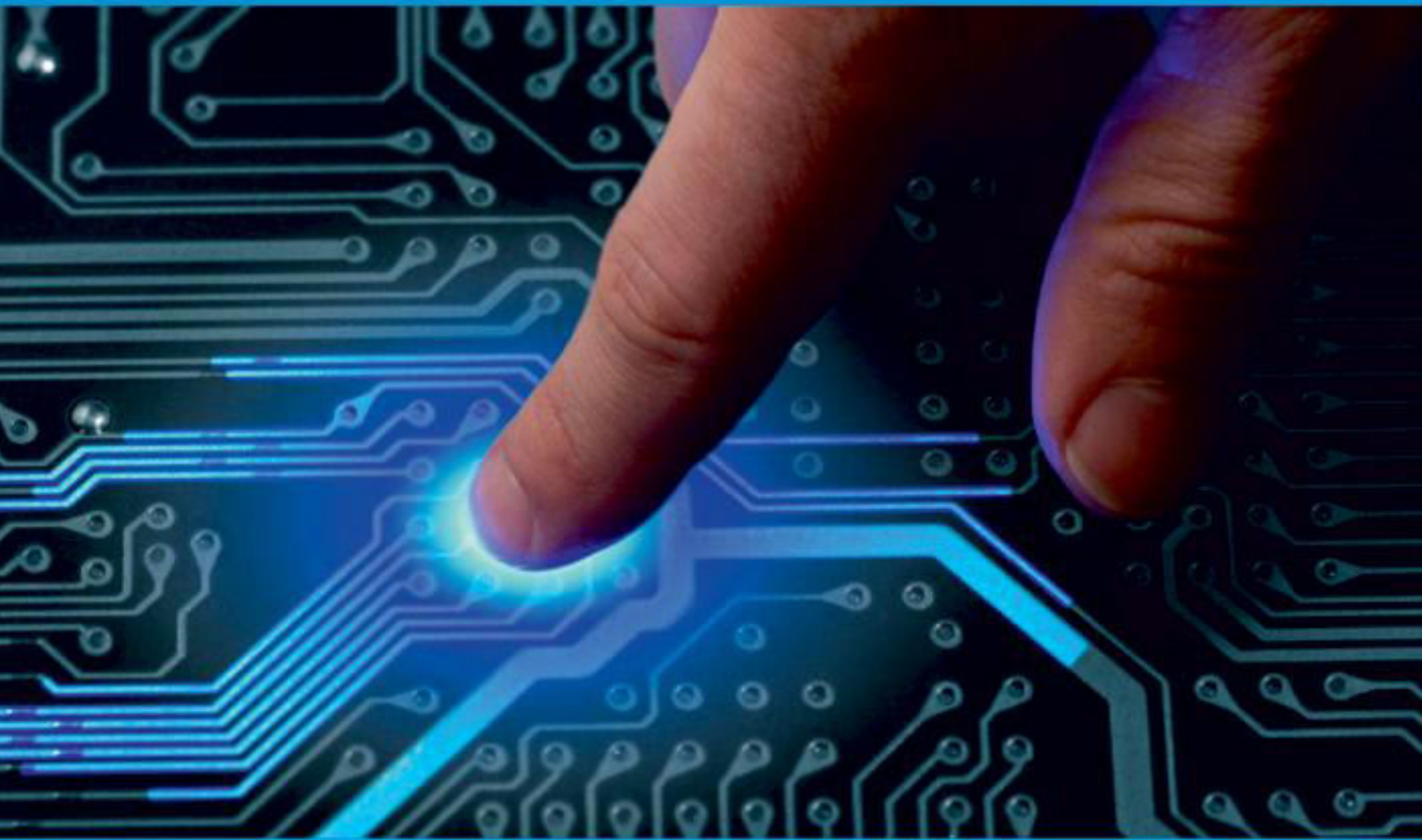
IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 9, Issue 6, June 2021

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.542

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906108 |

The Engineering Decisions for Mitigation of Damages in Landslide Hazardous Regions of Uzbekistan

