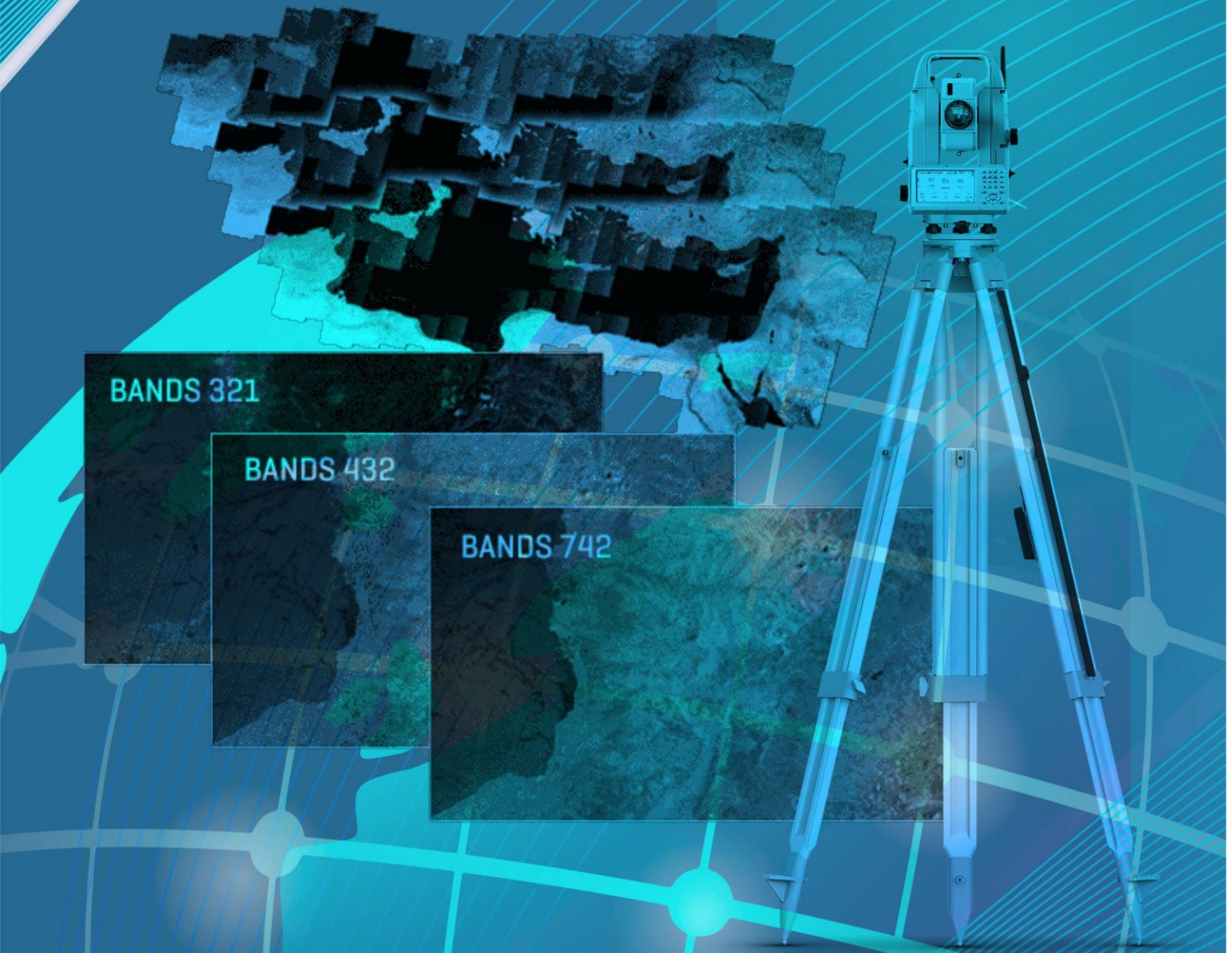
GKG

GEODEZIYA, KARTOGRAFIYA VA GEOINFORMATIKA

ILMIY - TEXNIK JURNALI

ISSN-I-2181-4546



GEODEZIYA KARTOGRAFIYA GEOINFORMATIKA

№2
2023

“Geodeziya, kartografiya va geoinformatika” Ilmiy-texnik jurnal 2023-yil 2-son

Muassis:

“Toshkent irrigatsiya va qishloq xo‘jaligini mexanizatsiyalash muhandislari instituti” Milliy tadqiqot universiteti

Jurnal 2023 yil aprel oyidan chiqa boshlagan

Bir yilda to‘rt marta chop etiladi (Q4)

Ruxsatnoma №062656

Manzil: *100000, Toshkent sh., M.Ulg‘bek tumani, Qori-Niyoziy ko‘chasi 39-uy.*
Tel.: *+998 90 974 91 49.*
E-mail: *u.muxtorov@tiiame.uz*

Научно-технический журнал «Геодезия, картография и геоинформатика» Выпуск 2 от 2023 г.

Журнал издан в апреле 2023 года.
Выходит четыре раза в год (Q4)
РазрешениеNº062656

Адрес: *100000, г.Ташкент , М.Улугбекский район, улица Кори-Ниязи, 39.*
Tel.: *+998 90 974 91 49.*
E-mail: *u.muxtorov@tiiame.uz*

"Geodesy, cartography and geoinformatics" Scientific and technical journal, issue 2, 2023

Founder:

"Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University

The magazine started publishing in April 2023

It is published four times a year (Q4)

Permission №062656

Address: 100000, Tashkent, M.Ulugbek district, 39, Qori-Niyazi street.
Tel.: *+998 90 974 91 49.*
E-mail: *u.muxtorov@tiiame.uz*

Mundarija/Содержание/Contents

5. Salishchev K.A. Mapping. 3rd ed. - M.: Publishing House of Moscow State University, 1990. - 400 p.

6. Tikunov B.C. Modeling in cartography: Proc. M.: Publishing House of Moscow State University, 1997-405 p.

UO‘K: 528.9:004.94

FAZOVIY MODELLASHTIRISH MA’LUMOTLARINI RAQAMLI KARTALAR TUZISHDAGI O‘RNI

S.Abduraxmonov *- “TIQXMMI” Milliy tadqiqot universiteti dotsenti*
Z.Mamatkulov *- “TIQXMMI” Milliy tadqiqot universiteti dotsenti*
Sh.Qodirov *- Gidrometeorologiya ilmiy-tadqiqot instituti mustaqil tadqiqotchi*

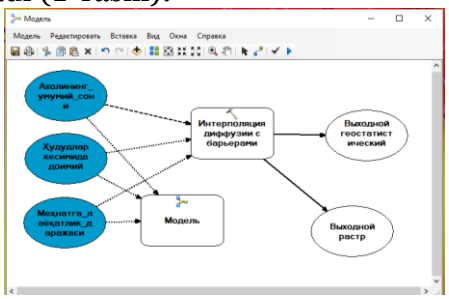
Annotatsiya. *GAT yordamida ma’lumotlarni tahlil qilishni modellashtirish asosida tezkor ravishda ma’lumotlarni aniqlash yuzasidan tahliliy ishlar bajarilishi amaliy ahamiyatga ega. Ushbu maqolada joylarda demografik jarayonlarni, jumladan aholi bilan bog‘liq bo‘lgan turli ma’lumotlarni onlayn tarzda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

Аннотация. *Практическое значение имеет оперативное выполнение аналитических работ по определению данных на основе моделирования анализа данных с помощью GAT в данной статье мы рассматриваем процесс моделирования густонаселенных территорий путем автоматической и дистанционной передачи на месте демографических процессов, в том числе различных данных, связанных с населением, в базу данных GAT-технологий в режиме онлайн.*

Annotation. *Of practical importance is the rapid implementation of analytical work to determine data based on modeling data analysis using GAT in this article, we consider the process of modeling densely populated areas by automatic and remote transfer of demographic processes, including various population-related data, to the database GAT-technologies online*

Asosiy qism. 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.

