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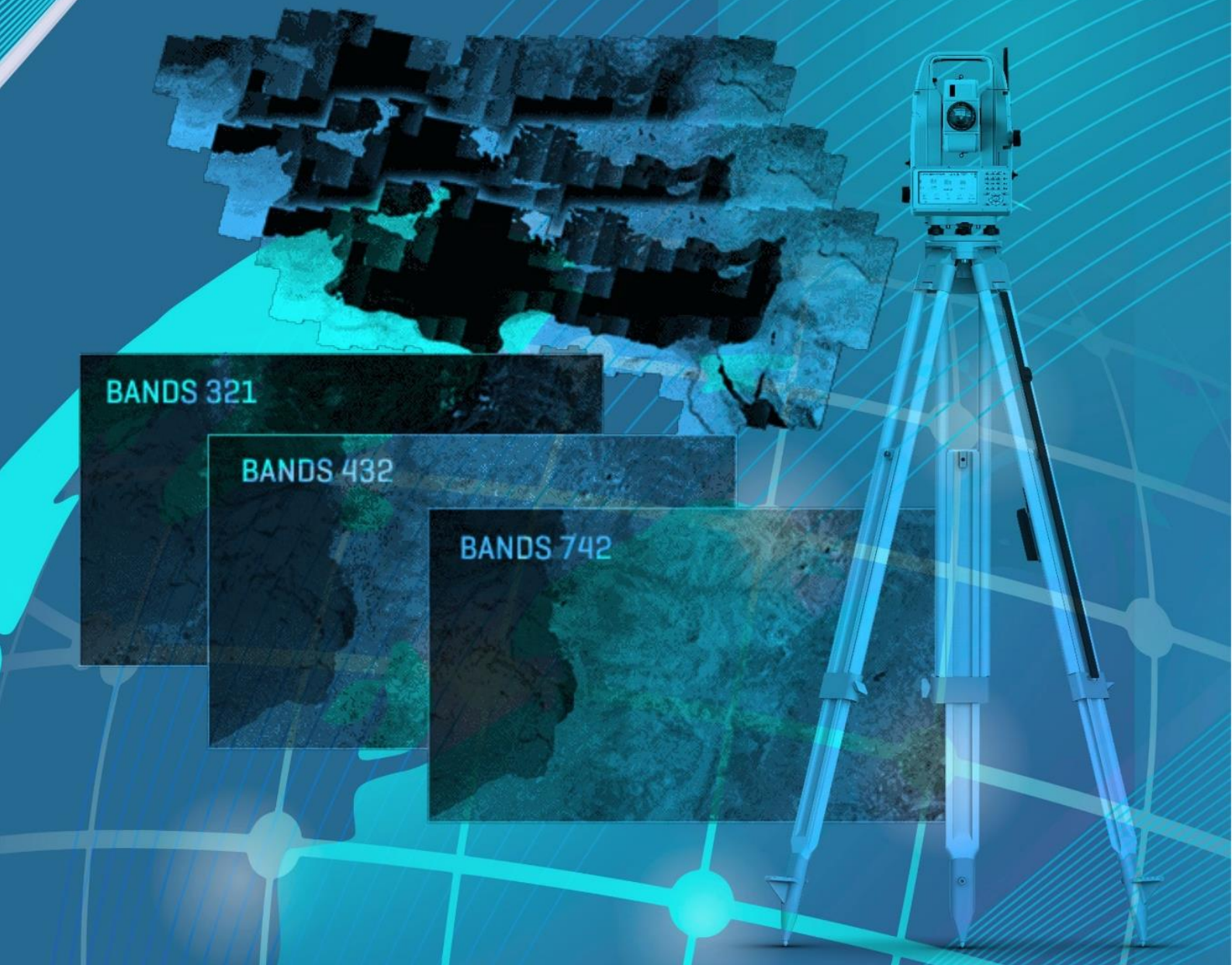

GEODEZIYA
KARTOGRAFIYA
GEOINFORMATIKA

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GEODEZIYA, KARTOGRAFIYA VA GEOINFORMATIKA ILMIY - TEXNIK JURNALI №1 2023

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DEVELOPMENT OF DEMOGRAPHIC MAPPING METHOD BASED ON GIS TECHNOLOGIES

S.N.Abdurakhmonov - *Associate professor of "TIIAME" NRU*

Annotatsiya. Hozirgi kunda kartografiya sohasida yangi geoaxborot yo'nalishining uslubiy va texnologik jihatlari faolligini yaqqol ko'rishimiz mumkin. Zamonaviy xaritalash usullarining rivojlanishi geoaxborot tizimlari va texnologiyalarining rivojlanishi bilan chambarchas bog'liq. Xaritalar yaratishning analog usullari o'rniga GIS dasturiy ta'minoti asosida ma'lumotlar bazalari va raqamli xaritalarni yaratishda geoaxborot kartografiyasi va geoaxborot tizimlarining ahamiyati katta. Kartografik axborotni olishning zamonaviy usulini takomillashtirish, tabiat va jamiyat haqidagi kartografik axborotni tez uzatish va tarqatish usullarini ishlab chiqish kabi eng muhim vazifalar turibdi. Demografik kartografiya sohasida GIS texnologiyalarini qo'llash ish hajmini keskin o'zgartirishga olib keladi, shuningdek, mahsulot dizaynini takomillashtirish va bajarilgan vazifalar natijasida aniqlikni oshiradi. Tadqiqot shuni ko'rsatadiki, demografik jarayonlarni aks ettiruvchi GIS texnologiyasi asosida yangi avlod xaritasini tuzishning yangi usulini ishlab chiqish zarurati mavjud. Ushbu maqola GIS texnologiyalari asosida xaritalarni ishlab chiqish uchun ma'lumotlar bazasini yaratish, tezkor identifikatsiya qilish, aerokosmik va boshqa manbalardan olingan ma'lumotlardan foydalangan holda fazoviy o'zgarishlarni kuzatish va GIS texnologiyalari asosida demografik raqamli xaritalash usullarini ishlab chiqishga qaratilgan. GIS texnologiyalari asosida demografik jarayonlarni xaritalash aholi bilan bog'liq bir qator amaliy vazifalar va tadqiqotlarni amalga oshirishga qaratilgan. Shundan kelib chiqib, O'zbekiston Respublikasining janubiy mintaqasidagi demografik vaziyatni tahlil qilishning tizimli usuli ishlab chiqildi va ishlab chiqilgan usulni qo'llash orqali raqamli demografik xarita yaratildi.

