Digital Land Cadastre Information System in Azerbaijan

Farid JAFAROV and Elshad KHANALIBAYLI, Azerbaijan

Key words: Digital Cadastre, e-Governance, Land management, Spatial planning, Azerbaijan.

Summary: Azerbaijan used to be a part of the Soviet Union 71 years (1920-1991). Once re-gained a state independence in 1991, the Republic of Azerbaijan started the economic and social reforms. The Land Reform became one of the first reforms launched in Azerbaijan. The state monopoly over the land had ended. The three types of ownership had been defined: state, municipal and private. The arable state land plots distributed among farmers free of charge.
The socio-political life, the loss of a great amount of workplaces in the country in early 1990's required the creation of new workplaces in a short time. This is why the distribution of land plots among citizens would have finished over a short period of time. Because of the fact that the implementation of the Land Reform was provided hurriedly and based on inaccurate Soviet maps, the cadastre maps after the Reform and land registration documents did not reflect the reality.
Starting from 2010, Azerbaijan managed to improve the land cadastre and registration through its State Committee on Property Issues. In this regard, we started studying the best international practice, involving new relevant equipment and applying modern technologies, and – in the end – achieved the creation of the Digital Land Cadastre Information System by collecting, processing and governing the cadastre information on the same platform. The system covers all the land plots of the country but 20% of the Azerbaijani territory occupied by Armenia. This system is successfully used right now.

Азербайджан был частью Советского Союзав в течение 71 год (1920-1991). После восстановления государственной независимости в 1991 году Азербайджанская Республика начала экономические и социальные реформы. Земельная реформа стала одной из первых реформ, начатых в Азербайджане. Государственная монополия на землю прекратилась. Были определены три типа собственности: государственная, муниципальная и частная. Пахотные государственные земельные участки распределяются среди фермеров бесплатно. Общественно-политическая жизнь, потеря большого количества рабочих мест в стране в начале 1990-х годов потребовали создания новых рабочих мест в короткие сроки. Вот почему распределение земельных участков среди граждан закончилось бы за короткий период времени. В связи с тем, что земельная реформа осуществлялась поспешно и на основе неточных советских карт, кадастровые карты после реформы и документы о регистрации земли не отражали реальность.
Начиная с 2010 года, Азербайджану удалось усовершенствовать земельный кадастр и регистрацию прав собственности через свой Государственный комитет имущественных

вопросов. В связи с этим мы начали изучать лучшую международную практику, используя новое соответствующее оборудование и применять современные технологии, и, в конечном итоге, добились создания Информационной системы цифрового земельного кадастра путем сбора, обработки и управления кадастровой информацией на той же платформе. Эта система охватывает все земельные участки страны, исключая 20% территории Азербайджана, оккупированной Арменией. Эта система успешно используется сейчас.

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During the Soviet times, only one type of ownership existed in Azerbaijan. This was the state ownership. After re-gaining the independence, reforms were held in all fields of economy in the Republic of Azerbaijan. Starting from 1993, one of the reforms, held in the Republic was the privatization of apartments, individual houses, cottages that are the parts of real estate, by the previous Technical Inventory Bodies.

Privatization of state property had been conducted by the State Committee on Management of State Property since 1996. Land reform was implemented during 1997-2001.

So, there are now 3 types of ownership forms in the Republic of Azerbaijan: 57% of land belongs to the state, 23% belong to the municipalities, and 20% to the private ownership. Reforms in this field are still continued.

