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CLIMATE CHANGE RISKS TO UZBEKISTAN INFRASTRUCTURE

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Annotation. In this article, flood floods affecting automobile roads and natural disaster relapse on maps using geoinfomation systems. The flood consists of forecasting the arrival. The impact of floods on highways was considered from the studied factors. Flood (Flood current) — a stagnant mud or mud rock stream consisting of a mixture of water and rock fragments that suddenly appear in the basins of small mountaineers. How to increase productivity, increase movement, increase the duration of movement, reduce work time), reduce the impact of a natural disaster. Floods pose a threat to settlements, railways, highways and other struactures.

Key words: railways, highways, mountains, flood consists, geoinfomation systems.

Аннотация. Ушбу мақолада автомобил йўлларига таъсир кўрсатадиган сув тошқинлари ва табиий офатларнинг такрорланиши геоахборот тизимларидан фойдаланган ҳолда хариталарда. Тўфон келишини башорат қилишдан иборат. Ўрганилган машинадан селнинг автомобил йўлларига таъсирланиб чиқилди. Тўфон (тошқин оқими) — кичик тоғ ҳавзаларида тўсатдан пайдо бўладиган сув ва тош бўлаклари аралашмасидан иборат турғун лой ёки лой тош оқими. Қандай қилиб ҳосилдорликни ошириш, ҳаракатни ошириш, ҳаракат давомийлигини ошириш, иш вақтини қисқартириш), табиий офат таъсирини камайтириш. Сув тошқинлари аҳоли пунктлари, темир йўллар, автомобиль йўллари ва бошқа иншоотларга хавф туғдиради.

Калит сўзлар: темир йўллар, автомобиль йўллари, тоғлар, тошқинлар, геоахборот тизимлар.

Аннотация. В данной статье паводки, воздействующие на автомобильные дороги, и рецидивы стихийных бедствий наносятся на карты с использованием геоинформационных систем. Потоп состоит из предсказания прихода. Влияние паводков на автомобильные дороги рассмотрено из изученных факторов. Половодье (Потопное течение) — стоячий грязевой или грязекаменный поток, состоящий из смеси воды и обломков горных пород, внезапно появляющийся в водоемах мелких горцев. Как повысить производительность, увеличить движение, увеличить продолжительность движения, сократить время работы), уменьшить воздействие стихийного

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бедствия. Наводнения представляют угрозу для населенных пунктов, железных и автомобильных дорог и других сооружений.

Ключевые слова: железные дороги, автомобилных дорог, горы, наводнения, геоинформационные системы.

INTRODUCTION.

In the following years, climate change is taking place all over the world, which in turn has its impact on all areas, among which we can see the ongoing impacts on highways. Today, with the participation of relevant ministries and departments, the deputies of the Legislative Chamber of the Oliy Majlis are developing a draft climate change strategy of the Republic of Uzbekistan until 2030. The road map, which will be developed on the basis of this strategy, will make it possible to purposefully implement targeted measures to adapt to climate change in our country [1].

All over the world, as a result of climate changes and greenhouse gases, the melting of permafrost and severe weather changes lead to. Climate change-is one of the pressing global problems. According to the World Bank, every year more than 100 million people become impoverished as a result of climate change, about 143 million people become immigrants, and this indicator is increasing from year to year. Uzbekistan is expected to be among the countries with the most water shortages with rising air temperatures, reduced precipitation and retreat of glaciers. In the research carried out on climate changes in the Republic of Uzbekistan, an increase in air humidity is observed according to the results of which scientists forecast changes in air humidity by 2095 (Figure. 1).

