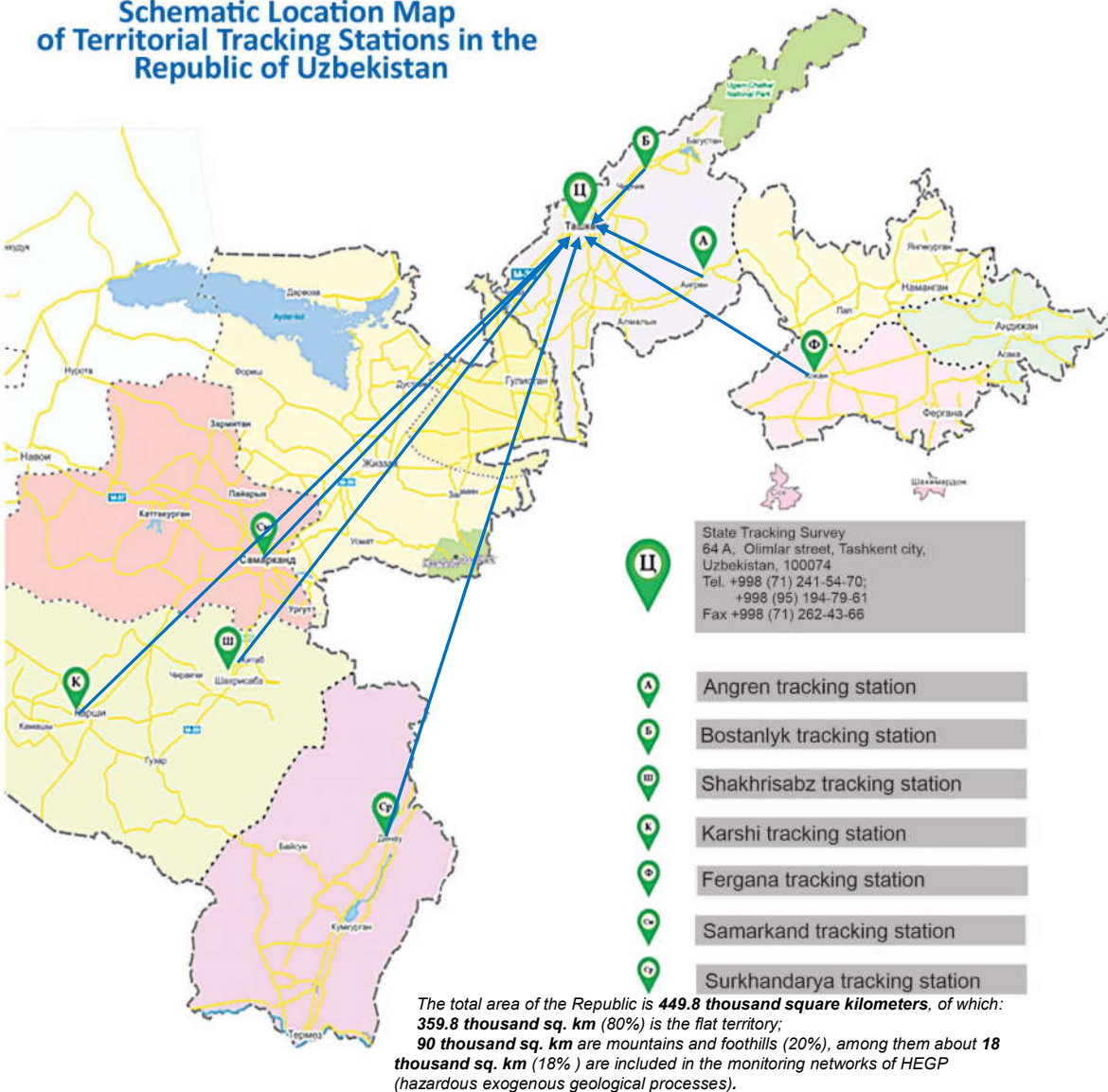# STATE COMMITTEE OF THE REPUBLIC OF UZBEKISTAN
ON GEOLOGY AND MINERAL RESOURCES
"State Survey of the Republic of Uzbekistan for Geohazards Tracking" State Institution


