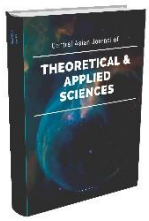

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Introduction of GIS Technology for Soil and Ecologycal Monitoring of the Foothill Areas of the South of the Fergana Region

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Annotation: *This article provides examples of the use of GIS technology for the effective use and monitoring of the lands of settlements located under mountainous areas. The introduction of GIS technology will allow to determine the exact geolocation of the area in the future, as well as with the help of ArcGIS programs and attribute information contained in them will allow for a high-quality and highly accurate monitoring system.*

Keywords: *foothill areas, soil, ecology, monitoring, assessment, geographic information systems (GIS), ArcGIS, data attributes, geolocation, architecture, urban planning, cadastre.*

Introduction

The mining plan of the Vadil's mines (Fergana region, Fergana district) is being developed in order to implement the program of accelerated industrial and innovative development of the economy of Uzbekistan through the implementation of major investment projects in the mining and metallurgical complex [1-5].

The district has a sufficiently developed transport and communication infrastructure, but is more represented by agricultural production. The population is concentrated in the nearest settlements – the villages of Vadil [1-10].

The relief of the deposit area in the northeastern part of the territory is mountainous with absolute elevations up to 400 m and relative exceedances up to 100 m [11-15]. The southwestern part is a slightly hilly plain with absolute elevations of 250-300 m and relative elevations of 5-15 m.

The area is located within the development of semi-desert landscapes. The lands of the district are deserted, unproductive. They are characterized by an almost complete absence of a fertile soil and vegetation layer suitable for agricultural purposes.

The climate of the area is sharply continental [16-20].

Vertical and horizontal zonality soils are common in the Fergana region. The soils of the vertical zonality include the soils of the gray-earth belt, and the horizontal zonality of the soil of the desert zone. The soils studied by us, light gray soils, meadow carp have a continental climate, the winter is mild, sometimes severe. The average temperature in January is -3.2°C (Fergana), the absolute minimum is 25°C (Table-1). On some winter days, the weather is warm. Summer is hot. The average temperature in July is +28°C, the maximum temperature is +40.4°C [21-25]. The total sum of effective temperatures in the Fergana region is 2430^{0}C, and in the Fergana region 2459^{0}C. The duration of the growing season is above 11^{0}C and is 223 days [26-30].

Table-1

Average long-term meteorological indicators [2]

Regions	Months												Middle year
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Air temperature, ^{0}C													
Fergana region	-2,3	1,2	8,1	16,1	21,2	25,2	26,2	24,4	19,5	13,1	5,4	0,3	13,2
Vadil	-2,2	0,9	7,6	15,4	20,5	25,1	25,9	25,1	19,6	12,6	8,5	0,3	11,3
Precipitation, мм													
Fergana region	14	12	18	13	12	8	4	3	2	9	14	12	121
Vadil	19	23	31	21	16	10	4	2	3	12	21	18	175
Relative humidity of the air, %													
Fergana region	83	83	72	62	53	46	51	57	62	69	76	83	66,4
Vadil	82	81	71	58	53	45	44	52	57	65	76	82	63,8
Soil temperature, ^{0}C													
Fergana region	-3	1	9	12	26	32	33	30	22	13	4	1	15,0
Vadil	-4	1	8	13	27	31	36	34	25	14	5	2	14,2

From the table data, it can be seen that the average annual air temperature both in the Fergana region and in the Vadil region is not the same and is 11.3-13.2^{o}C. As for precipitation, there is a big difference between the desert and the gray-earth zone. If there is 121 mm of precipitation in Vadilya, 175 mm is almost twice as much in the Fergana region [31-35]. The relative humidity is almost the same and is 64-67%, the soil temperature is also the same in both meadow and gray soils and is 14-15^{o}C.

Mountain region	
Highland subdistrict	The area of dissected watersheds and slopes
Subdistrict of medium - high mountains	Low Mountains area
Subdistrict of low mountains and foothills	Hilly foothills area - adyrov
Подобласть речных долин	The area of the upland sloping plains
Plain area	
Plateau subdistrict	The area of ancient river terraces and deltas
Subdomain of low mountains	The area of modern river terraces and deltas
Subdistrict of alluvial plains	The area of sandy accumulation

The northern part of the Fergana Region is stretched between the Kyrgyz and Vadil steppe lands [5] of Central Fergana.

