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THE CYCLE OF FLOODS AND THEIR NEGATIVE CONSEQUENCES IN THE KHARAGAULI DISTRICT

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Abstract. *Natural disasters pose a problem for many countries of the world, preceded by global climate warming, the result of which is landslides, avalanches, rock avalanches, glacial activities, mudslides, and flash floods. Here, we should single out the Kharaguli region, where floods and flash floods have occurred for years. Currently, tectonic processes are activated in the region, as a result of which landslides and rock avalanches are activated. As a result, the Karneba River was blocked by a landslide. In order to prevent the danger of a landslide, a channel was built, as a result of which unlimited flash floods were avoided. Therefore, constant observation and monitoring are needed to prevent catastrophic flash floods.*

Key words*. Landslide, rock avalanches, flash flood, mudslide.*

Introduction

Catastrophic events have become more frequent in the modern world. They mostly occur in mountainous regions. They cause great damage to the country's economy and population. Unfortunately, these events are also accompanied by human casualties.

Currently, natural disasters are a problem for almost every country, and their management and implementation of necessary measures are important. It is necessary to mention global climate warming, the result of which is landslides, avalanches, rock avalanches, glacial activities, and floods.

It should also be noted that Georgia is located in a zone of tectonic activity; its complex relief structure, deeply dissected steep slopes, and gravitational processes, which are facilitated by meteorological events, activate natural disasters. Such disasters are also accompanied by floods. In addition, we should not forget about the human factor, whose activities hurt nature.

By the beginning of the 21st century, 2000 landslides and rock avalanches had been mapped in Georgia. They became active over the years as a result of abundant precipitation and intensive snowmelt. Their results have been recorded in many places in Upper Adjara, Mountainous Gura, Upper Imereti, Racha, and Svaneti regions. [1, 3, 4]. In addition, Georgia is located in a 9-magnitude seismic zone.

The 1991 earthquake was special for Upper Imereti. 270 people died during the earthquake. At that time, up to 35 dammed lakes appeared in the river valleys. Of these, the largest were the lakes of Patsa, Khakhieti, and Jruchula. [3,5]. During the same period, cracks appeared in many places where surface water accumulated. It is worth noting that as a result of the breakthrough of dammed lakes, a flash flood occurs, the stream passes through the river itself, where it was dammed, and then covers the entire territory. An example of this is the breakthrough of the Khakhietistskali dammed lake. As a result, the flood flow passed the Khakhietistskali River, and the Kvirila and Rioni rivers in its continuation. The levels and passage times of the flash flood flow were recorded at all operating hydrological stations. [3,5]

Unfortunately, human casualties are also common during natural disasters, as was the case in Racha and Nergeeti. [6,7,8]

In fact, in mountainous Imereti, landslide-prone regions have been experiencing natural processes for years. An example of this is the basins of the rivers Kvirila, Dzirula, Chkherimela, Lukhuta, and Khansitskali, tributaries of the Rioni River.

In 1999, 2001, and 2003, torrential rains in the Baghdati district caused floods, which caused significant damage to the district. In 2001, floods occurred in the Baghdati district on both the Khanistskali River and its tributary, the Kershaveti River. In May of the same year, there was also a flood on the Lukhuta River, which is reflected in the works of Sofio Gorgijanidze. The river destroyed the agricultural fields of the first and second obcha of the villages. [9,2]

The basins of the Chkherimela and Dzriula rivers stand out, where there were cases of valley blockage after landslides: in 1957, 1959, 1987, 1994, 1998, 2004, and 2019. Floods, in fact, still occur locally everywhere against the backdrop of climate change. [3, 9].

Study area

Here we will highlight the Kharagauli district, where in 2001 a flood occurred on the Karneba River. The river washed away the entire erosion slopes and caused flooding in the lower reaches. With the help of expedition materials, which were conducted in December 2001 by Sofio Gorgijanidze and Vasil Tsomaia, as well as Tamila Kopadze, the river valley in the Kharagauli district was investigated. It was established that the entire river valley is landslide-prone, where creeping landslides also acquire a catastrophic character. (Fig. 2) Unfortunately, at that time, the damage and the area of flooding in the territory were not determined.

Fig. 1. Karneba River landslide, left slope (photo by S. Gorgijanidze 2001) [2].