Distribution of land fund of Azerbaijan by categories is as follows:

– Agricultural lands
– Lands of residential areas
– Industrial, transport, communication, defense and other special lands
– Lands of special protection nature areas
– Lands of the forest fund
– Lands of the water fund
– Lands of the reserve fund
– Territories occupied by Armenia

The performance of Electronic Land Cadaster Works in Azerbaijan is as reflected in the following table:

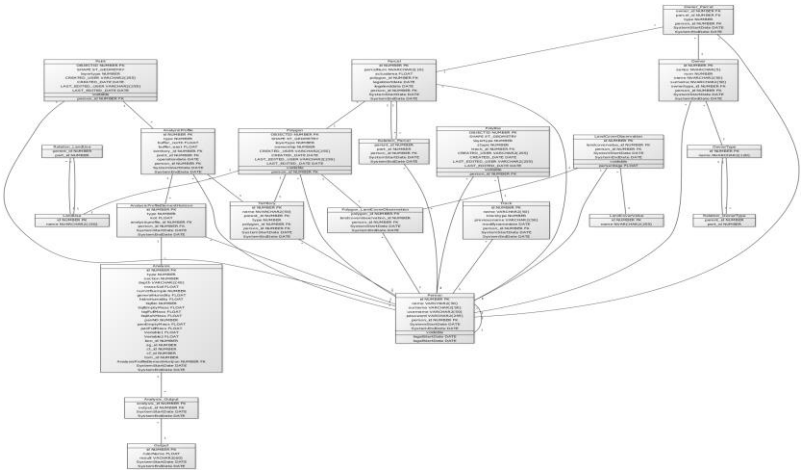
No.	Work name	Execution situation	Area, ha
1	Making perfect cadaster of Baku	Implemented	212,515
2	Making perfect cadaster of Sumgayit	Implemented	12,200
3	Making perfect cadaster of Sheki	Implemented	230,000
4	Making perfect cadaster of Ganja	Implemented	12,500
5	Making perfect cadaster of 53 district centers and the settlements adjacent to it	Implemented	130,000

6	Scanning the maps of winter and summer pastures, forest areas in the country, placing on the digital map of the country with coordinates	Implemented	2,524,670
7	Nakhchivan Autonomous Republic	The execution is carried out by the relevant body of Nakhchivan	564,250
8	Occupied territories and frontier lands (17% of the total area)	Execution is temporarily unavailable	1,469,340
9	Establishment of a perfect cadastre in the digitalized areas of ortophotomaterial, including:	Establishment of Electronic Land Cadastre Information System has been begun and the work will be completed by complication of municipal maps in 2020.	3,500,000
	a) implementation of cadaster works in share lands, elimination of discrepancies		1,300,000
	b) implementation of land record, establishment electronic cadastral database, preparation of digital cadastral map of area		1,860,000
	c) implementation of cadaster record works in rural settlements, establishment of electronic cadastral database, compiling digital cadaster map		340,000
Total territory of the Republic of Azerbaijan			8,655,481

Development goals of real estate cadastre activities in Azerbaijan

– To apply modern international standards, advanced techniques and technologies to cadastral production of Azerbaijan;
– To develop real estate unified electronic cadastral database and produce real estate digital cadastral maps in Azerbaijan that meets European standards;
– To provide high-quality electronic cadastre service to customers;
– To eliminate monopoly from time to time in the field of cadastral surveying, and to form modern private surveyors institution.

Cadastre data model for cadastral works in Azerbaijan for the first time Developed within the “Real Estate Registration” Project in 2011years is reflected in the below picture:



AZPOS (CORS) Network for Azerbaijan System Overview

For geodesy and cadastral works

Azerbaijan Positioning Observation System (AZPOS) is 37 Continuously Operating Reference Stations (CORS) network in different regions of Azerbaijan. 37 Continuously Operating Reference Stations, enabling point positioning in real time with an accuracy of ±2 cm horizontally and ±4 cm vertically at the entire territory of the Republic (excluding Nakhchivan and Mountainous Autonomous Garabagh), continuously receive GPS/NAVSTAR and GLONASS satellite signals. The system maintains service flexibility based on both real time kinematics (RTC) and Differential Global Navigation Satellite System (DGNSS) operations. RTC operations have more distance availability rather than DGNSS operations. Both operations require reliable internet coverage. CORS operate continuously 7 days/24 hours.

AZPOS will provide the following benefits: Access to comprehensive geospatial reference systems; high productivity and operation availability in common system; Real-time 3D positioning, RTC in cm level and DGNSS (Differential Global Navigation Satellite System) in meter level operations;

All surveying works in the Republic will be carried out in the same system and format. Map and cadastral works, engineer surveying, underground communication works, planning works etc. will be carried out rapidly and with reduced costs by means of the system.