Shermuxamedov Ulugbek Zabixullayevich, Tayirov Shopulat Shomansur o'g'li

Head of department "Bridges and tunnels", Ph.D., Professor, Tashkent State Transport University, The Republic of Uzbekistan, Tashkent city Mirabad district, st.Adylkhodzhaeva I, Uzbekistan

Student, without an academic degree, Tashkent State transport university, The Republic of Uzbekistan, Tashkent city Mirabad district, st.Adylkhodzhaeva I, Uzbekistan

ABSTRACT: Uzbekistan represents one of the most prone to natural hazards of the countries in Central Asia. Its territory is characterized by a variety of natural conditions and resources, as well as landscape features and is most vulnerable not only to an earthquake, but also to such phenomena as heavy precipitation, mudflows, landslides and avalanches. Because of a mountain landscape and a large number of the rivers the population living in mountain terrain is subject to high risk of landslides and mudflows.

According to the Kyoto Protocol of the UN Framework Convention on Climate Change, one of the priorities for mitigating possible global climate change is climate risk management, which includes the development of a set of measures that minimizes the possible damage resulting from the emergence of climate-dependent natural disasters.

Successful and competent implementation of the whole range of measures to protect against landslide hazard is an important technical, economic and social aspect of the construction and operation of infrastructure facilities.

The article provides information on ongoing measures to protect the population, territory and infrastructure from the hazards associated with landslides and the elimination of their consequences. The whole complex of measures aimed to the decision the engineering tasks of anti-landslide protection are turned into the recognition and assessment of threats, stabilization and retention of the landslide massif.

I. INTRODUCTION

The Republic of Uzbekistan is a continental country in Central Asia, located between the Amu Darya and SyrDarya rivers, between the Aral Sea and the foothills of the Tien Shan. Uzbekistan borders with Kazakhstan in the north and northeast, Kyrgyzstan and Tajikistan in the east and southeast, Afghanistan in the south and Turkmenistan in the southeast. Most of the territory of Uzbekistan is occupied by plains, including the Turan Plateau, on which one fifth of the country's territory is located. The area of the country is 447,400 square kilometers, and the population is 32 million people. The highest and lowest points of the country's territory are 4,301 m and -12 m, respectively. The Amu Darya and Syr Darya are the largest rivers in the country, used mainly for irrigation, including arable land [1].

The climate in Uzbekistan is continental. It is characterized by hot summer months and cold winters. The temperature in summer often exceeds 40°C, while the average winter temperature is -2°C, although sometimes it can drop to -40℃. Most of the country is characterized by dry weather - the average annual rainfall ranges from 100 to 200 mm, with most of the rainfall occurring in the winter-spring period. Uzbekistan is subject to several types of disasters caused by natural hazards, such as earthquakes, droughts, floods, landslides, and man-made, including transport accidents and emergencies.

Uzbekistan is located in a zone characterized by a moderate to high degree of seismic hazard. Analysis of disaster data shows that Uzbekistan has been exposed to destructive earthquakes several times in the past. On April 26th, 1966 y., an earthquake struck the capital of the country, Tashkent, in which 10 people died, 100,000 people were injured, and economic damage amounted to $300 million. The earthquake with a magnitude of 7,0 in the Gazley region on May 17th, 1976 y. caused economic damage of $85 million [2].

The mountainous and foothill areas of the country are also subject to significant risk of landslides. At the same time, over the past 80 years, more than 2,600 cases of large mudslide have been reported. As the result of landslide in the area of

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906108 |

Angren on May 4th, 1991 y., 50 people died, landslide in January 1992 y. caused the death of 1 person, and the total number of victims was 400 persons[3]. In the high-mountainous region of the Namangan on March 15th, 2017 y. five people became victims at the action of landslide mass of 13300 cubic meters, two cars remained under the landslide mass. A mudslide 2 m wide and 15–20 m long covered the 69-th km of the road. At the epicenter the width of this mudflow landslide reached 4–4,5 m, and its length up to 35–40 m.

Figure 1. Landslides on the area of the road Tashkent – Chimgan, (March, 2017y.)