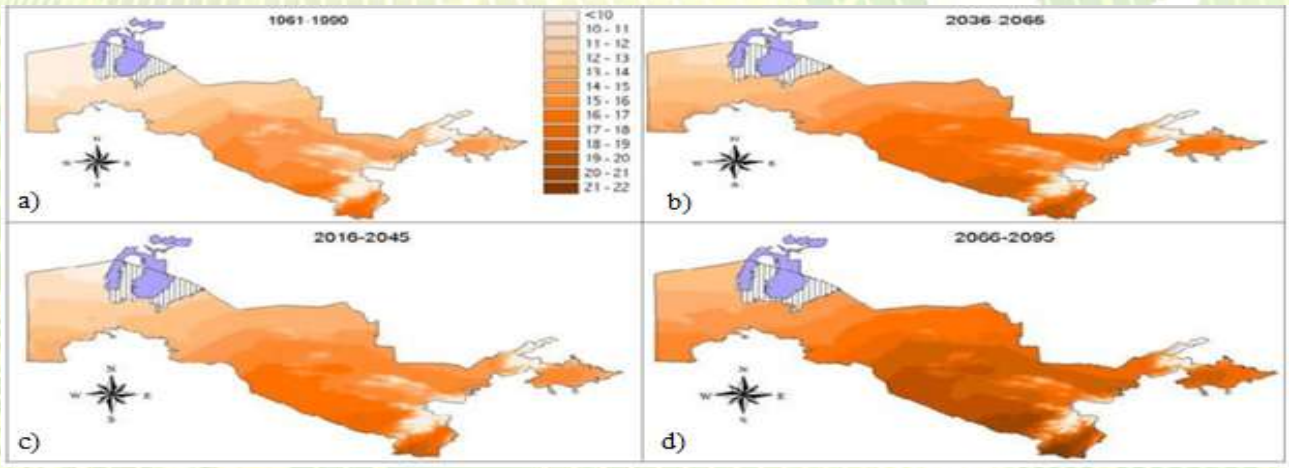


Figure. 1. Forecast of future expected air temperature in the Republic of Uzbekistan a) weather forecasting from 1961 to 1990, b) weather forecasting from 2010 to 2045, c) weather forecasting from 2036 to 2066, d) weather forecasting from 2066 to 2095

The study of the harmful effects of climate change (flood arrival, snowdrifts, grunt kissing, rock mountainjins kissing) on highways, the development of

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measures to predict and prevent it from happening are among the pressing problems of the current day.

The impact of floods on highways was considered from the studied factors. Flood (Flood current) — a stagnant mud or mud rock stream consisting of a mixture of water and rock fragments that suddenly appear in the basins of small Mountaineers. How to increase productivity, increase movement, increase the duration of movement, reduce work time), reduce the impact of a natural disaster. Floods pose a threat to settlements, railways, highways and other structures.

The direct cause of flood arrival is heavy rain, heavy melting of snow, absorption of reservoirs, fewer earthquakes, volcanic eruptions.

Classification of flood flows: according to the mechanism of origin, it is divided into three types: erosive, breakthrough and landslides.

In the case of erosion, the water flow is initially saturated with grunt and Foothill materials due to the leaching and erosion of the soil in its path, and then a flood wave is formed.

The formation of a flood is characterized by an intensive process of water accumulation, rocks are eroded at the same time, a flood occurs in saturated grunts, and the absorption of the reservoir occurs. The flood mass descends along the slope or river core [2].

During landslides, the mass of rocks saturated with water (including snow and ice) is disturbed. The saturation of the current in this case is close to the maximum.

Each mountain in the region has its own reasons for turbidity. In the Caucasus, for example, they are mainly caused by rain and heavy rain (85%).

In recent years, natural causes of mud floods have been added to man-made factors, violations of the rules of use of mining enterprises, explosions during the laying of roads and the construction of other structures, deforestation, improper agricultural work, violation of soil and plant cover.

When moving, the flood flow is a constant stream of mud, rock and water. In the steepest front of a muddy wave from 5 to 15 m high, precipitation forms the "head" of water. the maximum height of the head of the flood stream sometimes reaches 25 m. The classification of floods based on the causes of origin is summarized below (table 1).

Table 1

Classification of flood floods based on the main reasons for their occurrence

№	Types of floods	Causes of occurrence	Distribution and origin

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1	Rainy	Heavy rains, long-term rains	The most massive type of floods on Earth is formed as a result of erosion of slopes and the appearance of landslides
2	Snowy	Strong snow melting	It takes place in the subarctic mountains. This is due to the breakdown and waterlogging of snow masses
3	Ice	Strong melting of snow and ice	In high mountain areas, the origin is associated with the absorption of melt glacial
4	Volganli	Volcanic eruption	In areas of active volcanoes. Due to the largest, rapid snow melting and increased water content of crater lakes
5	Seismogen	Strong earthquakes	In the upper seismic regions. Severance of land masses from slopes
6	Limnogenis	Formation of Lake	Dam demolition in high mountain areas
7	Anthropogenic direct impact	Accumulation of anthropogenic rocks. Zero-free earthen	In places of storage of Grunt mass. Erosion and displacement of artificial rocks. Collapse of dams
8	Anthropogenic indirect influence	Violation of soil and plant cover	In areas of forests and Meadows. Erosion of pastures and river banks

