

# Comparison of Piano Key and Rectangular Labyrinth Weir Discharge Efficiency

Anh Tuan Le <sup>1,\*</sup>

<sup>1</sup>*Faculty of Water Resources Engineering, Thuyloi University, Hanoi, Vietnam*

*\*Corresponding Author: latuan@tlu.edu.vn*

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**Abstract**

Nonlinear weirs, such as labyrinth and piano key weirs, are suitable methods to handle increased flood flows that may be expected due to climate change. Although specific physical models are considered to be an effective way of investigating fluid flows, simply conducting physical model tests is insufficient to fully comprehend the hydraulic and discharge characteristics of non-linear weirs. In this study, computational fluid dynamics algorithms have been used extensively to investigate complex flow physics instead of relying on reduced scale models. The discharge capacity of the piano key weir and the rectangular labyrinth weir is compared using a three-dimensional numerical model, which is validated by the available experimental data. The results confirm that piano key weir is more efficient than the rectangular labyrinth weir for a wide range of head water ratios. By analyzing the contribution of discharge over inlet, outlet and sidewall crests, the factor that make the piano key weir superior to the rectangular weir is the sidewall discharge.