Monitoring of hazardous exogenous geological processes in the Republic of Uzbekistan

2022

Schematic Location Map of Territorial Tracking Stations in the Republic of Uzbekistan

State Tracking Survey
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Ⓐ Angren tracking station

Ⓑ Bostanlyk tracking station

Ⓦ Shakhrisabz tracking station

Ⓚ Karshi tracking station

Ⓕ Fergana tracking station

Ⓢ Samarkand tracking station

Ⓢ Surkhandarya tracking station

*The total area of the Republic is **449.8 thousand square kilometers**, of which:*
***359.8 thousand sq. km** (80%) is the flat territory;*
***90 thousand sq. km** are mountains and foothills (20%), among them about **18 thousand sq. km** (18%) are included in the monitoring networks of HEGP (hazardous exogenous geological processes).*

The Structure of the State Survey of the Republic of Uzbekistan for Geohazards Tracking
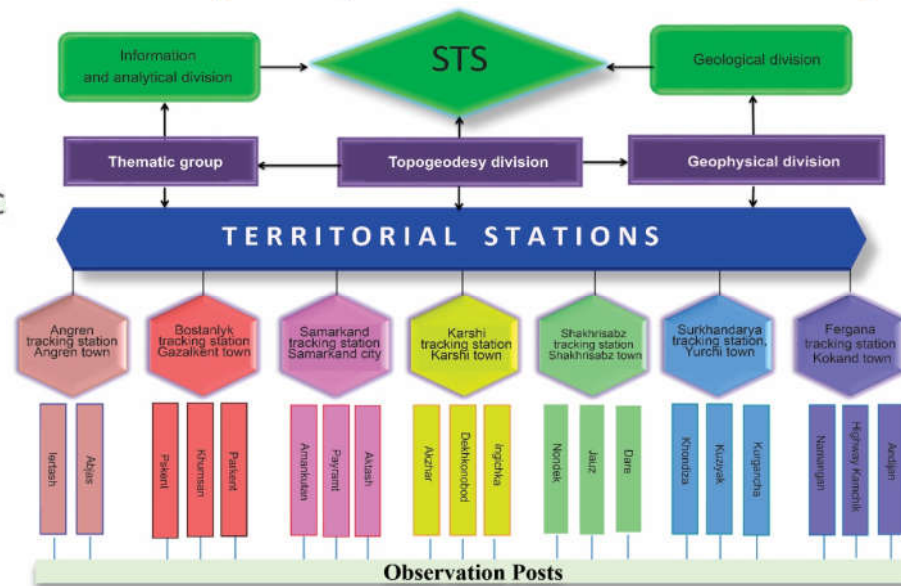
Research Structure

The study of dangerous geological processes was started in 1958.

➤ **1958 -** the Bostanlyk Landslide Party was created;

➤ **1962** - the Laboratory of Engineering Geodynamics was established at the Institute of HYDROINGEO;

➤ **1991 -** the Engineering-Geological Expedition at the "Uzbekhydrogeology" Production Association was created;

➤ **1994** – the State Survey of the Republic of Uzbekistan for Geohazards Tracking (GT) under the State Committee of the Republic of Uzbekistan for Geology and Mineral Resources was established

The mountainous territories of the Republic of Uzbekistan are most susceptible to dangerous geological processes (landslides, devolution, subsidence, suffusion, karsts). Among them, landslides are the most dangerous. There are about 2.0 thousand landslide sites in Uzbekistan, where more than 12 thousand landslide dislocations have occurred on an area of 18 thousand km². From 30 to 300 repeated landslide dislocations are recorded annually in mountainous areas, and in years with abnormal precipitation, the number of repeated and new dislocations of various volumes can reach up to 1 thousand.

The main tasks of the State Tracking Survey are as follows:

➢ identification of areas (zones) of development of dangerous natural geological processes (landslides, devolutions, suffusion, karst, subsidence) study and prevention of their activation.

➢ organization and monitoring of hazardous geological processes within settlements, zones of health and other public facilities in mountainous and foothill areas.