If we follow the chronology. After that, in August 2019, scalable floods occurred again in the Kharagauli district. The flood damaged the Leghvanuri River bridge, which connected the village with the Didvake district. It also affected the population and destroyed agricultural fields. In February 2020, again in the Kharagauli district, the Chkherimela River destroyed the protective wall and the road. In January 2021, already on the Dzrula River, in the Boriti section, floods washed away bridges and damaged the road. In addition, landslides were activated in some places. In some places, mudslides developed. [2,3,5]

It is noteworthy that all of these events were preceded by excessive atmospheric precipitation. Here, climatic conditions are the primary factor, although human influence on nature is also significant.

As for the events of 2025 in the villages of Khemaghali and Ghverki in the Kharagauli district, it is associated with the activation of landslide and rock avalanche bodies in terms of tectonics, which is still the subject of research. The process began around May and intensified gradually. This was followed by the blocking of the Karneba River at the end of August. The landslide that descended on the territory of the village of Lashe blocked the river and blocked it in several places. The landslide area is actually 72.5 ha. The largest blockage was the second-dammed lake, which posed a threat to both the village of Lashi and the central railway. (Fig. 2).

It should be noted that flooding was prevented as a result of the involvement of local authorities. A channel was made on the blocked mass, from which the dammed water began to flow. The river here restored its

initial water flow, and the next day, a channel was made on the second-dammed lake. As a result, the risk of flooding was eliminated. There was also no precipitation during this period.

Fig. 2. The landslide and the dammed lake Karneba. (Photo by N. Kapanadze) 2025.

The distance between the existing points is 37 meters, and the depth of the lake itself was about 8 meters. (Fig. 3)As for the height of the blocking, it is 2.1 meters according to the research and observations of Nikoloz Kapanadze. We also have a longitudinal profile of the river (Fig. 4) and the approximate parameters of the dammed lake in its section. River length (m) is 527.6 and peromile 46.20244503. Name Z Difference, First Congestion 232.801622 2.055104 and First Congestion 230.746518. This is the first data that is still under research.

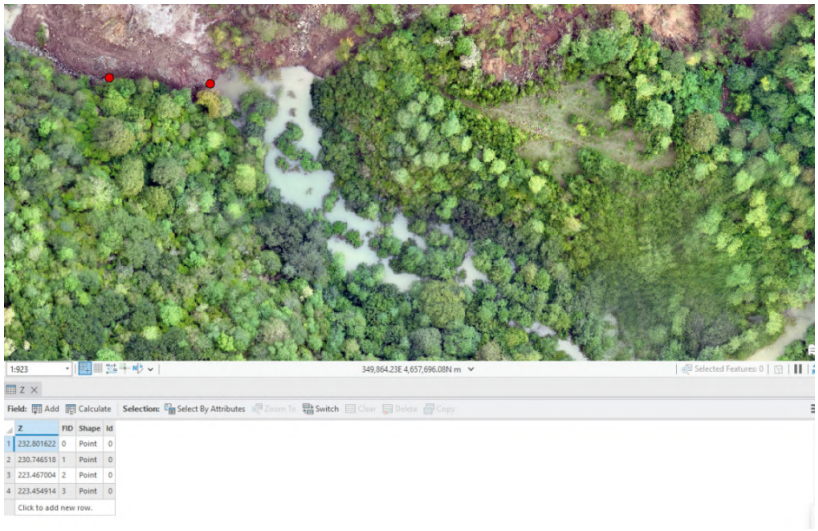

Fig. 3. Sections between the Karneba River's steep slopes.
The difference in elevation between the points is 37 meters. (N. Kapanadze) 2025.

