CENTRAL WATER AND POWER RESEARCH STATION

MATHEMATICAL MODEL STUDIES TO ASSESS HYDRODYNAMICS, SEDIMENTATION, WAVE TRANQUILLITY AND EFFECT OF WAVE DISTURBANCE ON THE PROPOSED DOCKS/BERTHS DURING SHIP NAVIGATION IN THE CHANNEL FOR PROPOSED MASTER PLAN 2047 FOR THE PARADIP PORT, ODISHA.

STUDY OVERVIEW

Paradip Port Authority (PPA) requested CWPRS to carry out mathematical model studies to examine the feasibility of the proposed harbour developments for the different layout options. The mathematical models MIKE 21 SW, BW, HD, ST, and LITPACK were used for wave transformation, wave tranquility, tidal hydrodynamics, sedimentation/siltation, littoral drift, and shoreline change studies. A regional wave transformation model was developed for the Odisha coastline, and wave hindcast simulations were carried out for 33 years, covering 1990-2022.

APPROACH

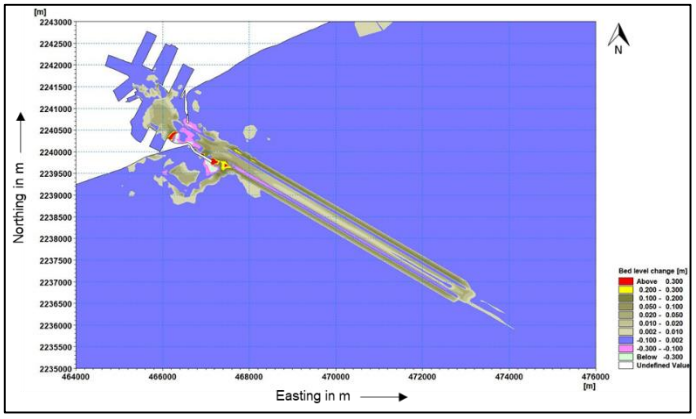
MIKE 21 BW considers solving of Boussinesq's equation and is used to study the likely wave agitation inside the harbour, which thereafter depending of wave height determines the tranquility. BW is a phase-resolving, two-dimensional Boussinesq-type wave model for calculation and analysis of short- and long-period wave disturbance in ports and harbours (DHI, MIKE BW., 2023).

IMPACT/SIGNIFICANCE/OUTCOME

In Proposal-1, the total annual sedimentation in Approach Channel, Port Area and Sand Trap is estimated to be about 2.41 Mcum, and, the capital dredging is estimated to be about 9.8 Mcum.

KEY FINDINGS

The annual sedimentation and the capital dredging is the minimum in Proposal-1; however, considering the area available for berthing of the vessels, Proposal-3 is found to be more suitable even though there is marginal increase in the annual sedimentation and the capital dredging in Proposal-3.



Sedimentation pattern in Proposal-3 during Non-monsoon season

Sedimentation pattern in Proposal-3 during monsoon season