II..MAIN TASKS OF STATE SERVICE FOR MONITORING HAZARDOUS GEOLOGICAL PROCESSES

To date, the state bodies of the republic have accumulated some experience in disaster risk reduction and liquidation of their consequences. In the republic have been createdand equipped the regiment of civil defense forces and rapid reaction units. Now their branches are created, and anti-flood commissions are operated in the regions.

The State Service of the Republic of Uzbekistan for tracking hazardous geological processes: monitors education and development, as well as warns of the possibility of the formation of natural geological processes occurring as a result of economical activity of the damaging processes in the territory of the Republic of Uzbekistan for the purpose of notification of local governmental bodies and authorities.

The main tasks of the State Tracking Service are:

identification of areas of development of hazardous geological processes (HGP) and warning of their possible activation;

organization of monitoring of the formation and development of HGP, notification of local state bodies and administration, interested ministries, state committees and departments;

preparation and issuance of recommendations on the rational use of territories in the areas of active development of hazardous geological processes aimed at preventing the formation of new foci;

implementation of state control over the implementation of the relevant regulations and requirements issued by the results of the monitoring of HGP by local governmentsl bodies and various organizations of the republic.

III. ENGINEERING LANDSLIDE PROTECTION

Protection of the population and territories from emergency situations associated with landslide, flood, mudflow and avalanche events is one of the priority tasks in the field of safety.

The strategy for protection from landslides is to design and build special structures that can protect buildings, roads, bridges and other structures from destruction.

Engineering protection against landslides can be active and passive. Passive methods of protection are a set of works on the collection of information, analysis and calculation, as well as the timely recognition of safety hazard and its assessment. Active arrangements include the installation of regulatory and protective structures, changing the terrain relief and river beds.

One of the most effective types of preventive anti-landslide arrangements is solidification unstable soils. For these purposes, geogrids and special systems based on nets are used. Retaining walls are being built to contain the landslide massif. Greater efficiency is demonstrated by gabion structures.

As a precautionary measure, good results are obtained by artificially lowering the level of groundwater. Such work can reduce or completely stop the damaging effects of water on the ground, which reduces the risk of a landslide. The

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906108 |

change in relief also prevents the movement of the ground and contributes to its stabilization. High anti-landslide effect gives a combination of several technologies and materials, for example, relief layouts and the use of a geosynthetic lattice. The use of geosynthetics in landscape works is justified not only from the point of view of efficiency, but also taking into account environmental safety. In all types of work, experts use only proven materials that have been tested [4].

Hazard recognition and assessment refers to passive protection methods. The recognition and assessment of threats allows to assess the damage from the possible consequences of the descent of ground masses and to determine the need for measures to prevent them. To identify a landslide hazard at the earliest possible stage, it is necessary to assess the activity of the landslide (calculation of the stability coefficient) and calculate the volume and trajectory of the movement of the soil masses. For this purpose are performed the engineering-geological, engineering-geodesic, hydrogeological, hydrological surveys, meteorological observations and modeling of the development of ground processes, as well as monitoring of the HGP.

If the probability of landslides is high, then it is necessary to use active engineering protection methods. In this case, they include measures to stabilize and retain the landslide massif.

IV. STABILIZATION AND RETENTION OF THE SOIL MASS

To implement engineering protection against landslide processes are usedstabilizing the soil massif, draining, flattening or cutting into blocks, changing the properties of the soil [4].

The main factor in provoking a landslide is its water logging. To prevent this, drainage structures are the most effective, blocking the path of surface and groundwater to the landslide massif.

Surface drainage and deep drainage systems are used for drainage. Surface waters are diverted by ditches, underground waters - by tunnels or horizontal wells. Despite the high cost of these activities, the cost of building drainage systems is much lower than the cost of eliminating the consequences of a possible disaster.

Drainage systems are designed in such a way as to collect the maximum possible flow of surface water from the area and take it to the places of possible discharge or to treatment facilities.

For small volumes of drainage water collection, one-pipe closed drainage is used (Figure 1). For cleaning during silting, inspection wells are installed at a distance of no more than 40 meters from each other. Perforated corrugated pipe is used for drainage. The perforation and diameter of the pipes is chosen depending on the conditions of water collection and the estimated volumes of taken water. Ditches are filled with crushed stone and dry rubble.

