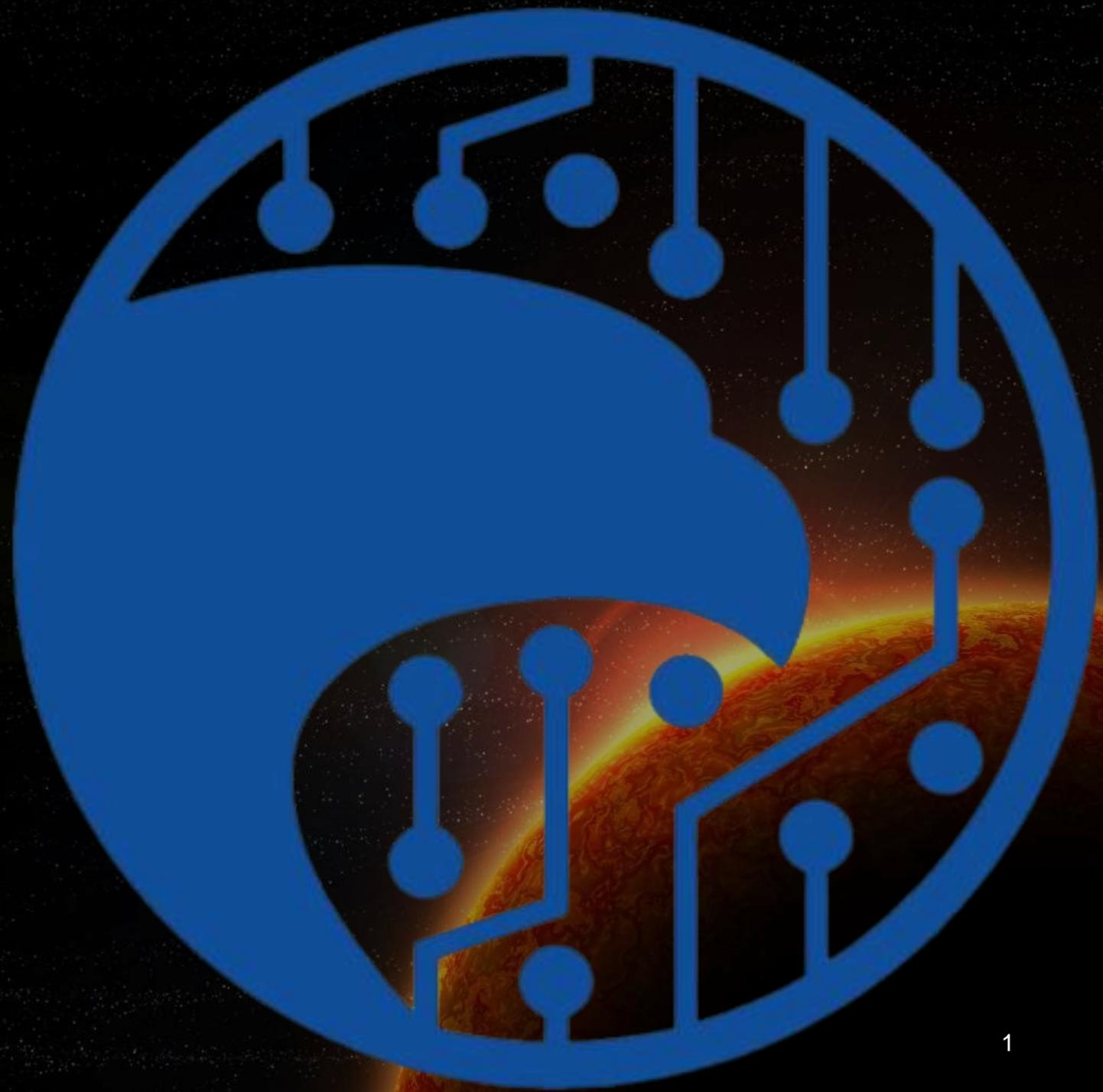




MINISTRY OF DIGITAL DEVELOPMENT,
INNOVATIONS AND AEROSPACE
INDUSTRY OF THE REPUBLIC OF
KAZAKHSTAN

On the development of the space industry of the Republic of Kazakhstan

Vienna, 2023



DEVELOPMENT STRATEGY



The mission is to carry out space activities that contribute to economic growth and improve the quality of life of the population of the Republic of Kazakhstan



