

## Using Multi-Scale Monitoring Technology with Airborne LiDAR DEMs to Evaluate Remediation efficiency of Sediment Disaster in Shih-Men Reservoir Watershed

Bor-Shiun Lin, Chun-Kai Chen\*, Cheng-Yang Hsiao, Shu-Yeong Chi

Disaster Prevention Technology Research Center, Sinotech Engineering Consultants, Inc. Basement, No. 7, Lane 26, Yat-Sen Road,  
Taipei, 11071, Taiwan.

Correspondence: Fax +886(2)2758-0273, Tel +886(2)2758-0568 EXT. 281; E-mail: [ckchen@sinotech.org.tw](mailto:ckchen@sinotech.org.tw)

In recent years of global climate change, heavy rainfall during typhoons caused widespread landslide and debris flow. Of those, many were compound and complicated disasters. Those brought huge amount of sediments to the reservoir and river channels. The sediment caused difficulty in the operation of water treatment facility, which inflicted severe social and economic problems. According World Bank's report in 2005, the ratio of population living in Taiwan suffered from two or more natural disasters to its area was the highest in the world. Hence, during the flood seasons of 2001 to 2005, Typhoons Toraji, Nari, Aere, Haitang, Matsa, Talim, and Longwang struck Taiwan and caused serious sediment disasters. Masses of sediment were washed into the reservoir, resulting in increased turbidity both in the reservoir and rivers within the watershed. Reservoir turbidity quickly increased from a normal level of 30-50 NTU to 80,000-120,000 NTU. This far exceeded the capacity of the Shih-Men water treatment plant, triggering a severe water shortage. It had tremendous impacts on the Taiwan public and industry. When a NT\$80 billion budget (later increased to NT\$140 billion) to solve this problem. Afterward Taiwan Legislative Yuan passed "Special Statute for managing and remediating Shih-Men Reservoir watershed and its catchment area.

In accordance with the "2006 to 2011 Shih-Men Reservoir Watershed and its Catchment Remediation Plan" relevant agencies were asked to propose multipurpose remediation plans. The primary goals of the proposed plans are to reduce reservoir turbidity levels, extend the life of the dam and improve remediation efficiency. Watershed conservation and remediation can be separated into two periods: The first period was implemented from 2006 to 2009 and primarily focused on the remediation of exposed landslide scarps and placement of check dams. The second period was implemented from 2009 to 2011, and was primarily focused on the vegetative recovery of slopes.

This study utilized the multi-scale monitoring technology which incorporated f Airborne LiDAR DEMs to establish reliable real-time data for validating the efficiency of Shih-men watershed's management project. The management project aims to reveal

vegetation recovery, extent of soil and water conservation, and the reduction of sediment yields as well as to mitigate the sediment disasters and trace topological changes. This study shows that all of the engineered watersheds have met the above expected targets and that sediment discharges are under control due remediation efforts.

Keywords: Shih-Men Reservoir, multi-scale monitoring, LiDAR, remediation efficiency, soil and water conservation.