Kalit so'zlar: kartografiya, GIS texnologiyalari, mintaqaviy tahlil, demografik xaritalash.

Аннотация. В настоящее время мы отчетливо видим активность методологических и технологических аспектов нового геоинформационного направления в области картографии. Развитие современных картографических методов тесно связано с развитием геоинформационных систем и технологий. Важность геоинформационной картографии и геоинформационных систем значительна при создании баз данных и цифровых карт на основе программного обеспечения ГИС вместо аналоговых методов создания карт. Важнейшими задачами являются совершенствование современных методов получения картографической информации, разработка способов быстрой передачи и распространения картографической информации о природе и обществе. Применение ГИС-технологий в области демографической картографии приведет к кардинальному изменению объема работ, а также к улучшению дизайна продукции и повышению точности в результате выполняемых задач. Исследование показывает, что существует необходимость разработки нового метода картографирования

нового поколения на основе ГИС-технологий, отражающего демографические процессы. В данной статье основное внимание будет уделено созданию базы данных для разработки карт на основе ГИС-технологий, быстрой идентификации, мониторингу пространственных изменений с использованием данных из аэрокосмических и других источников, а также разработке методов демографического цифрового картографирования на основе ГИС-технологий. Картографирование демографических процессов на основе ГИС-технологий направлено на выполнение ряда практических задач и исследований, связанных с населением. На основании этого разработан системный метод анализа демографической ситуации в южном регионе Республики Узбекистан и с применением разработанного метода создана цифровая демографическая карта.

Ключевые слова: картография, ГИС-технологии, региональный анализ, демографическое картографирование

Abstract. Nowadays we can clearly see the activeness of the methodological and technological aspects of the new geoinformation direction in the field of cartography. The development of modern mapping methods is closely related to the development of geoinformation systems and technologies. The importance of geoinformation cartography and geoinformation systems is significant in creating databases and digital maps based on GIS software instead of analog methods for creating maps. There are the most important tasks such as improvement of modern method in obtaining cartographic information, and development of ways to quickly transmit and distribute cartographic information about nature and society. The application of GIS technologies in the field of demographic cartography will lead to drastic changes in the scope of work, as well as improve product design and increase the accuracy as a result of the performed tasks. The study shows that there is a need to develop a new method for mapping a new generation based on GIS technology, reflecting demographic processes. This article will focus on creating a database for development of maps based on GIS technologies, rapid identification, monitoring spatial changes using data from aerospace and other sources, and development of demographic digital mapping methods based on GIS technologies. Mapping demographic processes based on GIS technologies aims at implementing a number of practical tasks and research related to population. Based on this, a systematic method has been developed to analyse the demographic situation in the southern region of the Republic of Uzbekistan, and a digital demographic map has been created by applying the developed method.

Keywords: cartography, GIS technologies, regional analysis, demography mapping.

Introduction. In the developing world, human consciousness grows as well as its needs. It is not surprising that the XXI century is considered the age of information, and the age of technology. If we do not keep up with the times, if we fail to keep up with the news, learn and absorb the news, then it is very difficult to find our place in life. In recent years, tremendous research has been carried out in all areas of science and technology, and unprecedented results have been achieved. In particular, it is not secret that cartography and Geoinformatics are developing as branches of science, technology and production. The introduction of geographic information systems (GIS) into science has made the industry more rapid.

Actually, the study of demographic processes in different regions of the

country on the basis of modern geoinformation technologies and cartographic methods, collection, storage, database creation, digitization, analysis, processing, registration, evaluation, automatic forecasting, researches on modeling, integration, and visualization based on spatial data has not been sufficiently studied. Therefore, there is a need to study demographic processes based on geoinformation technologies and cartographic methods.

The reliability of cartographic research is to ensure that its task is solved correctly, in other words, if the result is closer to reality, the research will be more reliable.

It is very difficult to assess reliability because the result obtained is based on many reasons: theory of errors, cartometric calculations, mathematical statistics, and so on. It should also be noted that some results do not have clear evaluation criteria, they can be evaluated only on the basis of scientific experience and on the basis of the researcher's academic degree.

Therefore, a separate approach is required for each event in determining the level of reliability of scientific and practical tasks solved using cartographic research methods.

Moreover, the development of modern methods of mapping is directly related to the development of geographic information systems and technologies.

Modern mapping methods are online methods of data collection that ensure the reliability and modernity of databases on maps created on the basis of geographic information systems and technologies. The modernity of the data on the created maps is characterized by an integral connection to the database, which is collected quickly and reliably using special software tools.

Materials and methods of research. Demographic maps are important for the study and explore of demographic processes. Also, based on the results obtained, it will play an important role in identifying and evaluating the structural parameters of the population infrastructure, natural conditions, and socioeconomic factors based on innovative approaches.

One of the main objectives of GIS technology is the development of thematic maps and plans, their processing, databases formation, integration and their visualization.

Today, there is the activeness of the methodological and technological aspects of the new geoinformation cartography in the field of cartography [Abdurakhmonov, 2018].

