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CREATING A WEB MAP OF THE ECONOMICALLY ACTIVE POPULATION OF THE REPUBLIC OF UZBEKISTAN

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Abstract

In recent years, particularly over the last decade, web mapping has advanced through the use of statistical and online geospatial data. Nearly all mapping data is utilized worldwide. Mobile communication devices now feature location-based services, and the location of every event and object on Earth is available. Due to the development of the internet, the use of statistical data for web mapping and its applications has rapidly expanded. This article discusses the creation of a web map of the economically active population of the Republic of Uzbekistan for the period 2010–2023, using the ArcGIS Pro software based on statistical data. Through web mapping, the article identifies and examines trends and interactions between various components in relation to technological advancements. The review of the results concludes with an exploration of certain opportunities and directions.

Our government has outlined a series of tasks in decrees and resolutions aimed at improving the living standards of the population by developing the economy and agriculture of our republic. There is a need to rationally utilize natural and labor resources and to efficiently allocate agricultural sectors, taking into account the republic's natural and socio-economic conditions. Additionally, the Action Strategy for the Further Development of the Republic of Uzbekistan for 2017–2021 specifically emphasizes the task of "...accelerating the modernization and development of agriculture, and continuing institutional and structural reforms to reduce state involvement in agricultural development." In implementing these tasks, it is important to conduct research, including improving the cartographic provision of agricultural sectors and infrastructure in the regions and developing web maps based on geographic information systems and technologies (GIS) [1].

Key words

ArcGIS Pro, ArcGIS online, statistics, Web map, Web GAT, Web cartography.

Introduction

The need for Geographic Information Systems (GIS) based on Web GIS is increasing for the easy and quick distribution, sharing, visualization, updating, and processing of spatial and attribute data, which supports decision-making in various fields [2]. Web GIS software has enabled the production of user-oriented maps. As a result, in addition to geographers, geographic data scientists, and land surveyors, it has become possible for other users to create map content [3]. Some scholars refer to this transformation as "Neogeography" [4]. However, some scholars emphasize that the term "GeoWe" could be a more accurate term to describe this concept [3].
Specialists must collect data during field research following various disasters, and the data obtained must be reliable. Assessing damage immediately after a natural disaster involves evaluating the structural integrity of buildings and ensuring human safety by evacuating citizens from areas at risk during recurring earthquakes. This critical process is carried out by expert

structural engineers after disasters like earthquakes. At this stage, the engineer must assess the current risk level of a building and report post-earthquake findings. Traditionally, conventional methods are used in this process. However, Web GIS can provide highly effective and efficient results in managing information exchange between decision-makers and decision-making mechanisms [5]. Today, GIS software is widely used for disaster response and spatial data analysis. Spatial data and related technologies, particularly Geographic Information Systems (GIS) with capabilities for visualizing, searching, analyzing, and managing spatial data, have proven to be crucial for natural disaster management [6].

The growing and dynamic nature of data today requires diverse approaches for storing and sharing large datasets [7]. Storing, capturing, querying, analyzing, and sharing dynamic data has become more convenient due to advancements in Web GIS technologies. Currently, Web GIS technologies, widely utilized through cloud-based solutions, enable multiple users to simultaneously access and analyze large volumes of positional data. From this perspective, these technologies ensure the rapid production, analysis, and storage of spatial data for institutions and individuals following natural disasters such as earthquakes, floods, and landslides.

Web Mapping Service: This provides clients with an interface to access geographic data maps and detailed information about specific features displayed on the map. The term “map” refers not to the geographic data itself available on the internet but to the visual representation of that geographic data [8].

In exploring definitions of web mapping provided by global scholars through various scientific studies, web mapping involves:

- Data management and updates [9,10],
- User authentication and security [11],
- Collection of user-generated forms (such as various surveys and requests) [12],
- Access to databases [13].

These components highlight the multifaceted nature of web mapping, supporting its role in efficient data handling and visualization for diverse applications.

“Web mapping is the process of designing, implementing, creating, and delivering maps on the World Wide Web” [14].

“Web mapping is the process of using maps obtained by an information system for spatial and geographic information” [15].

“Web mapping is the process of using maps provided by geographic information systems (GIS)” [16] have been defined.

Web maps are maps created using geographic information technologies and placed on the Internet. The terms “Web map”, “Web GIS” and “Web cartography” are close to each other in terms of their goals and objectives. Currently, there are several methods for creating web maps. These include web platforms and services for creating cartographic works on the Internet (CartoDB, Animaps, Scribble Maps, Click2Map, ZeeMaps, UMapper, etc.), software belonging to the GIS family (ArcGIS, GlobalMapper, MapInfo, etc.), and programming languages (Javascript, Python, PHP, Java, Scala, Haskell, Swift, and Rust) [17].

ArcGIS Online is an application part of the Esri Geospatial Cloud that connects people, places, and data through interactive maps [18].

ArcGIS Online is used to create maps, analyze data, share, and collaborate [19]. Nowadays, the Internet has become a modern tool for the field of cartography. Maps on the Internet are interactive and dynamic, which facilitates easy access and allows them to adapt to the needs of the user in terms of content and scale [20].

Technologically, web mapping is implemented through the ArcGIS platform. ArcGIS Desktop is used to create a database for display and then export them to ArcGIS Pro. ArcGIS Pro

is used to create and symbolize a set of predefined maps at any scale. These maps are then converted into web layers in ArcGIS Online to create and share web maps and ready-to-use web applications that allow the creation of user interfaces and interactive tools for using spatial data [21]. Interaction with datasets for online mapping and spatial analysis is achieved using the ArcGIS Online cloud service [22].

Interactive mapping is not only a tool for visualizing demographics, but also for geospatial analysis and decision-making [23]. The cloud service model is the most suitable option in the rapidly changing environment of socio-economic datasets. Zastrow [24] points to the advantages of reducing technical skills requirements and the need for server access.

Web cartography explores the possibilities of creating, transmitting, and using cartographic data and visualizations presented on the Internet [25].

1. Methodology

In this article, a web map of the economically active population of the Republic of Uzbekistan was created using the ArcGIS Online platform and statistical data. Video tutorials were extensively utilized for this purpose [26].

To conduct the research in this article, the boundaries of the region were loaded into the ArcGIS Pro software. The borders of the Republic of Uzbekistan were downloaded from the internet by searching for “Uzbekistan shape files,” with boundaries divided by regions

[27].