The area of the deposit "South of the Fergana district" belongs to the landscape zone of the northern deserts. The following types of soils prevail in this zone: light gray soils formed in low-altitude conditions on steep and gentle slopes of ridges, ordinary gray soils and gray-brown soils of the foothill plain of Vadyl.

Objective

The object of the study was selected irrigated typical, light, gray-earths, sub-mountain hollow-horned plains, coupled with merged removal cones and upper river terraces, composed of loess, loess-like loam and skletno-fine-grained proluvium and deluvium on the territory of the Fergana district "Vadil" [36-40].

Light gray soils are common on the foothill plain, at an altitude of 161-210 m above sea level. The mechanical composition is light-loamy, from the bottom it turns into sandy loam. Humus in this soil contains less than 0.79-1%. The upper horizon of light saline gray soils is slightly saline. Salts are found in large quantities from 9 cm, their content increases downwards. Sulfate salinization [41-46].

Common serozems are developed on flat elevations and gentle slopes under grass-wormwood vegetation at an altitude of 400 to 600 m. Ordinary serozems are strongly crushed [9]. The humus content is from 0.81 to 1.12%. Carbonates in soils are in different amounts, their content increases down the profile.

Gray-brown soils are common on the foothill plain. Developed on tertiary Cretaceous sediments under sagebrush-boyalychnaya vegetation at an altitude of 130 to 500 m. The humus content is up to 1%. According to the mechanical composition, they are usually loamy.

Methodology

There are many definitions of Geographic Information Systems (GIS). In the simplest and most primitive ways (usually used by mathematicians and programmers): GIS is a spatially oriented database of certain lands. At first glance, this is how it is: the heart of any GIS is a database, which, unlike other databases, has a geographical reference [2-30]. However, the "machine-software" approach to GIS clearly prevails in this definition.

Here the most important advantage of geographical information systems over other information systems and databases is lost: the possibility of spatial analysis and the creation of fundamentally new models of the reality surrounding us based on the results of the analysis [1-46].

The use of GIS for land assessment by region allows us to transfer the solution of this complex problem to a new qualitative basis, especially when designing intensive farming systems and agrotechnologies, agrochemistry and land monitoring, not to mention high agrotechnologies and adaptive landscape (ecological) farming systems of high accuracy. The creation of a land assessment basis in the modern time of life for accurate farming systems is almost impossible without GIS technologies.

Fig.1. Satellite layer

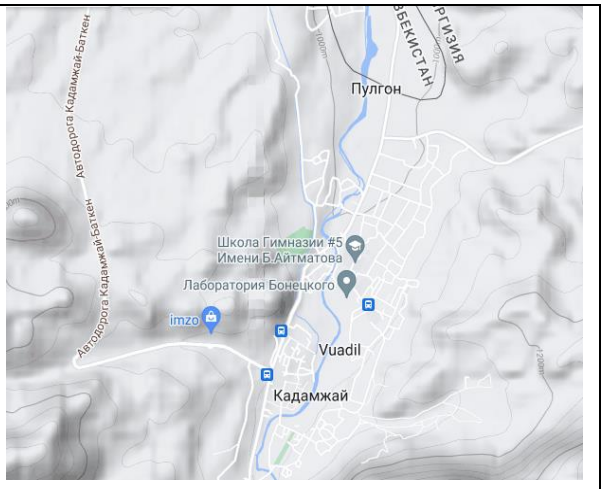

Fig.2. Satellite relief layer

Figure 1-2 shows an example of data collection to create an additional satellite layer in the ArcGIS program.

Results

The most important advantages of GIS at this time are:

- convenience of storage, copying, reproduction and storage of archives and their information on any media and networks;
- timely introduction of environmental attribute GIS data, will save additional costs when monitoring the foothill lands;
- in mapping the foothill areas, this theory will allow you to perform unlimited large-scale cartographic work and cartogram analyses;
- in addition, soil data on the terrain, when introduced to GIS technologies, will allow creating databases of various ecological conditions of the foothill areas;
- ease of processing large amounts of information. (GIS provides ample opportunities for combination, sorting, data sampling, areas and agrochemical parameters of contours are easily calculated);
- greater visibility of the presentation of factual information, achieved by creating a large number of thematic maps;
- the ability to automate the process of creating maps;
- ease of making quarterly changes, the ability to create systems for automatic changes to the database for high-quality monitoring;
- the possibility of widespread use of information coming from remote sensing means of a certain land contour (aviation, space and drone);
- high accuracy of maps (with precise coordinates), especially when using global positioning systems (using GPS);
- the possibility of creating interactive reference and advisory systems for the required authorities of the regions.