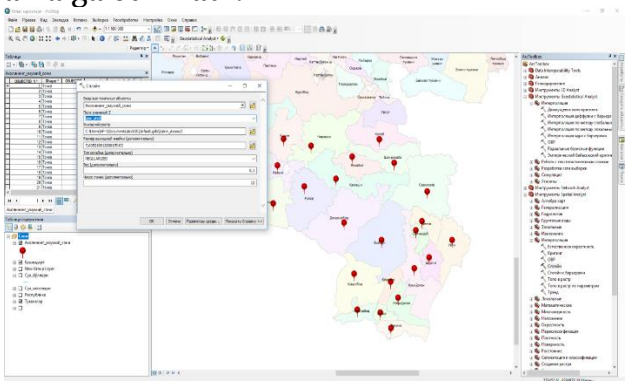
Respublika miqyosida kelib tushgan vektor ko‘rinishidagi geokodlar **“ArcGIS”** dasturiga import qilinadi. **“Model Builder”** darchasi yordamida mavzuli qatlamlar ketma-ket yoki zanjir shaklida insrumentlar paneli buyruqlariga ulanadi (1-rasm).



1-rasm. “Model Builder” darchasining ishchi holati

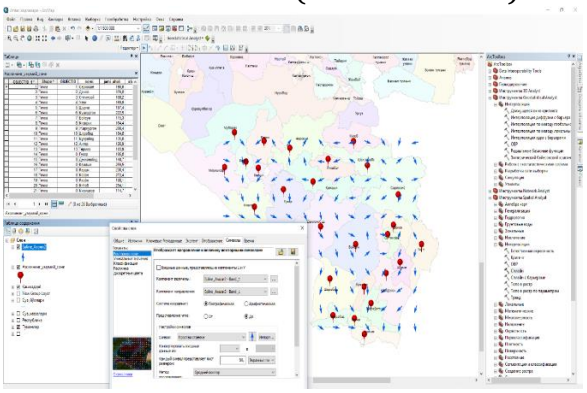
“Start” tugmasi yordamida yaratilgan model tekshiriladi va jarayonni ishga tushirish uchun buyruq beriladi. Natijada dastrning ishchi oynasida tahlillar vizuallashadi. Tahlillarning bir qancha turlari mavjud bo‘lib ular quyidagilardir:

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



2-rasm. Aholi yashash joylari markazlarini geokodlash jarayoni

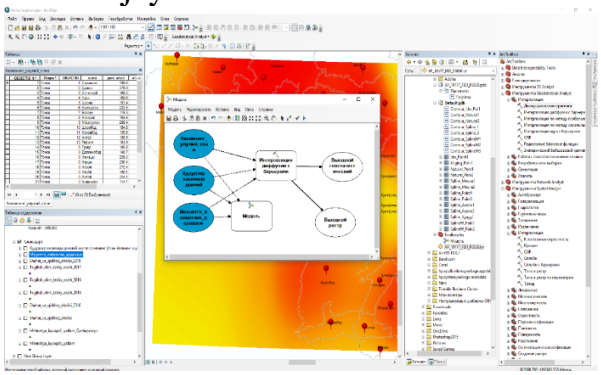
Bundan tashqari **“Geostatistical analyst”** buyrug‘i yordamida aholining harakatlanish oqimini vizuallashtirish va hududlarni shaharlashish jarayonnin kuzatishmiz mumkin (2 va 3-rasmlar).



3-rasm. 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).

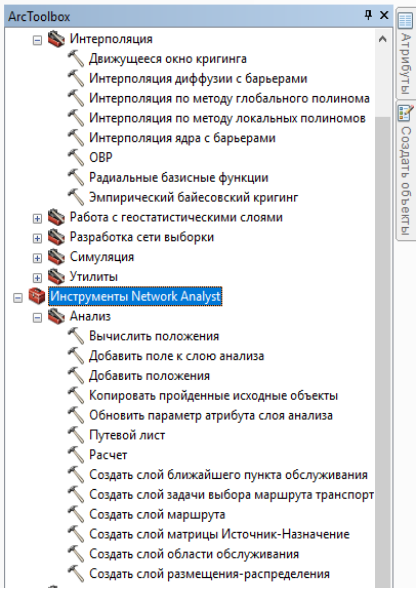
Fazoviy tahlilni amalga oshiruvchi bu instrumentlar o‘zi bajaradigan vazifasidan kelib chiqqan holatda mantiqan bog‘lanadi. Model yaratishda foydalanuvchidan instrumentlarni to‘g‘ri tanlash, sozlash va o‘zaro to‘g‘ri ketma - ketlikda joylashtirish talab etiladi.



4- rasm. ModelBuilder ishchi oynasi.

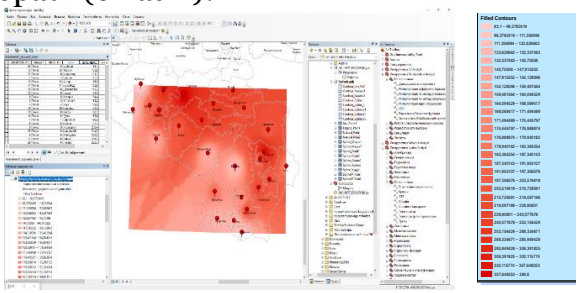
Bu modelni yaratish uchun avval geokodlar yaratiladi OVR instrumenti faollashtiriladi. Keyingi qadamda mavjud geokodlar atributdagi qiymalar tanlanadi hamda belgilangan atribut bo‘yicha topib belgilovchi *Select by Attribute* instrumenti ishga tushiriladi (5-rasm).

Belgilangan obyektlarni yangi qatlamda ifodalash uchun Make Feature Layer instrumenti hamda jadvallar yaratuvchi instrumentlar *Summary Statistics* va *Table To Excel* dan foydalaniladi.



5- rasm. ModelBuilder ishchi oynasida zaruriy instrumentlar

Bu instrumentlarni barchasini Instrumentlar panelidan olib *ModelBuilder* ishchi oynasida joylashtiriladi. Natijada tahlil o‘z ifodasini topadi (6-rasm).