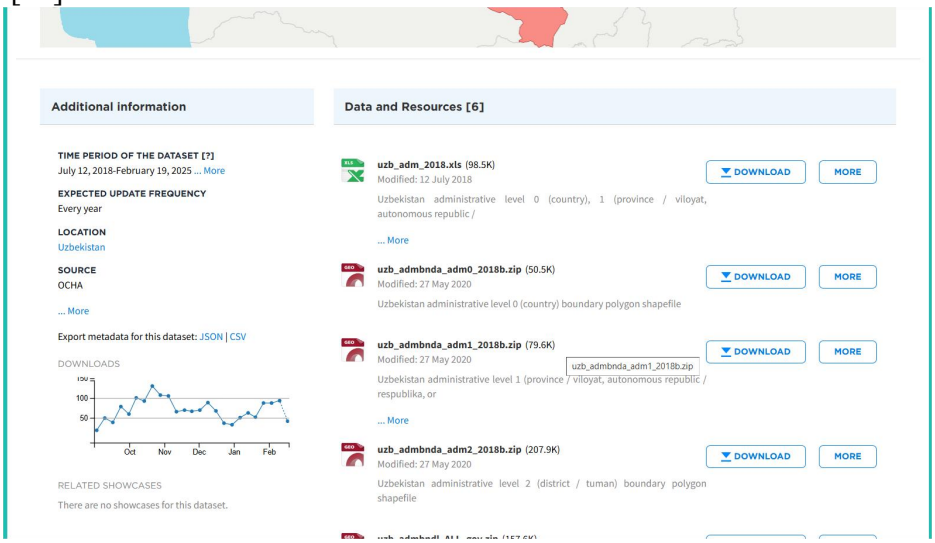

Figure 1. Downloading the boundaries of regions

Additionally, statistical data from a database was downloaded in Excel table format to load attribute data. This included data for the economically active population of the Republic of Uzbekistan, covering the total economically active population, as well as the economically active population in urban and rural areas, for the period from 2010 to 2023 [28].

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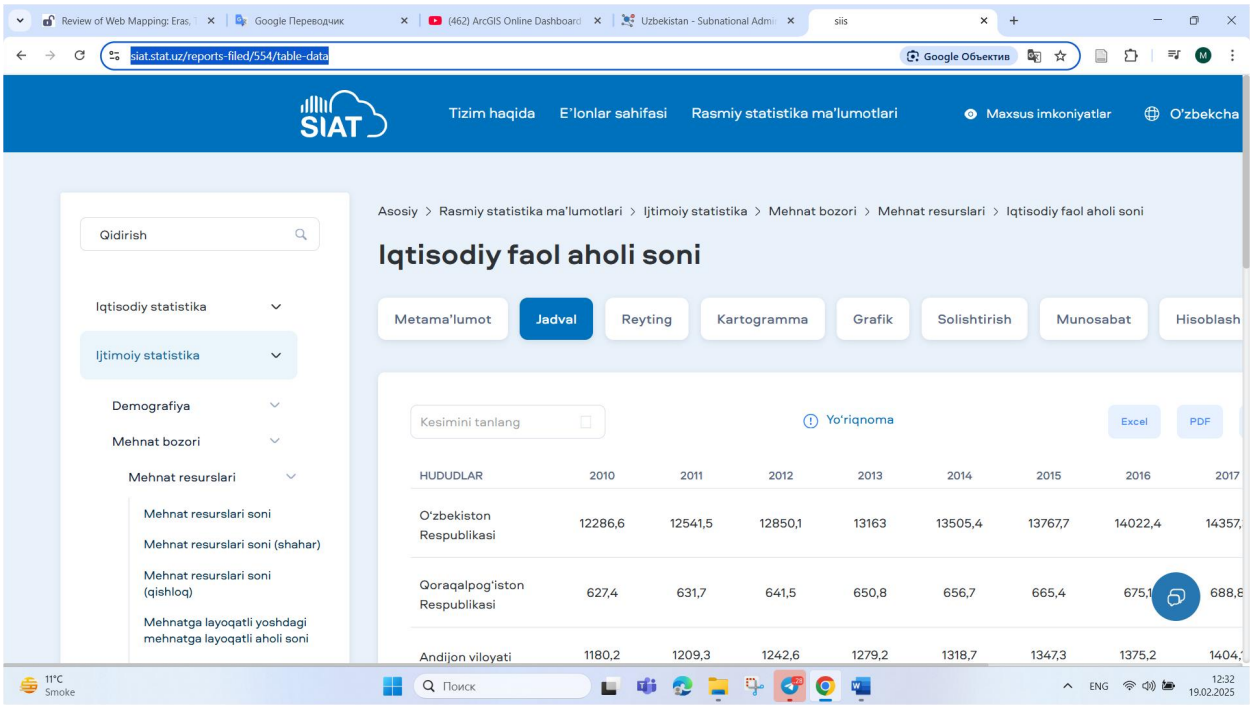

Figure 2. Downloading the data

One of the map types that can be used in ArcMap is a web map, which can be created using the ArcGIS.com map viewer in a web browser and utilized by any ArcGIS client, such as ArcGIS for Desktop, ArcGIS Mobile, web applications, and others. Access to all ArcGIS mapping services is provided through the creation of web maps. It is also possible to use ArcGIS for Desktop to publish a map as a service [29].

All data was loaded into the ArcGIS Pro software.