METHODS. Based on the main factors of occurrence, floods are classified as follows: zonal manifestation — the main factor of formation is climatic conditions (precipitation). They depend on the characteristics of the zone. Assembly is carried out regularly. The paths of action are relatively constant; regional manifestations (the main factor in the formation is geological processes). The assembly occurs from time to time, and the methods of action are unstable; anthropogenic is the result of human economic activity. Togland occurs where there is the greatest load on the roof. New flood basins are being established. The assembly is episodic.

Classification by strength (by flowing solid mass): 1. Strong (strong power)with bringing more than 100 thousand m3 materials. They occur once every 5-10 years. 2. Average capacity with bringing materials from 10 to 100 thousand m3. They occur once every 2-3 years. 3. Low-power (low-power), with the removal

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of materials less than 10 thousand m3. They occur every year, sometimes several times a year.

Classification of flood basins by flood frequency characterizes the intensity of development or its seleactivity. According to the frequency with which flooding occurs, three groups of flood basins can be distinguished: 1. High flood activity (once every 3-5 years and with frequent repetitions); 2. Average flood activity (with repetitions every 6-15 years); 3. Low flood current activity (repeated once every 16 years or less).

Villages are also classified according to their influence on structures: 1. Low-power-small washing areas, partial clogging of the water tap holes. 2. Medium-strength-strong washing, complete blockage of holes, damage and breakdown of buildings without a foundation. 3. Strong-great destructive power, demolition of bridge farms, destruction of bridge supports, stone buildings, roads. 4. Catastrophic-complete destruction of buildings, road sections in combination with road pavement and structures, burial of structures under sedimentary rocks.

Sometimes the classification of basins by the height of the sources of water bodies is used: 1. High Mountain. The origin is higher than 2500 m, the size of the cutting from 1 km2 is 15-25 thousand m3 per village; 2. Middle Mountain. Sources lie within 1000-2500 m. the volume of removal from 1 km2 is 5-15 thousand m3 per flood; 3. Low mountains. Sources are lower than 1000 m, the volume of current output from 1 km2 is less than 5 thousand m3 in one flood.

Climate changes are leading to the occurrence of anomalous phenomena, and the effects of global climate change are also observed in the Republic of Uzbekistan. According to the data of the research results of the World Bank, by 2050 the population in the Republic of Uzbekistan exceeds 50 million. The population can migrate to Mountain and upland areas due to water shortages and high temperatures in the basin. The territory of the Republic of Uzbekistan belongs to the arid zone of Central Asia. Climatic risks are closely related to water safety, food safety and land degradation in Uzbekistan.

The area where the research object a - 373 Highway “M-39 Gulistan – Bouka – Angren - Kokand and Osh through Andijan” is located has 3 meteostances. More than 100 years of data from meteostans can be seen when analyzing the increased air - temperature in the area of the whip pass. An increase in air - temperature is the cause of the occurrence of specific dangerous phenomena on mountain and mountain highways. Accidents have been studied by snowdrifts affecting the safe and uninterrupted movement of vehicles in the conditions of exploitation of highways in mountainous areas. In the area where the research object is located, it

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was found that the temperature increased by 3 degrees when studied in the cross section of years (Figure. 2)

Uzbekistan Republic of Central Asia joilashgan region, ushbu region temperate zonaning zhanubiy chastining Continental sector joilashgan and the important area of ega baklib, relatively monotonous climate bilan ajralib turadi. The greatest amount of precipitation falls on the northern slopes of Tien Shan and the southeastern part of Kunlun.

Several models are used, forecasting flood flows in Mountain and foothill areas, where highways are located, and determining the damage caused by them [2].

1. Methodology for assessing the economic risk of flood floods of Moscow State University;
2. Assessment of individual and collective risk of flood floods;
3. Methodology for assessing the economic risk of flood floods;
4. Methodology for multi-criteria assessment of flood risks.

