ISSN: 2775-5118 VOL.4 NO.11 (2025) I.F. 9.1

THE MAIN CAUSES OF FLOODS THAT CAN OCCUR AT HYDROELECTRIC POWER STATIONS AND DAMS, AS WELL AS PREVENTIVE MEASURES

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Annotation. *The article provides brief information on the main causes of floods that may occur at hydroelectric power plants, dams, as well as their material and moral damage. It also highlights measures to prevent floods in areas affected by water surges at hydroelectric power plants, dams and weirs.*

Keywords: *flood, danger, breaking wave, hydroelectric power stations, dams, dikes, wave crest.*

Introduction. Natural disasters of any nature that occur lead to disruption of the country's economy, the death of many people or disruption of life, damage to nature and other negative consequences.

Natural disasters usually alarm a person with their sudden occurrence, in a short period of time they can level the territory, turn residential buildings into ruins, cause serious damage to property, communication networks, etc..

Scientific researchers in foreign countries consider a natural disaster as a process that creates a catastrophic situation and distorts their daily way of life, forcing the population to continue to need help. As a result of a natural disaster, the population has a special need for medical and other types of assistance.

According to the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 455 "On the classification of man-made, natural and environmental emergencies" (10/27/1998),

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natural disasters are divided into geological hazards, hydrometeorological hazards and emergency epidemiological, epizootic and epiphytotic situations.

The purpose of the study: Floods are considered the most dangerous among hydrometeorological hazards that can lead to death of people, flooding of settlements, some industrial and agricultural facilities, disruption of infrastructure and transport communications, production and human activity.

A flood is a temporary flooding of an area as a result of an increase in the level of a river, lake, reservoir or sea. Flooding can be caused by melting snow and glaciers, prolonged rains and clogging of river sediments with ice fragments as a result of dam bursts.

Many floods can be the main causes of floods, depending on the circumstances of the formation of the water flow.

Depending on the causes of their occurrence, five groups of floods are distinguished:

Group 1 - floods caused by spring snowmelt - a significant and rather long-term rise in the water level in a river, which is called a flood;

Group 2 - floods caused by heavy rains, sometimes due to snowmelt in winter due to warming weather - are characterized by rapid, relatively short-term rises in the water level and are called a flood;

Group 3 - floods caused by high resistance to water flow in a river. Usually this occurs at the beginning and end of winter in ice jams and piles;

Group 4 - floods caused by wind blowing water in large lakes and reservoirs, as well as in places where rivers flow into the sea;

Group 5 - floods formed during the rupture or failure of water structures.

Floods are divided into four categories according to their size or scale and the damage caused.

- low (small) floods observed on rivers in the plains cause insignificant material damage, practically do not disrupt the way of life of the population;

- high-level floods, with significant flooding, cover relatively large parts of river valleys, sometimes disrupt the economic and domestic lifestyle of the population, and lead to partial evacuation of the population in densely populated areas;

- large floods cover river basins, stop economic activity, cause significant material damage, and lead to mass evacuation of the population and material assets;

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- catastrophic floods cause flooding of large areas in one or more river systems, significant material damage, and death of people.

A surge wave is a wave of considerable height and speed, which is formed in front of a water flow that is trying to break through, and has a large destructive force.

A surge wave occurs when two processes overlap: the water of a reservoir falls from the upper bank to the lower bank, which causes a surge and a sharp increase in the volume of water at the place of fall and causes the water level to flow from one place to another [7].

A surge wave, unlike wind waves that appear on the surfaces of large bodies of water, has the ability to move a large mass of water in the direction of its movement. Therefore, a surge wave should be considered as a specific mass of water moving downstream and constantly changing its shape, volume and speed [5,6,7]. The effect of a penetration wave on objects is similar to the effect of a shock wave from an air nuclear explosion, except that the impacting rock is water. A longitudinal section of the resulting wave is shown in Figure 1.