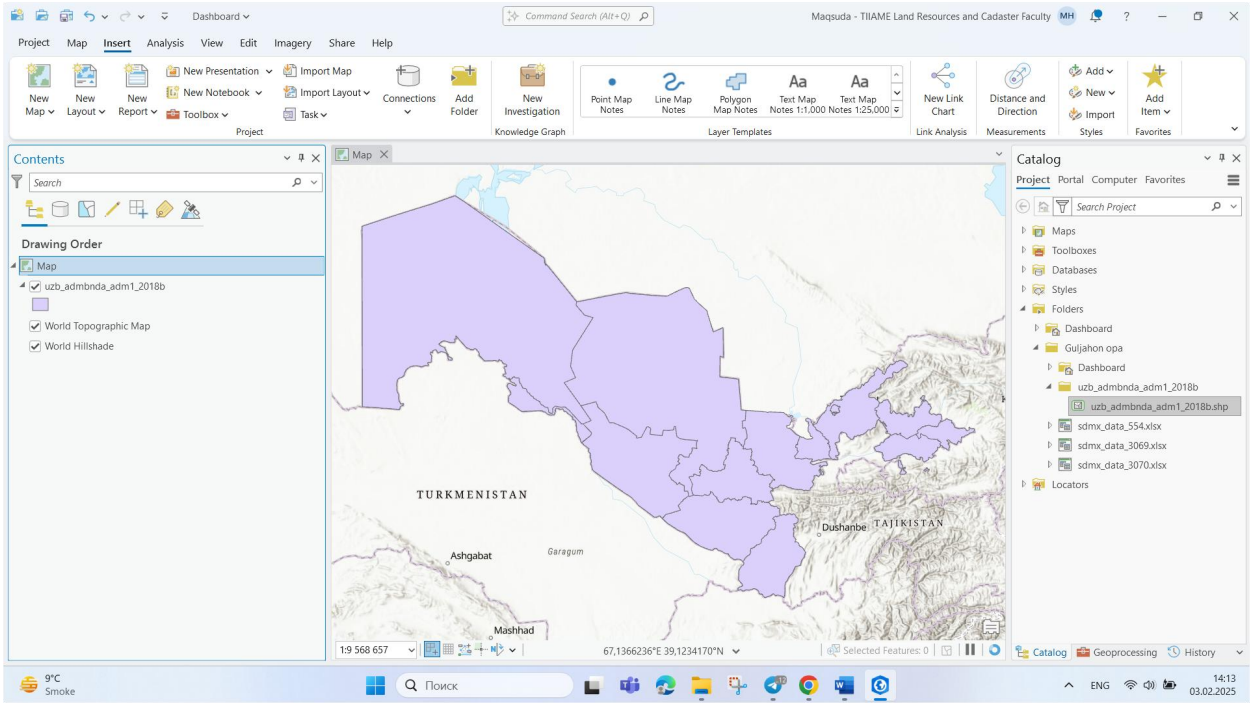

Figure 3. Shape file loaded into the software

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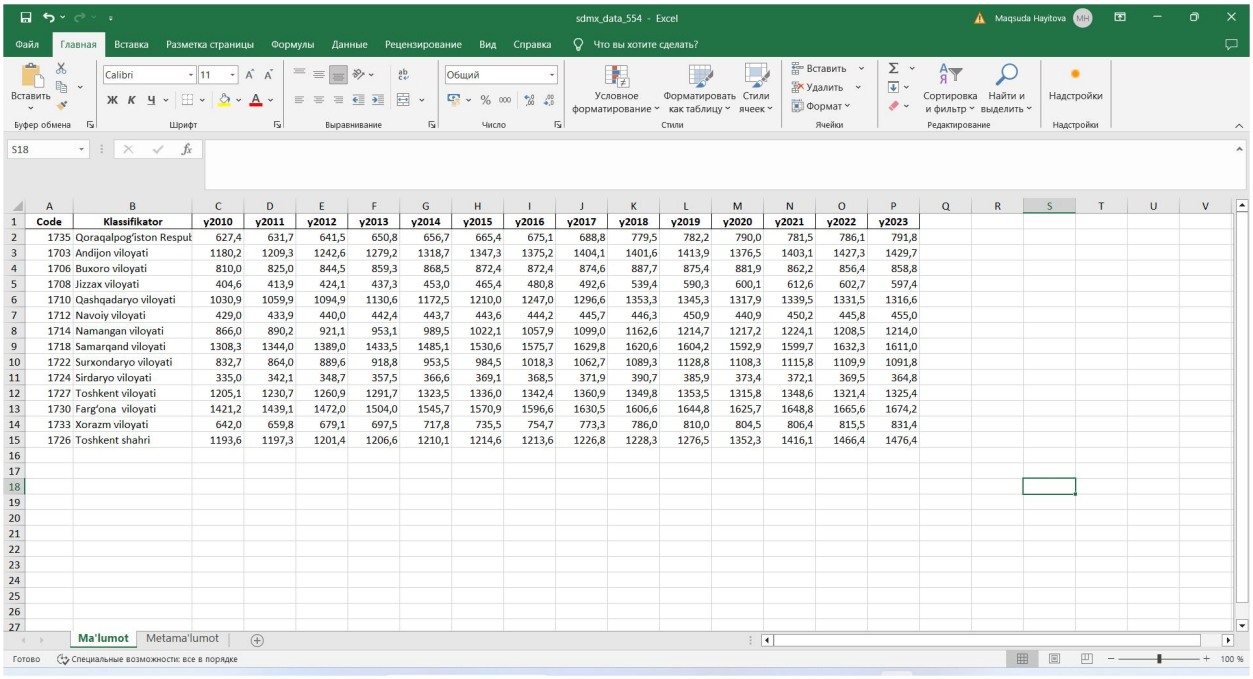

Code	Klassifikator	y2010	y2011	y2012	y2013	y2014	y2015	y2016	y2017	y2018	y2019	y2020	y2021	y2022	y2023
1735	Qoraqalpog'iston Respul	627,4	631,7	641,5	650,8	656,7	665,4	675,1	688,8	779,5	782,2	790,0	781,5	786,1	791,8
1703	Andijon viloyati	1180,2	1209,3	1242,6	1279,2	1318,7	1347,3	1375,2	1404,1	1401,6	1413,9	1376,5	1403,1	1427,3	1429,7
1706	Buxoro viloyati	810,0	825,0	844,5	859,3	868,5	872,4	872,4	874,6	887,7	875,4	881,9	862,2	856,4	858,8
1708	Jizzax viloyati	404,6	413,9	424,1	437,3	453,0	465,4	480,8	492,6	539,4	590,3	600,1	612,6	602,7	597,4
1710	Qashqadaryo viloyati	1030,9	1059,9	1094,9	1130,6	1172,5	1210,0	1247,0	1296,6	1353,3	1345,3	1317,9	1339,5	1331,5	1316,6
1712	Navoiy viloyati	429,0	433,9	440,0	442,4	443,7	443,6	444,2	445,7	446,3	450,9	440,9	450,2	445,8	455,0
1714	Namangan viloyati	866,0	890,2	921,1	953,1	989,5	1022,1	1057,9	1099,0	1162,6	1214,7	1217,2	1224,1	1208,5	1214,0
1718	Samarqand viloyati	1308,3	1344,0	1389,0	1433,5	1485,1	1530,6	1575,7	1629,8	1620,6	1604,2	1592,9	1599,7	1632,3	1611,0
1722	Surxondaryo viloyati	832,7	864,0	889,6	918,8	953,5	984,5	1018,3	1062,7	1089,3	1128,8	1108,3	1115,8	1109,9	1091,8
1724	Sirdaryo viloyati	335,0	342,1	348,7	357,5	366,6	369,1	368,5	371,9	390,7	385,9	373,4	372,1	369,5	364,8
1727	Toshkent viloyati	1205,1	1230,7	1260,9	1291,7	1323,5	1336,0	1342,4	1360,9	1349,8	1353,5	1315,8	1348,6	1321,4	1325,4
1730	Farg'ona viloyati	1421,2	1439,1	1472,0	1504,0	1545,7	1570,9	1596,6	1630,5	1606,6	1644,8	1625,7	1648,8	1665,6	1674,2
1733	Xorazm viloyati	642,0	659,8	679,1	697,5	717,8	735,5	754,7	773,3	786,0	810,0	804,5	806,4	815,5	831,4
1726	Toshkent shahri	1193,6	1197,3	1201,4	1206,6	1210,1	1214,6	1213,6	1226,8	1228,3	1276,5	1352,3	1416,1	1466,4	1476,4