Methodology for assessing the economic risk of flood floods of Moscow State University: Taking into account the risks associated with the preparation of risk groups, measures can be taken to identify risks, as well as. Risk-as well as the consequences of ittimoli, risk if the potential is a threat. Risk, rule developed, turli jullar bilan olingan adjective attributedir. Among them, one can highlight the expert assessment, the common point assessment. Another group of risk assessment methods includes those that assess the likelihood of consequences. They are usually based on theoretical and statistical research. Risk is based on the statement that it is a function of influencing, vulnerability and protection of an object from dangerous natural influences.

Assessment of individual and collective flood risk: today there are very few scientific studies on flood risk assessment. A.L. Shniparkov et a [3]. For the first time, the individual and collective risk of flooding across Russia was assessed on a small scale.

RESULTS AND DISCUSSION. The following indicators are used to assess the risk of flood floods:

- The likelihood of human death as a result of flooding in a certain area during the year. The indicator is the risk of individual flooding.
- The likely number of flood victims in a given area during the year. The indicator is a collective risk.

Strong trends in the rise are observed in the minimum air temperature regime. Most stations have significantly increased minimum temperatures in April (60%), June (78%), July (74%), August (64%) and September (56%). A very large

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number of stations were found to significantly increase the minimum air temperature in October - December (from 12% to 40%) (Figure. 3).

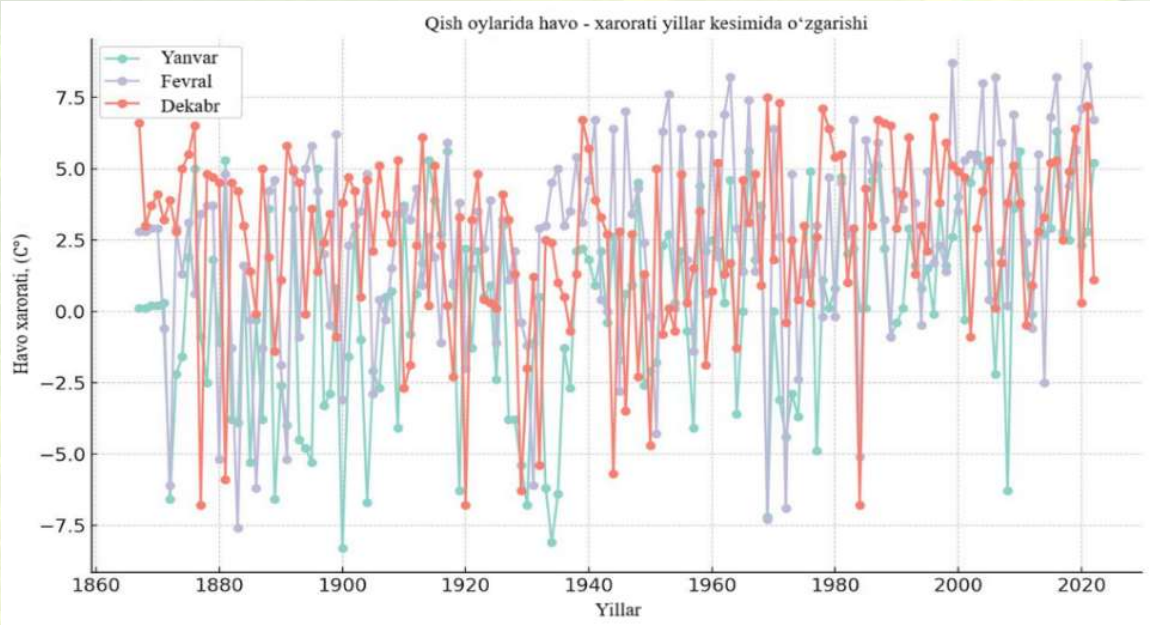


Figure. 3. Change in the cross – section of the weather-temperature in the winter months in the whip pass

It was found that the main causes of dangerous phenomena occurring at the object of the study were drastic changes in one climate. Anomalous cold and anomalous hot ham observed in subsequent years confirm (Figure. 4).