Reference

1. Arabboevna A. M., Shavkat o‘g‘li Y. S. The Use of Geoinformation Systems in the Study of the Land Fund of Household and Dekhkan Farms //Texas Journal of Multidisciplinary Studies. – 2022. – Т. 8. – С. 163-164.
2. Хакимова К. Р., Абдукадирова М. А., Абдухалилов Б. К. РАЗРАБОТКА ТЕМАТИЧЕСКИХ СЛОЕВ НА ОСНОВЕ СОВРЕМЕННЫХ ГИС-ПРОГРАММ КАРТ ЭКОЛОГИЧЕСКОГО АТЛАСА //Актуальная наука. – 2019. – №. 11. – С. 39-43.
3. Makhmud K., Khasan M. Horizontal Survey of Crane Paths //Middle European Scientific Bulletin. – 2021. – Т. 18. – С. 410-417.
4. Madaminovich A. B. The use of gis technology to create electronic environmental maps //ACADEMICIA: An International Multidisciplinary Research Journal. – 2020. – Т. 10. – №. 5. – С. 438-440.
5. Kh T. K. et al. Strength Evaluation of the Charvak Earth Dam in a Plane Formulation //Middle European Scientific Bulletin. – 2021. – Т. 18. – С. 424-434.
6. Сорокин А. Г., Каюмов О. А. Динамическая модель трансформации стока р. Амударьи в среднем течении //Водные ресурсы Центральной Азии (Материалы научно-практической конференции, посвященной 10-летию МКВК). Алтаты. – 2002. – С. 154-158.
7. Khakimova K. R., Ahmedov B. M., Qosimov M. Structure and content of the fergana valley ecological atlas //ACADEMICIA: An International Multidisciplinary Research Journal. – 2020. – Т. 10. – №. 5. – С. 456-459.
8. Abduvaxobovich A. A. Methods of Improving Physical and Mechanical Properties of Light Concrete on the Basis of Chemical Additives //Texas Journal of Multidisciplinary Studies. – 2022. – Т. 8. – С. 165-167.
9. Marupov A. A., Ahmedov B. M. General Characteristics of Zones with Special Conditions of use of the Territory //Middle European Scientific Bulletin. – 2021. – Т. 18. – С. 446-451.
10. Hamidov A. A., Shermatova Z. Changes in the cities of the fergana valley and its surroundings under the influence of anthropogenic factors //ACADEMICIA: An International Multidisciplinary Research Journal. – 2021. – Т. 11. – №. 6. – С. 736-739.
11. Shavkat o‘g‘li Y. S., Zuxriddinovna M. S., Shuxratbek qiziOlimova D. RAQAMLI TASVIRLARNI QAYTA ISHLASH VA QAYTA ISHLASHNI TOIFALASHTIRISH //INNOVATION IN THE MODERN EDUCATION SYSTEM. – 2022. – Т. 2. – №. 18. – С. 425-429.
12. Хакимова К. Р., Абдукадирова М. А., Абдухалилов Б. К. РАЗРАБОТКА ИННОВАЦИОННЫХ МЕТОДОВ В КАРТОГРАФИЧЕСКОМ ОПИСАНИИ ЭКОЛОГИЧЕСКОГО СОСТОЯНИЯ //Актуальная наука. – 2019. – №. 11. – С. 34-38.
13. Kasimov M., Habibullaev E., Kosimov L., (2020). Determination of the chimney roll, An International Multidisciplinary Research Journal, 10(6), Pp 1313-1318.
14. Каюмов О., Кенда Д. Я., Манопов Х. В. ВІДНОВЛЕННЯ ТА ЗБІЛЬШЕННЯ ПРОДУКТИВНОСТІ ВОДОЗАБІРНИХ СВЕРДЛОВИН //ΛΟΓΟΣ. МИСТЕЦТВО НАУКОВОЇ ДУМКИ. – 2019. – №. 8. – С. 47-50.
15. Marupov A., Axmedov B. General characteristics of zones with special conditions for using the territory of the city of Fergana //Збірник наукових праць ΛΌГОΣ. – 2020. – С. 7-10.