Figure 4. The table was processed

After making the necessary changes to the tables, all of them are uploaded to the software. All the data in the table is linked to the attribute data table of the regional boundaries.

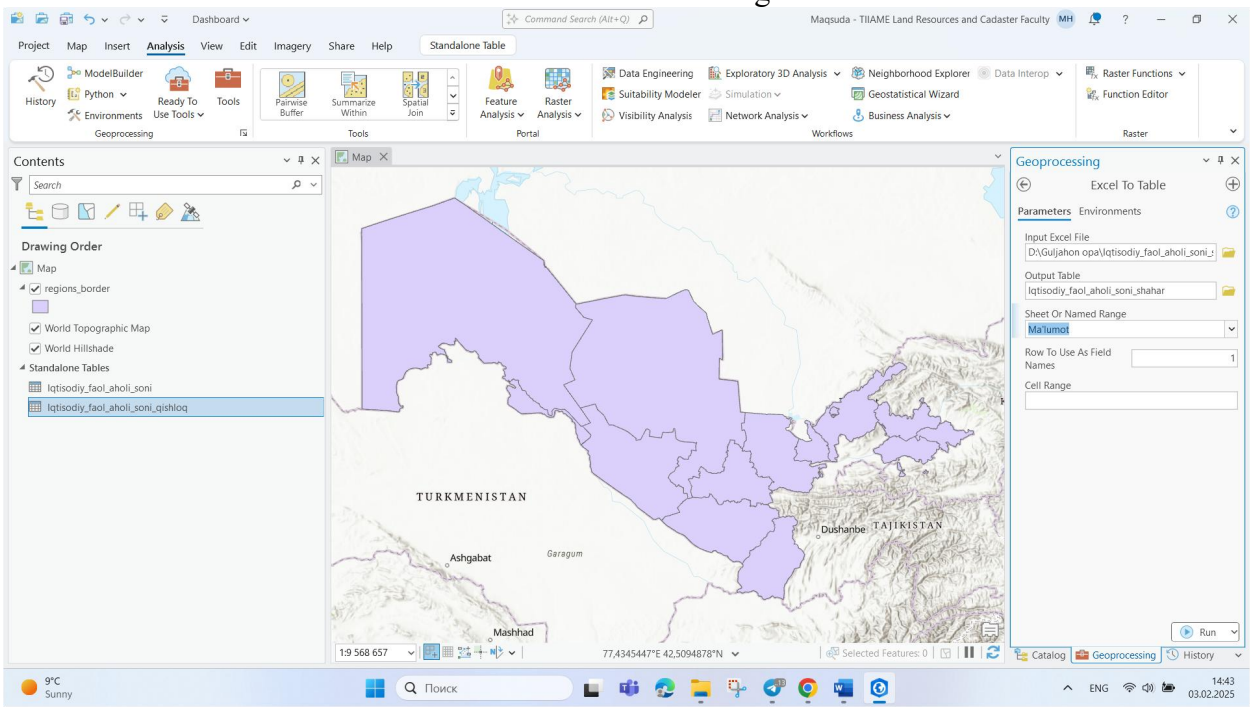

Figure 5. Loading tables into the program

ArcGIS Online makes it easy to upload files and add content from the cloud. It can read many file types, including spreadsheets, KML, GeoJSON, and simple geospatial files. If you need to refine your data, ArcGIS Online includes tools to help you prepare for visualization and analysis. Interactive web maps support data visualization, editing, and analysis, and can be viewed on mobile and desktop devices [30].

After downloading the data, the upload to the ArcGIS Online platform began.

Figure 6. ArcGIS Online platform

To create a web map, once the map is uploaded to the ArcGIS software, all this data must then be uploaded to ArcGIS Online. For this, all the processed materials in the Shapefile are exported to the selected file and archived [31].

Open-source web maps are the integration of GIS and internet technologies. GIS offers solutions to one of the most critical issues for users — restricted access to data. Open-source web maps are considered a means of accessing, analyzing, and transmitting GIS data. The World Wide Web, FTP (File Transfer Protocol), and HTTP applications facilitate access to and transmission of data files via open-source web maps.

Online GIS provides users with convenient access to GIS data from various sources in a distributed environment. GIS users can access or download any desired data using a web browser application [32].

We access this platform by entering our own login and password, and a file is created here to carry out the research. Then, by switching to the ArcGIS Pro software, the above-mentioned data is uploaded to the ArcGIS Online platform.