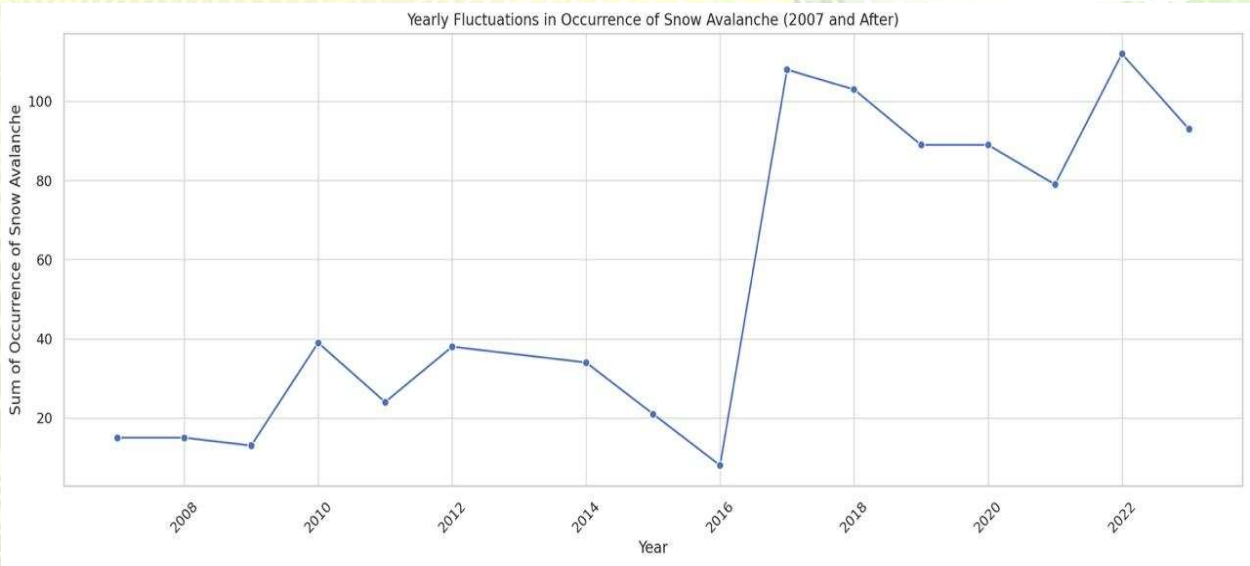


Figure. 4. Snow avalanches in which a cross-section of years occurs at the object of the study

While the air - temperature is increasing during the summer months, the temperature of the basin is changing due to the unusual climate in the winter season, which in turn is causing a sharp increase in dangerous climatic phenomena. In the mountainous regions of the Republic of Uzbekistan, dangerous phenomena as a result of climate changes are increasing in the following years - including

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snowdrifts are observed a lot (Figure. 5).

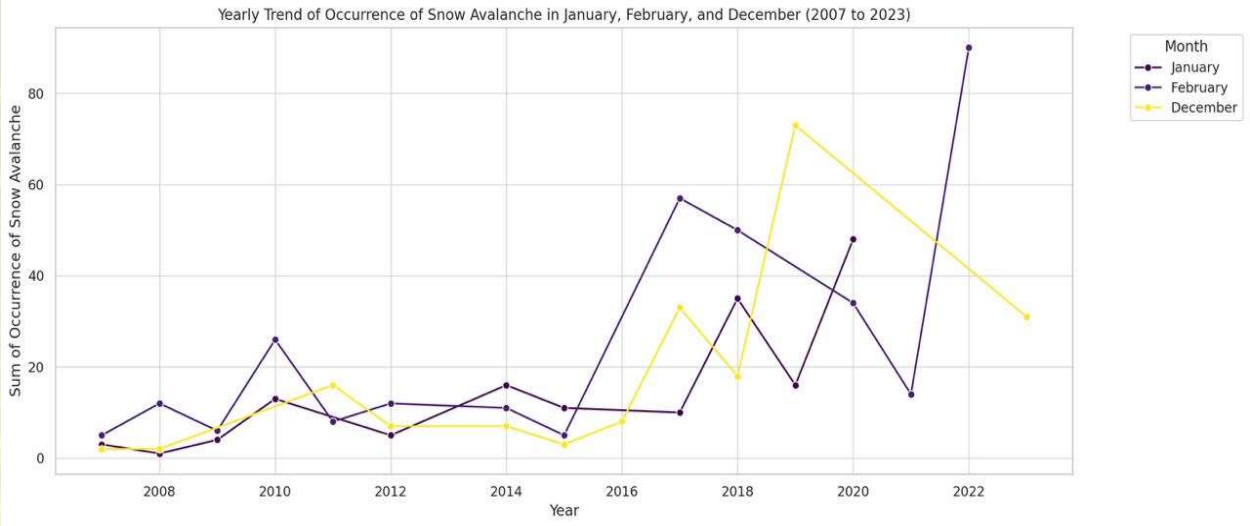


Figure. 5. Snow avalanches occurring in the winter months cross section at the research facility

The formulas for calculating individual and collective risks take into account their dependence on quantitative indicators of flood activity, such as the frequency of flow flows, the duration of the main period, the influence of area and social factors (population size and density, population size, vulnerability of the population in space and time, mortality rate).