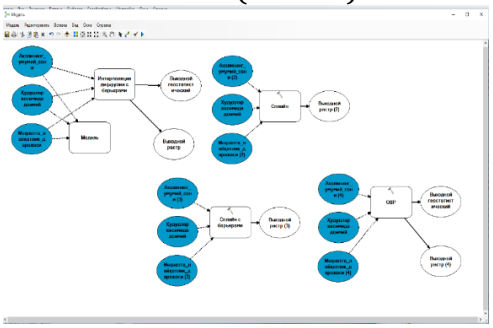
6-rasm. ModelBuilder tahlil natijasi.

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 obyekt va koordinatalar birligi.

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

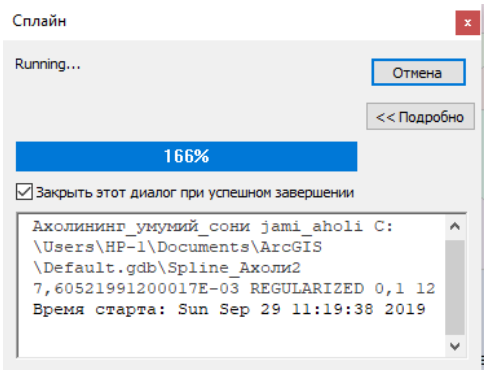
Agar instrument to‘g‘ri sozlanib, ishlashga tayyor holatga kelsa uning rangi o‘zgaradi. Barcha instrumentlar o‘zaro bog‘lanib, ishlashga tayyor holatga kelganida ModelBuilder oynasi quyidagi ko‘rinishda bo‘ladi (7-rasm).



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.

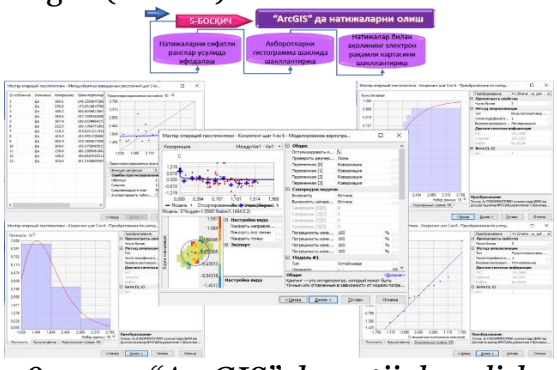
Biz ko‘rib chiqayotgan shartlar bo‘yicha darchada belgilangan shartga ko‘ra, aholi soniga oid qiymatlarni kiritamiz va OK tugmasini bosamiz. Natijada ekranda analiz jarayonlarini ko‘rsatib turuvchi oynacha paydo bo‘ladi (8-rasm). Bu model ishlayotganidan dalolat beradi. Agar tahlil jarayonida biror xatolik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



8-rasm. Modelning ishlash jarayoni

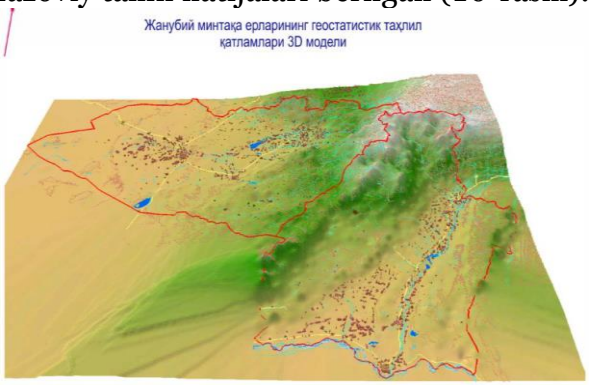
Mazkur jarayonlarni grafik ketma - ketligi quyidagi sxemada keltirilgan. Unda, aholi zichligini fazoviy tahlil qilishda:

- 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

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. Abdurakhmonov, S. Review of methodological issues of application of geographic information systems in service maps and their compilation. 2021 y.
4. 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.
5. Abdurakhmonov, S., Abdurahmanov, I., Murodova, D., Mirjalolov, N., Djurayev, A. Development of demographic mapping method based on gis technologies. 2020 y.

UO‘K:528.9:332.3:004

RAQAMLI TEXNOLOGIYALAR INTEGRATSIYASI ASOSIDA YERDAN FOYDALANUVCHILAR CHEGARALARINI KARTAGA TUSHURISH

S.Abduraxmonov *- “TIQXMMI” Milliy tadqiqot universiteti dotsenti*
Q.Niyozov *- “O‘ZDAVERLOYIHA” davlat ilmiy loyihalash instituti mustaqil tadqiqotchisi*
Sh.Qodirov *- Gidrometeorologiya ilmiy-tadqiqot instituti mustaqil tadqiqotchi*

Annotatsiya. *Mamlakatimiz iqtisodiyotining turli sohalarida, shuningdek, barcha hududlarni raqamli koʻrinishdagi kartaga tushurish, geodezik ishlarni monitoring qilishda, qurilish sohasida zamonaviy innovatsion texnologik dasturlarni, xususan Geoaxborot tizim va texnologiyalar (GAT) dasturini ishlab chiqarish sohasiga toʻgʻri qoʻllashning afzallik tomonlari haqida soʻz boradi. 2020-yilga "Ilm-marifat va raqamli iqtisodiyotni rivojlantirish yili" deb nom berildi. Bu haqda prezidentimiz Oliy Majlis aʼzolariga 2020-yil 24-yanvar kuni yoʻllagan murojaatnomalariga koʻra raqamli iqtisodiyotni rivojlantirish boʻyicha bir qator islohotlar amalga oshirilishi moʻljalangan.*

Kalit soʻzlar. *Xarita, Geoaxborot tizim, aerofotosyomka, ortofotoplanlar, GPS, SASPLANET, geodeziya, kartografiya.*

Аннотация. *В различных сферах экономики нашей страны, а также преимущества цифрового картографирования всех регионов, мониторинга геодезических работ, правильного применения современных инновационных технологических программ в сфере строительства, в частности, Геоинформационной системы и технологий (ГАТ). программа в производственный сектор. 2020 год назван «Годом развития науки и цифровой экономики». Согласно посланию нашего президента членам Олий Мажлиса 24 января 2020 года, запланирован ряд реформ по развитию цифровой экономики.*

Ключевые слова. *Карта, Геоинформационная система, аэрофотосъемка, ортофотопланы, GPS, SASPLANET, геодезия, картография.*

Annotation. *In various spheres of the economy of our country, as well as the advantages of digital mapping of all regions, monitoring of geodetic works, the correct application of modern innovative technological programs in the field of construction, in particular, the Geoinformation System and Technologies (GAT). The program in the manufacturing sector. 2020 is called the "Year of Development of Science and the Digital Economy". According to the message of our president to the members of the Oliy Majlis on January 24, 2020, a number of reforms for the development of the digital economy are planned.*

Keywords. *Map, Geoinformation system, aerial photography, orthophotoplanes, GPS, SASPLANET, geodesy, cartography.*

Kirish. "Raqamli Oʻzbekiston-2030" dasturi doirasidagi faoliyat asosida IT-parklarni tashkil etish, "Elektron hukumat" tizimini yanada takomillashtirish hamda qurilish, energetika, transport, sogʻliqni saqlash, arxiv, taʼlim, geologiya, qishloq va soʻv xoʻjaligi, kadastr sohalarini toʻliq raqamlashtirish koʻzda tutilgan edi.