With significant amounts of drainage water and large drainage lengths, two-pipe drainage is used (Figure 2). The second pipe is used as a transit pipe from the upper part of the drainage and is used without perforation.

When using combined drainage, analogues of transit pipes are open ditches (Figure 3). This eliminates the need for the manholes and at the same time ditches collect surface water. However, this method is applicable mainly for slopes with a sufficient slope angle.

When constructing drains and drainage ditches, it is recommended to apply constructive solutions that retain all properties with joint deformation of drainage and soil: use geosynthetics and geogrids, texbent (composite flexible waterproofing) as bottom waterproofing trays and ditches, stone paving to reduce the speed of water flow and protect texbent, corrugated pipes.

One of the most expensive and difficult methods to stabilize massif is deep drainage. However, in some cases this method is the only possible one. Deep drainage is divided into two types: horizontal drainage gallery and radial drainage. Both methods are good because they allow to cover a large area and accurately determine aquifers. The essence of the drainage gallery is the construction of the mine workings in the form of a drift, which goes around the landslide massif in the potential slip plane of the landslide (Figure 4). The goal is to intercept and divert groundwater through the gallery and drain the main body of the landslide.This method requires the most accurate determination of the slip zone in engineering and geological studies.

The method of deep radial drainage consists of a device on the surface of a slope of a vertical shaft with successive fixing of its walls as it penetrates (Figure 5). In places of maximum water occurrence, taking into account the slope of the aquifer, ascending filter wells are drilled. Water through them falls to the bottom of the mine, from where it is drained to the surface of the slope by gravity through the discharge well. This structure is efficient, inexpensive and easy to maintain. The advantage is the ability to control the process of drainage, and if necessary - to drill or cement wells.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906108 |