AZPOS-Network Design

AZPOS stations have been installed above the administrative buildings of government which are available for security and easier service in 30-40 km distance from each other. Base stations antennas have been fixed by means benchmark made of high quality material.

The Management Centre has been provided with software which controls the activities of the stations, as well as able to maintain data management, data corrected in real time adjustments and calculations.

The Control Centre is monitoring the data received from 50 reference stations in the Republic territory and provides 100 parallel users with RTK services, meantime 25 parallel users with Web services.

Orthophoto maps produced in Azerbaijan

The main purpose for the development of new ortophoto maps is the development of varius scaled new ortophoto maps for registration and cadastre of land parcels and other real estate objects. Ortophoto plans developed on the basis of the aerial imagery are of 1:1000 scale in urban and regional areas and 1:5000 scale in rural and municipal areas.

1:10000 scaled ortophoto maps developed on the basis of satellite imagery cover the mountaneous areas, territories located around the republic boundaries and summer-winter pastures, conservation areas as well.

Areas	Scale of aero flights	Scale of Orthophoto maps	Areas covered by produced orthophotos
Urban areas	1:8000	1:2000	5100.99 sq.km
Rural areas	1:20000	1:5000	42840 sq.km
Mountainous and borderline areas	Satellite images	1:10000	19120 sq.km

Compilation of Digital maps through the use of Photogrammetry.

At present, the basis of accounting works is digital graphics vectorized from stereo images. This digital vector data is downloaded to IPAD in accordance with the actual situation in GIS programs. Data is collected from the site.

Research and systematization of archive documents

The 300 dpi was scanned with sensitivity and was georeferens in the WGS-84 (zone 38-39) coordinate system in the UTM projection. Project structure that reflects the results of land reform materials Gauss Kruger's to the coordinate system WGS-84 (zone 38-39) in the UTM projection of Pulkovo 1942 (zona 8-9) coordinate system.

This map of the area properties of materials, relief structure, settlements, as well as plant and facilities located in the area of roads, underground and surface communications infrastructure, water containers and forested areas reflects the invaluable information.

The list of property owners who have received a share of the Land Reform program where written in FoxPro text-DOS system transformation of Latin fonts/ "Unicode" systems

Cadastral data collection mechanism

As part of the data have been kept in the papers so far, they are referred in the archive materials, boundaries are defined in the field with modern geodetic equipment, and cadastral date are collected from the field in accordance with existing data model.

