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Prediction of Sediment Transportation Characteristics after River Improvement

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One of the largest rivers restoration project in Korean history had been carried out for three years (2009-2011). The project was consists of 440 million m3 of dredging and 335 km long levee reinforcement along Nakdong river. Nakdong river, the second largest river, is 511 km in length with alluvial characteristics and 23,384 km2 in basin area. Most of longitudinal bed slopes, cross sections and sinuosity were changed due to the widening and deepening the cross section of the river during the project. In addition, eight weirs with movable gates were consecutively constructed in Nakdong river. These artificial changes of river environments caused many impacts on channel morphology and hydraulic characteristics. Some of them were predicted but the others were unexpected.
Field survey has being periodically performed along the main and tributary channels after the project, so the geomorphologic changes and sediment transport characteristics could be quantified. Especially, sediment flow rates and bed degradation/aggradation phenomena were observed along main and tributaries after the project. Sediments from tributaries were silted at the mouth of tributaries. Head cut phenomena had been observed with higher propagation speed and greater depths than expected. Alluvial characteristics for new environment are essential for planning the river management, but there is not enough monitoring data due to the short period of survey since the end of project.
Therefore, this study focused on the development of new sediment transport characteristics by hybrid the new measured data after the project and old ones before the project. Even though, there is not enough monitoring data especially for large flow rates yet, sediment rating data for new environment were developed at 4 gaging stations. A sediment transport governing method for low flow was adopted from nine sediment transport prediction methods which are provided by GUIDE program. Hydraulic characteristics under new river environment, such as shear velocity and average velocity, were examined and compared with old ones in adopting the governing method for large flow, which has not been experienced up to now. Sediment rating curves for weirs were also developed to provide the continuity of sediment transportation through weirs. These sediment rating curves can be applied as upstream boundary condition so that the discontinuity of sediment transportation at weirs could be overcome.

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