16. Salyamova K. D., Turdiqulov X. X. Analysis of stability of ground dams under seismic loads //Scientific-technical journal. – 2020. – Т. 3. – №. 1. – С. 37-41.
17. Хакимов К. Ж. и др. ТЕХНОГЕННЫЕ ОТХОДЫ-ПЕРСПЕКТИВНОЕ СЫРЬЕ ДЛЯ МЕТАЛЛУРГИИ УЗБЕКИСТАНА В ОЦЕНКЕ ОТВАЛЬНЫХ ХВОСТОВ ФИЛЬТРАЦИИ МЕДНО-МОЛИБДЕНОВЫХ РУД //Universum: технические науки. – 2020. – №. 12-1 (81). – С. 54-59.
18. Mamanazarovna E. M., Abbosxonovich M. A. Analysis of Agricultural Soils Designation of Different Linear Protected Zones using GIS Technology //CENTRAL ASIAN JOURNAL OF THEORETICAL & APPLIED SCIENCES. – 2021. – Т. 2. – №. 11. – С. 188-192.
19. Hamidov A. A., Najmiddinova G. Geoecological fundamentals of nature protection and rational use of natural resources in the fergana valley //Asian Journal Of Multidimensional Research. – 2021. – Т. 10. – №. 6. – С. 260-263.
20. Shavkat o‘g‘li Y. S. et al. QISHLOQ XO ‘JALIK KARTALARINI YARATISHDAGI GEODEZIK ISHLAR //THEORY AND ANALYTICAL ASPECTS OF RECENT RESEARCH. – 2022. – Т. 1. – №. 5. – С. 460-466.
21. Abdukadirova M. A. The Role of Builder and Building in the Development of the Country Is Invaluable //The American Journal of Interdisciplinary Innovations Research. – 2021. – Т. 3. – №. 05. – С. 81-84.
22. Musinovich S. M., Khaitmuratovich K. I., Raximovna K. K. Innovative Irrigation Technology //Middle European Scientific Bulletin. – 2021. – Т. 18. – С. 514-520.
23. Manopov X. V., Kasimov M. KARTALARNING RAQAMLI MODELINI YARATISH //INTERNATIONAL CONFERENCES ON LEARNING AND TEACHING. – 2022. – Т. 1. – №. 8. – С. 252-258.
24. Marupov A. A., Ahmedov B. M. General Characteristics of Zones with Special Conditions of use of the Territory //Middle European Scientific Bulletin. – 2021. – Т. 18. – С. 446-451.
25. Salyamova K. D. et al. The Stress State of A Soil Dam Under Dynamic Action, Taking Into Account the Dissipative Properties Of The Soil //International Journal of Progressive Sciences and Technologies (IJPSAT), http://ijpsat. ijsht-journals. org. – 2021. – Т. 25. – №. 2. – С. 51-62.
26. Xayitmurodovich K. I., Abbosxonovich M. A., Qizi M. M. D. Estimation Of Irrigated Soils Of Fergana Region (On The Example Of Dangara District) //The American Journal of Agriculture and Biomedical Engineering. – 2021. – Т. 3. – №. 05. – С. 8-12.
27. Hamidov A., Khalilov K. LAND LEGISLATION AND SOIL PROTECTION IN THE FERGHANA VALLEY //Конференции. – 2021.
28. Berdaliyeva Y. X. et al. Gis Dasturlari Yordamida Geografik Asos Qatlamlarini Joylashtirish Va Ularni Boshqarish //International Conferences On Learning And Teaching. – 2022. – Т. 1. – №. 6. – С. 312-314.
29. Abduqodirova M. A., qizi Mirzakarimova G. M. GIS TEXNOLOGIYASI YORDAMIDA KARTANING GEOGRAFIK ASOSINI TUZISH, UNI TAHRIR QILISH //INTERNATIONAL CONFERENCES ON LEARNING AND TEACHING. – 2022. – Т. 1. – №. 6. – С. 309-311.
30. Musinovich S. M., Khaitmuratovich K. I., Raximovna K. K. Methods of Irrigation of Gardens and Vineyards in Salty Land //Middle European Scientific Bulletin. – 2021. – Т. 18. – С. 521-525.

