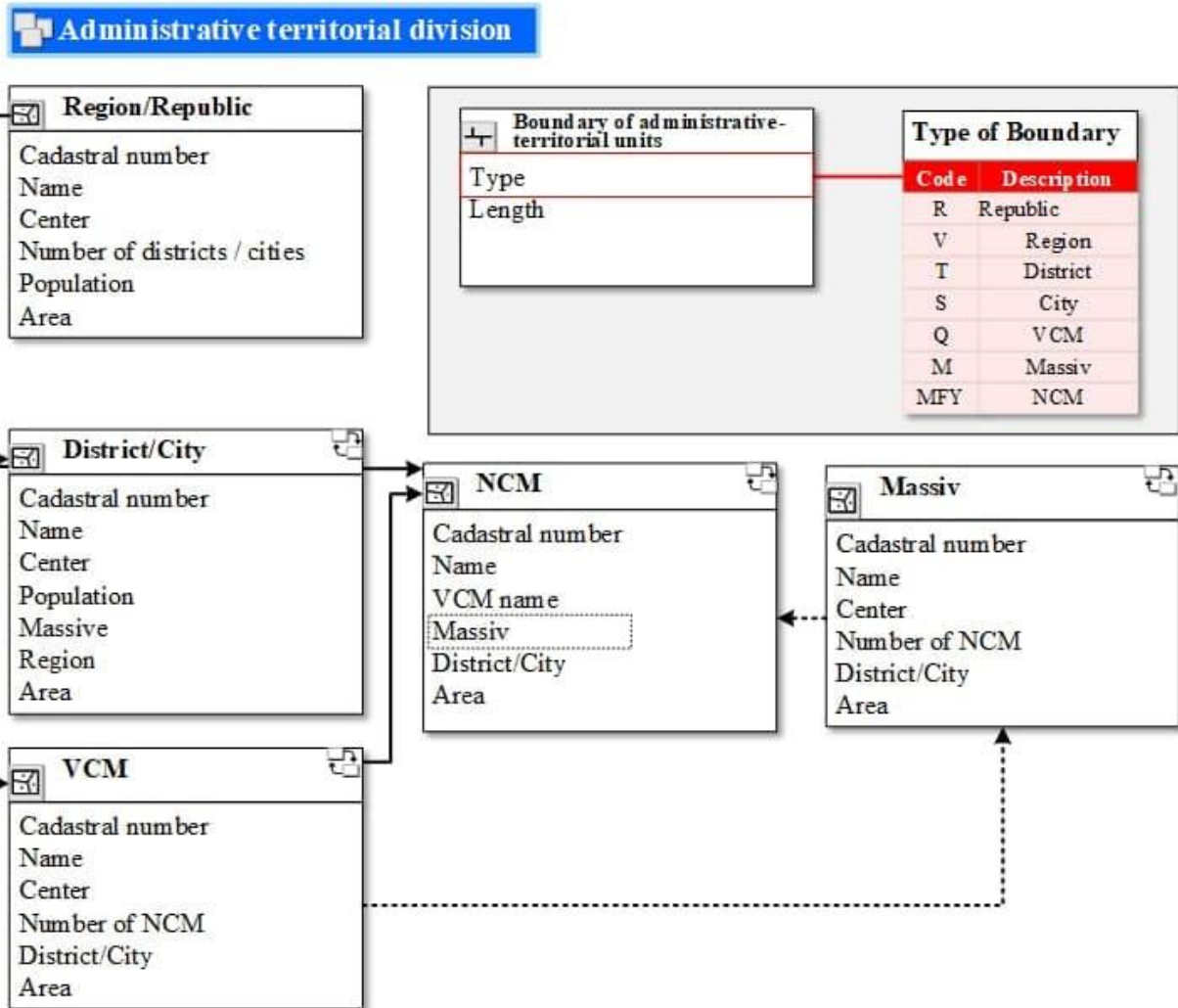


Figure 6. The structure of the division of administrative-territorial units.

Administrative-territorial units are systematized by the database of administrative-territorial structures (objects) of the Republic of Uzbekistan on the basis of the information of the classifier of departmental statistical classification [18].

The boundaries of the MFY and the massif were digitized on the basis of information from the Bukhara branch of the State Research and Design Institute "Uzdaverloyiha".

To improve the speed and quality of digital land cadastral mapping, crop placement and information entry into the land database, attribute "domains" of land categories and rows of information have been created. In addition, conditional symbols have been developed by coloring each land category and its rows to increase the ease with which users can edit information on a digital map.

In this case, all attribute domains are in the form of a template in the land database, and the symbols are stored in ArcGIS style format.

Attribute information of land contours is given in the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 299 of 2018 "On measures to further improve the procedure for demarcation of administrative-territorial units, inventory of land resources and geobotanical research in pastures and hayfields." The table

"Accounting in the section" has been improved. At the same time, new attribute information not included in the table was introduced, taking into account the fact that the contours are not repeated in the republic, taking into account the use of information by various ministries and departments:

- single contour number (cadastral number);
- old contour number;
- irrigated agricultural lands;
- Lalmi farm lands;
- intensive gardens;
- intensive vineyards;
- afforestation along rivers and water bodies;
- forest nurseries;
- protected forests;
- swamps;
- saline soils;
- sands;
- MFY name;
- array name;
- district cadastral number;
- regional cadastral number;
- boundaries of illegal constructions;
- type of illegal construction
- YFID (ground user binding code).

The physical structure of the land contours was created in the ArcGIS program in a polygon structure.

Conclusion

1. Development of the technical and technological scope of the multi-purpose land database, its content, regulatory framework and basic technical characteristics by further improving the exchange of spatial information in the process of consistent reforms not only in developed countries but also in our country. indicates that it is one of the issues.

2. The use of spatial information on land resources in our country has been carried out since 1995, but no special scientific and practical research has been conducted to create and maintain a multi-purpose land database. This shows that the improvement of the multi-purpose land database has not been fully resolved.

3. The creation of the current land database covers 4 areas, including: 1) technical registration of land plots; 2) assessment of real estate, 3) determination of the normative value of agricultural land, and 4) state registration of rights to real property was carried out by districts. This indicates that the creation of a single land database in the country has not been fully implemented.

4. Digital land cadastral map, "attribute domains" of land categories and rows information to create information on crop placement and multi-purpose land database, increase their speed and quality.
5. To increase the convenience of users to edit information on a digital map, a "set of symbols in Latin script based on the Uzbek language" was developed, which is stored in ArcGIS style format by coloring each land category and its rows into 8 groups.
6. In order to increase the efficiency of the multi-purpose land database, it is necessary to have the conditions of topological rules, naming of layers, the internal structure of the layers and their geometric expression.
7. In order to increase the efficiency of the multi-purpose land database, a description of the conditions of topological rules in the process of cartographic work was developed. The land database of Vobkent district of Bukhara region has been improved using advanced methods and functional capabilities of geo-information technologies for efficient use of agricultural lands. At the same time, for the first time in the region, a model of a single database of administrative-territorial units was created.

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