The importance of geoinformation cartography and geoinformation systems is significant in creating databases and digital maps based on GIS software instead of analog methods for creating maps [Sabitova, 2009].

It should be noted here that another great feature of GIS software is that a cartographic basis for the map being created will allow you to quickly and efficiently generate all-subject maps using statistics. This requires the creation of a large-scale cartographic basis from the map scale to be created.

GIS technologies are a key tool in demographic mapping. At the same time, each demographic data is represented in separate layer by the direction. All data presented on the basis of demographic digital mapping layers compiled in GIS software will be analysed and will automatically generate forecast maps in the future. Fig. 1 shows the examples of the advantages of GIS technologies in demographic mapping. It focuses on the advantages of GIS technology to ensure the readability, visibility, quality and other advantages of thematic mapping based on software systems and geosciences.

Advantages of GIS technologies in mapping demographic processes include functionality, scalability, visibility, ease of updating, efficiency, flexibility, modelling, compactness, and other features of the

maps. The benefits of GIS software also guarantee the completeness of maps being created.

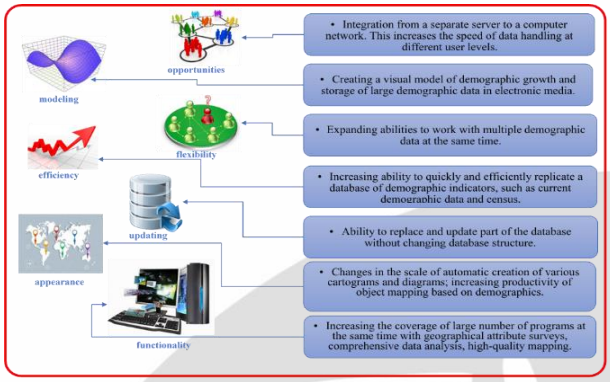

Fig. 1. Advantages of GIS technologies in demographic mapping

It is desirable to use the materials of regional statistical departments based on the data of regional, district, and rural citizens' gatherings to obtain accurate data on the population of the southern region. In general, demographic mapping is more complex, it is important to pay close attention to the relief, hydrography, transport systems, and boundaries of the area in which the map is being created. Demographic maps made in Uzbekistan are mainly maps of complex and educational atlases, which are small-scale [Tojieva, 2010], cannot be sufficiently accurate.

In this research ArcGIS and MapInfo software have been widely used to create, edit, update, store, and process cartographic data. In general, from the point of view of accepted GIS terminology, these programs also have a database management system (Fig. 2).

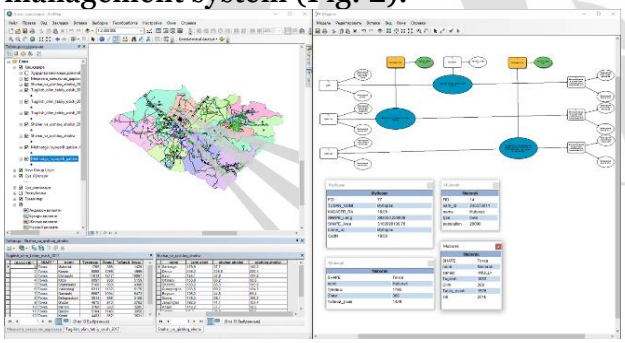

Fig. 2. Database management in ArcGIS software

Software with all the capabilities needed to create a map that describes the current state of demographic processes in the region is selected (Fig. 3). Creating a high-precision map based on the selected software requires you to fill the database with accurate and reliable sources.

It is also important to use aerospace photos to indicate the location of the population and their characteristics on demographic maps, as it allows separating settlements and its functional characteristics are much easier [Mirzaliev et al., 2009].

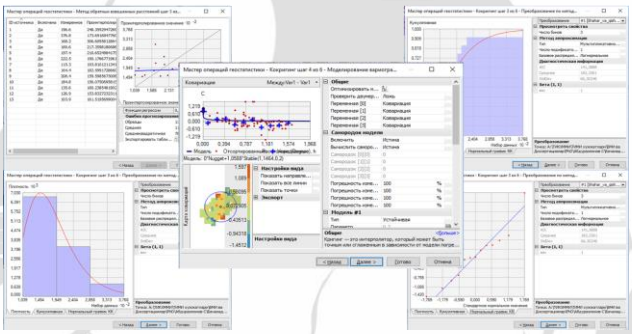

Fig. 3. Analysis of demographic processes in ArcGIS software

In recent years, automated methods for duplicating maps have been developed and implemented. In order to speed up the mapping processes and improve their quality, a method for printing map titles and various major inscriptions on adhesive paper was developed [Musaev et al., 2015].

Mapping of demographic processes on the basis of GIS software is aimed at a number of practical tasks and research related to the population. In the periodic demographic mapping process based on the developed demographic mapping technology, the increase in the accuracy of data in the creation of databases and the speed of data collection is proved.

It will also improve the classification and analysis of objects, the development of a system of symbols of the created maps, the accuracy of working with thematic layers of the map, the development of the map layout, its preparation for publication and printing.

When creating population maps, the work is based on one system. Based on this, the developed demographic digital mapping technology will improve the quality of electronic digital population maps. The structure of population maps using special GIS software and cartographic research methods allows to improve the speed of analysis, processing and forecasting of information on maps.

In general, it took almost 8 months to develop this demographic mapping technology based on completing the tasks mentioned in the results of research and their discussion part of the paper.

Results of research and their discussion. The study shows that there is a need to develop a new method for mapping a new generation based on GIS technology, reflecting demographic processes. Based on this, the following demographic digital mapping method has been developed (Fig. 4).