We are striving to develop our own advanced space technologies for the creation and launch space systems, for development scientific and production capabilities in relevant industries. In perspective we are planning to attend in International missions to the planets in the Solar system



The vision is a state with a developed space infrastructure capable of turning the possibilities of space activities for the benefit of the population of the Republic of Kazakhstan

DIRECTIONS OF DEVELOPMENT



Support of R&D activities, development of human resources;



JSC «National Center Of Space Research And Technology»



LLP «Institute of Ionosphere»



Production of space equipment and technologies;



LLP «Fesenkov Astrophysical Institute»



LLP «Ghalam»



Development of the remote sensing space system and services based on it;



JSC «National Company «Kazakhstan Gharysh Sapary»



Development of the space communication system and services based on it;



JSC «Republican Center for Space Communications»



Development of the potential of the Baikonur complex, ensuring the safety and effective use of property;



RSE «INFRAKOS»



RSI «Baikonyrbalance»



JSC «Kazakh-Russian Joint Venture «Baiterek»



Development of international cooperation.

SCIENTIFIC RESEARCH IN THE FIELD OF SPACE ACTIVITIES



TECHNOLOGIES FOR MONITORING OBJECTS OF FAR AND NEAR SPACE

- ✓ Software complexes;
- ✓ Optical systems;
- ✓ Telescopes.



TECHNOLOGIES FOR SPACECRAFT

- ✓ On-board control system;
- ✓ Power supply system;
- ✓ Earth Station;
- ✓ Software.



MULTI-LEVEL COMPLEX FOR KEY SPACE WEATHER PARAMETERS MEASUREMENTS

- ✓ Measurements of the solar radio spectra of the Sun
- ✓ Ground-based neutron monitoring

TECHNOLOGIES FOR MONITORING OBJECTS OF FAR AND NEAR SPACE

On current situation in developing of National Space Situational Awareness (SSA) at Academician Omarov Assy-Turgen Observatory FAI.

Deploy the system for near-Earth survey and awareness for safety of Kazakhstan satellites, space debris and hazardous asteroid monitoring.

2024 : 6 telescopes, optical systems, complex of program

Project overview

SSA and analysis of NEO data

<ul style="list-style-type: none">• Survey of satellites• Near-miss events prediction and monitoring	<ul style="list-style-type: none">• Deploy new instruments• LEO observations• Implement ML and NN capabilities	<ul style="list-style-type: none">• Integration into world-wide SSA platforms• Systematic near-Earth surveys• Provide information on NEO to users and key partners
2021-2023	2022-2024	2023-2025



Exterior view of the pavilion (left) and the Wide Angle Optical System installed in it (right)

By 2025 it reaches 15 telescopes

TECHNOLOGIES FOR SPACECRAFT

- Platform 100 kg
- Ground based segment based on SDR technologies



- Optical pay load BDL imager and technology of resolution enhancement during the post-processing
- Onboard computer OBC ARM Gen1

- Technology for creating spacecraft communication earth stations
- Onboard satellite control complex

- Software and mathematics for high-precision of spacecraft motion
- Satellite energy saving system



KAZAKHSTAN MULTI-LEVEL COMPLEX FOR KEY SPACE WEATHER PARAMETERS MEASUREMENTS

Neutron Monitor 18 NM-64 at high mountain cosmic ray station (3340 m a.s.l.) (www.nmdb.eu)
Geomagnetic observatory «Alma-Ata» (1300 m a.s.l.)



Measurements of the solar radio spectra of the Sun from the CALLISTO spectrometer at Almaty and the solar radio emission flux density at frequencies of 1.08 GHz and 2.8 GHz (2700 m a.s.l.) All measurements are included in a common information system that displays real-time measurements with high resolution.

Developed:

- ✓ A prototype system for generating an alert signal about the beginning of a large proton enhancement in solar cosmic rays on Earth to warn about radiation hazards in spacecraft orbits
- ✓ A disturbance index for the state of near-Earth space



SPACE COMMUNICATION SYSTEM

Meeting the needs of 2 satellite communication channels : KazSat-2 (2011-2026), KazSat-3 (2014-2029)

KazSat-3

KazSat-2

Realized

- ✓ Economic incentive for Non-GSO systems to enter the Kazakhstan market (acceptable tax rates)
- ✓ Coverage of communication services in 176 remote villages using «KazSat»
- ✓ Test connection of rural schools to high-speed internet using Starlink technologies