Maʼmuriy-hududiy birliklar chegaralarini belgilash, yer resurslarini xatlovdan oʻtkazish hamda yaylov va pichanzorlarda geobatanik tadqiqotlarni oʻtkazish tartibini yanada takomillashtirish chora tadbirlari samaradorligini oshirish toʻgʻrisidagi Vazirlar Mahkamasining qarori tasdiqlangan.

Soʻngi yillarda respublikamizda yerardan oqilona va samarali foydalanishni tashkil etish, yer munosabatlarini tartibga solish, yerlardan foydalanishda davlat nazoratini kuchaytirish borasida raqamli texnologiyalarni qoʻllash samarali natijaga erishish mumkin.

Yuqoridagilarni inobatga olib hamda yerlarni muhofaza qilish va ulardan oqilona foydalanish yuzasidan davlat nazoratini kuchaytirish, yer resurslarini aniq hisobini yuritishni tizimli yoʻlga qoʻyish, qishloq xoʻjaligi yerlaridan, jumladan, sugʻoriladigan, lalmi va yaylov

yerlardan foydalanish samaradorligini oshirish maqsadida Vazirlar Mahkamasining 2018-yil 23-aprel, 299-son qarori qabul qilindi.

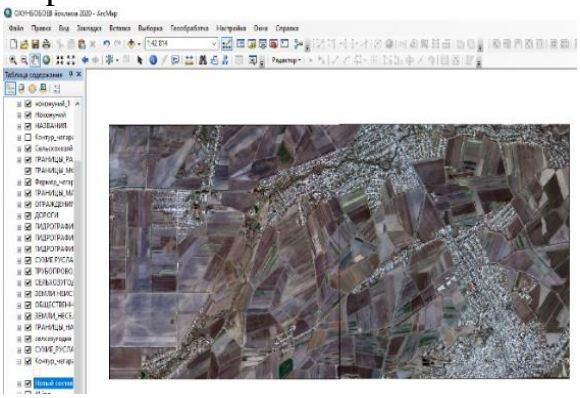
Ushbu qarorda O‘zbekiston Respublikasi Yer resurslari, geodeziya, kartografiya va davlat kadastri davlat qo‘mitasining yerdan foydalanish va uni muhofaza qilishni nazorat qilish bo‘yicha davlat inspektorlari tashkiliy-huquqiy shaklidan qat’iy nazar, yerdan foydalanuvchilar tomonidan ularga ajratib berilgan yerlardan foydalanish holatini (moliyaviy xo‘jalik faoliyatiga aralashmagan holda) muntazam monitoring qilib borish huquqiga ega.

2018-2019-yillarda Koreya davlatining KOMPSAT-3 va KOMPSAT-3A sun’iy yo‘ldoshlari yordamida Respublika xududini to‘liq qoplovchi kosmik suratlar olindi va sug‘oriladigan yerlar va aholi punktlari uchun 1:10 000 masshtabdagi 5 712 ta (100%) va Respublikaning qolgan (tog‘, tog‘oldi va cho‘l) xududlari uchun 1:25 000 masshtabdagi 3 608 ta (100%), jami 9 320 ta ortofotoplanlar yaratildi.

Ko‘chmas mulkni hisobga olish, sug‘oriladigan yerlarni xatlov qilish maqsadida Qashqadaryo, Toshkent, Xorazm viloyatlari va Toshkent shahri hududlarida aerofotosyomka ishlari bajarildi.

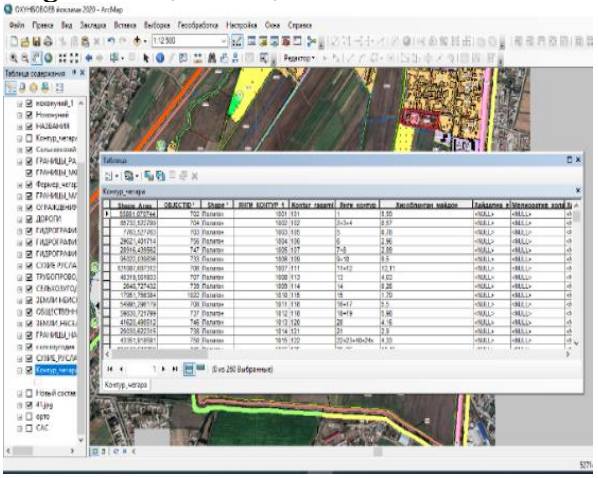
Aerosuratlardan foydalanib 6 724 ta 1:2 000 masshtabdagi va 387 ta 1:10 000 masshtabdagi ortofotoplanlar yaratildi (1-rasm).

Ortofotoplanlarda koordinatalar tizimi judayam katta ahamiyatga ega. Davlat koordinatalar tizimi aniqlangan ma’lumotlariga asosan Gauss-Kryugerning yassi to‘g‘ri burchakli kordinatalarga qayta hisoblab chiqilgan. 1942-yildagi geodezik koordinatalar tizimi, nuqtalarning koordinatalari davlat koordinatalar tizimida qabul qilingan boshlang‘ich nuqtaga nisbatan nuqtaning koordinatasi ortofotoplan – aerokosmik suratlarni fotogrametrik usulda aniq geodezik asosga (koordinata va balandlik bo‘yicha) bog‘lab tayyorlangan fotoplanlardir.



1-rasm. Ortofotoplanlarining nomenklatura asosida joylashuvi

Dala kuzatuv jarayonida tuman (shahar) yer kadastri daftarida ro‘yxatga olinmagan yer uchastkalari aniqlangan holatda, yerdan foydalanuvchilar haqidagi zarur ma’lumotlar (yer ajratish bo‘yicha huquqiy hujjatlar, amalda foydalanilayotgan yer maydoni, maqsadi va yerga egalik qilish huquqi haqidagi normativ hujjatlar va qarorlari to‘g‘risidagi ma’lumotlar) to‘planadi, yerdan foydalanuvchi yoki o‘zining vakili ishtrokida amalda foydalanilayotgan yerning kontur chegaralari kartada belgilanadi (2-rasm).



2-rasm. Yerdan foydalanuvchilarning chegaralari va atributiv ma’lumotlari

Yuqorida aytilganidek yerdan foydalanuvchi chegaralari aniqligini tekshirish uchun joyda GPS orqali o‘lchanib solishtiriladi.

Ortofotoplanlardan olingan natijalarning aniqligi 95% ni tashkil qiladi.

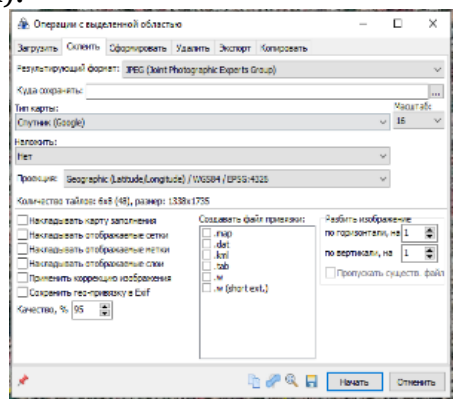
Har bir piksel yacheykalarning ichidagi aniqlik 0.5 m. ga teng bo‘lishi kerak (3-rasm).