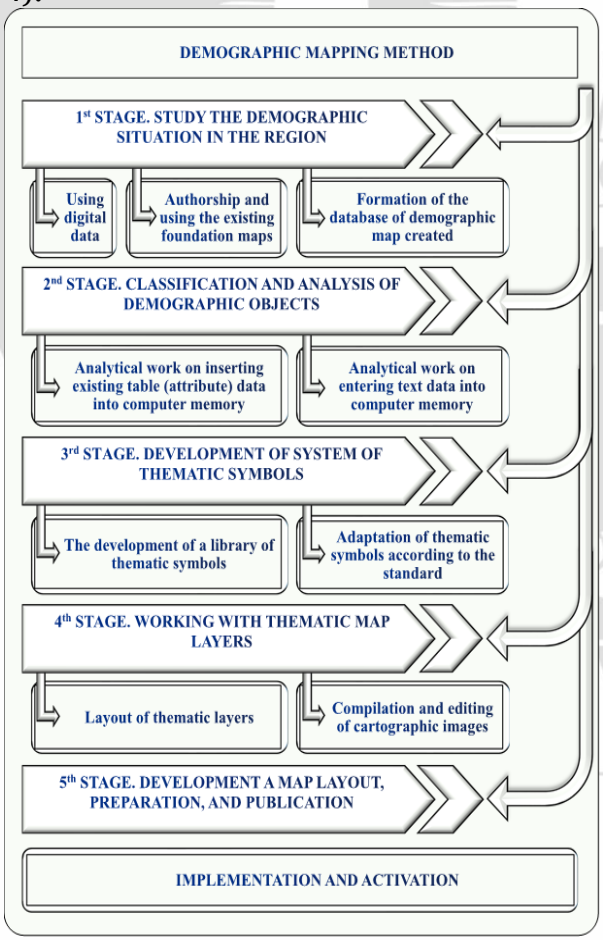

Fig. 4. Demographic mapping method

The sequence of tasks on the implementation of demographic mapping method is as follows:

Study the demographic situation in the region. At the same time, digital data is collected and databases are formed with the accumulation of copyright authorities, stock maps, and remote sensing (RS) materials. The scope of work at this stage also includes the process of geographical study of the demographic situation in the selected region.

Classification and analysis of demographic objects. In this stage, existing tables (attributes) and text data collected are entered into the computer's memory.

Development of a system of thematic symbols. In this case a bibliography of thematic symbols describing demographic processes as well as a legend based on the standard bibliography of thematic symbols describing events and phenomena in the area is created.

Working with thematic map layers. In this case, the thematic layers are correctly arranged in the selected sequence, and mapping and editing of cartographic images is performed.

Once the above steps have been successfully completed, the map layout (boundary of the image area, its placement relative to the map frames, map title, scale, legend, various digital and text data, tables, graphs, additional cross-maps etc.) will be developed, and publication will be done.

Based on the above mentioned stages, a systematic method has been developed to analyse the demographic situation in the southern region and its digital demographic map has been created (Fig. 5).

Conclusions. It is possible to create digital maps of population in different directions based on the techniques of demographic digital mapping method developed above. When mapping demographic processes in GIS software, the data is digitized and displayed on a computer screen, which involves complex

editorial preparation. Maps numbering is performed by scanning cartographic materials using custom objects and at the end by converting raster data into vectors.

