

Explaining the physical relation between estuary shape and bankfull discharge

JACQUELINE ISABELLA ANAK GISEN & HUBERT H. G. SAVENIJE

Water Management, Civil Engineering and Geosciences, Delft University of Technology, 2628CN Delft, Netherlands

j.isabellaanakgisen@tudelft.nl

Abstract River discharge, and in particular the bankfull discharge is a key parameter in morphological and hydrodynamic studies of estuaries. There appear to be empirical relations that link them together. However, research on morphology and hydrology of estuaries is generally done separately, and little research has been done to identify the relationship between these processes. This study aims to discover the physical explanation for the empirical relation that exists between geometrical characteristics of estuaries and the bankfull flood discharge. The relationship between the ideal estuary depth and the bankfull river discharge has been analysed in 13 estuaries around the world using stepwise regression. The outcome was compared to Lacey's theory of hydraulic geometry. From the analysis, it shows that the ideal depth of an estuary is a function of the bankfull flood discharge to the power of $1/3$ to $1/2$ which indicates an agreement with Lacey's formula. In order to verify the accuracy of the relation, existing and new measurement data from estuaries worldwide will be collected and compiled to strengthen the reliability of this finding.

Key words estuaries; geometry; flood discharge; alluvial; tide