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A Study on Countermeasures against Taitung Coastal Highway Morphological Changes

After the establishment of the “Wave attack warning system for Taitung coastal highway” in 2017, Institute of Transportation, MOTC (hereafter referred to as IOT) further launched cooperation with National Cheng Kung University in 2018-2019 for analyses of mid-to-long term trend of morphological changes and potential disaster occurrence of Taiwan Route 9 via hydrodynamics and numerical modeling of morphological changes. Applicable improvement countermeasures are devised in aspects of highway wave attacks and coastal erosion, for providing countermeasure references to coastline protection engineering in the future.

The southern section of Taiwan Route 9 is the main route from Taitung to the west; of which the coastal section is susceptible to typhoons and wave attacks that cause traffic safety concerns to the public. The Directorate General of Highways needs to assign resident guards to watch out for road conditions during the typhoon season, with preventive traffic closure implemented at the Nan-Xing and Duo-Liang Sections. For improving the accuracy of the wave attack warning system, IOT cooperates with the National Sun Yat-sen University aiming to correcting system forecast values using algorithms of real-time ocean meteorological observation data, so that the severity of typhoon and wave attacks can be estimated with higher accuracy.

In addition to wave attacks, this coastal road also suffers from beach erosion and shoreline retreat for years, where countermeasures for improvements also need to be devised. IOT therefore cooperates with National Cheng Kung University to analyze

the local sea state, sediment transport trend, historical satellite images and typhoon events for understanding mid-to-long term topographic changes and potential disasters. Results show that the Duo-Liang Section of Taiwan Route 9 in Taitung is subject to coastal scouring section and that the Nan-Xing Section is susceptible to wave attacks.

By studying improvement measures taken in the past as well as current engineering methods combining with on-site interview and site survey, compilation and assessment of countermeasures for improving coastal Taiwan Route 9 in Taitung are implemented by way of near shore hydrodynamics and numerical modeling of morphological changes. Preliminary assessments show that the Duo-Liang Section may adopt detached submerged breakwaters to mitigate direct wave impacts and coastline scouring. Suggestions are made for the Nan-Xing Section to take sand bypassing method for beach nourishment at 440K+500 (currently 423k+565), to replenish the eroded coastline for protecting toe of the revetment, thereby mitigating damage caused by wave attacks. Results of the study are submitted to the Directorate General of Highways for the strategic reference in improving coastal highways` in Taitung.