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Integrated Multi-Scale Environmental Monitoring to Evaluate Remediation Effectiveness of Sediment-related Disaster Induced Typhoon Morakot for Tseng-Wen Reservoir Watershed

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Utilizing measurements obtained from multi-scale monitoring techniques, this study creates a database for the Tseng-Wen Reservoir watershed that includes digital topography measurements taken both before and after implementation of watershed remediation engineering. From these data sets, the conservation efficiency and environmental recovery are assessed. Results from this study can be incorporated into later remediative techniques, planning, watershed health assessments and management strategies. This study presents primary findings and draws specific conclusions from those findings. Results are summarized below:
(1)Analysis of multi-period, high-accuracy digital topography data sets reveals that after implementation of remediative works, sediment yields in the Dapu remediation area ranged between 5 to 97% of pre-remediation levels. Also, regarding trapped sediment, remediation has increased sediment trapping rates, which now range from 4.9 to 37.8% and average 19.5%.
(2)Results from a soil erosion pin study reveal that soil loss due to erosion on remediated slopes has been reduced by at least 33.64%, indicating that remediation has very effectively reduced erosion-induced soil loss.
(3)Vegetative cover on "mountain-slope" zoned areas dropped from 92.23% to 77.48% as a result of typhoon Morakot. In 2010, remediation works were commenced and by September of 2011, shortly after typhoon Nanmadol, vegetative cover reached a level of 90.05%.
(4) Before typhoon Morakot and subsequent soil and water remediation works, 200 to 300 days of natural re-vegetation in the Tseng-Wen reservoir watershed resulted in 220 ha of restored or re-vegetated landslides. After typhoon Morakot, remediation works commenced. Given the number of days in which it took to naturally restore 220 ha using natural re-vegetation, in the same amount of time, assuming no extreme weather events, over 1,000 ha of land could have been restored using remediation techniques. This result shows that soil and water remediation does accelerate the re-vegetation of landslides.
(5)Results of the Tseng-Wen Reservoir watershed sediment budget analysis reveal that between 2010 and 2011, the estimated landslide sediment retention volume for the "mountain-slope" zoned areas was 5,941,891 cubic meter , the overall erosion suppression volume was 55,791 cubic meter and the total river sediment suppression volume was 286,092 cubic meter. In total, 6,283,701 cubic meter of sediment was kept from entering Tseng-Wen River, which accounts for 45.53% of the sediment retention target for this project and demonstrates the brilliance and outstanding effectiveness.

Keywords:Tseng-Wen Reservoir, Sediment Retention, Conservation Efficiency, Environmental Recovery, Watershed Health Assessment.