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Collaboration of Modelling and Field Monitoring for an Analysis of Quick Erosion/Siltation in Tidal River

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MunBal bank near to the mouth of Han River, the largest river in Korea, experienced serious bank erosion and fence failures after the 2011 summer flood. The bank shoulder was used as traffic road JaYoo-Ro which is the busiest highway in Korea. Therefore an analysis to provide count measures against erosion was necessary in urgent priority. The research, including the hydrological and hydraulic reviews and characteristic analysis of river sediment with numerical and physical analysis had launched in 2011 winter.
The research review includes river Geomorphology, Hydraulic sediment conditions, river bed forms, tidal conditions, Hydrologic conditions, and river alignment works during last couple of decades. Analysis of the flow rates and tidal records for last twenty years along Han River were performed to find out the causes of bank erosion and to design river training structures. River cross sections including one hundred years old maps near MunBal bank also reviewed so the lateral and meandering pattern analysis could be made possible. Continuous monthly field survey also has being performed up to now and it provides idea when and where the erosion and siltation phenomena show up in time series.
Total length of the river is about 514 km. The width of the lower river and the average depth at MunBal bank is about 2 km wide and 7 m - 10 m deep in 2011. The design flood flow rate is about 37,000 m3/s. The tidal effects are so strong along the mouth of Han River that the maximum adverse flow velocity reaches about 3m/s at MunBal bank. Field monitoring revealed that large sand bar (2 km long, 500 m wide) in middle of river at MunBal bank divides river in two channels, and the right channel (4 km long, 200-300 m wide, 15m deep) was eroded/silted very quickly depends on season and hydraulic conditions.
The research (consist of numerical analysis and field monitoring) could find that erosion was caused by floods, tides, alignment works near to MunBal bank. Especially the bank suffered from two types of erosion: one in summer from flood, another is in winter from bore tides. As a result of the research the river training structures consist of seven groins was proposed with the aid of numerical and physical hydraulic modelling.

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