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THE RESULTS OF MONITORING THE FORMATION OF FLASHFLOODS IN MOUNTAINS AND FOOTHILL AREAS OF UZBEKISTAN

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Abstract. The article deals with the analysis of increasing number of emergency situations that are related to global climate change and as a consequence of this process rising amount of flashfloods and maximum flow rates during the last decade. For calculations, mathematical and statistical methods were applied, afterwards field data with calculated measurements comparisons were carried out. Our results show a direct relationship between increased floods and global climate change. Moreover, the maximum costs of mudflows are also increasing. Moreover, climate change and natural disasters have transboundary character and also depend on the conditions of natural resource management. Therefore, effective disaster prevention requires cross-border monitoring and early warning.

Keywords: flashfloods, The Kashkadarya River, climate change, foothill areas.

Introduction. Natural extreme events in recent decades on the territory of Uzbekistan there has been a tendency to their growth. floods, mudflows, and other dangerous natural phenomena associated with water become regular. The results of this study show that the frequency of occurrence of natural hazards is increasing as the effects of global climate change process [8]. Since 2015, the number of mudflows in the region has been growing rapidly. Such flows for short periods, calculated in tens of minutes or several hours, destroy bridges, roads, fill up canals, fields and other cultivated lands with their drifts. Mudflows threaten cities and villages located in the foothills and mountains of our republic [9, 10, 11].

Flashflood is a temporary mountain stream, characterized by high solids content and a quick rise in level. Mudflow, as a rule, consists of water and rock destruction products and is characterized by a sudden occurrence and rapid and short-term movement [1].

Three conditions are necessary for the formation of mudflows:

- the presence on the slopes and channels of a sufficient amount of rock destruction products;
- the presence of a sufficient amount of water for flushing or demolition and moving along the beds of loose material;
- strongly dissected mountainous terrain, the presence of steep slopes, slopes and channels.

Mudflows happen in the vast territory of the highlands of the Ferghana Valley, Tashkent, Kashkadarya, Surkhandarya, Samarkand, Jizzakh and Syrdarya regions of the Republic of Uzbekistan. Global climate change on the earth's surface has had a significant on the pattern of precipitation [3]. In particular, liquid precipitation that falls mainly in the spring – summer period has been demonstrating in recent years by a special concentration on a small area, and precipitation in the form of rain falls most intensively in this area. This leads to the formation of hazardous mudflows [7].

Materials and methods. In this research we used materials from exploitation and field studies on the recurrence of hazardous natural phenomena of small piedmont rivers of Uzbekistan. For calculations, mathematical and statistical methods were applied, and then comparisons were made between field data with calculated measurements [5].

Results and discussions. Mudflows are widespread throughout the mountainous and foothill parts of Uzbekistan and are often they have transboundary nature, since most mudflows occur in neighboring countries - Kyrgyzstan and Tajikistan [1].

In the Kashkadarya region, large mudflow centers are the basins of the Kashkadarya, Guzardarya, Tanhizydarya, Yakkabagdarya Rivers and also creeks of the foothill regions of the region.

In terms of the duration of existence all rivers of the Kashkadarya region are divided into two categories:

- rivers with a constant flow of water throughout the year;
- temporary creeks which are operating periodically, often only during periods of rainfall.

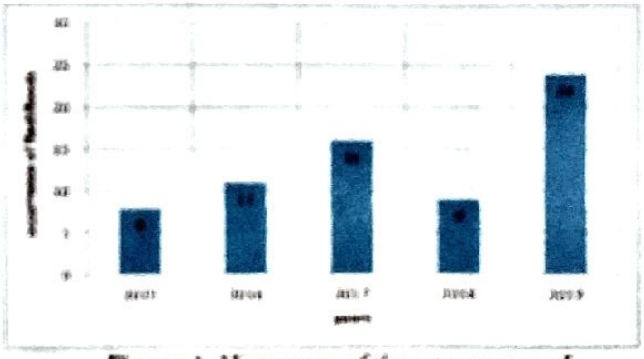

Figure 1. Histogram of the occurrence of flashfloods for 2015-2019 years

Monitoring of flashfloods for 2015-2018 in the Namangan region showed that 95 mudflows were recorded during this period (Fig.2):