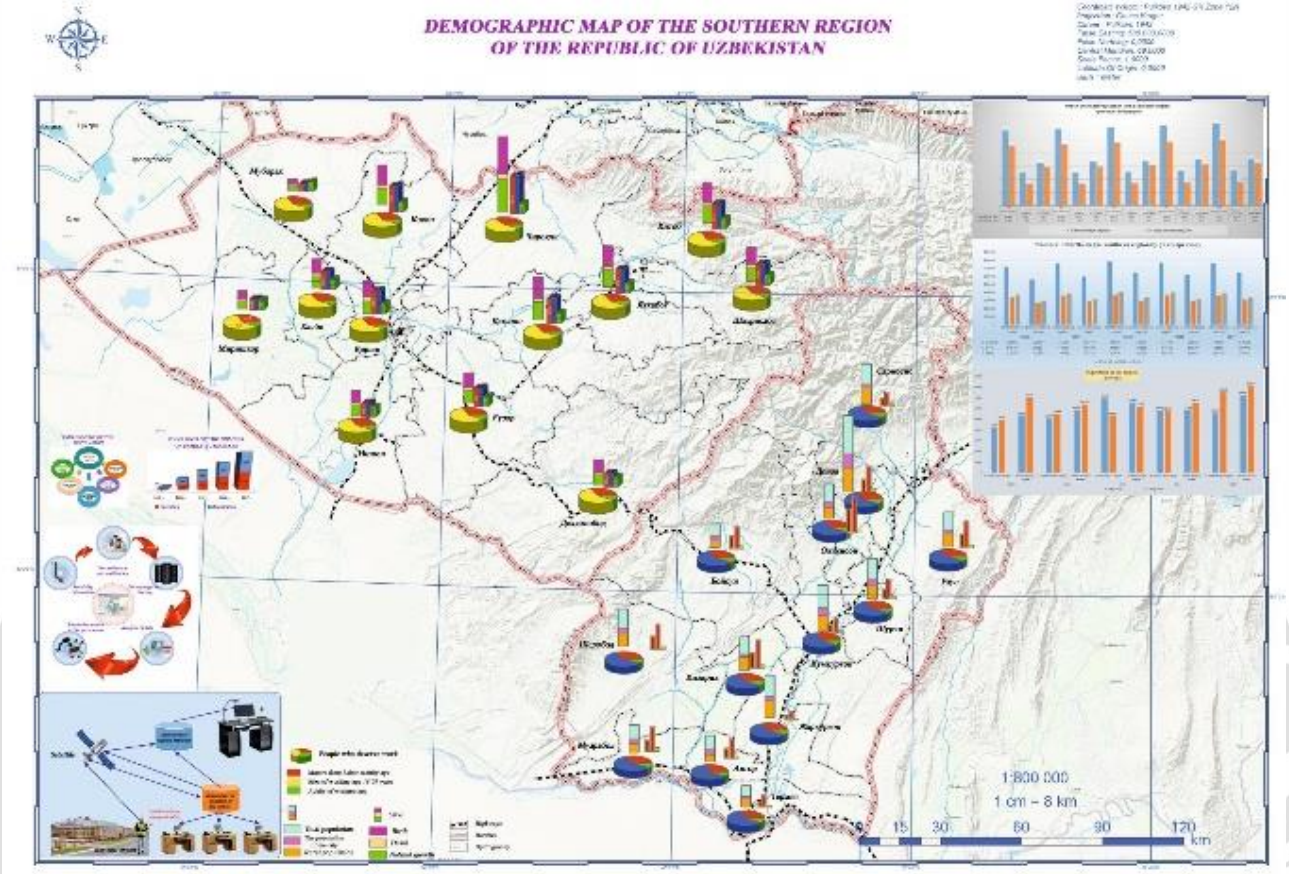

Fig. 5. Digital demographic map of the Southern region of the Republic of Uzbekistan

In the periodic demographic mapping process based on the developed demographic mapping technology, the increase in the accuracy of data in the creation of databases and the speed of data collection is proved.

It will also improve the classification and analysis of objects, the development of a system of symbols of the created maps, the accuracy of working with thematic layers of the map, the development of the map layout, its preparation for publication and printing.

When creating population maps, the work is based on one system. Based on this, the developed demographic digital mapping technology will improve the quality of electronic digital population maps. The structure of population maps using special GIS software and cartographic research methods allows to improve the speed of analysis, processing and forecasting of information on maps.

GIS technology allows us to work with databases and maps in an integrated way, and an infinitive number of other tools. We can see this in the creation of maps and plans, their processing and data integration. Mapping demographic processes based on GIS technologies aims at implementing a number of practical tasks and research related to population.

Due to the fact that the work on mapping is based on a single system, the developed digital mapping method improves the quality of digital population maps. Mapping using custom GIS software and cartographic survey techniques allows you to analyse the information contained in them, improve the accuracy and speed of creating thematic maps.

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References

1. Abdurakhmonov S.N., Inamov A.R. Application and integration of innovative technologies in cartographic visualization of regional demographic processes. Tashkent: TIIAME Press, 2018. 107 p. (in Uzbek).
2. Abdurakhmonov S.N. Dadabayeva A., Erkulov G. Development of data on the creation of maps of demographic processes in the system of geographic information technology. XXI International scientific and practical conference “Advances in Science and Technology”. Tashkent, June, 2019. P. 50–52. (in Russian).
3. Abdurakhmonov S.N. Geoinformation Systems and Technologies (GIS) and Information on the use of GPS accessories in integrated demographic process. International Journal of Multidisciplinary Research and Publications ISSN (Online). 2019. P. 2581-6187. 4. Berlyant A.M. Cartography. Textbook for universities. Moscow: Aspect Press, 2002. 162 p. (in Russian).
5. Kayumov. A.A., Yakubov U.Sh., Rayimjonov Z.H. Basics of population geography and demography. Tashkent: Universitet Press, 2018. P. 26–94. (in Uzbek).
6. Mirzaliev T., Musaev I., Safarov E.Yu. Socio-economic cartography. Tashkent: Yangi asr avlodi Press, 2009. 165 p. (in Uzbek).
7. Musaev I., Mukhtarov O., Ergashov M. Geoinformation systems and technologies. Tashkent: TIIAME Press, 2015. 59 p. (in Uzbek).
8. Oymatov R.K. Cartographic design. Tashkent: TIIAME Press, 2017. 220 p. (in Uzbek).
9. Safarov E.Y., Prenov Sh.M., Allanazarov O.R., Sayidov A.K., Raxmonov D.N. Cartography and geovizualization. Tashkent: TIIAME Press, 2015. 123 p. (in Uzbek).

UDK: 528:314.8 (575.122)

ANDIJON AGLOMERATSIYASIDA SHAHARCHALAR SONINING ORTISHI VA AHOLISI O‘SISHINING KARTOGRAFIK TAHLILI

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N.N.Teshayev *- “TIQXMMI” MTU assistenti*

Annotatsiya. *Ushbu maqolada GAT texnologiyalaridan foydalanib mavjud atributiv ma’lumotlar asosida xaritalar yaratish metodikasi haqida so‘z yuritiladi. Andijon viloyati O‘zbekiston Respublikasining aholi eng zich joylashgan hududi hisoblanadi. Hududdagi urbanistik jarayonlarni virtual kuzatish imkonini beruvchi xaritalarni yaratish orqali Andijon aglomeratsiyasi yadrosi atrofida shaharchalar sonining ortishi, aholining zich joylashuvini aniqlash imkonini beradi.*

Kalit so‘zlar*: Aglomeratsiya, Shaharlashish, Geoaxborot tizimlari, Kartalashtirish*

Аннотация. *В данной статье рассказывается о методологии создания карт на основе существующих атрибутивных данных с использованием технологий GAT. Андижанская область – самый густонаселенный регион Республики Узбекистан. Увеличение количества*

filial Bakinskogo gosudarstvennogo universiteta geograficheskoye obщestvo Azerbaydjana. «Mejdunarodnoy nauchnoy konferensii, posvyaщennaya 85-ti letiyu professora M.A.Museibova". Baku, 2012g., -513-515 str.

5. Shokirov SH.S., Musayev I.M., Akbarov M.S. Masofadan zondlash. Toshkent. "IQTISOD-MOLIYA", 2015. 192 b.

6. Musayev I. M., Eshnazarov D. B., Manopov Kh. V., (2021). Order And Methodology For Determining Administrative-Territorial Borders Based On Digital Technologies. The American Journal of Engineering and Technology, 3(03), 49-57.