Свойство	Значение
Информация о растре	
Столбцы и строки	9190, 8103
Число каналов	3
Размер ячейки (X, Y)	0,5737, 0,5737
Размер без сжатия	213,05 MB
Формат	TIFF
Тип источника	Общий
Тип пиксела	целое число без знака
Глубина пиксела	8 Бит

3-rasm. Ortofotoplanning xususiyatlar

Lekin, ortofotoplanlarni har yilik yoki har oylikni chet eldan ya’ni Korea, Xitoy, Rosiya Federatsiyasidan sotib olish davlat byudjetiga ziyon keltiradi. Shuning uchun yana bir dasturdan SASPLANET dasturidan foydalangan holda yilning har 6 oylik ma’lumotini olish imkonyati mavjud.

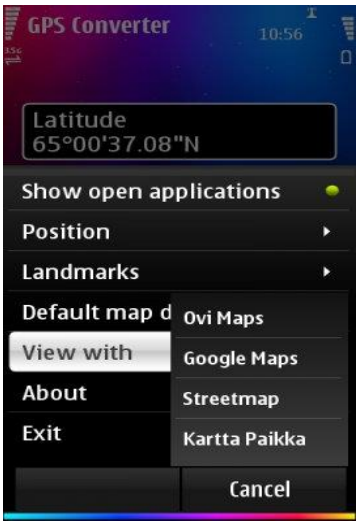
Bunda bizga SASPLANET dasturi yordamida joyning hozirgi vaqtdagi ko‘rinishini olishimiz mumkin. Bu dasturning afzaligi shundaki, yuklab olingan rastr ma’lumotlarnini o‘zining kesh xotirasiga “map, dat, kml, tab, w, w (short ext)” formatlarida yuklab oladi (4-rasm).



4-rasm. SASPlanet dasturida rastrni yuklash

Bizning sohada ya’ni geodeziya kartografiya va kadastr sohalarida mutaxasislariga shu usulda ish yuritish bir qancha afzalik va qulayliklar yaratadi. SASPLANET dasturidan yuklab olayotganda GISS dasturiga to‘g‘ri va yuqori aniqlikda joylashishi uchun biz, proyeksiyalarni va koordinatalarni to‘g‘ri tanlashimiz zarur.

SASPLANET dasturidan olingan rastr ma’lumotlarni joyga to‘g‘ri tushganligini aniqlashimiz uchun GPS qurilmasida o‘lchanayotgan joyni ob-havo sharoiti ochiq va yaxshi bo‘lishi lozim, yer konturlarini GPS qurilmasidan birma bir o‘lchab, ortofotoplanlar orqali tushurilgan chegaralarni atributiv ma’lumotlari bilan solishtirb chiqishimiz maqsadga muvofiq (5-rasm).



5-rasm. GPS qurilmasining menyusi

Yer resurlaridan foydalanishdagi va uni raqamli ko‘rinishga o‘tkazish jarayonida duch kelishimiz mumkin bo‘lgan muammolar qatorida haydalma yerlar chetidagi texnik ishlov berish texnologiyasining noto‘g‘ri qo‘llanilishi oqibatida yuzaga keladigan partov yerlarning fermer balansida ekin ekilgan yer statusida bo‘lishi va buning natijasida qishloq xo‘jaligida foydalanishdan manfaat bo‘lmaganligi asnosida yerdan foydalanuvchi va yer beruvchi davlat idorasi orasida tushunmovchiliklar yuzaga chiqadi. Ushbu masalaning qonun hujjatlarida muqim yechimi ham mavjud emas.

Xulosa

Ushbu maqola orqali fermer chegaralarini o‘zgarmas hududiy obyektlar, ya’ni dala chetidagi o‘q ariqlar, zovurlar, dala va avtomobil yo‘llari hamda turli boshqa o‘zgarmas nuqtali cheklar

asosida belgilash va doimiy nazorat qilish, konturlar qismlarga ajratilgan hollarda esa dala o‘rtasiga mavsumiy (muvaqqat) ariqlarni joylashtirish bilan chegara belgisini o‘rnatish taklif qilindi. Ariqning eni va boshqa o‘lchamlari hudud va konturning obyektiv va subyektiv sharoitlari asosida belgilanadi.

Yuqoridagi ishlar natijasida fermer xo‘jaliklari yoki boshqa qishloq xo‘jaligi tashkilotlari o‘rtasidagi kelishmovchiliklarni bartaraf etishga erishish imkoniyatlari ko‘rib chiqilgan.

Foydalanilgan adabiyotlar ro‘yxati:

1. S. Avezbayev, T. Karabayeva “Yer tuzish” 2005.
2. Abdurakhmonov S, Abdurahmanov I, Murodova D, Pardaboyev A, Mirjalolov N, Djurayev A. Development of demographic mapping method based on gis technologies. InterCarto, InterGIS. 2020;26:319-328. doi:10.35595/2414-9179-2020-1-26-319-328
3. Abdurakhmonov S. The study of regional demographic processes based on geographic information technology and cartographic methods (for example, the southern region of the Republic of Uzbekistan).
4. Jamshid Choriev, Turavoy Muslimov, Ramz Abduraupov, Azat Khalimbetov, Sarvar Abdurakhmonov. Fundamentals of developing and designing portable weirs for farmlands.
5. Sarvar Narzullayevich Abdurakhmonov, Olimjon Allanazarov, Uzbekkhon Burxanovich Mukhtorov, Zoirjon Mirjalalov, Nuriddin Tulkinovich, Abdurakhmonov Integration and Visualization of Information into the Database when Compiling Electronic Digital Demographic Maps.
6. Yer munosabatlarini tartibga solishga doir qonun va me’yoriy hujjatlar to‘plami [I qism], T., 2000. Qosimjon Rahmonov
7. A.N.Inamov, J.O.Lapasov, S.I.Xikmatullayev, Injenerlik geodeziyasi
8. T.X. Boltayev, Q. Raxmonov, O.M. Akbarov. Geoaxborot tizimining ilmiy asoslari.

UO‘K: 528.9:332.3:004

REVIEW OF MAPPING REGIONAL DEMOGRAPHIC PROCESSES USING INNOVATIVE METHODS AND TECHNOLOGIES

S.Abdurakhmonov *– “TIIAME” National Research University, Department of “Geodesy and Geoinformatics”*
E.Safarov *- National University of Uzbekistan*
Sh.Qodirov *- Gidrometeorologiya ilmiy-tadqiqot instituti mustaqil tadqiqotchi*

Annotatsiya. *Hodisalar va ob’yektlarni tavsiflash uchun fan va texnikada statistik, kartografik va sun’iy yo'ldosh materiallari kabi turli xil usullardan foydalanilmoqda. Mintaqalar, demografik jarayonlar va hodisalar to'g'risidagi ma'lumotlarni to'plash va qayta ishlashda zamonaviy GIS texnologiyalarini qo'llash demografik tadqiqotlarda juda talabchan. GIS dasturiy ta'minotining asosiy xususiyati geografik fazoviy ma'lumotlarni birlashtirish va tahlil qilish va xarita yaratishdir. Ushbu tadqiqotda GIS dasturiy ta'minotidan foydalangan holda mintaqalarda demografik ma'lumotlarni tasniflash va yaratish mintaqalardagi demografik jarayonlarni tartibga solishga yordam berganligi aniqlandi.*

Аннотация. *Для описания событий и объектов используются различные типы методов в науке и технике, такие как статистические, картографические и спутниковые*

материалы. Применение современных ГИС-технологий для сбора и обработки данных о регионах, демографических процессах и событиях является весьма востребованным в демографических исследованиях. Основной особенностью программного обеспечения GIS является интеграция и анализ географических пространственных данных, а также создание карты. В ходе этого исследования было установлено, что классификация и создание демографических данных в регионах с использованием программного обеспечения ГИС помогли регулировать демографические процессы в регионах.