- for 2015 -30, of which the maximum in June is -5;
- for 2016 -9, of which the maximum in the month of May is -23;
- for 2017 -34, of which the maximum in the month of May is -22;

for 2018 -22, of which the maximum in June is -18;

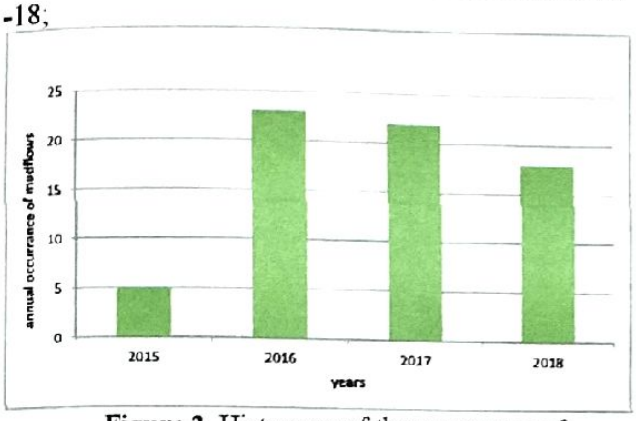

Figure 2. Histogram of the occurrence of flashfloods for 2015-2018 years.

Mudflows are observed from March to August. Their greatest repeatability takes place in April-May. Mudflows are caused mainly by rain showers and form in areas with maximum rainfall.

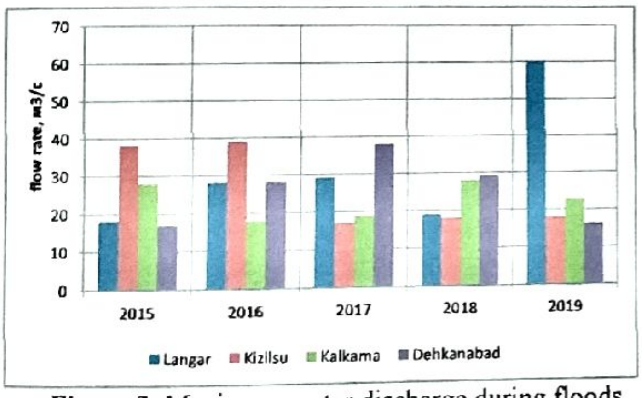

Figure 3. Maximum water discharge during floods in the Kashkadarya river basin.

As Fig. 3 shows, year by year there is an increase in the maximum water discharge in the tributaries of the Kashkadarya River. Especially in 2019, in the Langarsay River, the maximum flow rate has growth significantly compared to previous years.

The study of data for long-term observations of the formations of mudflow activity and its spatial-temporal variability throughout Uzbekistan allow the following outcomes:

as a whole, in the country, the area of the basins of the mudflow of active watercourses is 53770 km2 (12% of the total area of the Republic of Uzbekistan), the number of flashflood-based watercourses is 709, the number of national economic and other objects located in the mudflow zone is 858 [5];

The most exposed to flood risk are: Namangan (19%), Ferghana (14%), Surkhandarya (13%), Tashkent (12%), Samarkand (12%) and Kashkadarya regions (12%);

the largest number of mudflows was registered in the areas located in the Ferghana Valley (40%), characterized by a maximum population density [6];

Peak of mudflow activity for the territory of Uzbekistan occurs in April (30%) and May (36%);

Mainly mudflow activity (85%) in Uzbekistan is caused by heavy rains and high intensity rains [1]. Conclusions

In recent years, as global climate change on the earth's surface the more territories of Uzbekistan are becoming even more sensitive to climate change and in our region. Our results show a direct relationship between increased floods and global climate change. Moreover, the maximum costs of mudflows are also increasing.

This fact has its effect on the increased risk of natural disasters in Uzbekistan (mudflows, snow avalanches, dry years). Climate change and natural disasters are transboundary in nature and also depend on the conditions of natural resource management. Therefore, effective disaster prevention requires cross-border monitoring and early warning.

The damage from mudflows in general is very significant. This damage can be significantly reduced, and the harmful effects of mudflows are minimized with the right scientifically sound organization of mudflows: assessing the mudflow hazard of the developed mountain areas, conducting effective anti-mudflow measures, primarily preventive, preventive, and creating mudflow prevention services.

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