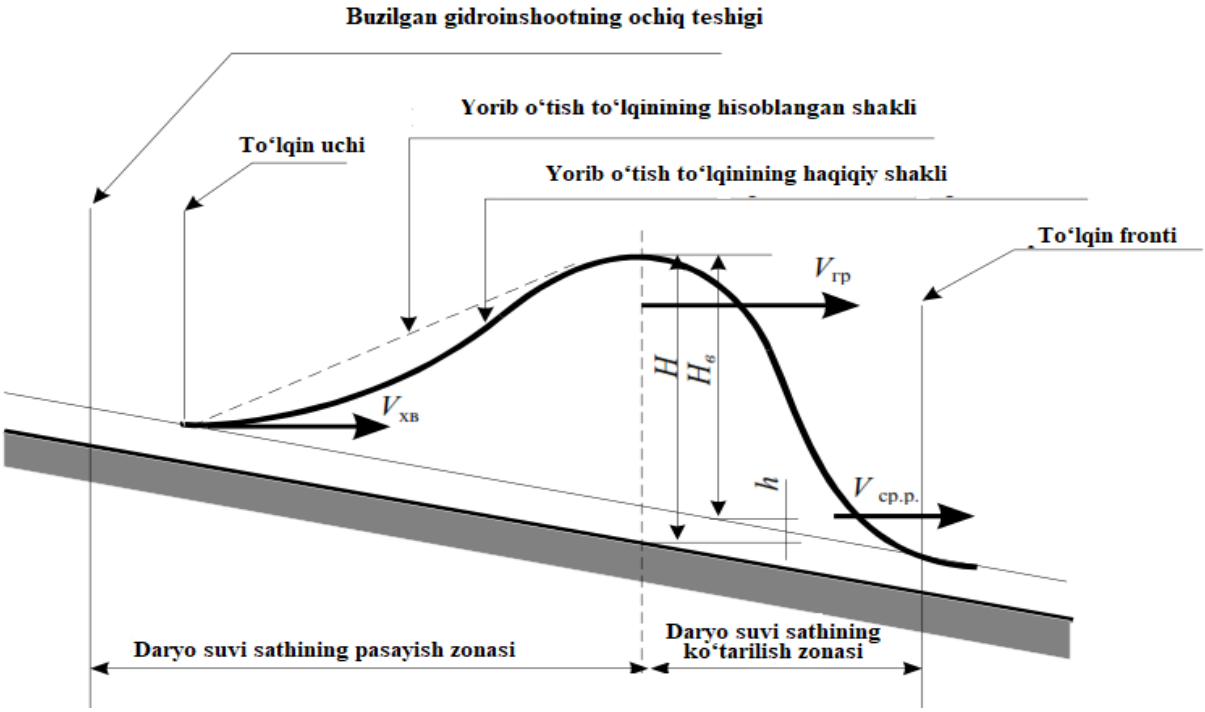

Figure 1. Schematic longitudinal section of a breaking wave: h - water level in the river; HB - wave height; H - flow depth.

The beginning of a wave that moves forward at high speed is called a wave front. The wave front can be sharp when large waves move close to damaged water structures, and relatively flat when they move far away from water structures. The area of greatest wave height is called the

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crest, and it moves more slowly than the wave front. The end of the wave - the tip of the wave - moves even more slowly.

The height and speed of the breach wave depend on the hydrological and topographic conditions of the river [4]. For example, for plain areas, the speed of the breach wave varies from 3 to 25 km / h, while in mountainous and foothill areas it can be equal to 100 km / h. Forested areas reduce the speed and reduce the height of the wave. The speed and parameters of the damaging factors of the breach wave are given in Tables 1–2 [7].

Table 1.

Average speed of the breaking wave, km/h

Characteristics of Uzans and Kairs	***j* = 0,01**	***j* = 0,001**	***j* = 0,0001**
In rivers with flooded fields	4–8	1–3	0,5–1
In meandering rivers with vegetated or uneven rocky bends, widening and narrowing bends	8–14	3–8	1–2
In rivers with well-developed bedrock and narrow and medium-sized bends without significant resistance.	14–20	8–12	2–5
In rivers with steep banks and narrow bends with little curvature.	24–18	12–16	5–10

Table 2

Values of parameters of damaging factors of penetrating waves

Parameters of damaging factors	**Parameter values**
Current depth (wave height), m	1.5 – for weak ones; 4 and more – for strong and complete disorders;
Current velocity, m/sec	2 – for weak ones; 2.5 and more – for strong and complete disorders

The characteristics of flood zones include:

–the number of people in flood zones;

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–the number of settlements in the flood zone (cities, urban-type settlements, rural settlements, completely flooded, partially flooded, in the flood zone, etc.);

–the number of objects in various sectors of the economy in the flood zone;

–the length of railways and highways, power lines, communications and communications in the flood zone;

–the number of flooded, destroyed and damaged bridges and tunnels;

–the area of agricultural land covered by the flood; the number of dead farm animals.

