

Potential of Reservoir Capacity Enhancement Adopting Piano-Key Weir Type Spillways – A Case Study of Wemedilla Reservoir in Dambulla, Sri Lanka

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Development of storage facilities has been identified as one of the adaptation options for Climate Change in Sri Lanka. The objective of the present study was to carry out a case study for Wemedilla Reservoir in Dambulla, Sri Lanka to demonstrate the potential of using Piano Key Weir (PKW) spillways to increase the reservoir capacity. The Ministry of Irrigation in Sri Lanka has identified Wemedilla Reservoir as a key location in Diverting Mahaweli Water to North Western Province. Increased storage capacity in Wemedilla Reservoir will provide benefits to many areas. So, Wemedilla Reservoir was chosen for the current Case Study. According to the Department of Irrigation, Sri Lanka, Wemedilla Reservoir's Full Supply Level (FSL) is 221.34 m above mean sea level (AMSL) and its High Flood Level (HFL) is 222.56m AMSL and therefore, the difference between HFL and FSL is 1.22m. The proposed PKW crest elevation was taken as 222m AMSL, and an amount of 0.56m was hence, kept for accommodating the afflux. Four (04) PKW configurations were selected for the Case Study. Flood routing was performed for floods with 1,000 and 10,000 year return periods and the results were compared with that of the existing spillway. The PKW configuration with an Upstream-downstream length of 7.2m and 11 PKW units could be identified as the best out of the four proposed configurations. With the proposed PKW configuration, the capacity of Wemedilla Reservoir can be increased by 11% while afflux reductions of 41% and 40% were observed for 1,000 year and 10,000 year return periods respectively. The present work demonstrated the capacity enhancement potential of Wemedilla Reservoir with the incorporation of PKW, without raising the reservoir bund level or acquiring upstream land. Physical model testing, cost-benefit analysis and a comprehensive study on environmental and social impacts are further required before implementing this proposal.

Keywords: Piano Key Wier, Reservoir Capacity; Spillway Discharge, Climate Change Adaptations