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Evaluation of the economic efficiency of the modern anti-debris flow structure

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Abstract
Based on the calculation carried out to determine the economic efficiency of the anti-debris flow structure, it is established that annual economic efficiency of the mentioned construction, compared to curvilinear trampoline-type anti-debris flow structure, amounts to 323.4 Gel/ long.m., which gives the possibility of its implementation in debris channels.

Keywords: Debris Flow, Anti-Debris Flow Construction, Economic Efficiency.

Introduction

Today's existing anti-debris flow structures cannot contain debris flows in extreme situations, as a result of which they collapse (destruction) together with the protected objects.

The highest containing effect of anti-debris flow structures can be obtained only by taking into account the physical-mechanical and dynamic characteristics of the debris flow and also by determining the effect of its gradation zone.

The social and economic damage caused by debris flows is estimated in millions of GEL (Georgian Lari). For example, the damage caused to city Alma-Ata was estimated at more than 40 million GEL, as for Kvareli region in Georgia, according to the calculations of JSC "GeorgianWaterProject", loses 2 million GEL every year because of it.

The experimental and theoretical attitudes obtained through research, the movement of high-density debris flow is difficult to evaluate economically, therefore, the study of the economic efficiency report was carried out on the example of anti-debris flow structure.

In Anti-debris flow construction, various anti-debris flow protection structures are known, which are used in specific cases, taking into account the characteristics of the mudflow channel.

It should be noted that the construction of anti-debris flow structures is often carried out with expensive materials (iron, concrete), which are difficult to deliver to the site in mountainous zones.

We have developed a new penetrating type anti-debris flow structure of high reliability and durability. (Fig. 1).

Fig. 1: Penetrating type of anti-debris flow structure.

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At the same time, during the development of the construction, emphasis was placed on its maximum reliability and the reduction of construction costs.

In order to determine the economic efficiency of the proposed anti-debris flow structure, a curvilinear trampoline-type anti-debris flow construction was selected as a comparative base. (Fig. 2).

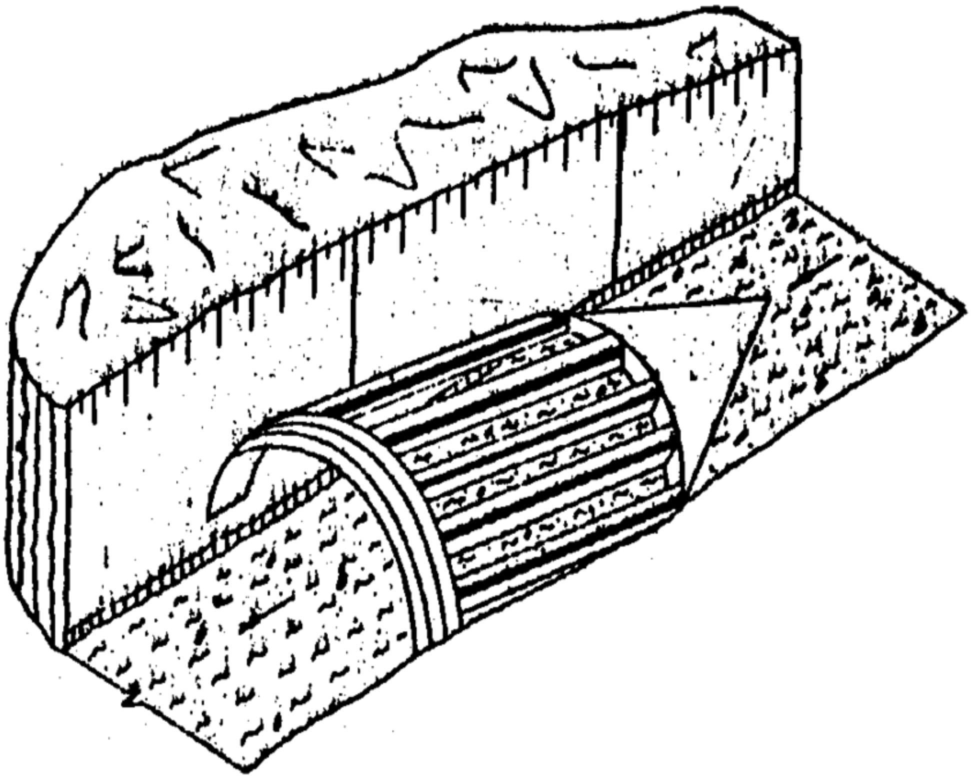

Fig. 2. Trampoline-type anti-debris flow structure.

Capital investments on the curvilinear trampoline-type anti-debris flow structure amounts to 4050 GEL/long.m.

Capital investments on the penetrating type anti-debris flow structure amounts to 1894 GEL/long.m (See. Table 1).

Table 1: Calculation of the cost of the penetrating type anti-debris flow structure.

№	Name of the material	Unit dimension	Quantity	Unit cost, GEL	Total cost, GEL
1	Concrete	m3	12	150	1800
2	Armature	T	0,6	1200	720
3	Amortized tires	T	10	50	500
4	Amortized metal wheels of tires	T	6	400	2400
5	Metal axis (50 mm)	m	57	6,25	356
6	Anchors	unit	12	200	2400
7	Inert materials in tires	m3	50	14	700
Total					8876
	VAT 18%				1598
Total					10474
Price per1 long.m.					1894

Annual economic efficiency of anti-debris flow structure is calculated by the following formula [2,3,4]:

Э annual = (K1 – K2) E, (1)

Where K1 – Capital investments in the construction of the base structure;

K2 - Capital investments in the construction of the proposed structure;

E - Normative efficiency coefficient (E = 0,15);

Эannual = (4050 – 1894) x 0,15 = 323,4 Gel/ long.m. (2)

Thus, the annual economic efficiency of the anti-debris flow structure, compared to the curvilinear trampoline-type structure is 323.4 long.m., which gives the opportunity to implement it in mudflow type water channels.

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