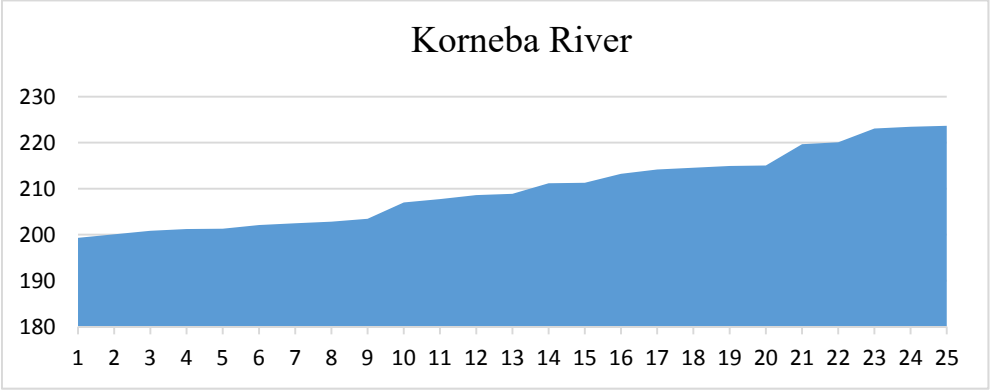

Fig. 4. Longitudinal profile of the Karneba River.

Conclusions

Based on all of the above, it is necessary not only to get acquainted with such objects, but also to constantly observe and monitor them. The fact is that against the background of modern global warming, many natural disasters have become more frequent and more severe. This requires constant attention.

As for the Kharagauli district, at the first stage, it is important to study the relief map of the region, and it is also necessary to study the hydrographic situation. It is important to record the scale of the natural disaster with geo-information maps. It is important to install early warning systems in all critical areas. Channels and drainage should be made taking into account the mechanism of a natural phenomenon. As well as early warning systems, which ensure a quick response in the event of a natural phenomenon. It is necessary to study it not as a geographical object, but as a dangerous object, the breakthrough of which will be accompanied by catastrophic flooding. In fact, these processes are still underway. [7,9]

To sum up this crucial topic, all these instruments will help us avoid the expected floods and floods.

References

1. Natural Disasters and Sustainable Development Issues in Georgia and Bordering Territories. TSU Publishing House, Tbilisi, 2003, pp. 48-58.
2. Gorgijanidze S., Flooding caused by river blockages and dangerous hydrological events related to their breaches (on the example of Georgia). 2005 p. 141. (Thesis)
3. Gorgijanidze S. THE BRIEF ANALYSIS Of GEOGRAPHY Of MOUNTAIN RIVER FLOODING IN GEORGIA /S.Gorgijanidze/ Scientific Reviewed Proceedings of the IHM, GTU, vol.132. 2022, pp. 14-18.
4. Basilashvili Ts. Floods on mountain rivers and their prediction under conditions of information deficiency. Shifr # IHM-13-12- GTU-2429. Tbilisi. 2015, pp. 78.
5. Gorgijanidze, S., Gorgodze, T., Tsintsadze Catalog of Glacially Inundated Lakes, Tbilisi: Publishing House “Samshlobo”, 2024.
6. [6] Gorgijanidze, S. M., Jincharadze, G. A., Silagadze, M. M., & Tchintcharauli, I. R., The geography of risks of the breakthrough of glacial lakes and valleys. Journals of Georgian Geophysical Society, 26(2), 2023. https://doi.org/10.60131/ggs.2.2023.7442
7. Gorgijandze S.N., Gorgodze T.Z., Jincharadze G.A., Kobakhidze N.SH., Gulashvili Z.M., Dvalashvili G.B., Silagadze M. Crucial Moment of Topographic Map for Effective Management of Natural Disasters. International Scientific Conference “Complex Geophysical Monitoring in Georgia: History, Modern Problems, Promoting Sustainable Development of the Country”, Tbilisi, Georgia. Publish House of Iv. Javakhishvili Tbilisi State University, Tbilisi, Georgia. 2024/10/17. ISBN 978-9941-36-272-9. http://openlibrary.ge/handle/123456789/10647
8. Gorgijanidze, T. Gorgodze, G. Dvalashvilic, G. Jincharadze, M. Silagadzed., Abstracts of the International Cartographic Association, 9, 39, 2025. RIMMA2025 – International Conference on Forecasting, Preparedness, Warning, and Response, University of Bern, Switzerland. https://doi.org/10.5194/ica-abs-9-39-2025
9. Gorgijanidze S., RIVER COLLAPSE, POOLS, AND FLOODS WERE CAUSED BY OUTSIDE FACTORS. Transactions of the Institute of Hydrometeorology, Georgian Technical University, vol.121, 2015, pp. 34-37.