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Experimental Study on a Vertically Movable Sabo Dam

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Due to the impact of climate change in recent years, the frequency and scale of extreme rainfall events have obviously increased in Taiwan. It had cause several rivers deposited a large amount of sediment due to landslides and/or debris flows. For example, severe rainfall brought by Typhoon Morakot in 2009 had resulted in a large amount of collapses in the upstream catchment of the Laishe river as well as other areas, which led to an uplift of about 20 m on the riverbed. The severe uplift of the riverbed had caused a great threat to the safety of the nearby settlements. For decreasing the threats, a suitable control method is needed to regulate the amount of from the river upstream to the downstream. Since the riverbed had been uplift about 20 m due to the deposition of lose sediment, it is difficult to build a traditional sabo/slit dam on the uplifted riverbed. A new " Vertically Moveable Sabo Dam " (VMSD) is proposed to be installed on a suitable river notche. Two deep piles with vertical guide slots were installed in the left and right riverbanks to form a strong frame of the VMSD. A piece (or few pieces) of moveable horizontal beam (beams) is (are) placed between two deep vertical piles to for a barrier so as to control the amount of sediment transported by water flow through the VMSD. The moveable beam is not fixed but can vertically slide down when the riverbed has been scoured to keep it contact with the riverbed, so as to the sediment transport over the device is under control.

The present experimental study on the sediment control by the proposed VMSD was in a 10 m long, 0.4 m wide, 0.5 m high rectangular flume. The moveable beam was about 37 cm long, 6 cm wide, and 3 cm high. Uniform sediment having a mean diameter of 0.85 mm was used in experiments. The experiments were conducted with different upstream water discharges (2,000 cm3/s, 3,000 cm3/s, and 4,000 cm3/s) and channel-bed slopes (0.8 %, 1.0 %, and 1.2 %). The water flow and sediment transport passing through the device of VMSD were observed. The results show that water flow and sediment transport not only passing through the top of the movable horizontal beam but also from the bottom of the movable horizontal beam due to strong seepage flow. The strong seepage flow beneath the movable horizontal beam caused severe sediment scouring, and the scour cause the movable horizontal beam slide down so as to keep contact with the riverbed. Even though the experimental result has shown that the new proposed vertically moveable sabo dam can be used to control the sediment transport in the river where has severe sediment deposition of riverbed, more study is needed on the effects of sediment size, bed slope, flow discharge, the shape and scale of the device, among others before the new device can be apply to control sediment transport in a real river.