PLANS

- Satellite communication system based on a spacecraft with hybrid payload
- Coverage of communication services in 504 remote villages using «KazSat» and NGSO systems
- 2000 schools will be connected to high-speed Internet using Starlink technology

Position 58.5° longitude

«KazSat-3R_HTS»

972 MGts

Ku-Band satellite capacity

Ku

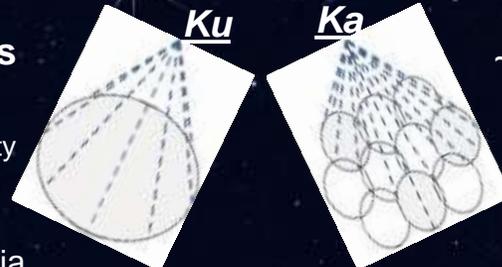
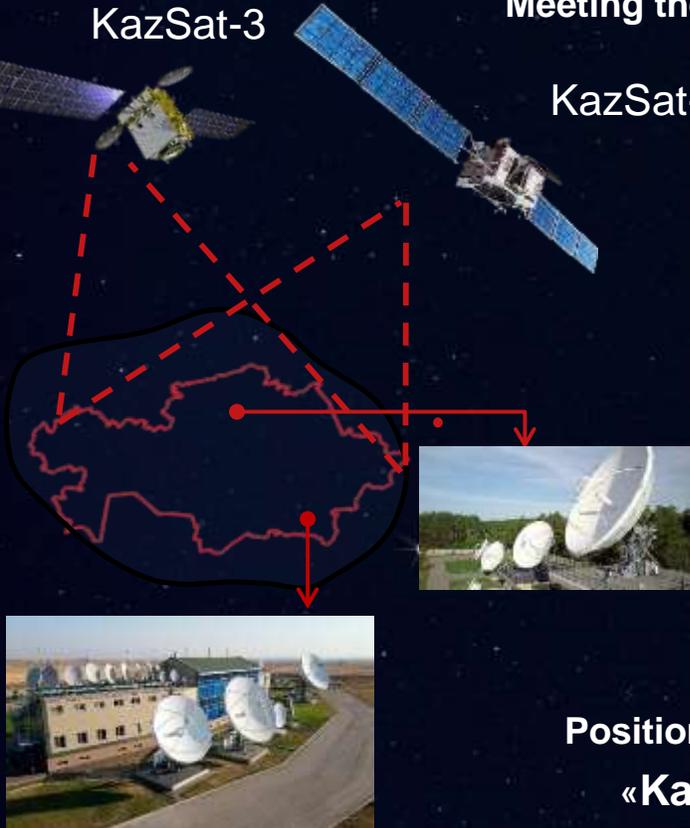
Ka

~ 7 Gb/s

Ka-Band capacity (HTS)

Service area:

Territory of Kazakhstan and Central Asia



SPACE MONITORING



CROP MONITORING

COVERED: 22 million hectares
100% of the RoK cropland



FOREST MONITORING

COVERED: 18,6 million hectares
100% of the forest fund of the RoK



WATER RESOURCES MONITORING

COVERED: 3 million hectares



RANGELAND MONITORING

COVERED: 207 million hectares
100% of the pasture lands of the RoK



MONITORING OF LAND USE

COVERED: 100% of the territory of the RoK



WASTE MONITORING

COVERED: 33 million hectares, 23 cities



MONITORING OF EMERGENCY SITUATIONS

COVERED: 272 million hectares
100% of the territory of the RoK



SUBSOIL USE MONITORING

COVERED: 3,6 million hectares

Space monitoring of land management

The geodatabase of JSC "NC" "Kazakhstan Gharysh Sapary"



Satellite images of the current and previous year

Availability of crops:

залежь

Cadastral number:

__***-321

Land user:

KX «****»

Land category:

Agriculture

Land: arable land

Status: **not in use**

Availability of crops :

посев

Cadastral number :

__***-789

Land user:

KX «****»

Land category:

Agriculture

Land: arable land

Status: **in use**



Cadastral data of various land for their intended purpose

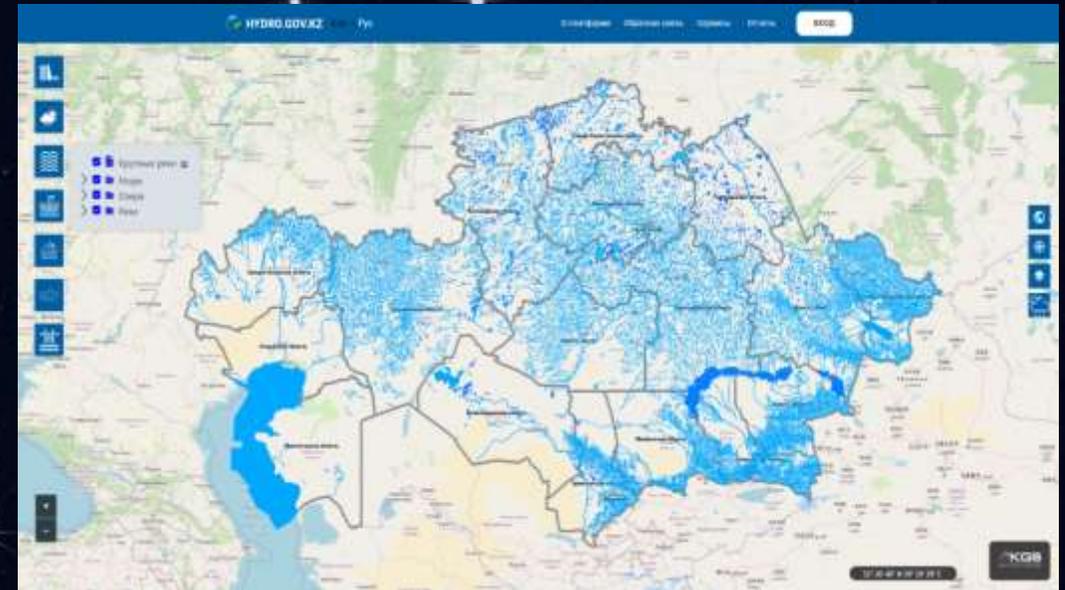
Space monitoring of water consumption

Assessment based on remote sensing data

- Classification of 10 agricultural crops (Zhambyl region, 12 crops)
- Productivity Water consumption up to field level
- Water productivity Evaporation, filtration, etc.

Calculation of water consumption by crop type

Culture types Water consumption, M³/ha



Functional

Modules:

Mapping Water user reporting

Water supply processes

Processes for the formation of legal acts



GEOSPATIAL PLATFORMS

«MINERALS.GOV.KZ»: Unified platform of subsoil users

Registration

View interactive map

Submission of an application

Consideration by the authorized state body

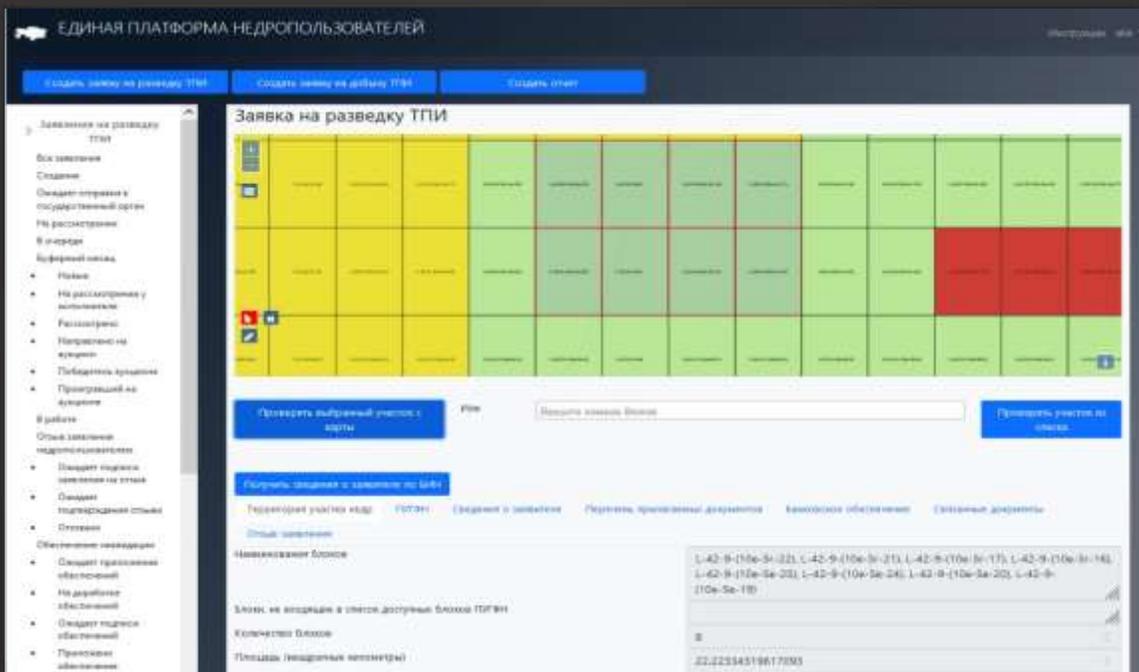
Notification

License issuance

Reports

Functionality:

