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Numerical and Experimental Study on Debris-flow Breaker

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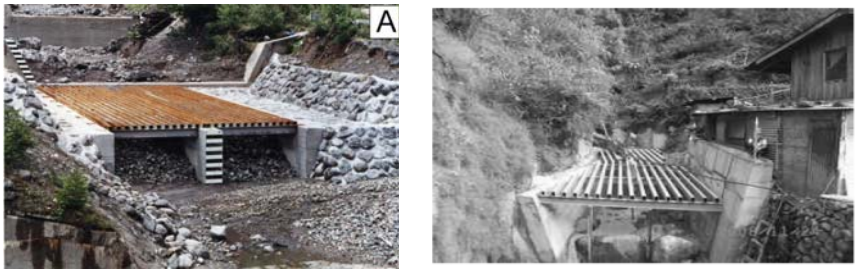
Debris flows are common in mountainous areas throughout the world, which contain varying amounts of mud, sand, gravel, boulders, and water. In addition to causing significant morphological changes along riverbeds and mountain slopes, these flows are frequently reported to have brought about extensive property damage and loss of life (Takahashi, 1991; Hunt, 1994; Huang and Garcia, 1997). Therefore, the understanding of behavior and mechanism of debris flow and the study of preventive measures are very important in order to manage the sediment disaster in the river basin and prevent the downstream hazards.

To reduce the debris flow hazards, it is common to couple structural and nonstructural preventive measures. Preventive measures require the consideration of the various scenarios and involve the evaluation of hydrological, hydraulic, sediment size distribution, topographical and other parameters.

Usually, Sediment control function temporarily stores the excess sediment in the upstream pocket of sabo dam and later discharge safely. The capacity of sabo dam to control sediment is determined by sediment storage capacity between the stable slope and the temporary slope of accumulated sediments. Debris flow is gradually accelerates according to bed slope. Sabo dam have to be control the increasing amount of sediment discharge. If using the debris-flow breaker at upstream with another sabo dam, it could be more effective control more than without debris-flow breaker. Because this structure can be reduce the energy beforehand. In addition, debris-flow breakers have an advantage not only reduce the energy but also suitable narrow area (Figure 1.)

Debris-flow breakers have advantage not only to reduce the energy but also to create suitable narrow area, cost-efficient, simply designed, easily repaired and maintained. It is known that two phenomena occur when a debris flow crosses the debris-flow breaker. First, infiltration happens as the process of deposition in the debris flow due to water drains through the permeable deck. Second, the pore water pressure changes on the debris-flow breaker. In this paper, fundamental experiments and numerical simulation are conducted to investigate debris-flow breakers. In addition, a methodology is proposed to assess the suitability of a variable deck shape and change of pressure on the deck according to separation of water. Numerical model to calculate travel length and deposit thickness of different sediments depends on opening size and blocking size.



(a) Debris-flow breaker (b) Suitable narrow area

Fig.1 Debris flow breaker