Abstract. *Different types of methods in science and technology, such as statistical, cartographic, and satellite materials are being used to describe events and objects. The application of modern GIS technologies in collection and processing of data on regions, demographic processes and events is highly demanding in demographic studies. The main feature of GIS software is to integrate and analyze geographic spatial data, and create map. In this research, it was found that classification and creation of demographic data in regions using GIS software helped to regulate the demographic processes in the regions.*

Introduction

In recent years, enormous research and studies have been conducted in all sciences and fields, and unprecedented results have been achieved. In particular, the development of cartography and geo-informatics as a science, technology and industry is no secret to any specialist [1, 2]. The advent of Geographic Information Systems (GIS) in science has led to the rapid development of the industry with images. The main content of all GIS is an automated cartographic system, a combination of software and computer equipment designed to create and use maps, solve various problems [4, 7]. GIS technologies play very important role in mapping demographic processes using geographic data. An expanded database of cities, towns and villages can be formed when creating digital maps summarizing demographic processes [5, 6]. With the introduction of innovative technologies, statistical information relevant to the population based on new data on the ground can be received online from local officials and integrated with a geo-data database, which allows to constantly monitoring the dynamics of the population. At present, almost all maps are created using GIS technologies, and interdependence and integration of geo-informatics as well as cartography can be easily seen in a mapping process [10, 13]. It is stated that the interrelation of cartography and geo-informatics in demographic map can be seen in the following stages [3]: 1) in GIS programs, linking spatial data to a single coordinate system, and using a large-scale topographic maps; 2) entering remote sensing data and other information (statistical and analytical) used in GIS software into computer memory; 3) Vectorization of data in the form of digital maps to form a component of GIS technology databases; 4) stratification of the thematic structure of spatial objects.

A number of practical tasks related to demographic changes and mapping those ones can be accomplished using GIS software. Furthermore, the application of scientific ideas based on integrated, excellence-based geo-information research in the creation of demographic maps creates opportunities for systematic socio-economic study of the population [8, 9, 11].

Large-scale electronic digital maps are being developed and used in software programs belonging to the GIS family (ArcGIS, QGIS and MapInfo). The study of

demographic processes in regions based on GIS technologies and cartographic methods encompassed the formation and geolocation of databases in mapping, spatial data modeling, integration, improvement of demographic processes and visualization [12-16]. Moreover, modeling of spatial data and geolocation of demographic processes using GIS technologies, development of recommendations for the use of innovative methods and technologies in the creation of demographic maps are the main GIS based step in demographic studies.

Materials and Methods

Karshi city of Uzbekistan was selected as study site in this research. ArcGIS, QGIS, MapInfo programs, questionnaires, regional analysis, and geolocation methods belonging to the family of cartographic, aerospace, statistical, GIS technologies were used in the research process. A systematized structure, Demo GIS [2, 3] consisting seven stages was developed towards analyzing demographic situations in the regions and the creations of their digital maps (Fig. 1). Obviously, the formation of this created Demo GIS and map creation system accelerates work process and increases the quality of maps and data accuracy. Noteworthy, the existing mapping stages, which existed before the development of methods and technologies for creating electronic digital maps, involved very complex processes [5].

In this research, the use of existing paper maps as a basis in the creation of digital and electronic maps of some regions does not give the expected result. Therefore, in order to solve the problem, it is necessary to create a cartographic basis. In this case, remote sensing materials were used to create a cartographic basis. The creation of a new cartographic basis provided for the use of images from the landscape spacecraft [11, 13, 14]. This method was useful in improving the quality and accuracy of the cartographic basis. The formation of fundamentally new stages in the process of preparation and copying of original map using the methods and technologies of digital mapping is directly related to the software belonging to the family of geographic information systems. NDVI was calculated using NDVI = (IQ-Q) / (IQ + Q) the formula [8, 10-12]. In this case, IQ is the infrared spectrum of the image; Q is the red spectrum of the image.

Fig. 1. Demo GIS structure in the creation of demographic maps.

Results and discussion

It was found that remote sensing methods provided good opportunities for monitoring and analysis of demographic processes in the regions, as well as for the creation of maps based on the collected results. In this section, analytical studies using several remote sensing methods was reviewed. It was possible to capture high-resolution and continuous (in months, years) satellite images of regions using Google Earth Pro. The main purpose of this would be to track changes in housing over the years. It provided an opportunity to monitor the expansion or contraction of the area occupied by residential areas due to growth and decline in population, and to increase the accuracy of data in population maps created by regions. Another

advantage of Google Earth Pro was that it could be easily installed and run even on non-highly configured computer. Obtaining a satellite image of the area using Google Earth Pro was done in the following sequence: once Google Earth Pro was launched, there desired area was found on the globe. This was done by searching or searching the map for the location of the area (Fig. 2). The geographic location program from the selected regions automatically found the desired area. From this, a district or city settlement, where scientific research can be found, would be selected.

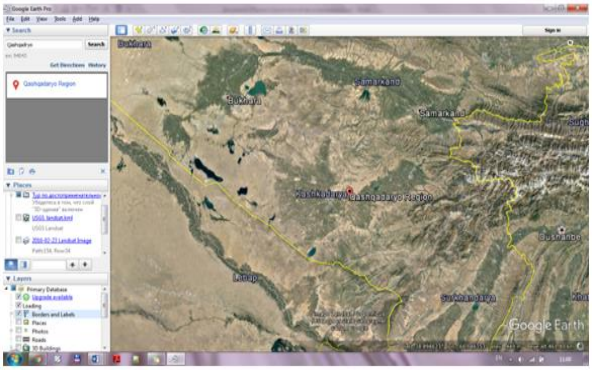


Fig. 2. Search window in Google Earth Pro.

Additionally, images of the area over the years can be seen using the View Historical Images command. By moving the column to the left, images from previous years can be easily seen. The screen save command saves the screen image to the computer's memory (Fig. 3).

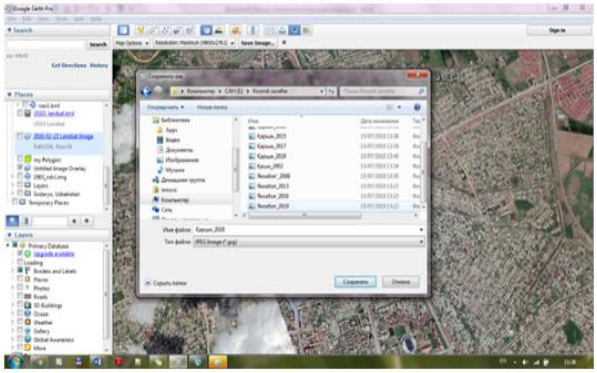


Fig. 3. Saving a spatial image to computer memory.