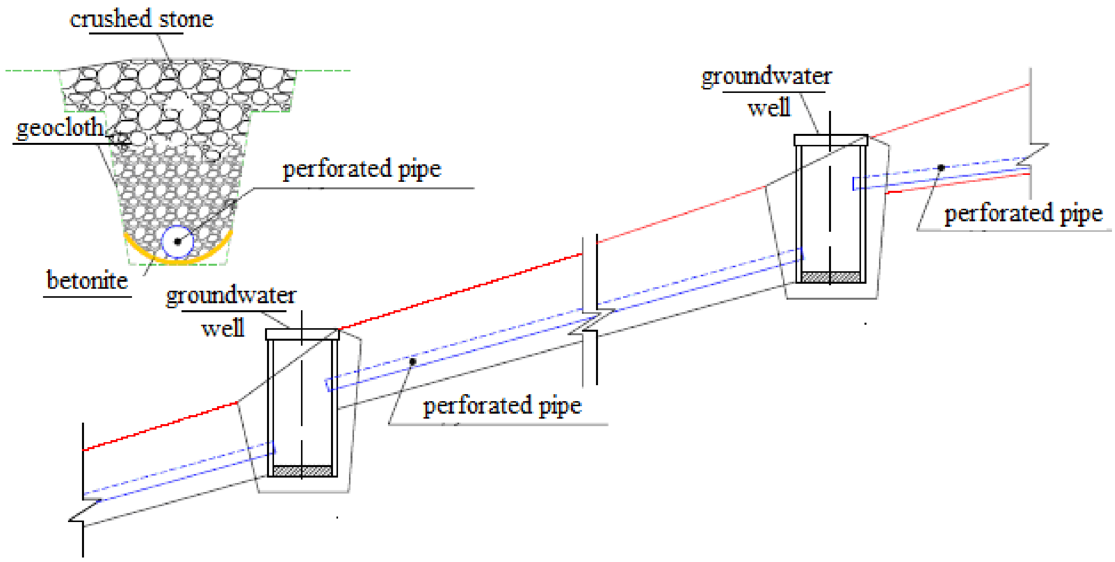


Figure 1. Single pipe closed drainage

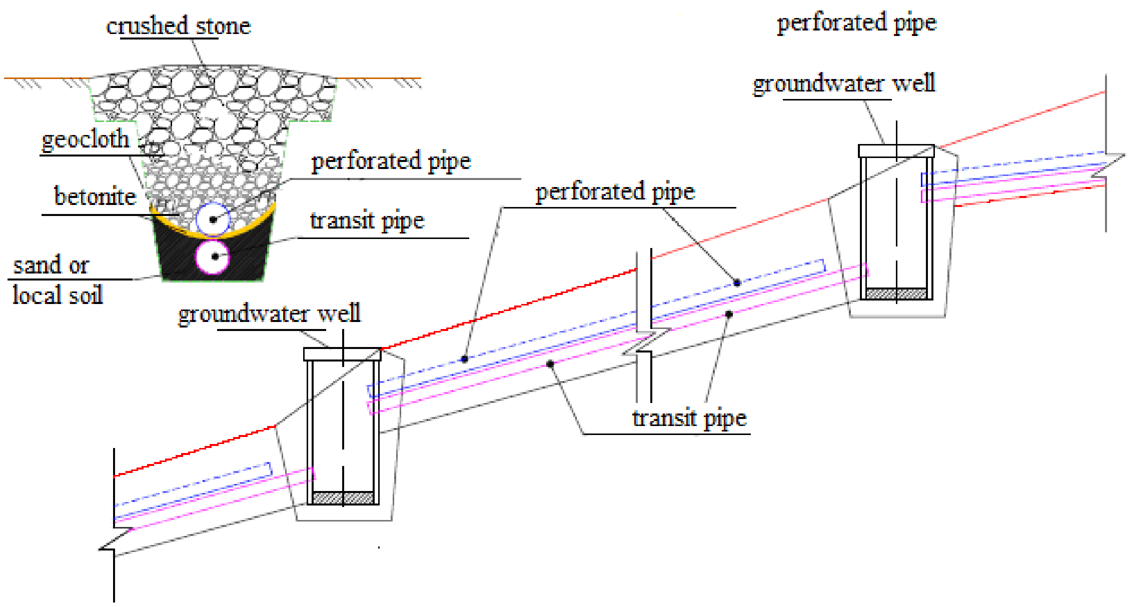


Figure 2. Double pipe closed drainage

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906108 |

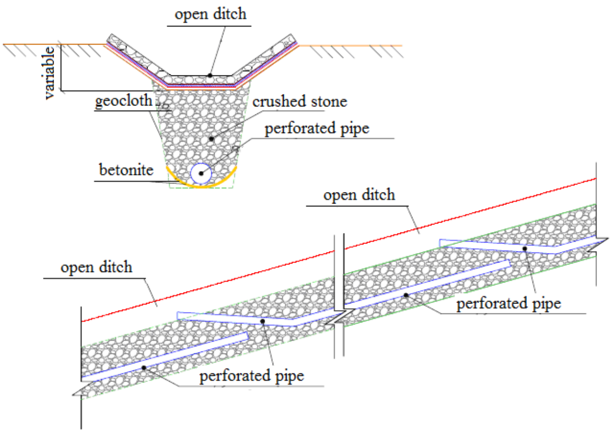


Figure 3. Combined drainage

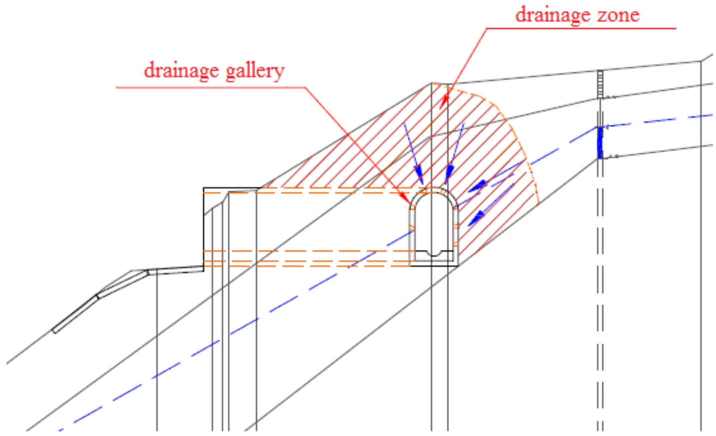


Figure 4. Drainage gallery

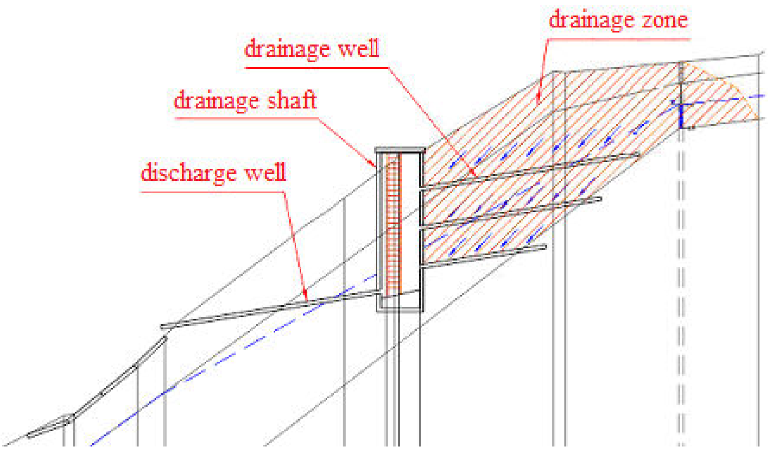


Figure 5. Radial drainage

The efficiency of dissection will be higher if the higher the connectivity of the soil. It is safe to say that properly and professionally executed drainage of the landslide body, at least to the slip line, is one of the most effective anti-landslide measures.

The redistribution of soil masses on the landslide massif with the aim of stabilizing and increasing stability is a very effective method, but it requires considerable expenses and is not always possible due to the presence of buildings and other ground objects. In addition, these actions can lead to the development of a landslide, as in the process of work, the water absorption capacity of the displaced soil increases deeply, its density, cohesion and angle of internal friction decrease. This state can last for several years, until the massif is consolidated.

The optimal means of stabilizing the landslide massif in such cases is the set of the ascending drainage slits or drainage buttresses in the bottom of the massif, dissecting the landslide body. The efficiency of dissection is higher, the higher the connectivity of the soil.

V. CONCLUSION

Uzbekistan is subject to several types of disasters caused by natural hazards, such as earthquakes, droughts, floods, landslides, and man-made, including transport accidents and emergencies.