➢ provision of the Ministry of Emergency Situations of the Republic of Uzbekistan, interested functional and territorial subsystems of the State Emergency Service with geological information on the possible development of hazardous geological processes with recommendations on the rational use of territories in landslide-prone areas.

➢ control over the implementation of the State Tracking Survey instructions by local authorities on the resettlement of residents and the coordination of land acquisition for newly built settlements and facilities, control over the preservation of the stability of mountain slopes during their development, etc...
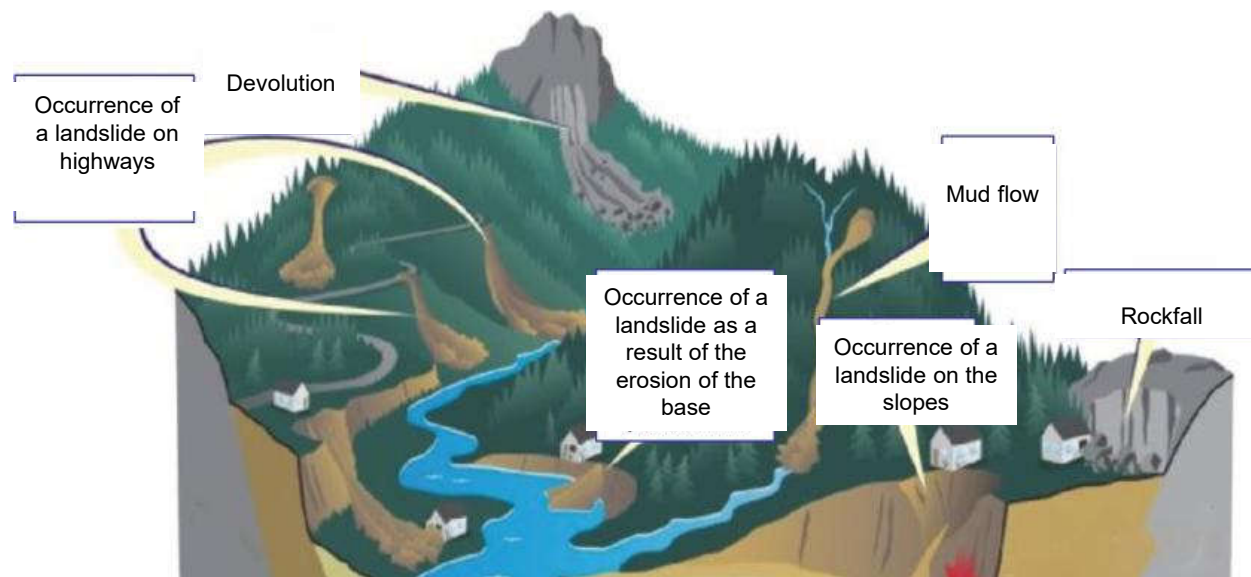
FACTORS OF LANDSLIDE FORMATION

- *hydrometeorological conditions;*
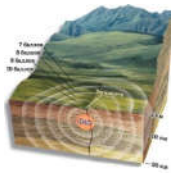
- *seismic factors (earthquakes);*

- *technogenic impact on the natural environment.*

Devolution

Occurrence of a landslide on highways

Mud flow

Occurrence of a landslide as a result of the erosion of the base

Occurrence of a landslide on the slopes

Rockfall

The most typical occurrences of hazardous exogenous geological processes

*The "Tsentralny" Landslide in the Tashkent region, 2011*

The "Tsentralny" landslide with a volume of up to 100 million m^3 was formed in May 1993 in the upper part of the edge of the open-pit mine 35-40 m below the Tashkent – Osh highway. Landslide movements until 2010 were relatively insignificant, up to 0.3 – 0.35 m per year. In 2010, there was a slight acceleration of the landslide dislocation to 1.0 m per year.

In 2011, there was a sharp activation of the landslide with a multiple increase in the rates of horizontal and vertical dislocation up to 800-1000 mm / day.

At the present time, the landslide has been unloaded by mining operations by 50% and its displacement rate has decreased to 30-40 mm/day. As a result of the expansion of the head part of the landslide, a section of the Tashkent-Osh highway was destroyed, which was moved higher up the slope.

