

Research Brief

SILTATION PROBLEMS IN THE CALACA HARBOR

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The Calaca Harbor is used by the National Power Corporation (NAPOCOR) as a bulk unloading facility for coal for its power plant at Calaca, Batangas. Siltation problems have been experienced in the harbor since 1985. This has prompted NAPOCOR to consider some structural changes in the harbor layout. To evaluate the various alternative structural measures the NAPOCOR has engaged the services of National Hydraulic Research Center (NHRC) to conduct hydraulic model investigations on the harbor. This research project is undertaken for fourteen months and is completed in October 1990.

Prior to the model investigation the NHRC also undertook the collection of the environmental conditions in cooperation with the NAPOCOR staff. Results of the data and information analysis were then utilized as inputs to the study. Important parameters affecting the siltation problems are wave climate, current flow pattern and river sediment contribution. Waves which are from the south east and south west predominantly contribute to the sediment process.

For the purpose of conducting the investigation, a distorted model with a horizontal scale of 1:200 and vertical scale 1:40 was designed, constructed and tested. The model which has the capability to simulate wave action on the bed load materials, is housed indoor and covers some 495 square meters. Nearshore bathymetry from the beach front down to elevation -30 meter is reproduced and represented with fine sand whereas the offshore area from elevation -30 m to -50 m is represented by cement mortar.

To simulate the wave conditions, two pendulum type wave generators each of which are 10 meters wide are installed in the basin. One generator can produce waves coming from the south east direction and the other wave generator is oriented in the south west direction. To eliminate reflected and refracted waves floating PVC pipes are placed along

the sides of the wave generators. Wave gauges are installed in several areas in the model to measure wave heights.

The existing breakwater layout was tested with induced waves of the prevailing wind system and typhoon conditions. The wave directions considered during the test were those coming from the south west and south east. Results confirmed that the sediments are predominantly transported by waves due to the south east monsoon and the sediments in the harbor are due to the bed load coming from the Cawong river.

Four layouts were then investigated under the same typhoon conditions with prototype wave heights of 3.20 meters. The changes in the layout are either extension of the eastern breakwater, rotation of the breakwater or both. The hydraulic performance of these alternatives were analyzed according to the flow patterns due to wave action, the area affected by the sediment transport, and the effective impoundment of the sediment laden flow. Based on the test result of the model investigation, the layout with a forty (40) meter extension aligned with the existing breakwater gives a highly satisfactory performance.