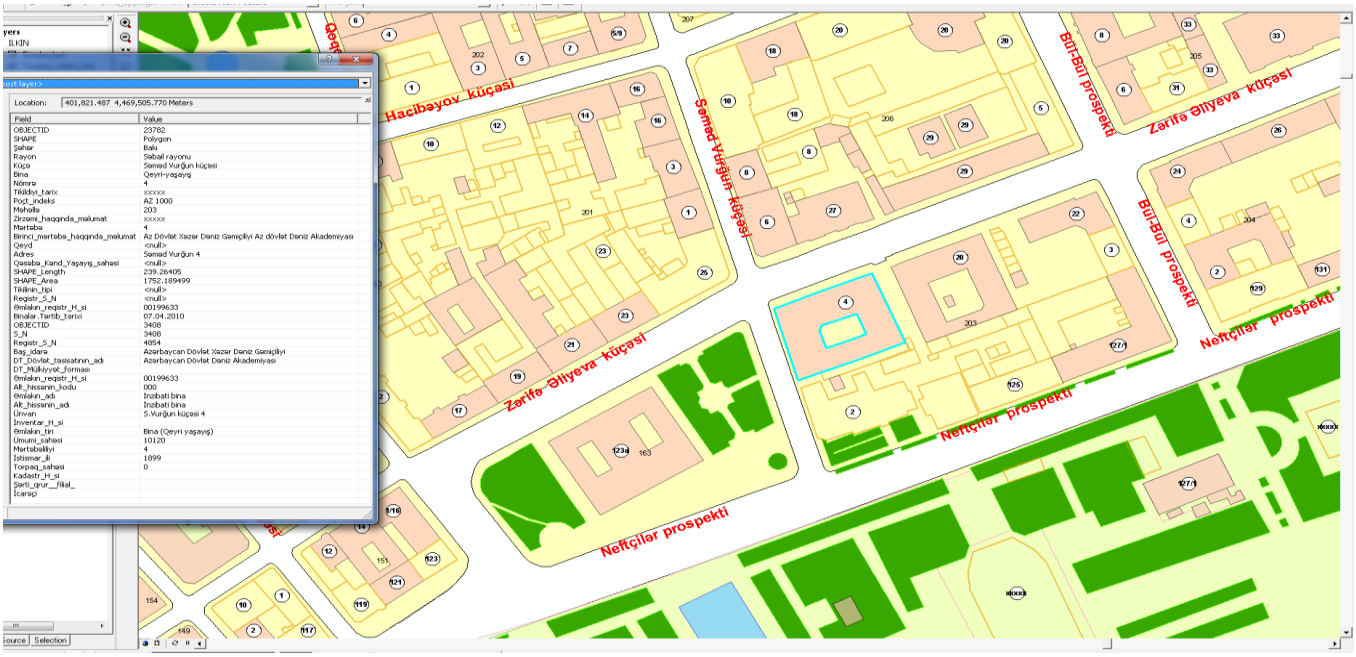
Activities and Aims for the Land Registrations / Cadastre Project

Mass cadastral works are implemented under the projects. This is executed mainly on the following directions:

– Capturing of ownership and boundary-data „on-site“
– Complete and systematic surveying and registration
– Simplification of registration process
– Data base for legal registration of ownership and for municipal and state land management
– Involvement of property owners in areas (fields)
– Public awareness and information campaign
– Public presentation of surveying results

Description of registered land parcels in digital cadastre map

So, a comprehensive cadastral database is established on the basis of the accurate measurements obtained from the GPS navigation systems. The database entails the main indicators like geometry, area, type of use, assignment, type of ownership of a land parcel.



Electronic Land Cadastre is developed and conducted on the base of modern geoinformation (GIS) technologies, by using the latest scientific and technological achievements.

Real estate cadastre is conducted on the graphic line (topographic maps, plans, ortophoto plans and etc.). At present, the applied technology is one of the widely used methods in world experience. Base data of real estate cadastre are connected to the address accordingly in the digital maps or plan in this system.

Cadastre data, on land parcels, given to ownership during the land reform, as well as, used and rented, are managed within the administrative boundaries of the regions of the Republic. Main strucutre of cadastre plans is compiling the topographic plans of areas, that it is considered for the ownership, rent and other operations by measuring in the field.