Collective risk assessment is carried out according to the formula (formula 1):

$$R_{mf} = P_{mf} \cdot V_s \cdot V_t \cdot d \cdot K_l \cdot F; \quad (1)$$

Here it is: R_{mf} — risk of collective flooding, dead /year; Pmf — recurrence of floods, nechi times a year; V_s — vulnerability of the population in its location, number of days; V_t — population weakness during flood floods, without a unit of measure.; d — population density in the assessed area, man/км^2; K_l — flood flood mortality rate coefficient, without a unit of measure; F — location in an area prone to flood dressing, км^2 .

V_s the vulnerability of the population in the area to flood floods (number of days) is due to the area being damaged by flood floods (formula 2):

$$V_s = S_a / S_t, \quad (2)$$

Here it is: S_a — area of area prone to flood floods within the basin under study, St — total area of the basin.

Methodology for assessing the economic risk of flood floods: During the meeting, the parties discussed issues related to providing assistance in solving problems related to providing assistance in solving problems, as well as making decisions on quality assurance.

Local self - government is the level of power that reflects the controlled territory of the average basic life cycle of a person. This allows the use of the level

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of munisipal formation (MSH) as a unit of accounting for determining the level of socio-economic development of an administrative unit for modeling purposes and linking it with natural and arising risks.

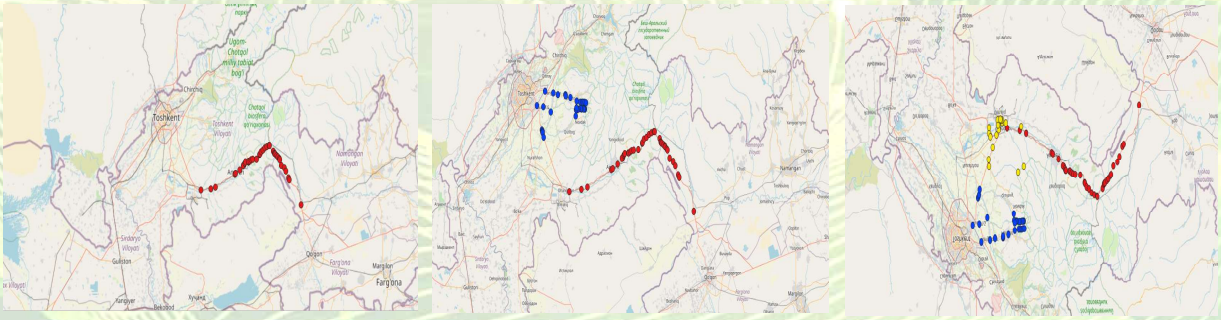
Thus, to assess the risk of floods at this level, the following data are available: area size, population, commercial and non-profit fixed assets, volume of production of industrial and agricultural products. All this is not enough to calculate such a basic general indicator of the state of the Ministry of Defense as a typical gross urban product [3].

To assess the risk of floods in economic indicators, instead of population density and population size, the values of the conditional gross urban product in administrative regions were used.

Methodology for multi-criterion assessment of flood risks: let us consider in more detail the procedure for constructing a flood risk index using the idea of the method of summary indicators (XKU), the basis of which is N.V. Listed in the works of khovanova [4]. The characteristics of the flood can be characterized by sufficient completeness, taking into account the following relatively independent initial characteristics: x_1 – flood basin areas (F), x_2 – slope of the flood dressing divider Basin (H), x_3 – the diameter of the largest stone, carried by the stream (D), x_4 – Flood transition speed (V), x_5 – maximum flood flow (Q_{max}), x_6 – population density in the region (ρ).