The mountainous and foothill areas of the country are also subject to significant risk of landslides. At the same time, over the past 80 years, more than 2,600 cases of large mudslide have been reported. Protection of the population and territories from emergency situations associated with landslide, flood, mudflow and avalanche events is one of the priority tasks in the field of safety. The main factor in provoking a landslide is its waterlogging. In this regard, in this paper, in order to eliminate a possible catastrophe, effective engineering solutions are proposed for drainage facilities, blocking the path of surface and groundwater to the landslide massif.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542 |

|| Volume 9, Issue 6, June 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0906108 |

Surface drainage and deep drainage systems are used for drainage. Surface waters are diverted by ditches, underground waters - by tunnels or horizontal wells. Despite the high cost of these activities, the cost of building drainage systems is much lower than the cost of eliminating the consequences of a possible disaster.

Drainage systems are designed in such a way as to collect the maximum possible flow of surface water from the area and take it to the places of possible discharge or to treatment facilities.

REFERENCES

1. Gupte S 2009*Report of Disaster risk assessment in Central Asia and the Caucasus* (Tashkent:UNDPin Uzbekistan) p206
2. ZaynutdinovaD 2016 *Strengthening disaster risk management capacities in Uzbekistan*(Tashkent: Tashkent National University Press) p 154
3. Shaazizov F Sh2017*Modeling of natural processes occurring in the mountainous and foothill areas of the Republic of Uzbekistan*(Tashkent: Ministry of Emergency Situations Press of the Republic of Uzbekistan) pp 119-126
4. MiralimovM. 2018*Instructions for the design and construction of anti-mudflow and anti-landslide structures for engineering protection of highways*(Tashkent: Research Institute of Highways)p 156

INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 7.542

doi crossref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

Scan to save the contact details