The most typical occurrences of hazardous exogenous geological processes

The "Khandiza" Landslide – stream in Surkhandarya region, 2017

Upper zone, 2015

Middle zone 2015,
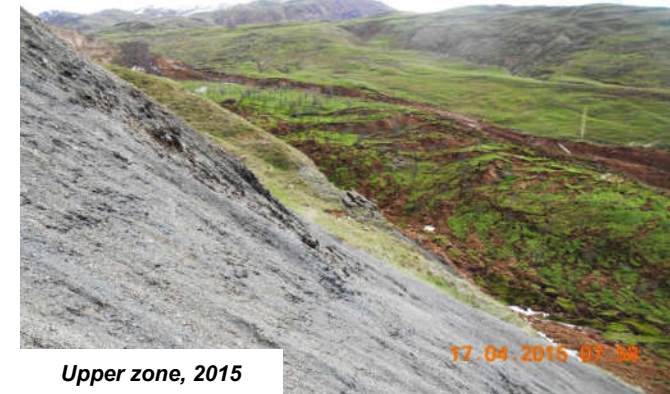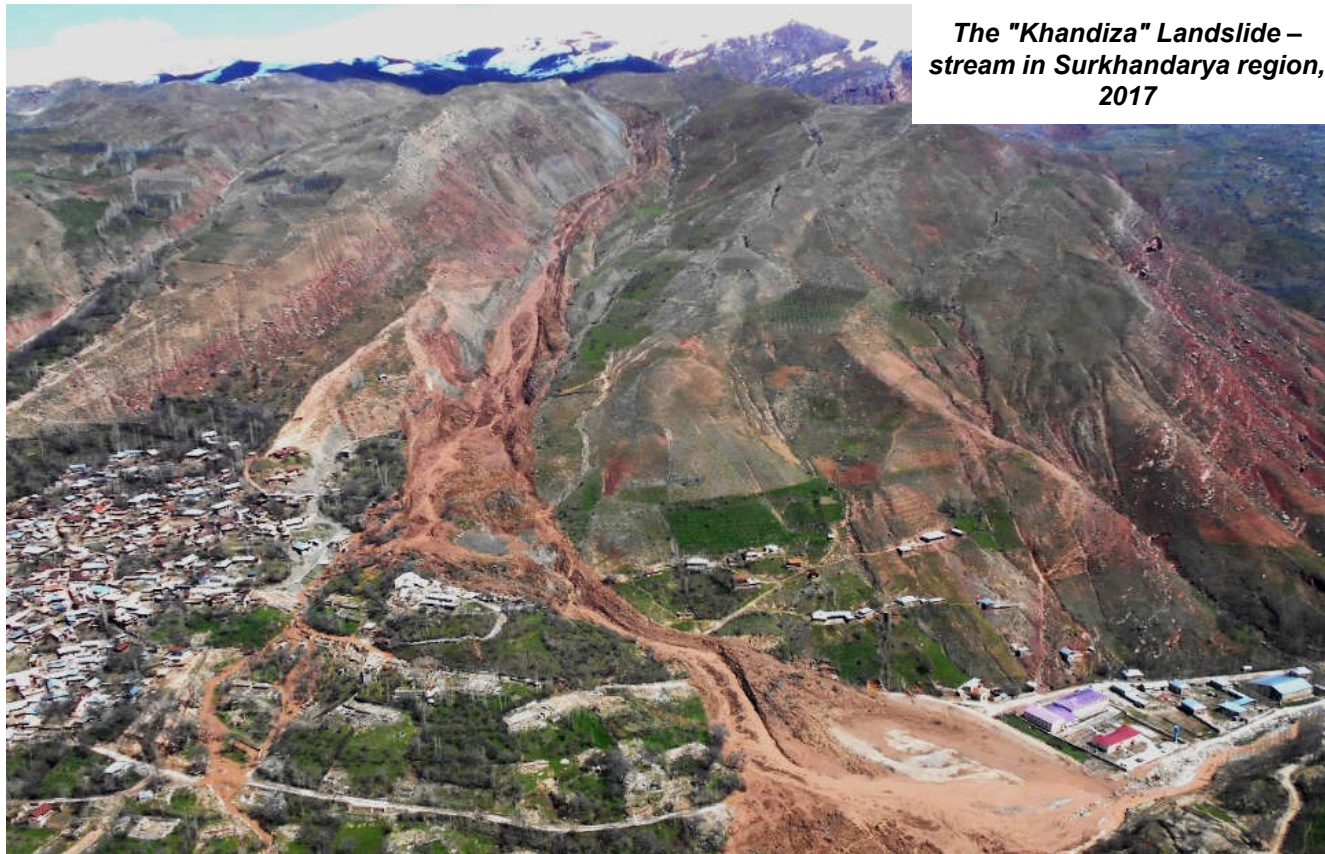
The landslide shifted twice. For the first time on April 6, 2015, with a volume of 1.5 million m^3, the total horizontal displacement was 960 m, a maximum of 570 m in the first four days. The stabilization process came on day 12. The second time the activation of the mud flow occurred on March 31, 2017 with a volume of 0.5 million m^3, the displacement was 1200 m with a flow width of 20 -100m. The landslide destroyed the school building and temporarily blocked the riverbed for a width of 70 m, a height of 3 m, the volume of the blockage amounted to 50.0 thousand m^3.

