



ELSEVIER

Contents lists available at ScienceDirect

Ocean and Coastal Management

journal homepage: www.elsevier.com/locate/ocecoaman

Assessment of implementation stages of submerged breakwater on the bay and shoreline at Al-Ahlam Sea Resort, Northwest Coast, Egypt



Khyal A. Zahra*

Coastal Research Institute, National Water Research Center, Egypt

ARTICLE INFO

Keywords:

Breakwaters
Lagoon
Marine survey
MIKE 21 model
Sedimentation

ABSTRACT

Al-Ahlam Sea Resort is located at km 92 of International Coastal Road on the Northwest Coast of Egypt. Coastal projects, such as shore-parallel breakwaters cause man-induced coastal changes. Consequently, the stages of their implementation almost affect the shoreline changes and sedimentation in the area. Hence, many problems associated with these structures induce beach erosion on down-drift side which may extend beyond the project area. The study objectives are to evaluate factors inducing the problems, assess the impact of the delay of construction phases of the breakwater on the bay and shoreline, and estimate the economic and environmental losses, hence proposing immediate and permanent appropriate measures. These have been achieved based on analyses of shoreline changes, sea level variations, waves and marine survey during the period between 2008 and 2015. The implementation plan of the submerged breakwater project was scheduled to start on 2010 and end on 2012, ignoring the periods of extreme waves, storms and summer swells. Due to difficulties facing the execution company in work in the project area during the last five years, the project is still under implementation and only about 60% of its recommended works has been achieved. The present study defines the existing conditions prevailing the project area and changes that have been instigated due to delay in the project execution schedule using field data and marine surveys performed during the period between 2010 and 2015. The study revealed that the area was subjected to sever erosion in the eastern zone and its adjacent area led to a loss in beach sand reached to 45000 m³. Besides, in the western side, sedimentation is prevailing due to the constructed artificial lagoon used for maintenance operations of the implementation marine equipment. This sedimentation leads to difficulties in the entry and departure to and from the lagoon. The study indicated that the delay of the implementation of the breakwater caused shoreline and morphology changes. These led to economic and environmental losses exceeds 2.0 million USD about 30% of the estimated original cost. The study recommended immediate start-up dredging works in the western zone and the middle sector of the project area to facilitate the maneuvering of the marine equipment, which can speed up the implementation process in order to finalize the execution of the breakwater and to reduce the economic and environmental losses. The equilibrium of the shoreline and the bay in case of completion of the submerged breakwater has been checked by application of MIKE 21 Numerical Model.

1. Introduction

1.1. Preamble

With over half the world's population living within 50 km of the coast, human influence on that biodiversity is inevitable, making the study of beaches even more important. Shoreline engineering refers to any method of changing or altering the natural shoreline system in order to stabilize it, which may actually cause shoreline retreat. The shoreline is one of the earlier and rapidly changing features of the coastal zone that is dynamic in nature, which react to any changes in

the coastal area. Coastal erosion is one of the most important socio-economic problems that challenge the capabilities of states and local authorities. Whether it is due to natural or man-made reasons, coastal erosion causes significant economic losses, social problems, and ecological damages (Özhan, 1993).

Coastline movement due to erosion and deposition is a major concern for coastal zone management (White and El-Asmar, 1999). Consequently, considerable interest over the last five decades in the coastal changes observed along Nile Delta (ND) coast, leads to studies of: coastal geomorphology; analysis of beach profiles up to the 6 m depth; aerial photography analysis; satellite image analysis; shoreline changes;

* Coastal Research Institute, National Water Research Center, Egypt, 15th Pharaana St., Shallalat, Alexandria, Postal code 21514, Egypt.
E-mail address: khyalahmed@hotmail.com.

dynamic factors on sediment transport and sediments (Khafagy et al., 1992). Moreover, coastal projects have been undertaken to protect some parts of the coast through hard structures, such as jetties, groins, seawalls and shore-parallel breakwaters (Iskander, 2013). The main problem associated with these structures is that they induce beach erosion on down-drift sides which may extend beyond the project area (Frihy and Deabes, 2011).

1.2. The area study

The Northwest coast of Egypt extends from Alexandria to El-Sallum along the Mediterranean Sea for 520 km (Iskander and El-Kut, 2014). The special characteristics of this area have made it very attractive for tourists' activities.

Some beaches along this coast are not fully suitable for recreational activities because of their physical and morphological characteristics. For instance, the rip current problems that started to arise due to the substantial development of the coastal regions of touristic villages and resorts during the last two decades. The purpose of such development was to provide suitable swimming conditions. However, due to natural complex coastal processes and irregular bathymetries, some villages suffer from irrelevant and dangerous swimming conditions that were created by rip currents (Ahmed, 2006). The study focused on Al-Ahlam Sea Resort (ASR) that is located at km 92 of International Coastal Road at the east side of Marina Al-Alamien Sea Resort (MSR) on the Mediterranean Sea on the Northwest Coast of Egypt. The coordinates are $29^{\circ} 3' 46''$ E - $29^{\circ} 4' 14''$ E and $30^{\circ} 49' 18''$ N - $30^{\circ} 49' 12''$ N. The general lay-out of the study area is illustrated in Fig. 1.

1.3. Problem description

The project implementation plan was organized to start on 2010 and finish on 2012, ignoring the periods of extreme waves, storms and summer swells. Due to difficulties that face the execution company in the work in the project area during the last five years, the project is still under implementation and only around 60% of its plan has been done. As a result of the delay of the construction process of the submerged

breakwater of ASR, shoreline changes had been occurred and the water depths of the bay had been changed. Hence, many problems associated with these changes, such as sedimentation in the bay as well as the artificial lagoon and the erosion at the east of the groin. Consequently, the implementation equipment has been trapped inside the artificial lagoon and couldn't drive through for finalizing its breakwater construction. Therefore, modification of the original breakwater design must be done due to the morphology changes. This leads to additional cost. In addition, the area of the artificial lagoon and the bay must be dredged to discontinue the economic and environmental losses.

1.4. The objectives

The objectives of the study are:

- Evaluation the factors inducing the problems;
- Assessment of the implementation stages of the submerged breakwater on the bay and shoreline at the Al-Ahlam Sea Resort; hence
- Estimation of the economic and environmental losses due to the delay of the construction phases of the submerged breakwater; and then
- Proposing immediate and permanent appropriate measures to overcome these problems.

2. Materials, methods and data collection

2.1. Methodology

In order to achieve the study objectives, the following activities have been combined to evaluate the delay problems of the breakwater implementation on the bay and the shoreline at the Al-Ahlam Sea Resort, and seeking solutions through:

- Compiling the previous related studies; and
- During the period from April 2008 to September 2015, the field survey and measurements of hydrographic marine survey work, waves, shoreline position, and sea level variations have been



Fig. 1. The general location of the study Al-Ahlam Sea Resort on Northwest Coast of Egypt.

Download English Version:

<https://daneshyari.com/en/article/8060492>

Download Persian Version:

<https://daneshyari.com/article/8060492>

[Daneshyari.com](https://daneshyari.com)