UDK: 528.91:504.064:004:001.57

GEOAXBOROT TIZIM VA TEXNOLOGIYALARI YORDAMIDA FAZOVIY MA`LUMOTLARNI MODELLASHTIRISHNING ELEKTRON RAQAMLI KARTALAR TUZISHDAGI O'RNI

S.N.Abduraxmonov - *"TIQXMMI" Milliy tadqiqot universiteti dotsenti*

Annotatsiya. *GAT yordamida ma'lumotlarni tahlil qilishni modellashtirish asosida tezkor ravishda ma'lumotlarni aniqlash yuzasidan tahliliy ishlar bajarilishi amaliy ahamiyatga ega. Ushbu maqolada joylarda demografik jarayonlarni, jumladan aholi bilan bog'liq bo'lgan turli ma'lumotlarni onlayn tarzda GAT texnologiyalari ma'lumotlar bazasiga avtomatik tarzda masofadan turib uzatish orqali aholi soniga nisbatan zich joylashgan hududlarni modellashtirish jarayonini ko'rib chiqamiz.*

Kalit so'zlar: *Modellashtirish, GAT texnologiyalari, ArcGIS, mavzuli qatlamlar, elektron karta*

Abstract. *GAT has hands-on experience in data analysis modeling, rapid data assessment, and analytical work. We will consider the process of modeling a population-dense database by automatically feeding demographic processes, various population-related data into an online GAT technology database.*

Key words: *Modeling, GAT technologies, ArcGIS, thematic layers, electronic map*

Аннотация. *ГИС имеет практический опыт моделирования анализа данных, быстрой оценки данных и аналитической работы. Мы рассмотрим процесс моделирования базы данных с плотностью населения путем автоматической подачи демографических процессов, различных данных, связанных с населением, в онлайн-базу данных технологии ГИС.*

Ключевые слова: *Моделирование, GAT-технологии, ArcGIS, тематические слои, электронная карта.*

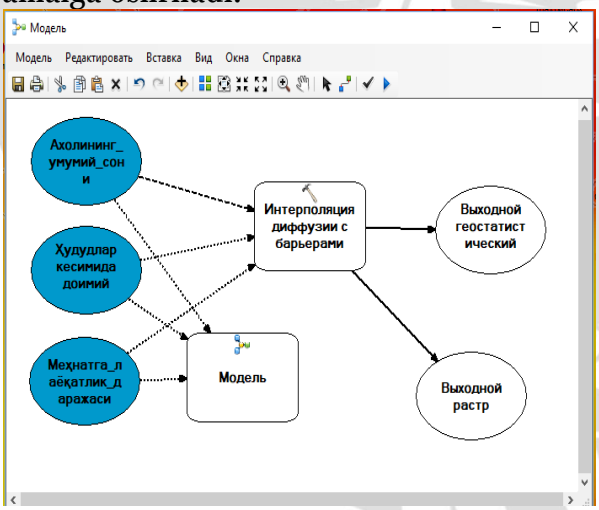
Kirish. Birinchi navbatda yaratiladigan modelning bajaradigan vazifasini aniq belgilab olish zarur. Misol uchun hududiy chegaralarning geografik joylashuvi o'rganish kabi ko'pgina masalalarni aniqlashda bu tizim keng imkoniyat yaratadi. Buning uchun hududiy chegaralarning geografik joylashuvini o'rganish zaruriy geodezik qurilmalar yordamida aniqlanadi va vektor ko'rinishida shakllantiriladi. Hududdagi aholi yashash joylarida aholiga tegishli bo'lgan statistik ma'lumotlar aniqlanadi va geokodlashtiriladi. Aniqlangan ma'lumotlar maxsus darsturlar yordamida

atributlashtiriladi. Hosil bo‘lgan ma’lumotlar onlayn tarzida bazaga yuboriladi.

Respublika miqyosida kelib tushgan vektor ko‘rinishidagi geokodlar **“ArcGIS”** dasturiga import qilinadi. **“Model Builder”** darchasi yordamida mavzuli qatlamlar ketma-ket yoki zanjir shaklida insrumentlar paneli buyruqlariga ulanadi (1-rasm).

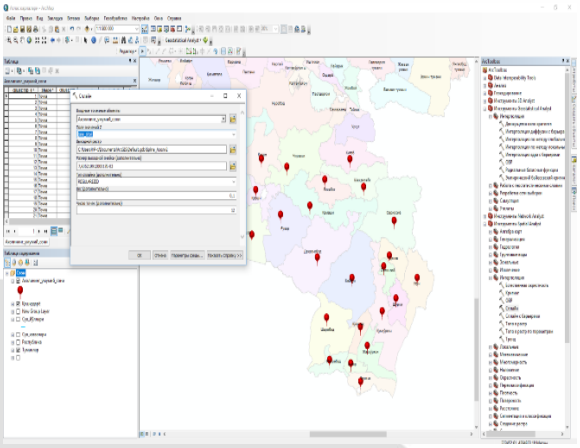
“Start” tugmasi yordamida yaratilgan model tekshiriladi va jarayonni ishga tushirish uchun buyruq beriladi. Natijada dastrning ishchi oynasida tahlillar vizuallashadi. Tahlillarning bir qancha turlari mavjud bo‘lib ular quyidagilardir:

- aholining umumiy soniga nisbatan hududlarda zich joylashuvi;
- aholining o‘sishi yoki kamayish dikamikasi;
- jins turlariga nisbatan gistogramma;
- aholining hududlarda joylashuvining relefga bog‘liqligi;
- myehnatga layoqatli aholi zonalarini aniqlash kabi barcha demografik jarayonlarni tavsiflovchi fazoviy tahlillar amalga oshriladi.

