



Groin Opening Effect on Shoreline

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

An actual scale model of a groin was designed and constructed to investigate the impact of the gap width on the shoreline changes in the close vicinity of the groin. The Surface water Modeling System (SMS) model has been used to simulate the wave hydrodynamics around the groin for about 5 years to study the impact of the proposed groin on the shoreline and wave conditions at various time steps. The model has been calibrated and validated against the collected and measured field data. The dominant wave/current conditions along the North-West coast of Egypt have been considered for various possible configurations of the semi-open groin to identify the appropriate design. Wind and wave data of the El-Dekhila port Meteorological Station (EMS) have been adopted for the period 2010-2014.

The results and analysis provide general guidelines for the use of groins with a clear opening in coastal resorts that can be applied to a wide range of wave climates. It has also been found that a groin with a clear opening can help to provide safe swimming conditions with minimum impact on the shoreline if groins were properly studied. Wide gap spacing and permeable groins generally reduce the shoreline changes. It is found that the maximum erosion and accretion depths are almost equal in case of $S > 0.15 L_g$ for the cases investigated (L_g is the groin length, S is the gap width). The effective length on the up-drift side is much more than that on the down-drift for the cases investigated in this work. The up-drift is affected up to twice the length of the groin in case of no gap and the length is about $1.1 L_g$ in case of gap width equaling $0.15 L_g$. The variation of the

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