–The qualitative characteristics of the damage to the flooded area depend on:

–the height of the water rise above the level of the river, reservoir, which can vary from 2 to 14 meters;

–the flooded area, which can vary from 10 to 1000 km2;

–the area of the flooded settlement, which can vary from 20 to 100%;

–the maximum level of water consumption during the flood period, depending on the catchment area, from 100 to 4500 m3/s (with a catchment area of 500 km^2, the maximum water consumption can be from 100 to 400 m^3/s, at 1000 km^2 - 400-1500 m^3/s, at 10000 km^2 - 1500–4500 m^3/s);

– the duration of the water rise, from 1 day to 2 days;

– the duration of the flood caused by the melting of spring snow and ice, from 1 day to 3 days on small rivers, and from 1 month to 3 months on large rivers.;

–The flow velocity varies from 2 to 5 m/s during high tide.

Prolonged rains. They occur mainly in summer and autumn in areas with humid climates. They cause flooding of territories, mainly due to rivers overflowing their banks. This is due to the overflow of water in rivers, due to the accumulation of large amounts of water in vast areas. Precipitation strongly affects the water level in rivers.

As a result of chronic snowmelt. In spring, large amounts of snow accumulate in many areas. Because of the heat, it melts, and streams of water can flood everything around. However, this does not lead to fatal consequences.

Accumulation of precipitation. Due to the accumulation of sediment in some parts of the rivers, the riverbed rises. This leads to an increase in the water level.

Therefore, hydrologists divide all cases of waterlogging into four categories:

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In lowland rivers, they are observed once every 5-10 years. If you take some preparatory measures, they do not affect vital activity.

High - they occur once every 20-25 years, flooding large areas of river valleys, in some cases causing damage to daily lifestyle. In some cases, people have to be relocated to safe places.

Well-known - it happens once every 50-100 years. At least 50% of agricultural land is flooded, which leads to a mass extinction of the population. The flooding of cities and towns begins.

Destructive - it happens once every 100-200 years, floods several river systems, completely changes the way of life.

As a result of the destruction of rocks, flooding of mountain rivers or other causes of deterioration of reservoirs. If for any reason the dam cannot maintain the water pressure, it will burst. This causes short-term but very severe floods.

Natural phenomena. Some natural phenomena can also cause flooding of territories. For example, earthquakes and landslides can lead to blockage of riverbeds.

Among these reasons, during the period of heavy rainfall in our country, the water level rises sharply, they do not fit into rivers, lakes and, as a result, flood arable land, residential areas, roads and take them off the trail.

During long–term observations, the probability of flooding in Uzbekistan was recorded in the months of April - June and the events that occurred are distributed as follows: 30% in April, 36% in May, 14% in June.

In the months of April and May, floods are observed on the slopes of Tashkent, Jizzakh, Samarkand, Surkhandarya, Kashkadarya regions and the Ferghana Valley.

In June and July, floodplain movement persists in the mountainous areas of Namangan and Ferghana regions. There is also a possibility of flooding in Tashkent, Jizzakh and Syrdarya regions. As a result of inspections of the divisions of the Main Department of Hydrometeorology in the regions, the main flood risk zones were identified: the Ferghana Valley (Ferghana, Namangan and Andijan regions); the south of Uzbekistan (Kashkadarya and Surkhandarya regions); the northeast and East of the East of Uzbekistan (Tashkent, Samarkand and Navoi regions).

The practical results of the study include the following: floods cause direct and indirect damage. Damage to residential and industrial buildings, roads and railways, electrical and communication networks, land reclamation systems, loss of crops and livestock, loss of raw materials, fuel, food, fodder, loss of fertilizers, amounts spent on moving people and material assets to a safe place, erosion of the fertile soil layer, all these relate to direct the type of damage.