The most typical occurrences of hazardous exogenous geological processes

Breakaway zone

Transit zone

The "Otbokar" Landslide-stream in the Kashkadarya region, 2019

Blockage

Blockage washaway

The landslide - the «Otbokar» stream, formed on April 25-26, 2019, is located in the upper reaches of the left tributary of the Jindidarya, the volume is 1.8 million m³, the length is more than 1.0 km, the river bed is blocked. Above the dam, a lake was formed with a length of 180-200 m, a width of up to 110 m, a depth of 8-10 m. After 3 hours, the blockage began to wash out from the right bank. The blockage with a length of more than 200m was washed to a depth of 7-10m and a width of 8-12m.

Survey methods

Topogeodesic survey using UAV
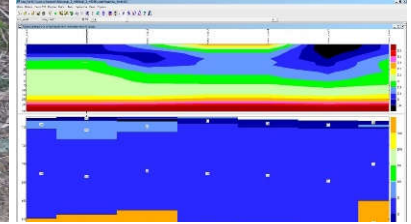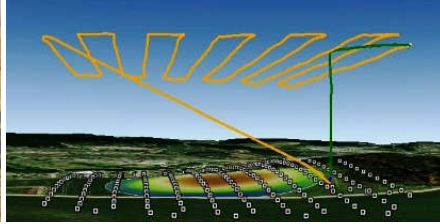
Geophysical works

Measurements of precipitation intensity

Measurement of landslide parameters with an electronic distance metre

Topography of landslides using an electronic total station

Landslide displacement measurement using an electronic extensometer

Measurements of landslide opening of break by marks

Removal of the coordinates of the landslide by a manual GPS "GARMIN« receiver

Landslide dislocation measurements using a GPS receiver

Measuring the opening of landslide cracks using a strain gauge

Step-by-step compilation algorithm of special engineering-geological maps

Topobase preparation

Space images interpretation

Geological and tectonic conditions
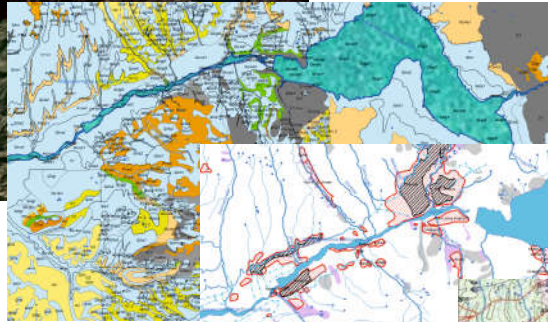
The boundaries of the villages points and HEGP
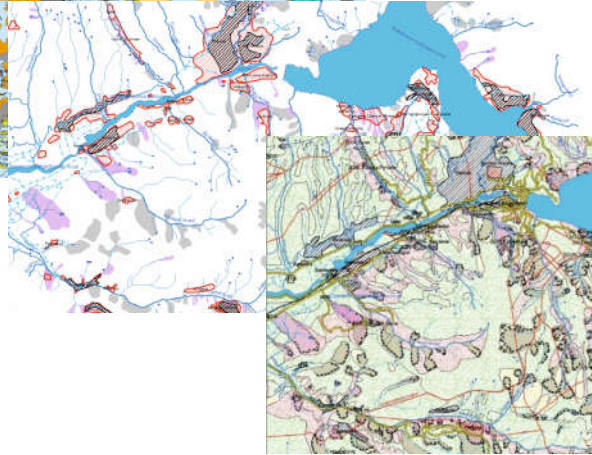
Specialized zoning map according to the degree of landslide hazard at a scale of S: 1:25 000