All possibilities in the processing of remote sensing materials were taken into account. At the local level, monitoring of changes in settlements over the years was also carried out. Remote sensing materials made it possible to analyze changes in local settlements and changes in population and changes in the impact of migration, and it was observed that the location of the population relative to the local relief structure. Spatial images were analyzed and maps of demographic processes in the region were created based on the results obtained (Fig. 4).

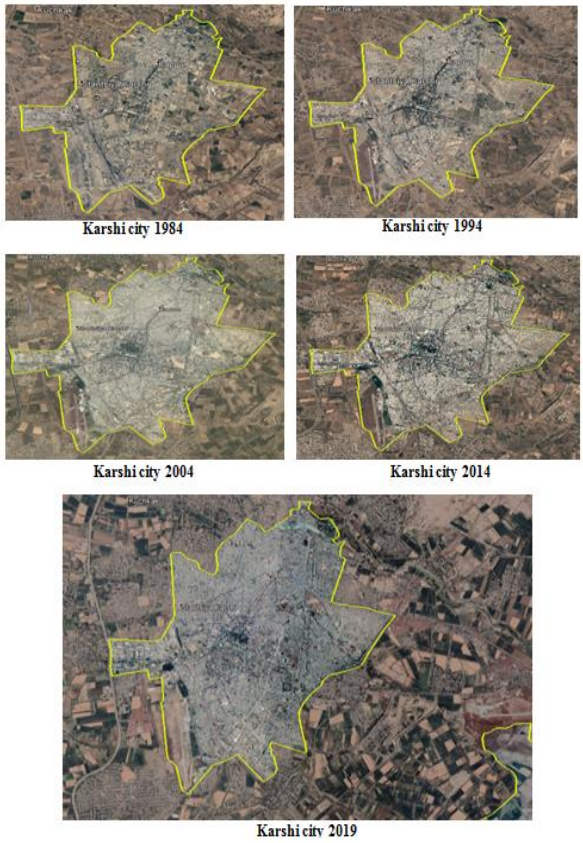
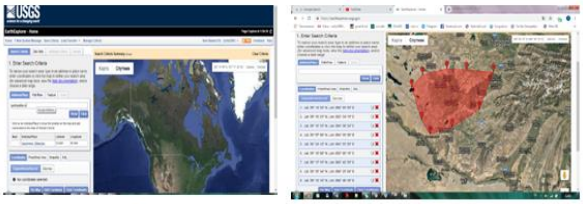


Fig. 4. Change of population settlement in Karshi city during 1984-2019 years.

In order to monitor demographic processes in the field and to compile maps of demographic processes, as well as to increase the accuracy of the data on the maps, analytical work was carried out in the region. For this, satellite images were downloaded through the Earth Explorer geoportal (Figures 5 and 6) and exported to ArcGIS, and NDVI analysis was performed [15].

The time period given in the criteria given is given when the image of the selected area is required (Fig. 7A). Once the desired area is selected, a system of space images in the database is selected.

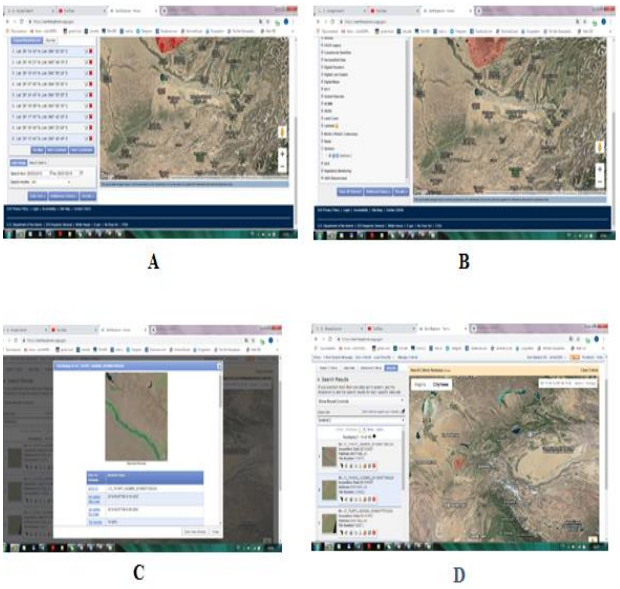
Fig. 5. A visualized 3D model of residential areas in the southern region in 1984-2019.



A B

Fig. 6. A. Download space images via Earth Explorer geoportal, and B. Search window

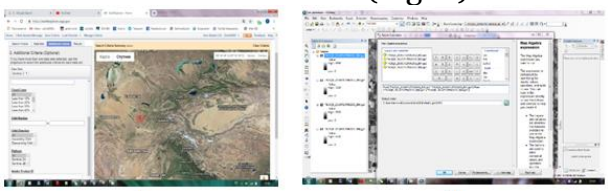
For example, images were taken by Landsat or Sentinel satellites. Multi-spectral images taken on the Landsat satellite had a resolution of 30 meters. One pixel in the photo covers an area of 30 meters by 30 meters. In the space image taken on the Sentinel-2 satellite, the resolution is 10 meters by 10 meters. The image of the Sentinel-2 is selected below (Fig. 7B). The next step will be a series of additional criteria. This row includes the cloud cover of the images, the orbital number, the title of the image, and other indicators (Fig. 7C). The result was then searched and images of the area were displayed (Fig. 7C). Additional information about the spatial image can be obtained through metadata (Fig. 7D). If the image is satisfactory, then a download command is issued. The images were exported to ArcGIS software and analysis work was performed.



A B C D

Fig. 7. A. Selection of a time image of the selected area; B. A satellite image taken on the Sentinel-2 satellite; C. Entering the indicators of the satellite image; and, D. Areas in the spatial image.

Different aspects of dependence on demographic processes in the NDVI analysis were considered. Clearly, the red and infrared spectra of images were used to perform NDVI analysis. Next, the Map Algebra panel was entered into the Spatial Analyst tool through the toolbox and then into the Raster Calculator (Fig. 8).



A B

Fig. 8. A. Adding additional data to the metadata and B. Raster Calculator window

Typically, the value of the results obtained by analysis varies from 1.0 to -1.0. The values corresponding to the population points were observed to be in the range of approximately 0.6 to 0.22. Hence, it has been proved that the observation of changes in periodic time intervals can carry out NDVI analysis in population-related cases and obtain the necessary results on population change (Figures 9 and 10).

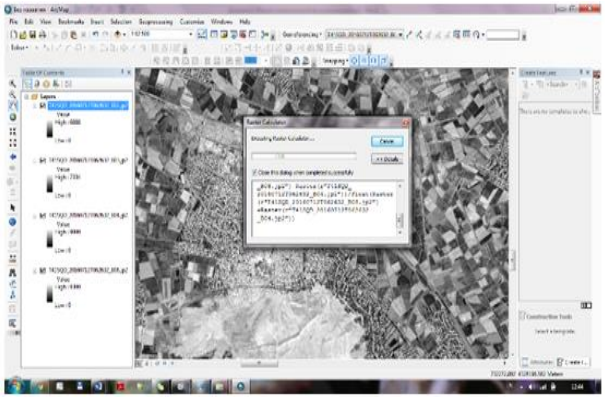


Fig. 9. The process of NDVI analysis.