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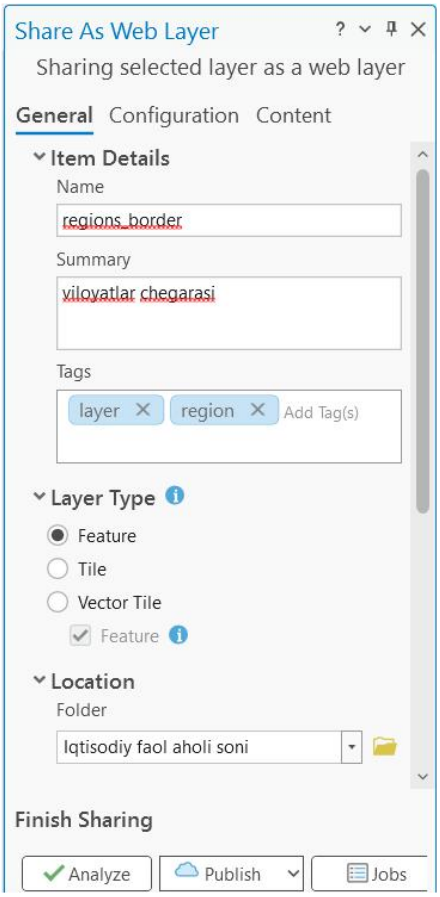

Figure 7. Uploading Data to the ArcGIS Online Platform

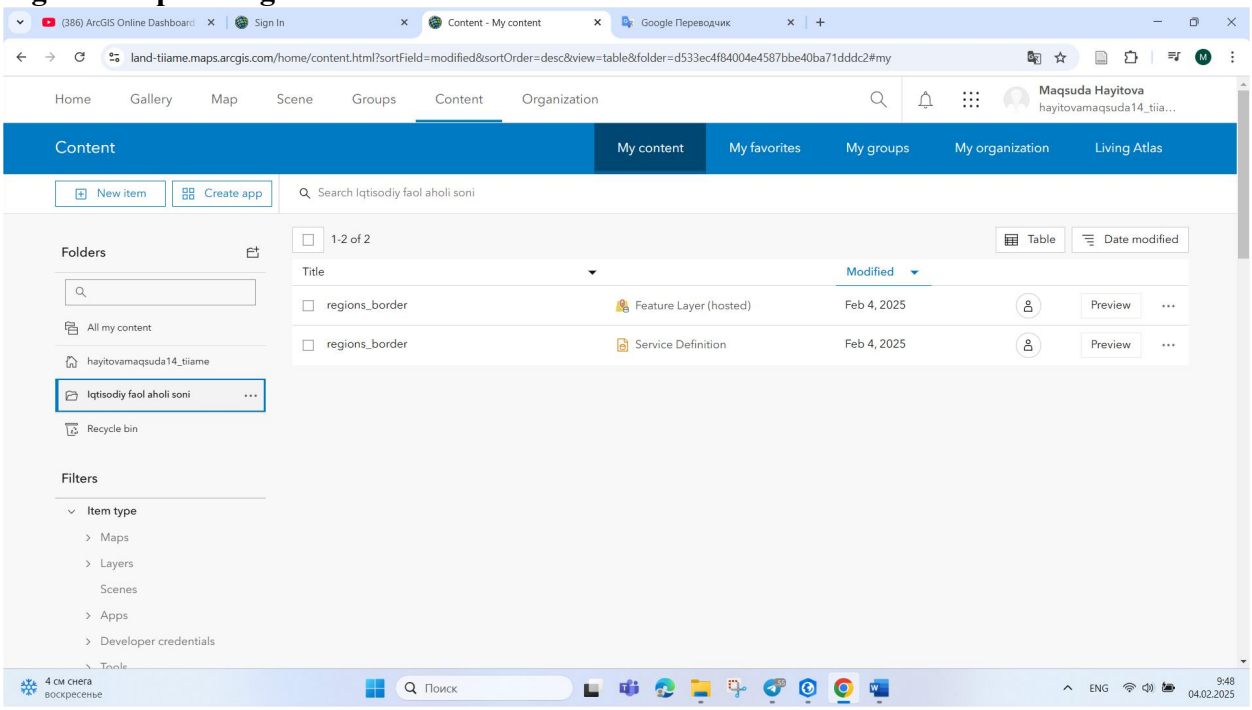

Figure 8. Uploading the Boundary for Conducting the Research

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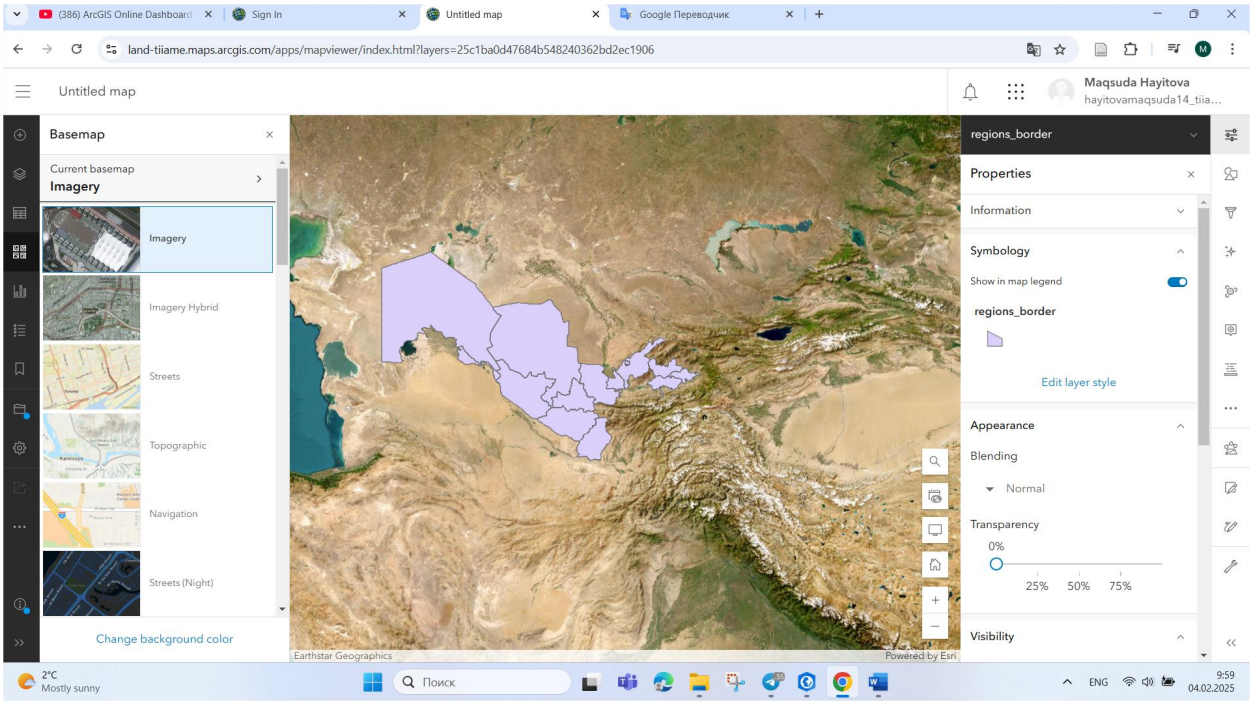

Figure 9. The map on the ArcGIS Online platform can be modified

Once the data is loaded, we can extract the names of the regions and display them in different colors.