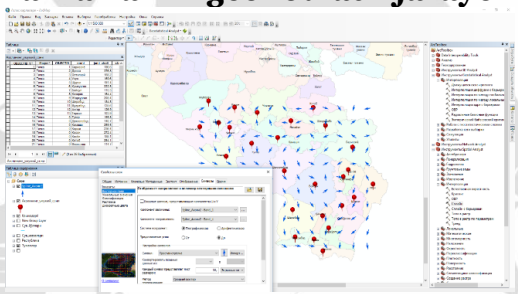


1-rasm. “Model Builder” darchasining ishchi holati

Bundan tashqari **“Geostatistical analyst”** buyrug‘i yordamida aholining harakatlanish oqimini vizuallashtirish va hududlarni shaharlashish jarayonnin kuzatishmiz mumkin (2 va 3-rasmlar).

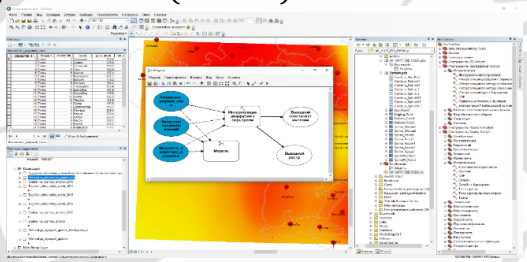


2-rasm. Aholi yashash joylari markazlarini geokodlash jarayoni



3-rsm. Aholini harakatlanish oqimi

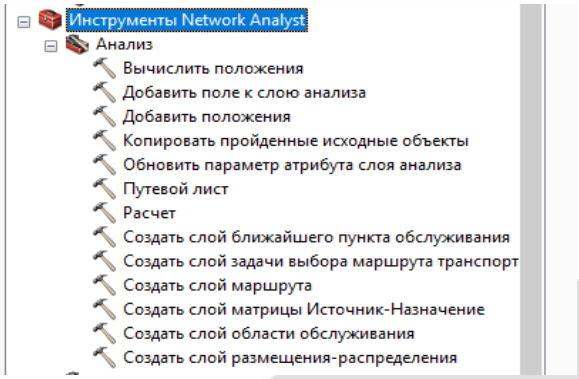
“Model Builder” darchasida biz yaratmoqchi bo‘lgan modelimizning ishchi algoritmi ishlab chiqiladi, ya’ni kerakli instrumentlar tanlanadi va shu oynaga bajariladigan shartlar ketma ketligi asosida joylashtiriladi (4-rasm).



4-rasm. ModelBuilder ishchi oynasi

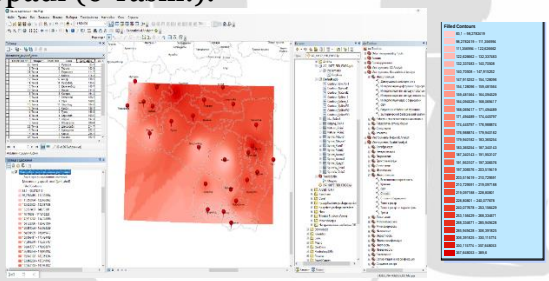
Fazoviy tahlilni amalga oshiruvchi bu instrumentlar o‘zi bajaradigan vazifasidan kelib chiqqan holatda mantiqan bog‘lanadi. Model yaratishda foydalanuvchidan instrumentlarni to‘g‘ri tanlash, sozlash va o‘zaro to‘g‘ri ketma - ketlikda joylashtirish talab etiladi.

Bu modelni yaratish uchun avval geokodlar yaratiladi IDW instrumenti faollashtiriladi. Keyingi qadamda mavjud geokodlar atributdagi qiymalar tanlanadi hamda belgilangan atribut bo‘yicha topib belgilovchi *Select by Attribute* instrumenti ishga tushiriladi (5-rasm).



5-rasm. ModelBuilder ishchi oynasida zaruriy instrumentlar

Belgilangan ob'ektlarni yangi qatlamda ifodalash uchun Make Feature Layer instrumenti hamda jadvallar yaratuvchi instrumentlar *Summary Statistics* va *Table To Excel* dan foydalaniladi. Bu instrumentlarni barchasini Instrumentlar panelidan olib *ModelBuilder* ishchi oynasida joylashtiriladi. Natijada tahlil o'z ifodasini topadi (6-rasm.).



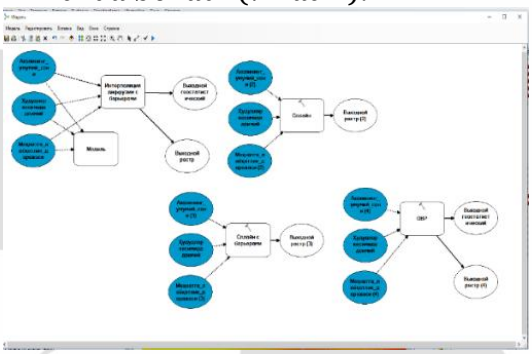
6-rasm. ModelBuilder tahlil natijasi

Ranglar shkalasiga ko'ra aholi zich joylashgan hududlar to'q qizil rangda bo'lib, aholining siyraklashuviga va joylashuviga ko'ra oy tus rangdagi ranglarda ifodalanadi.

Har bir instrument bajaradigan vazifasiga ko'ra sozlab chiqiladi. Masalan, ranglar spektori yaratadigan **"Geostatistical analyst"** instrumentini sozlanishiga to'xtaladigan bo'lsak. Bu yerda ikkita asosiy e'tibor beriladigan joy mavjud. Ular: geokod qatlamlarini yaratish kerak bo'lgan ob'ekt va koordinatalar birligi.