Special preventive engineering-geological map of landslide hazard, S: 1:10 000
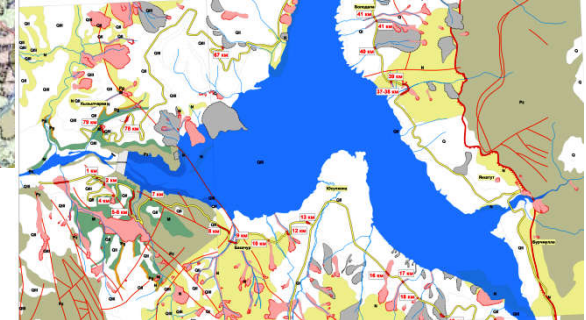
Database includes: hydro grid, highways, railways, electric power lines; modern boundaries of settlements, recreation areas and other social facilities were updated. Channels, rivers, sais, springs and watersheds have been vectorized, including dangerous geological processes:
- Ancient
- Old
- Modern

Types of preventive documents on the development of HEGP

Preparation of annual Warning information about possible manifestations of hazardous geological processes on the territory of the Republic of Uzbekistan
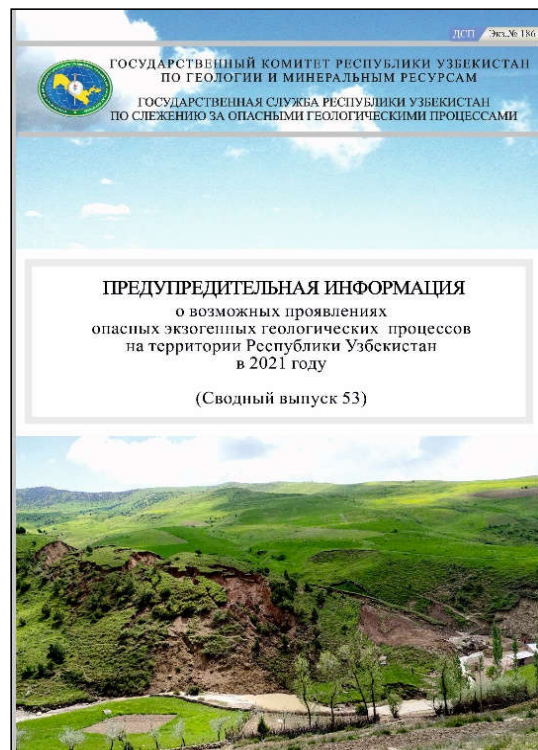
Issuance of information and regulations on settlements and economic objects

Conclusions:

- ❖ In the mountainous and foothill regions of the Republic of Uzbekistan, the share of dangerous exogenous geological processes (EGP) caused by various types of construction has increased significantly over the past 20 years.
- ❖ The spatial distribution, scale, depth, frequency of manifestation of HEGP and the magnitude of the consequences are becoming more and more noticeable from year to year, and their psychological impact on people is becoming more and more intense.
- ❖ The main burden from the manifestation of hazardous geological processes is experienced by the least socially protected from natural disasters, the inhabitants of mountainous areas, whose numbers are increasing, and the areas favorable for living and development are decreasing.
- ❖ The problem under consideration is especially acute for mountainous areas that have been intensively developed in recent decades. There is also the largest population growth by two and a half times in thirty years, which continues to be the poorest and the least protected from natural disasters.

The Mingchukur landslide

Charvak reservoir

Thank you for your attention!