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The costs associated with the purchase and supply of food, clothing, medicines, building materials and equipment, food products for the affected areas, reduced production of industrial and agricultural products, slowing economic development, deterioration of living conditions of the land population, insufficient use of flooded territories, rapid destruction of buildings and structures located in areas of permanent flooding are indirect damage.

The modern city is considered relatively vulnerable to cases of flooding. Because as a result of flooding, the soil settles. This, in turn, leads to numerous interruptions in the operation of sewer and water pipes, gas mains, power grids, and communication networks.

The time of the flood and its duration play an important role for agriculture. When crops are flooded, air from the soil will be removed, air exchange in moderate amounts will be disrupted, and carbon dioxide will pass from the roots of plants into water, as a result of which the plant will be poisoned. For this reason, crop yields decrease or they completely die.

The solution to the problem. Hydrologists usually warn in advance about rising water levels. In this way, it will be possible to predict most floods and reduce their damage. In these cases, the condition of dams and dams is checked, the population is notified and, if necessary, engineering work is carried out (for example, ditches are dug to drain excess water).

What should I do when I receive a flood notification? This is usually reported with information about the estimated time of flooding, its limits, as well as recommendations to the public and the evacuation procedure. If your house falls into the declared flood zone, the following rules must be observed:

turn off gas, water, electrical networks and stoves;

transferring expensive items to the upper floors;

It should be remembered that in this case, as in other natural disasters, there is a secondary danger, that is, the risk of accidents at industrial enterprises, the danger from damaged pipes and broken electrical wires. It is forbidden to consume products left in the water.

The factors used against floods in general include: an increase in the level of water flow in the river, deep plowing of land in the transverse direction against the current, raising the banks and sides of rivers.

Timely informing the population in case of a flood threat, evacuation of material resources of citizens, farm animals to safe places are among the most important tasks.

Before evacuation, every citizen must bring their home to a safe state, that is, turn off gas, water, electricity, lock windows and doors, take with them the necessary documents, money, as well as food and drinking water for at least three days.

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Conclusion.

It is always worth remembering that the time for the formation of a leash stream is very short and, given the speed of the flood, the time for spreading the flood message and carrying out environmental measures is very limited (it can take from several to 10-20 minutes).

By defining lists of housing and other facilities located in areas where floods are likely to occur, we can achieve the preservation of human lives by distributing appropriate recommendations with instructions to the public, creating a flood monitoring and notification service.

People who remain in flood zones should not succumb to various panics and swim (move) to the low-lying shore with the flow of water. During a flood, it is necessary that a certain part of the people (rescuers) remain in the disaster area and perform as much rescue work as possible.

LIST OF USED LITERATURE:

1. Toirovich, Ruziev Suxrob, Yasakov Zikrilla Xayrullaevich, and Achilov Anvar Mamarasulovich. "Early Calculation of Forces and Means to Reduce the Risk of Emergencies (Fires)." International Journal on Orange Technologies 5.12 (2023): 67-72.

2. Xayrullaevich, Yasakov Zikrilla, and Achilov Anvar Mamarasulovich. "Hayot Faoliyati Xavfsizligi Fanlarini Talabalarga Va Ishchi Xodimlarga O'qitishning Dolzarb Masalalari." Miasto Przyszłości 41 (2023): 236-240.

3. Тойрович, Рузиев Сухроб, Ясаков Зикрилла Хайруллаевич и Ачилов Анвар Мамарасулович. «Предварительный расчет сил и средств снижения риска возникновения чрезвычайных ситуаций (пожаров)». Международный журнал Orange Technologies 5.12 (2023): 67-72.

4. Gadaev, Abror Niyazovich, Zikrilla Xayrullaevich Yasakov, and Anvar Mamarasulovich Achilov. "Suv Taqchilligi Xavfi Va Uning Echimi Sifatida Noan'anaviy Suv Manbalari." Miasto Przyszłości 46 (2024): 1103-1108.

5. https://www.morebooks.shop/shop-ui/shop/product/9786206794219.