- viewing the interactive map;
- viewing geologic study reports;
- filing/revoking an application for exploration and mining of solid minerals;
- checking for overlapping layers of general geographic content;
- submission of reports on the results of work and fulfillment of license obligations;
- exchange of messages with the regulator.



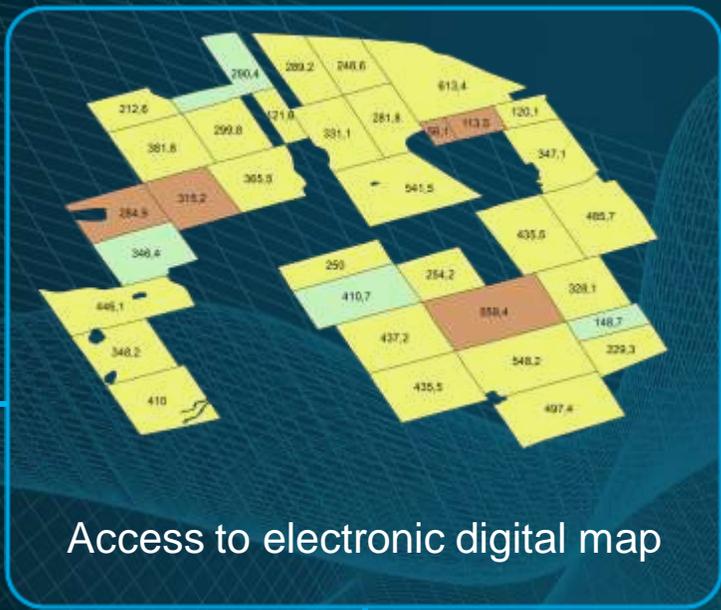
«AGROSPACE»: Platform of agricultural producers

Personal account

Authorization

Authorization Loading EDS

Authorized access through electronic digital signature (EDS)



Applying for public services

Applying for public services

Applying for public services

Historical data for each field

Analysis based on remote sensing data, entering and correcting agricultural land boundaries and personal data

Analysis based on remote sensing data, entering and correcting agricultural land boundaries and personal data

«HYDROSPACE»: Water resources platform



Satellite assessment and monitoring of the state of riverbed processes



Inventory of hydraulic structures (reservoir)



Digital accounting of water used for irrigation

Determination of productivity of irrigated lands

Analysis of water consumption up to the level of irrigated zones/branches

A system of control measures (fines, taxes for excessive consumption, etc.)

Creating a constellation of remote sensing satellites



Mission: Providing access to space technologies through advanced and innovative engineering solutions



KazEOSat-2
(2014 – 2026)

Resolution: 5 m
Productivity 500 000 sq.km/day



KazEOSat-1
(2014 – 2027)

Resolution: 1 m
Productivity 220 000 sq.km/day

KazEOSat-MR PROJECT

3 medium resolution satellites

- Productivity: 1 million km²/day
- Re-shooting: 1 time per day

Remote sensing microsatellite

- Resolution: up to 2 m (~ 1m in post-processing)
- Channels: 5 Pan, R, G, B, NIR+SWIR
- Shooting band width: ~ 40 km



System Parameters

KazEOSat-HR PROJECT

3 high resolution satellites

- Productivity: 600 thousand km²/day
- Re-shooting: 1 time per day

Remote sensing microsatellite

- Resolution: 0,7m (~ 0,5m in post-processing)
- Channels: 5 Pan, R, G, B, NIR
- Shooting band width: ~ 12 km



The background features a dark, almost black, field with intricate, glowing patterns of purple and blue particles. These particles form swirling, nebula-like structures that create a sense of depth and movement. The colors are most vibrant in the center and fade towards the edges.

THANK YOU FOR YOUR ATTENTION