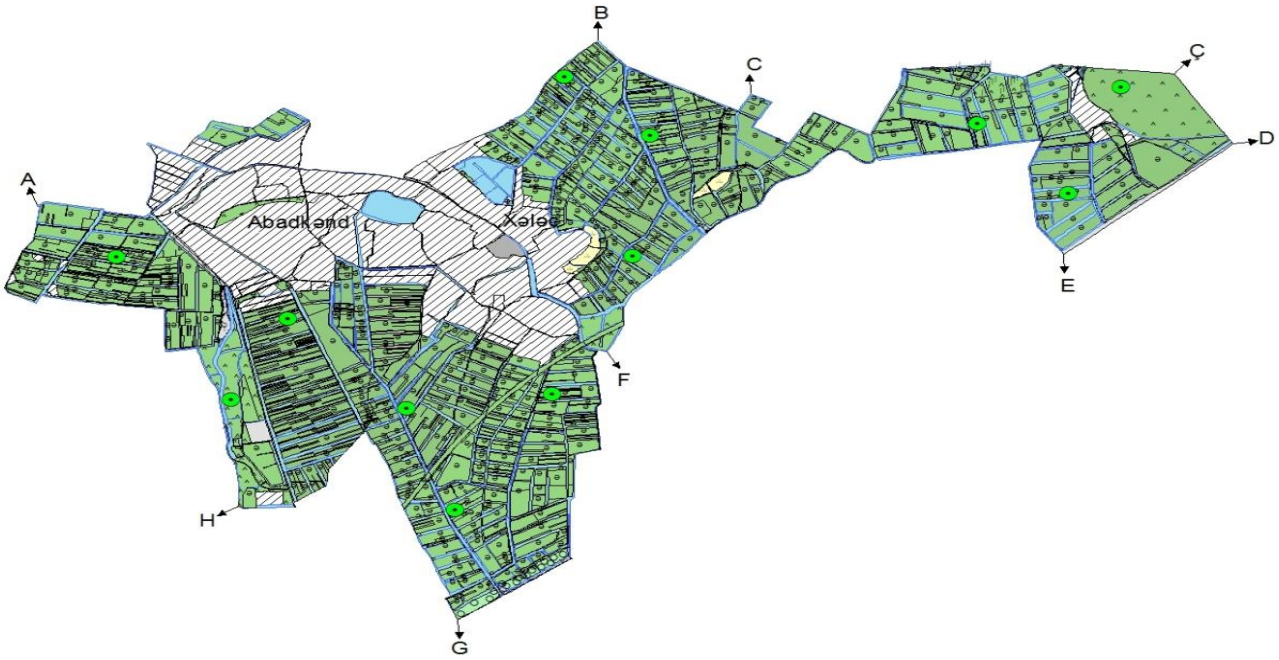
The software, meeting the modern requirements, was developed for compiling real estate cadastre, database was founded in GIS environment and data on each property (parcel) is included in its attribute.

Land Electronic Cadastral Information System

The presentation explains the workflow in development of the Information System of E-Cadastre Registration of Lands, shows the results and analyses of the land registration. The presentation also contains some proposals on the prospect of usage of land resources in Azerbaijan based on the qualitative and quantitative indices of lands.

Soil Map

Khalaj administrative territory of Salyan region Fragment of the map of soil - based on soil analysis results, it is determined which type of soil, For exsample Gray-grass and Open gray-grass tipe of lands.

