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Estimation of Suspended Sediment Load Using Artificial Neural Network in Khour Al Zubair Port, Iraq

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ABSTRACT

The port of Khour Al-Zubair is located 60.0 km south of the city centre of Basrah; it is also located 105.0 kilometres from the northern tip of the Arabian Gulf. The main goal of this paper is to estimate the concentration of suspended deposit (SSC) in "Khour Al-Zubair" port using a Multilayer Perceptron Neural Network (MLP) based on hydraulic and local boundary parameters while also studying the effect of these parameters on estimating the SSC. Five input parameters (channel width, water depth, discharge, cross-section area, and flow velocity) are used for estimating SSC. Different input hydraulic and local boundary parameter combinations in the three sections (port center, port south, and port north) were used for creating nine models. The use of both hydraulic and local boundary parameters for SSC estimation is very important in the port area for estimating sediment loads without the need for field measurements, which require effort and time.

Keywords: suspended sediment concentration, multilayer perceptron, neural network, Khour Al-Zubair port, Basrah city.

INTRODUCTION

The study and analysis of sediment transport at ports and coastal areas is an important issue in harbor engineering and marine structures; these studies focus on finding solutions to environmental problems such as erosion and deposition in navigational channels or near ocean shores. In particular, there are many problems with coastal structures such as piles, piers, and breakwaters that are of practical and economic importance, especially in the field of harbor engineering and marine structures. Excessive erosion near offshore facilities can affect the stability and durability of "hydraulic structures" like ports and breakwaters, potentially leading to their collapse (M. A. Afshar 2010, K. Babaeyan et al., 2002; H. Bihs, and N. Olsen 2011); on the other hand, increased sedimentation near port berths affects ship draft.

Sediment transport is critical to understanding how sediments are transported and deposited back at other sites. Erosion involves removing and transporting sediments (primarily from a boundary) and then depositing them at other boundaries. Erosion and sedimentation in marine channels and near coastal structures is a very complex matter, as in addition to the well-known influences on rivers, such as the critical velocity of flow and the state of the river bed and its boundaries, there are other influences in coastal areas that have a great impact on the erosion of deposition, namely tides, currents, and waves.

Wave activity is the primary factor in transporting coastal sediments, especially in shallow areas (see wind waves), followed by tides and shore currents. The waves generated by the wind play a major role in transferring energy from the open ocean to the coasts. Usually, during events of large waves, sediment is carted off the seaside look and docks offshore to form a shallow. Since the effective ripple occurrence disappears, the deposits gradually return to shore (Dean et al., 2002). Similarly, the biological procedures that alter the morphology of the coastlines, and the sediment size distribution is other critical factors for changing the state of those coastlines. Human influences and industrial works, in addition to the interactions between physical processes and