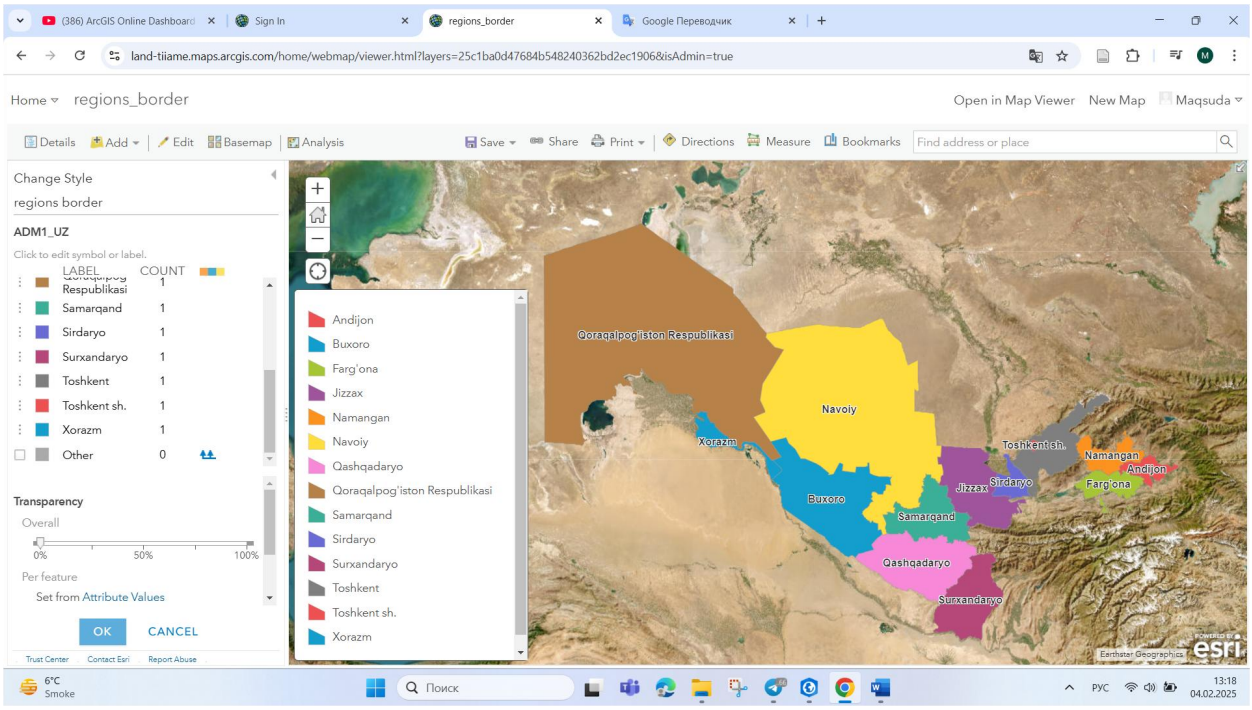

Figure 10. Editing the Map

The map above can be transferred to ArcGIS Dashboard, saved, and given a name.

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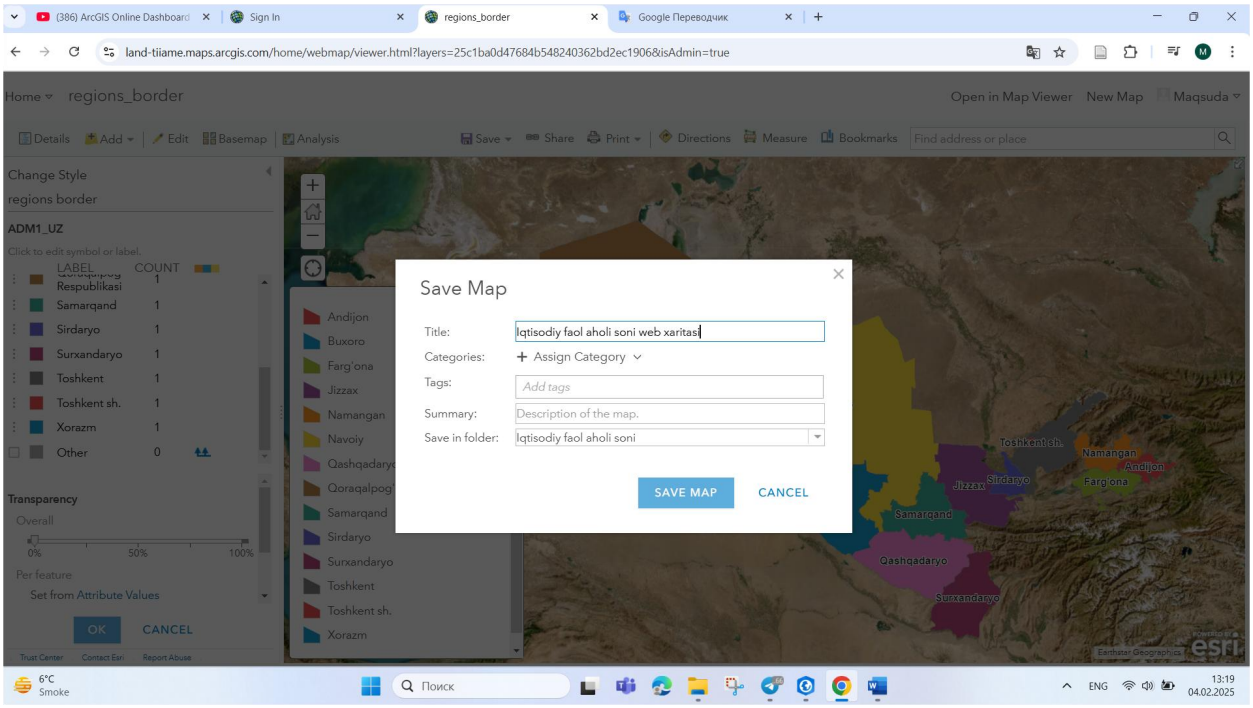

Figure 11. Saving the map

In this study, we need to show data on the number of economically active population. We can display this data on a web map in different colors and diagrams. We will first show the distribution of the number of economically active population by region.