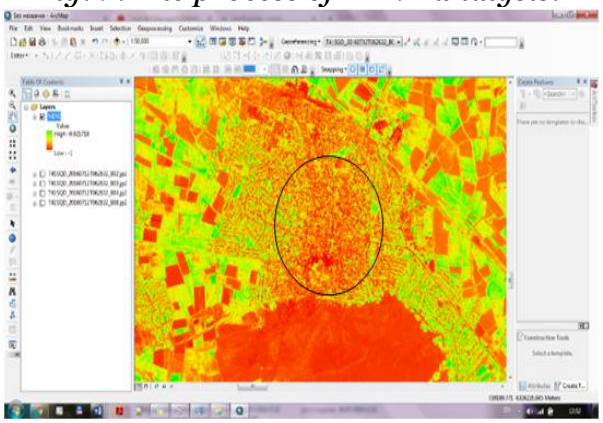


Fig. 10. The result of NDVI analysis.

In the processing of remote sensing materials, the obtained images were initially transformed into a trapezoidal form in the form of a photo scheme, and separate vector layers of common geographical elements were formed. Also, topographic maps were prepared as a basis for compiling the first demographic maps of the southern region [6]. Then the quality and topology of the electronic database of the card were controlled. In the next step, the vector layers * sxf. files extension has been converted to ArcGIS *.shp format. In ArcGIS, general geography, hydrography, settlements, roads, borders, relief, industrial and social objects are formed in separate layers and files. The description of the converted files, the symbols in the ArcGIS environment, and the systems of the described objects have changed somewhat.

The development of the thematic content of the map included the process of forming a general geographical content based on natural objects and complexes, as well as a set of conditional symbols and a legend of the map elements. In the production of thematic symbols, the characteristics of objects and complexes on the subject were taken into account. Many objects cannot be displayed due to the scale of the map. Therefore, non-scale symbols were widely used to describe these objects. Cartographic representation methods, dashed symbols were used to represent some elements of natural content. The advantage of the newly created electronic and digital demographic maps was that it was possible to solve the problem of correcting some errors and omissions in the mapping of the obtained research results, and it did not take much time.

Today, the collection of demographic data, the formation of a database is carried out on the basis of ArcGIS, MapInfo, Panorama, GeoDraw, GeoGraph, Atlas GIS, Win GIS, ArcInfo and other programs [8]. In this research used ArcGIS software from the GIS family, which was met the requirements for solving the problems occurred. Above, the mapping work was carried out based on Demo GIS digital demographic mapping technology developed in the second part of the first chapter of the research work. The new cartographic basis created in the program was interconnected to the results through placing the collected statistical data in a central database using the geolocation method. A population map of the southern region was then constructed using cartographic mapping methods [10].

Conclusions

The creation of maps, plans, and their processing and data integration through the constant replenishment of databases based on GIS technologies was studied. According to the result of the research, the methodology and technology of creating electronic digital demographic maps were developed. Furthermore, it was found that software belonging to the GIS family as well as selected software tools were compatible in exchanging information with other similar programs.

At the local level, monitoring of changes in settlements over the years was also carried out. Remote sensing materials made it possible to analyze changes in local settlements and changes in population and changes in the impact of migration, and it was observed that the location of the population relative to the local relief structure.

References

1. S. Abdurakhmanov, M. Atakov, A. Abdullaev, Bulletin of the state agency of the Republic of Uzbekistan “Yergeodeskadastr", 2, 12-13 (2014)
2. Y. Peng, F. Li, N. Xu, R. Kulmatov, K. Gao, G. Wang, Y. Zhang, Y. Qiao, Y. Li, H. Yang, S. Hao, Q. Li, S. Khasanov, Chinese Journal of Eco-Agriculture, 29(2), 312-324 (2021)
3. R. Kulmatov, A. Taylakov, S. Khasanov, Environmental Science and Pollution Research, 28(10), 12245-12255 (2021)
4. R. A. Kulmatov, S. A. Adilov, S. Khasanov, In IOP Conference Series: Earth and Environmental Science, 614(1), 012149 (2020)
5. N. Teshaev, B. Mamadaliyev, A. Ibragimov, S. Khasanov, InterCarto. InterGIS, 26(3), 324-333 (2020)
6. K. Khakimova, I. Musaev, A. Khamraliev, In E3S Web of Conferences, 227, 02003 (2021)
7. B. Alikhanov, S. Alikhanova, R. Oymatov, Z. Fayzullaev, A. Pulatov, IOP Conference Series: Materials Science and Engineering, 883(1), 012088 (2020)
8. I. Musaev, A. Bokiev, M. Botirova, In E3S Web of Conferences, 227, 05004 (2021)
9. N. Sabitova, O. Ruzikulova, I. Aslanov, In E3S Web of Conferences, 227, 03003 (2021)
10. S. Abdurakhmonov, I. Abdurahmanov, D. Murodova, A. Pardaboyev, N. Mirjalolov, A. Djurayev, InterCarto. InterGIS, 26, 319-328 (2020)
11. Z. Mamatkulov, J. Rashidov, G. Eshchanova, M. Berdiev, Z. Abdurakhmonov, In IOP Conference Series: Earth and Environmental Science, 614(1), 012086 (2020)
12. I. Aslanov, S. Khasanov, Y. Khudaybergenov, M. Groll, Ch. Opp, F. Li, E. Ramirez Del-Valle, In E3S Web of Conferences, 227, 02005 (2021)
13. M. Lehoczky, Z. Abdurakhmonov, In E3S Web of Conferences, 227, 04001 (2021
14. S. N. Abdurakhmonov, Research of regional demographic processes on the basis of Geoinformation technologies and cartographic techniques (in the example of the southern region of the Republic of Uzbekistan), PhD Dissertation (TIIAME), 185 (2020)
15. S. N. Abdurakhmonov, O. Allanazarov, U. Mukhtorov, N. Mirjalalov, Z. Abdurakhmonov, International Journal of Innovative Technology and Exploring Engineering (IJITEE), 9, 430-435 (2020)
16. A. Jumanov, S. Khasanov, A. Tabayev, G. Goziev, U. Uzbekov, E. Malikov, In IOP Conference Series: Earth and Environmental Science, 614(1), 012150 (2020)

UDK 528.482:69.032.2(575.1)

O‘ZBEKISTONDA SHAROITIDA KO‘P QATLI BINOLARNI DEFORMATSIYANI ANIQLASH USULINING QO‘LLANISHI

A.R.Valiyeva *- “TIQXMMI” Milliy tadqiqot universiteti assistenti*

Annotatsiya: *Deformatsiya jarayonlarining tabiati, shuningdek, deformatsiyaning u yoki bu turini keltirib chiqaradigan hodisalar yetarlicha yuqori*