6. А. Ачилов. (2021). ИНЖЕНЕРНЫЕ РЕШЕНИЯ ПО БЕЗОПАСНОСТИ ГИДРАВЛИЧЕСКИХ СООРУЖЕНИЙ. JournalNX — многопрофильный рецензируемый журнал , 250–252. Получено с https://repo.journalnx.com/index.php/nx/article/view/418.

7. Ясаков, З. Х., and А. М. Ачилов. "ЎЗБЕКИСТОНДА СУВ РЕСУРЛАРИ ХАВФСИЗЛИГИ ВА УЛАРНИ БАРҚАРОР БОШҚАРИШ." ZAMONAVIY FAN, TA'LIM VA ISHLAB CHIQARISH MUAMMOLARINING INNOVATSION YECHIMLARI (2022): 112-114.

\

8. Niyazovich, P. G. A., Y. Z. Khairullaevich, and A. Anvar. “The Water Deficit Solution in Central Asia: Rrainwater Using”. European Journal of Life Safety and Stability (2660-9630), Jan. 2022, pp. 212-5, https://www.ejlss.indexedresearch.org/index.php/ejlss/article/view/399.

9. Ruziev, S. T., and A. M. Achilov. "Chet Davlatlarda Aholini Favqulodda Vaziyatlarda Ogohlantirish, Xabar Berish Usullarini O ‘Rganish Va Tahlil Qilish." Miasto Przyszłości 40 (2023): 464-467.

10. Suleymanov, A. A., et al. "EVACUATION OF THE POPULATION IN CASE OF THREAT AND EMERGENCY SITUATIONS." JOURNAL OF ENGINEERING, MECHANICS AND MODERN ARCHITECTURE (2023): 67-72.

11. Ruziyev, Suxrob, et al. "Determination Of The Additional Aspiration Coefficient Formed In The Combustion Zone." Excellencia: International Multi-disciplinary Journal of Education (2994-9521) (2023): 59-68.

12. S. T., R., A. A. M., and K. M. Sh. The Role and Importance of Training and Tactical Training in Higher Education in Reducing Fire Risk. European Journal of Life Safety and Stability (2660-9630), Jan. 2022, pp. 208-11, https://www.ejlss.indexedresearch.org/index.php/ejlss/article/view/396.

13. Ruziev, Suhrob, and Adiljan Suleymanov. Harbiylashtirilgan obyektlarida favqulodda vaziyatlarni bartaraf etish. GlobeEdit, 2020.

14. Ruziev, S. T. "Determination of additional aspiration flows produced in the fire zone in field in field conditions with solutions."Central Asian Journal of Theoretical and Applied Science 3.6 (2022): 101-104.

15. Ruziev, S. T. va Ravshan Sultonov. "EXPERIMENTAL TAKIKOTLAR ASOSIDA ZAMONAVIY ASBOBLAR VA USKUNALARDAN FOYDALANILGAN XOLDA KOSHIMCHA ASPIRATION OKIMLARNI ANIKLASH."Gospodarka va Innovacje. 36 (2023 yil): 208-213.

16. https://www.morebooks.shop/shop-ui/shop/product/978-620-6-79365-6

17. https://www.morebooks.shop/shop-ui/shop/product/978-620-6-79416-5.

18. Ismaylov, K., Suleymanov, A., Toshev, S., & Ruziev, S. (2021). Option Of The Method Of Successive Approximations In Calculating The Epicenters Of Extreme And Emergency Situations. Ilkogretim Online, 20(3).

19. Ismayilov, K., Suleymanov, S. T., Ruziev, S. T., & Aripjanova, M. B. (2020). A new method of successive approximations when calculating elements of electromechanical machines. XXI Century. Technosphere Safety, 5(2), 168-172.

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20. Suleymanov, A. A., Ruziev, S. T., & Karimov, B. G. Localization Of Emergency Situations Using Aspiration Flow Coefficiency. JournalNX, 600-604.

21. Исмайилов, К., Сулейманов, С. Т., Рузиев, С. Т., & Арипджанова, М. Б. (2020). Новый вариант метода последовательных приближений при расчете элементов электромеханических машин. XXI век. Техносферная безопасность, 5(2 (18)), 168-172.