In addition, we have also shown the distribution of the number of economically active population by year.

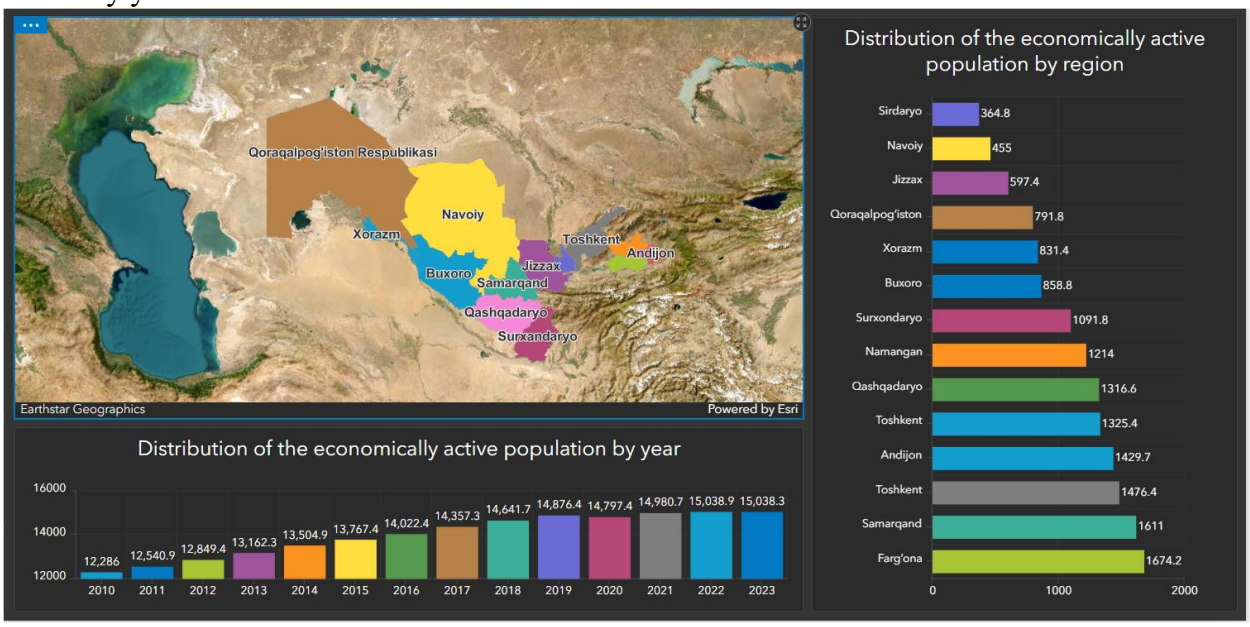

Figure 12. Distribution of the Economically Active Population by years and regions

We have also included information about the data obtained from the web map here.

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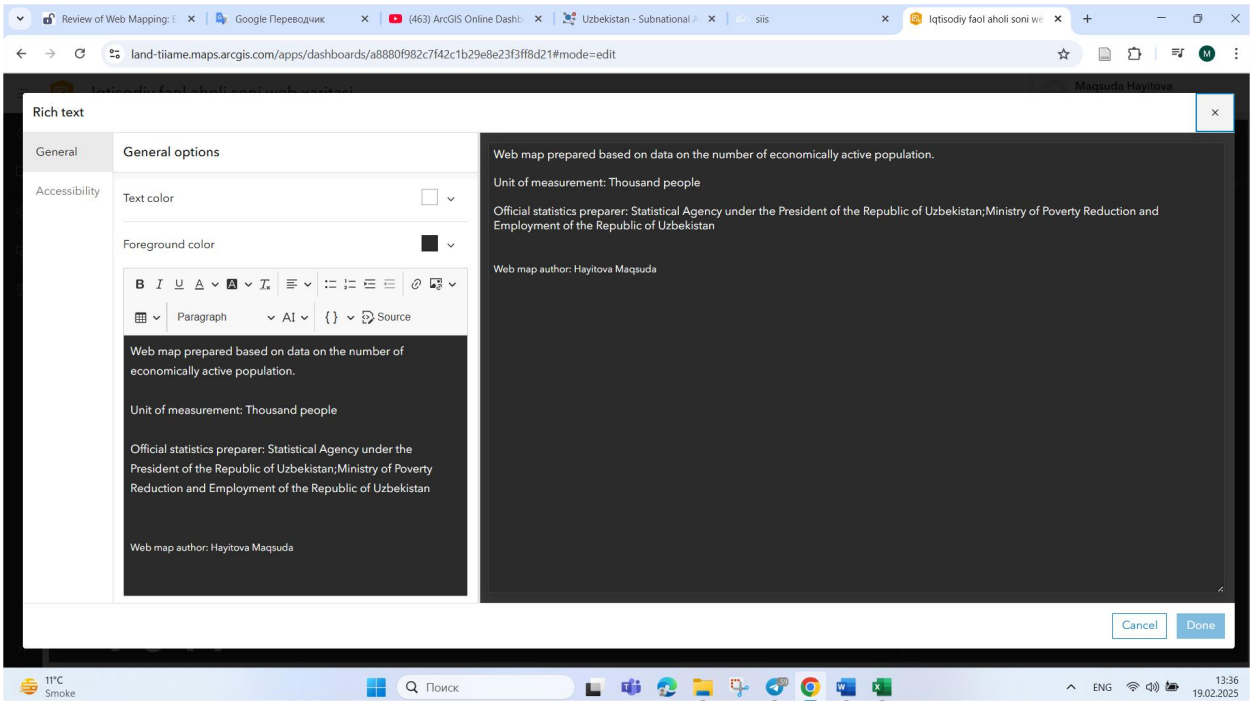

Figure 13. Entering data

2. Result

After preparing the web map, to visualize the values of the data across the entire region or to observe the changes in the number of economically active population in urban and rural areas, we will categorize the data into three indicators: cities, villages, or all areas.