Tadqiqot ishi uchun yaratilayotgan modelda geokod yaratilish zarur bo'lgan ob'ektlar qatoriga tuman markazi (hokimiyat binosi) va aholi yashash joylari kiritish mumkin.

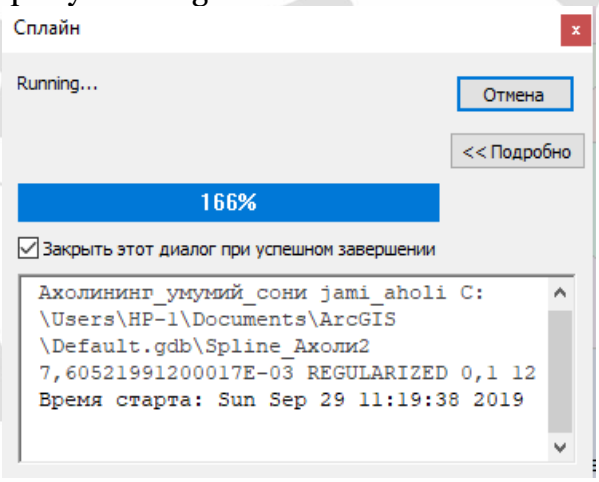
Agar instrument to'g'ri sozlanib, ishlashga tayyor holatga kelsa uning rangi o'zgaradi. Barcha instrumentlar o'zaro bog'lanib, ishlashga tayyor holatga kelganida ModelBuilder oynasi quyidagi ko'rinishda bo'ladi (7-rasm).



7-rasm. ModelBuilder oynasida yaratilgan, foydalanishga tayyor modelning ko'rinishi

Tayyor bo'lgan model algoritmi alohida saqlab nom beriladi. Modellar odatda Tools bo'limiga saqlanadi. Foydalanishga qulay bo'lishi uchun uni asosiy menyular qatoriga kiritib qo'yish lozim.

Biz ko'rib chiqayotgan shartlar bo'yicha darchada belgilangan shartga ko'ra, aholi soniga oid qiymatlarni kiritamiz va OK tugmasini bosamiz. Natijada ekranda analiz jarayonlarini ko'rsatib turuvchi oynacha paydo bo'ladi (8-rasm). Bu model ishlayotganidan dalolat beradi. Agar tahlil jarayonida biror xatolik kuzatilsa darchada qizil yozuvli ogohlantirishlar ko'rsatiladi.



8-rasm. Modelning ishlash jarayoni.

Mazkur jarayonlarni grafik ketma - ketligi quyidagi sxemada keltirilgan. Unda, aholi zichligini fazoviy tahlil qilishda:

- hududiy chegaralarni aniqlash;
- hududlar otmetkasini olish;
- ma'lumotlarni jamlash;
- ModelBuilder sxemasini qurish;
- ArcGiS da natijalar olish bosqichlari va ularning tarkiblaridagi bajarilishi kerak bo'lgan vazifalar ketma ketligi hamda natijaviy tahlillarni hukumatga interaktiv xizmat ko'rsatishi berilgan (9-rasm).

9-rasm. "ArcGIS" da natijalar olish

ArcGiS dasturida aholi zichligini fazoviy tahlil natijalari berilgan (10-rasm).

10-rasm. O'zbekiston Respublikasi janubiy mintaqasi yerlarining geostatik tahlili

Xulosa. Navigatorning koordinatalar tizimi sozlamasiga tuzatmalar kiritilishi ta'minlanganligi va bu tuzatmalar navigatorning geolokatsion ma'lumotlarini olishda tenglashtirish ishlarini mukammal darajada amalga oshiradi. Geolokatsiya ishlari orqali joyning koordinatalari aniqlandi. Raqamli demografik ma'lumotlar bazasi (server) bilan integratsion aloqa o'rnatish orqali yuqori aniqlikdagi zamonaviy ma'lumotlar uzatilish imkonini yaratiladi.

Elektron raqamli kartalar bugungi kunda demografik muammolarini hal etish bo'yicha istiqbolli chora - tadbirlarni belgilashga imkoniyat yaratadi. Bunda GAT texnologiyalari asosida ma'lumotlarni tezkorlik bilan to'plash hamda ma'lumotlar bazasini shakllantirish asosini yaratadi.

Geoaxborot tizim va texnologiyalari asosida ma'lumotlarni fazoviy tahlil qilishni modellashtirish asosida tezkor ravishda ma'lumotlarni aniqlash yuzasidan tahliliy ishlar bajarildi. Natijada GAT texnologiyalari yordamida demografik jarayonlarni tavsiflovchi ma'lumotlarni fazoviy tahlil qilish orqali analiz ishlarini olib borishga imkon yaratiladi.

Foydalanilgan adabiyotlar ro'yxati

1. Abduraxmonov S.N., Inamov A.R. "Mintaqaviy demografik jarayonlarni kartografik usullar bilan vizuallashtirishda innovatsion texnologiyalarini qo'llash va ularni integratsiyalash" // Monografiya Toshkent., 2018. 107 b.
2. Abdurakhmonov, S., Safarov, E., Yakubov, M., Prenov, S. Review of mapping regional demographic processes using innovative methods and technologies. 2021 y.
3. Yakubov, K., Khayitov, K., Abdurakhmonov, S. Suspension concentration distribution in a stream constructed by spur No. 19 on the Amu Darya river. 2021 y.
4. Abdurakhmonov, S. Review of methodological issues of application of geographic information systems in service maps and their compilation. 2021 y.
5. Narbaev, S., Abdurahmanov, S., Allanazarov, O., Talgatovna, A., Aslanov, I.Modernization of telecommunication networks on the basis of studying demographic processes using GIS. 2021 y.
6. Abdurakhmonov, S., Abdurahmanov, I., Murodova, D., Mirjalolov, N., Djurayev, A. Development of demographic mapping method based on gis technologies. 2020 y.