



## Transformation impact of vertical revetment on the river water quality and its mechanism

Van Tai Tang, Rajendra Prasad Singh\*, Dafang Fu\*

*School of Civil Engineering, Southeast University, Nanjing 210096, China, emails: rajupsc@seu.edu.cn (R.P. Singh), fdf@seu.edu.cn (D. Fu), tangtai.nu167@gmail.com (V.T. Tang)*

Received 19 December 2016; Accepted 30 June 2017

---

### ABSTRACT

The vertical hard revetment can cause the disturbance in river flow with the results of destroyed features, degraded biodiversity, decreasing self-purification ability and deteriorated water quality. The current work is focused on the application of prefabricated porous concrete template covered on wide-spread vertical hard revetment for improving water purification, increasing biodiversity and decreased negative impact of hard concrete revetment to river quality. Six kinds of porous concrete with different void ratio, aggregate size and water cement ratio were prepared to investigate the compressive strength and water purification properties. A river simulator device was used to determine the water purification capacity of the porous concrete in flowing condition. Water quality purification mechanism of porous concrete was discussed thoroughly by the analysis of microbial community diversity. Results show that the compressive strength and water purification ability of porous concrete were higher when the void ratio, size of the aggregate material and water cement ratio were 30%, 10–20 mm and 0.3, respectively. Under the flow velocity of  $V = 0.03$  m/s and hydraulic retention time of 6 d, the removal rates of  $M_2$  biofilm for chemical oxygen demand ( $COD_{Mn}$ ), ammonia nitrogen ( $NH_3-N$ ), nitrate nitrogen ( $NO_3-N$ ), total nitrogen (TN) and total phosphorus (TP) were 59.21%, 74.07%, 54.25%, 55.47% and 62.90%, respectively. Findings reveal that prefabricated porous concrete was efficient for river water purification. Porous concrete templates can be attached to a large number of microorganisms.

*Keywords:* Ecological slope; Porous concrete; Vertical hard revetment; Water quality; Biofilm

---

\* Corresponding author.