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Extension of the Deepwater Harbor in Lomé - Morphodynamic Study to design a Groin as Sediment Trap

Client: INROS Lackner AG

Location: Lomé, Togo

Construction: Deepwater harbor in Lomé

Scope of Work: Simulation of morphodynamic development during construction phase

Method: linked 2D wave- and sediment transport model

INTRODUCTION

The area west of existing breakwater was intended for the extension of a new harbor basin and associated storage area in Lomé (Fig. 1)



Figure 1: Expansion of deepwater harbor Lomé

To minimize the necessary sand volume for the construction of ground level, the process of sedimentation due to longshore sediment transport was intended to be used as a natural process instead of dredging necessary sand volume.

To identify the preferred variant for construction we were contracted to simulate the long-term morphodynamic development west of the existing groin.

METHODOLOGY

For this study a linked wave- and sediment transport model was setup. This model was calibrated using water levels from temporary gauges and ADCP-measurements (Fig. 2).

For the morphodynamic simulation the chosen spring-neap-cycle was exaggerated 12 times. Concerning the sediment transport this signifies a period of a whole year.

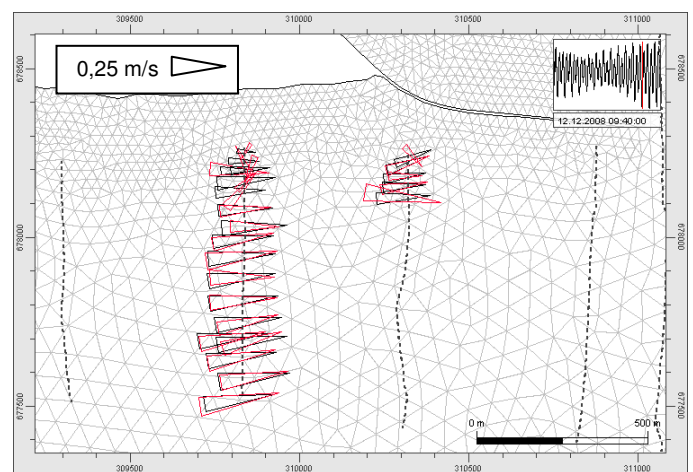


Figure 2: Measured (red) and calculated (black) flow velocities

RESULTS

None of the simulated cases introduced sedimentation in the harbor entrance and the harbor basin. East of the port lee erosion was minimized due to redirection of the longshore sediment transport to deep waters.

The effect of the significant wave height ($H_s = 1,15$ m bzw. $H_s = 1,50$ m) on morphodynamics was negligible.

CONCLUSIONS

The variant "Short Groin" showed significant effects. On account of this the "Long Groin" was unnecessary. The variant "Bent Groin" caused only minor higher mean amounts of sediment. An accumulation of sediment in the harbor basin did also not occur in the variant "Short Groin".

Therefore we recommended the construction of the "Short Groin" with comparable results as the most economical solution.