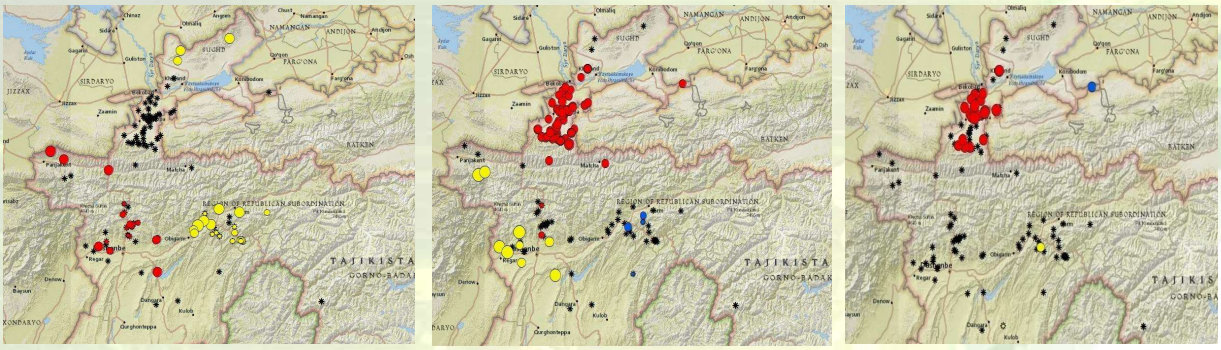
CONCLUSIONS. The study used six morphometric properties. The calculation was carried out for three, four and six characteristics (slope of the flood incoming stream, cross-sectional area, diameter of the largest rock, maximum flow rate, flow rate, as well as population density in the region) three options for grouping security are provided through the forecast of the occurrence of flood flows of Uzbekistan.

With the above-mentioned models, areas where flood floods can occur are listed and they are classified into types, different options for classifying the risk of flood floods are indicated according to the number of initial characteristics used, the genesis of the origin and the type of flood. Maps of the occurrence of flood floods were created using geoachborot systems (figure 1) [5].



a) **b)** **v)**

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g) d) e)

Figure 6. a) Flood classification using three early features. b) Flood classification using four early features. v) Classification of floods using six early features. g) Classification of flood floods. d) Classification of sedimentary floods. e) Flood classification using three early features.

Flood forecasting methods: forecasting typical targets is possible by the amount of precipitation that falls. As violence develops and dirt accumulates as a spoilage has arisen, it is important to quantify the kuchli egingarchilik quenching of custard. The precipitation of 35-40 mm of precipitation in the basins of the Rezaksoy and Ohongaron rivers, many ridges of which are composed of sedimentary loose rocks, is sufficient for the formation of floods. In the south of the Republic, which is somewhat more rigid, metamorphosed, 40-50 mm of precipitation is necessary for the formation of floods. Whip pass in the ohongaron Basin, including toggjins - granites, where diorites predominate, a violent jala with a sediment of at least 70-80 mm is required for Ohongaron floods to occur.

The formation of flood floods is associated with the season when the greatest amount of precipitation falls into liquid form. In the south of the country, floods occur in early spring, in March and April, in the north of Uzbekistan - in late spring, in may and June, the most abundant months of turbidity in the Ohongaron Valley are April and may. Ohongaron glaciers are mainly observed in July and August [4].

In 1989, in the Department of Hydrometeorological Service of Uzbekistan, the best selectologist specialists used calculations carried out by scientists from the Central Asian Research Institute of Hydrometeorology, Created the draft methodological guidelines" method of short-term forecasting of flood risks in the main regions of Uzbekistan". Although the amount of precipitation was taken as a basis, this method was based not on meteorological, but on synoptic characteristics [6].

This method has proven its reliability in drawing up forecasts of flooding shifts formed during long-term and heavy rains.

The duration of the forecast is from 12 to 24 hours, with high and high cyclones during the transition to cold times-up to one or two days.

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Currently, the formation of floods caused by precipitation in a state institution of Hydrometeorology is projected within 24-48 hours.

Warnings are issued on the basis of general weather forecasts: in what area, when precipitation is expected, in what form and in what quantity. Detailed forecasts are not given due to the lack of experienced specialists. At the end of the month and year, the consideration of the goals is carried out with an analysis of the causes of their origin, the place of occurrence of the flood, its flow, volume, damage, etc.

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