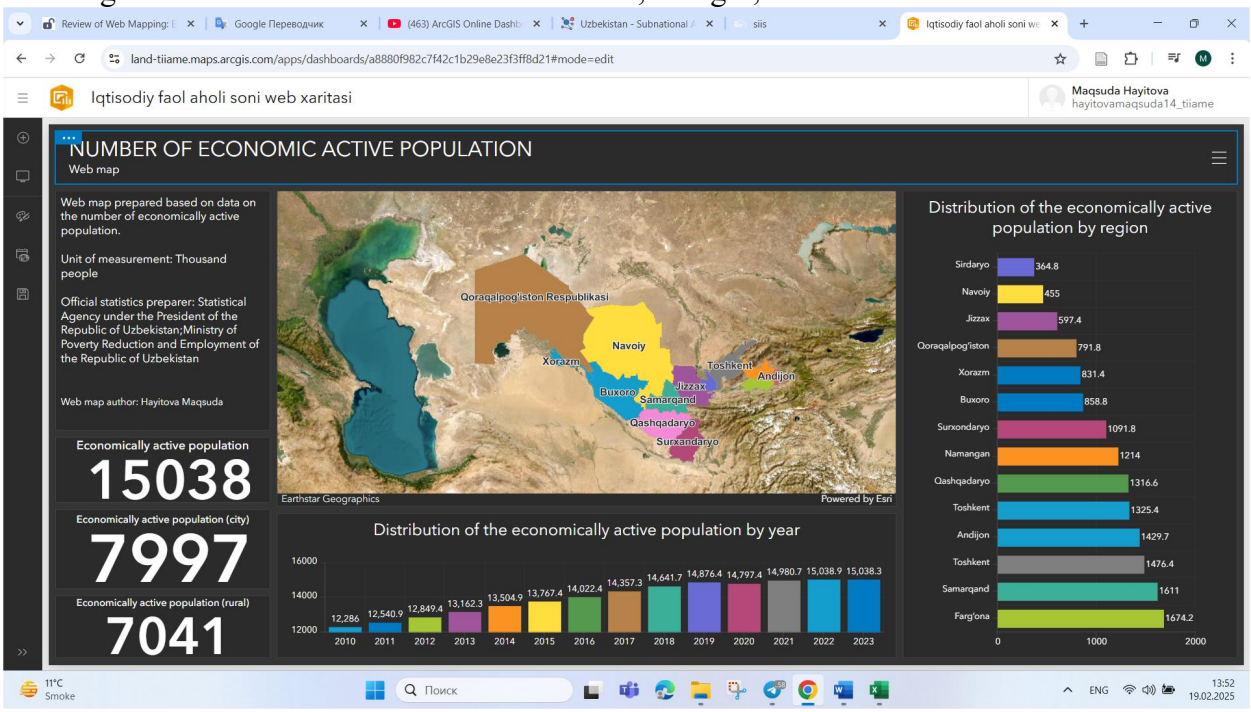

Figure 14. All data has been downloaded

Through the creation of this web map, we can determine the number of economically active population in each region and how many of them correspond to urban areas and how many to rural areas.

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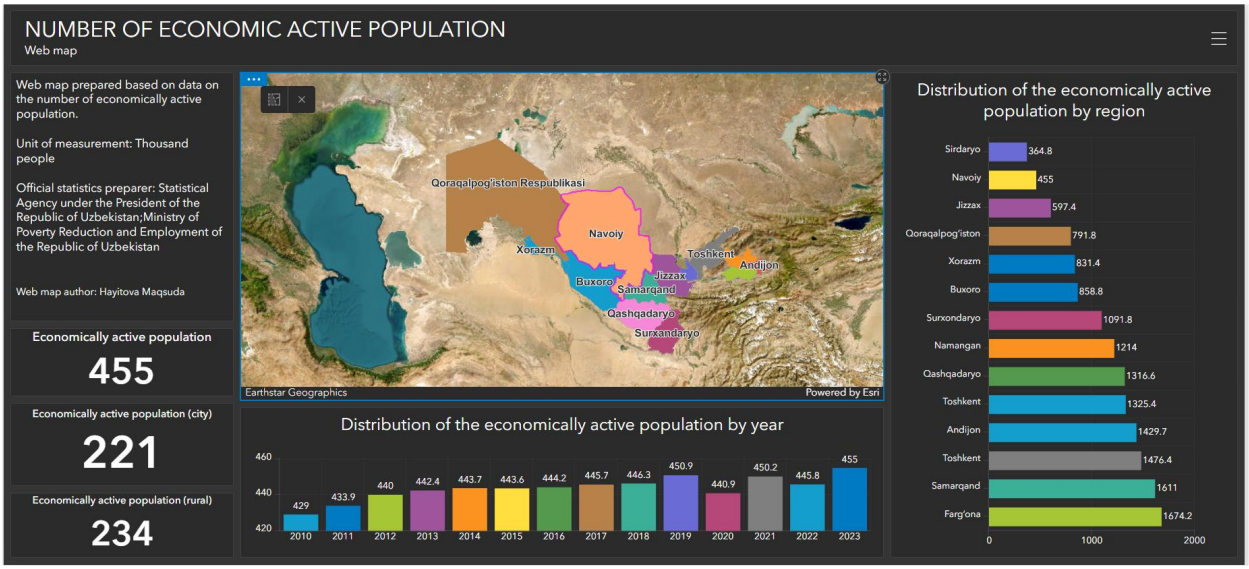

Figure 15. Changes in data across selected regions

The web map has been uploaded to a website. The web map can be viewed through the following link.

https://land-tiiame.maps.arcgis.com/apps/dashboards/a8880f982c7f42c1b29e8e23f3ff8d21#mode=edit

The web map has been uploaded at this link. By accessing it, one can view data on the economically active population from 2010 to 2023, organized by year and by regions of the Republic of Uzbekistan. According to the statistical data, the values of economically active population in urban and rural areas are also displayed. These details are accessible through the panel on the left side of the web map.

Conclusion

In conclusion, it can be stated that a web map was created in this article using statistical data. To create the web map, data on the number of economically active population was uploaded in the form of an Excel spreadsheet, processed, and then linked to the ArcGIS Pro software. The administrative boundaries of the regions of the Republic of Uzbekistan were also uploaded into ArcGIS Pro, and the aforementioned data was attached to their attribute table. Additionally, this file was uploaded to the ArcGIS Online platform, and a web map was created. By using this web map, one can access data on the number of economically active population across different years in the Republic. Moreover, the total number of economically active people, as well as their distribution in urban and rural areas, was also included. Given the increasing demand for such maps due to the growing development of the internet, this web map was created accordingly.

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