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HYDRODYNAMIC AND SEDIMENT DYNAMICS IMPACT ASSESSMENT FOR THE EDEN CITY AND DIVINA ISLAND PROJECT

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Abstract

The objective of the present study is to perform a hydrodynamic and sediment dynamics characterization of the present conditions and the potential impacts associated with the foreseen structures for the Eden City Real Estate Development Project in Yeroskipou/Paphos (Cyprus). This Development Project includes the construction of an artificial island of about 105 ha (reclaimed land, protections and beaches).

Keywords: Morphodynamics; Coastal erosion; Estuary; Sediments; Waves.

1. Introduction

The present study describes the procedure and results for the Eden City Real Estate Development Project in Yeroskipou/Paphos (Cyprus) which includes the construction of an artificial island, Divina Island, (Figure 1) of about 105 ha (reclaimed land, protections and beaches). The objective is to perform a hydrodynamic and sediment dynamics' characterization of the present conditions and the potential impacts assessment associated with the foreseen structures. In order to achieve this objective hydrodynamic and wave models were implemented and validated.



Figure 1. Divina Island Project (white lines) and Natura 2000 protection area for the posidonia seagrass (red box).

2. Methodology

The model's validation was mainly based on local ADCP data covering both summer and winter periods. It includes comparisons of modelled and computed values of water levels, currents and water temperature, concerning hydrodynamics, and values of wave height, wave period and wave direction.

The hydrodynamic model was set up using MOHID (Leitão et al., 2005) modelling system and the wave model was setup using SWAN (Ribeiro et al., 2009). For both models a one-way nesting approach (with several levels) was implemented. Also for both models boundary conditions were defined using large scale modelling solutions publicly available. Once the models were properly validated a set of different scenarios were simulated to assess the impacts on hydrodynamics and waves. The scenarios for these simulations were defined through the analysis of the available meteorological data (from a local meteorological station located in Paphos airport and from NOAA meteorological reanalysis).

3. Results and Discussion

The hydrodynamic impact assessment was made for 5 different meteorological scenarios and the wave's impact evaluation was made for 5 different offshore wave conditions. The results obtained show that the potential impacts regarding these two descriptors (currents and waves) are of low magnitude. The local currents are weak (usually under 20 cm/s in the Divina island location) and in this context any modification of the currents introduced by the new structures will hardly have enough energy to produce relevant changes in the local dynamic.

The transport patterns due to the combined action of currents and waves were also assessed. Finally a set of simulations were made to characterize the deposition of posidonia mats on nearby beaches.

References

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