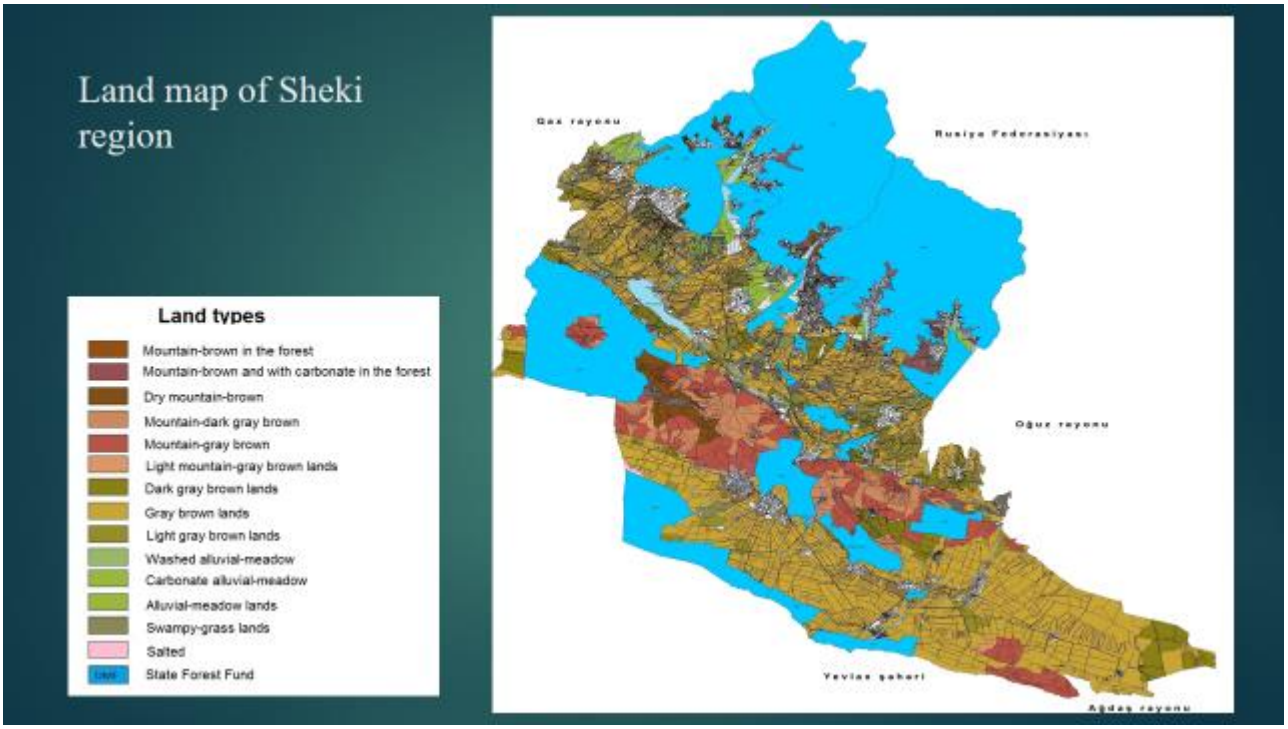


Salinization map

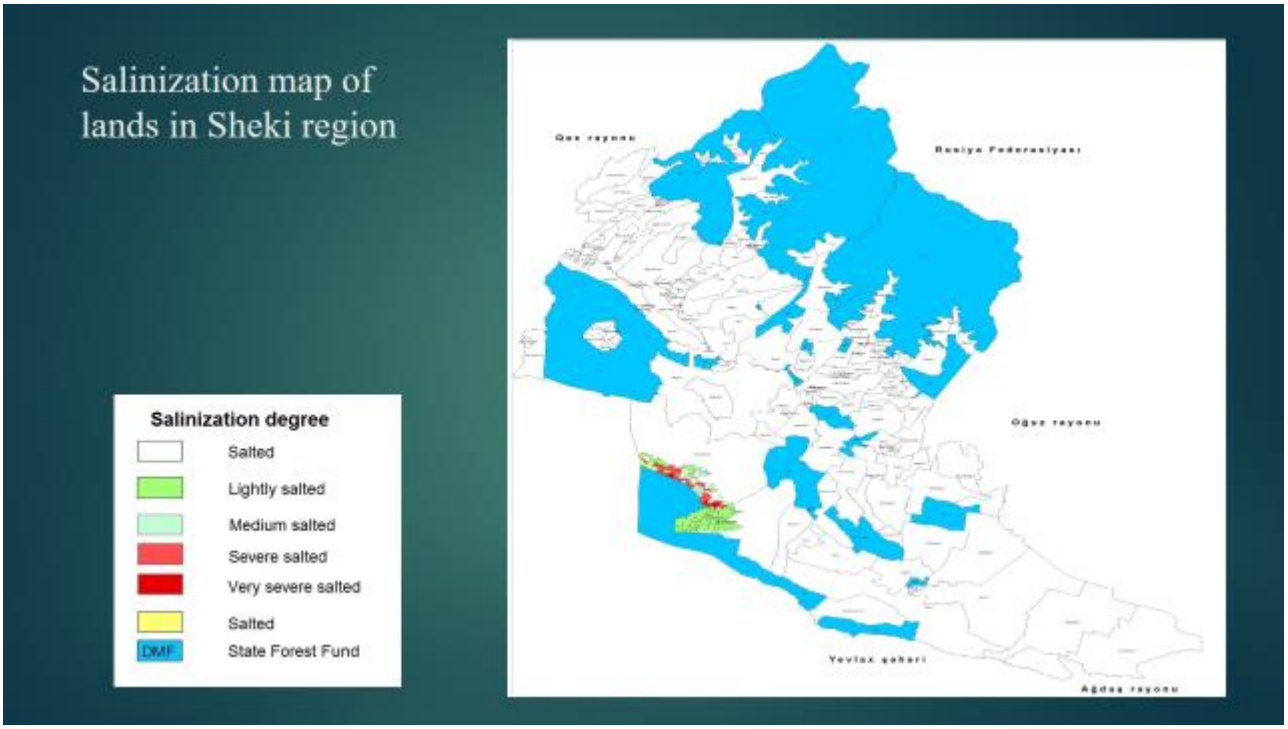
Type of salinization:

– Unsalted land
– Slightly saline soils
– Middle saline soils
– Severe saline soils

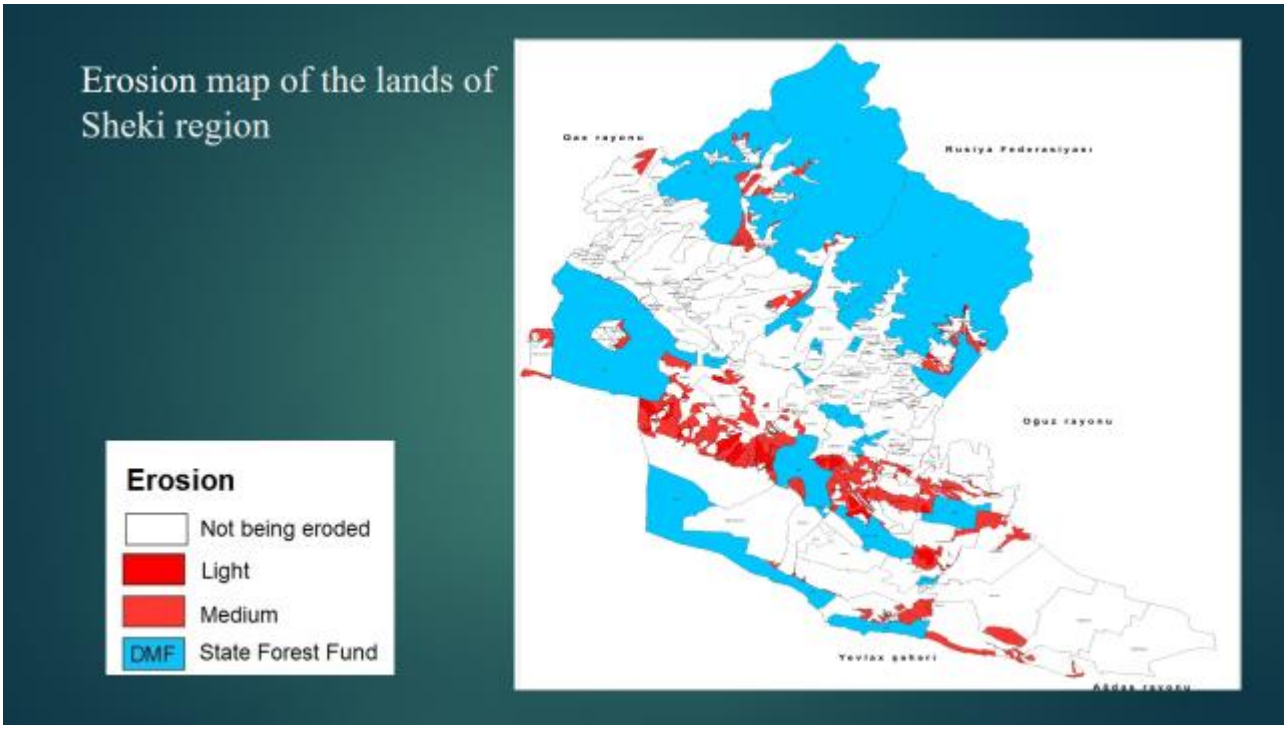
Land map of Sheki region



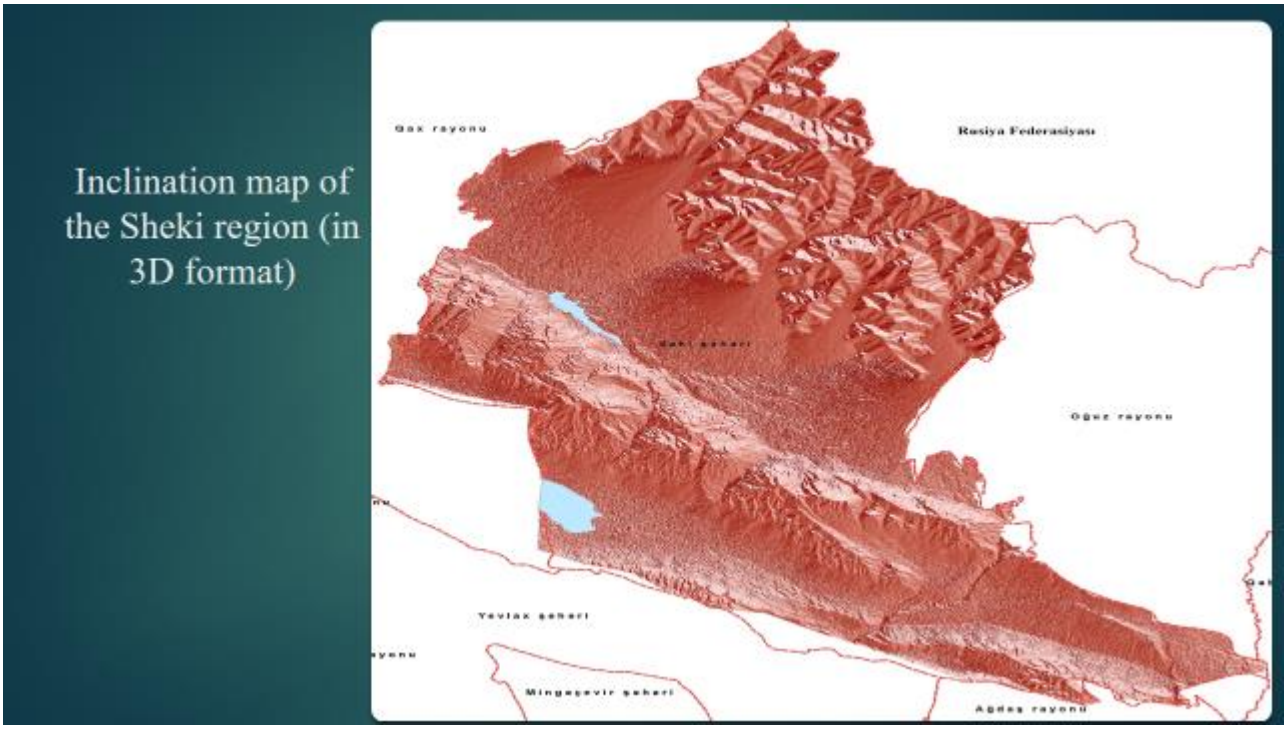
Salinization degree


Salinization map of lands in Sheki region
Salinization degree
Salted
Lightly salted
Medium salted
Severe salted
Very severe salted
Salted
DMF
State Forest Fund
Qax rayonu
Rusiya Federasiyası
Oğuz rayonu
Yevlax şəhəri
Ağdaş rayonu

Erosion map



3D/ Inclination



As a result of establishment of electronic cadaster information system and compilation of digital cadaster maps:

– Compiling the maps reflecting the reality over the Republic will be achieved;
– State regulation of land resources management, property relations regulation will improve, state control over property (land) will be more flexible;
– Discrepancies between spatial indicators and actual positioning status in land reform documents will be eliminated;
– Solving problems with cadastral maps will provide a reliable condition for eliminating numerous land disputes;
– Determination of lands in the Republic will achieve to accurate cadaster record over type of land use;
– A reliable database will be established for making of necessary projects related to the preparation and implementation of complex measures related to land fertility enhancement and protection;

CONTACTS

Farid Jafarov and Elshad Khanalibayli
The State Committee on Property Issues of the Republic of Azerbaijan

50 Yusif Safarov Str.
Baku
AZERBAIJAN
Tel.: +99450 2354448
Email: ekhanalibayli@mail.ru
www.emdk.gov.az