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Remote Real-time Riprap Protection Erosion AssessmenT on large rivers

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Large number of bridges in Europe is at the end of their life span, while the frequency of occurrence for extreme climatic events, driven by climate change, is increasing. Floods influence morphodynamic changes in the riverbed, such as scouring of the riverbed next to the bridge substructure, that can undermine the overall stability of the bridge. Placement of riprap protection around bridge piers is an approach that doesn't solve scouring problem, it rather displaces the scour hole elsewhere in the river channel, where its location is unknown because it is formed in the interaction between the flow and the structure, in site-specific conditions. Traditional approach to scour monitoring is effective only if surveys are conducted during the flood conditions, while the data acquired post-flood can underestimate the full potential of flood hazard. Detailed field surveys of hydraulic parameters during floods are essential in the understanding of morphodynamic evolution of the river channel, but are often scarce because they are time-consuming and require extensive resources (e.g. the survey equipment). Therefore, the majority of research was conducted using hydraulic flumes where both flow and the riverbed conditions are idealized

The goal of the R3PEAT project (Remote Real-time Riprap Protection Erosion AssessmenT on large rivers) is to bridge the gap between the real-time scour hole development and flow environment through development of real-time scour monitoring system. The research focus of the project is investigation of scouring processes next to the riprap protection around bridge piers - existing structures whose stability and safety are unknown in the hydraulic environment under the influence of climate change. Research methodology combines experimental investigations on scaled physical model (Phase I) with 3D numerical model (Phase II) into hybrid modelling approach, calibrated and validated with field surveys. The research objectives of the project are: (1) develop ScourBuoy prototype (2); calibrate the physical model with field surveys; (3) improve existing empirical equations for equilibrium scour hole development using hybrid modelling

approach; (4) investigate the dependence between turbulent flow characteristics and temporal scour hole development and (5) investigate dependence between turbulent conditions and incipient motion of sediment particles. The impact of the proposed project on the bridge management systems is expected through the development of a practical remote real-time system for erosion estimation around the riprap protection on large rivers that can be basis for the real-time decision support system.

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