31. Maksudovich M. I., Bakhromalievich E. D., Valiyevich M. K. Order And Methodology For Determining Administrative-Territorial Borders Based On Digital Technologies //The American Journal of Engineering and Technology. – 2021. – Т. 3. – №. 03. – С. 49-57.
32. Abduraufovich Q. O., Valiyevich M. X., Dilshodbeko'g'li H. E. Some issues of re-utilization of casing strings, unused water intake wells (for example, some countries in the south-western sahel) //ACADEMICIA: An International Multidisciplinary Research Journal. – 2020. – Т. 10. – №. 6. – С. 1568-1574.
33. Salyamova K. D., Turdikulov K. K. Stress state of an earth dam under main loads considering data from field observations //Journal of Physics: Conference Series. – IOP Publishing, 2021. – Т. 1926. – №. 1. – С. 012004.
34. Numanovich A. I., Abbosxonovich M. A. The analysis of lands in security zones of high-voltage power lines (power line) on the example of the Fergana region //EPRA International Journal of Multidisciplinary Research (IJMR). – 2020. – Т. 2. – С. 25-30.
35. Ogli Y. S. S., O‘G‘Li A. P. A. KOSMIK MA'LUMOTLAR YORDAMIDA YER TUZISH LOYIHA ISHLARINI OLIB BORISH //Ta’lim fidoyilari. – 2022. – Т. 25. – №. 5. – С. 23-25.
36. Abdukadirova M. A., qizi Mirzakarimova G. M. The use of Geo Information System in the Establishment of Land Balance //Middle European Scientific Bulletin. – 2021. – Т. 18. – С. 441-445.
37. Khakimova K. R., Holmatova D. B., Abdusalomov A. A. Basics of atlas mapping optimization in the ferghana region //ACADEMICIA: An International Multidisciplinary Research Journal. – 2020. – Т. 10. – №. 5. – С. 613-617.
38. Yangiev A. et al. Dynamics of an earth dam with account for rheological properties of soil under dynamic effect //IOP Conference Series: Materials Science and Engineering. – IOP Publishing, 2020. – Т. 869. – №. 7. – С. 072005.
39. Xakimova K. R., Marupov A. A., Mirzakarimova G. M. Maintaining Cadastral Valuation for the Effective Use of Agricultural Lands of the Fergana Region. ijarset. com “International Journal Of Advanced Research In Science, Engineering And Technology” //ORCID: 0000-0002-5120-4359. – 2019. – С. 6-10.
40. Arabboyevna A. M. et al. In orthophotoplane technology photomod mosaic module //International Journal of Discourse on Innovation, Integration And Education. – 2020. – Т. 1. – №. 4. – С. 93-97.
41. Абдукадирова М. А., ўғли Ёкубов Ш. Ш. ЭЛЕКТРОН РАҚАМЛИ ХАРИТАЛАРДАГИ КОНТУРЛАР ЧЕГАРАСИ УЛАРНИ МАЙДОН (ПОЛИГОН) КЎРИНИШДА ЧИЗИШНИНГ ARCGIS ДАСТУРИЙ ТАЬМИНОТИ ОРҚАЛИ АВТОМАТЛАШГАН УСУЛИНИ ТАКОМИЛЛАШТИРИШ //INTERNATIONAL CONFERENCES ON LEARNING AND TEACHING. – 2022. – Т. 1. – №. 8. – С. 133-136.
42. Ахмедов Б. М., ўғли Ёкубов Ш. Ш. КАДАСТР СЁМКАСИНИ БАЖАРИШ УЧУН ТОПОГРАФИК АСОСЛАР //INTERNATIONAL CONFERENCES ON LEARNING AND TEACHING. – 2022. – Т. 1. – №. 8. – С. 287-291.
43. Yuldashev G., Marupov A. A. Main ways to improve the efficiency of agricultural land use in the Fergana valley sample //Scientific Bulletin of Namangan State University. – 2019. – Т. 1. – №. 8. – С. 68-74.
44. Numanovich A. I., Abbosxonovich M. A. About The Special Regime Of Use And Standards Of Land Plots And Their Buffer Zones Located In Borders Of Roadside Strips Of Highways Of The Ferghana

Region of the Republic of Uzbekistan //The American Journal of Engineering and Technology. – 2020. – Т. 2. – №. 09. – С. 77-81.

45. Marupov A. Improvement of innovative mechanism for rational use of natural and land resources in Uzbekistan //Збірник наукових праць ΛΌГОΣ. – 2020. – С. 100-101.
46. Abduraxmonov A. A. et al. DAVLAT YER KADASTRIDA GIS TEXNALOGIYALARIDAN FOYDALANISH //INTERNATIONAL CONFERENCES ON LEARNING AND TEACHING. – 2022. – Т. 1. – №. 8. – С. 228-233.