

THE GEOMORPHOLOGICAL EVALUATION OF THE PROTECTION STRUCTURE OF ALEXANDRIA BEACHES BETWEEN SHATBY- MONTAZAH AREA

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Abstract

Alexandria beach exposure to the ongoing erosion processes. This led to change the coastline shape, and erosion beaches. Which are necessitated establishing numbers of engineering structures? To limit the erosion of the beach, and arise beaches again. These constructions have a positive impact in some areas and negative ones in other areas. This study exposed the recent coastline changes between 1985 -2012, and evaluates constructions in some placements, to determine their geomorphological effect in the study area.

1.Introduction:

Alexandria is the second largest city in Egypt, contains about 40 percent of the country's industrial capacity, in addition to being a prominent summer resort on the Mediterranean Sea. Alexandria beaches stretch for 120 km along the Mediterranean Sea, from Abu Qir, in the east to Al-Alamein in the west. These attributes make Alexandria a favorite tourist spot; more than one million local summer visitors together with about 4.5 million residents enjoy the summer season at Alexandria every year (Frihy et al. , 1996)

1-1 Location:

Alexandria is located at the northern coast of the Mediterranean Sea of Egypt; the area is located on the eastern part of the city beaches between Shatby and Montaza.

1-2 Previous work:

Alexandria is Egypt's second largest city, which is the country's main harbor. Therefore, there are many studies observed changes in study area Such as:

- Frihy O.E. et al. studies (1991-2003) processes reshaping the northwest Nile delta, and the coastal problems at Alexandria
- Soliman, A. et al. studies (2003-2010) about the engineering approach Egyptian Northern Coast. And his study Shoreline Response for Long Wide and Deep Submerged Breakwater of Alexandria City
- Iskander. M.M. Study (2000) dealing with, Sediment transport along Alexandria coast. And his study (2007) about Beach impacts of shore-parallel breakwaters backing offshore submerged ridges, Western Mediterranean Coast of Egypt.
- The study of Baine, M. (2001) about the artificial reefs.

1-3 Objectives:

This study aims to analyze the morphodynamic behavior of the coastline of Alexandria, between El Shatby and El Montaza after the construction of protection structures implemented, since 1985 until now. By making a comparison of the geomorphological situation before and after the engineering works. Define the evolution of the coastline.

1-4 Methodology:

To define the evolution of engineering works on the coastline by Comparing two recent satellite images, Land sat TM (1985) and land sat ETM+ (2005-2012). Georeference the map and images as UTM and WGS 84. The images had been radiometrically normalized. Establish number of cross section in selected position. Finally field check is made by using GPS to indicate the results.

2- Results and dissection:

Alexandria coastline was suffering due to the last fifty years from some geomorphological problems, Can be displayed in instability of the Nile delta coast due to lack of sedimentation and decreasing water flow into the sea. In addition

to the tectonic decline of the Nile Delta. Loss a part of the sand beach due to extending the shore road towards the sea. Beside the climatic changes which can be summarized as noticeable rise of temperature, sequent increase of wave height, and longer time of seasonable storms as features of climate changes. Incident waves, storm events, and sea level rise.

Consequent of the above factors changes in the coastline; we can recognize it in the study area. Figure 1. And table 1, which describe the coastline changes during the period between (1985 -2012). The coastline wrap rate doesn't show a big difference in the study area, we can recognize a slight increase in 2012, because of the protective structures are started in 2006.

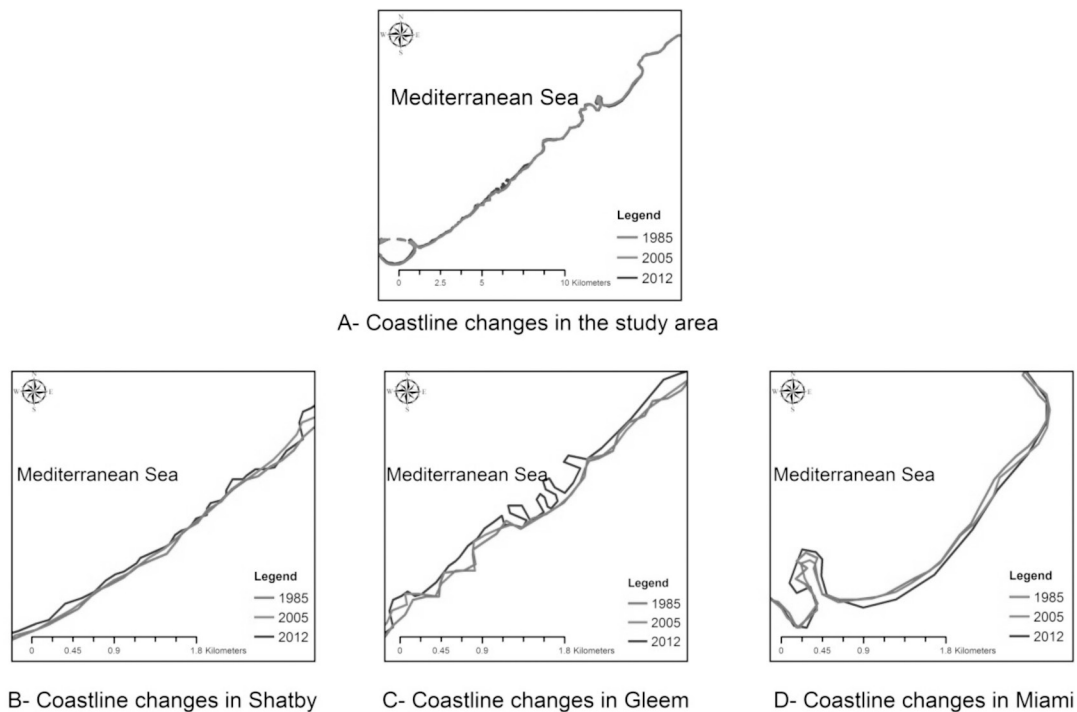


Figure 1. (A) Monitoring the coastline changes during the period between (1985 -2012) in the whole study area.

(B) Monitoring the coastline changes in Shatby during the same period,

(C) Monitoring the coastline changes in Gleem.

(D) Monitoring the coastline changes in Miami.

Source: Digitizing from the satellite images

Table 1: Some geomorphological characteristics of the coast line of the study area (1985-2012)

Year	Real Length (m)	Straight Length (m)	Overall wrap (m)	Coastline wrap rate (m/y)
1985	31.00	21.8	1.42	0.52 0.166
2005	32.04	21.8	1.47	
2012	33.2	21.8	1.52	

Source: measuring from the satellite images

Satellite image analyses and field work show that the beach width gradually decreased due to the action of the waves and currents. With the time, some beaches have disappeared totally and the wave action has attacked the toe of seawalls (El-Sharnouby and Soliman, 2011). So some techniques used to reduce the rate of coastline erosion and even add new beaches. Especially after establishing the Cornish road, Table 2

Table 2: The relationship between the width of the road and the distance between the road and the coast

year	Shatby		Gleem		Miami	
	Road average width (m)	The average distance between the road and the sea(m)	Road average width (m)	The average distance between the road and the sea(m)	Road average width (m)	The average distance between the road and the sea(m)
1985	39	52	34	68	24.5	100.9
2005	48	60.5	41	109	35.7	119.7
2012	48	60	42	111	35.8	120.2

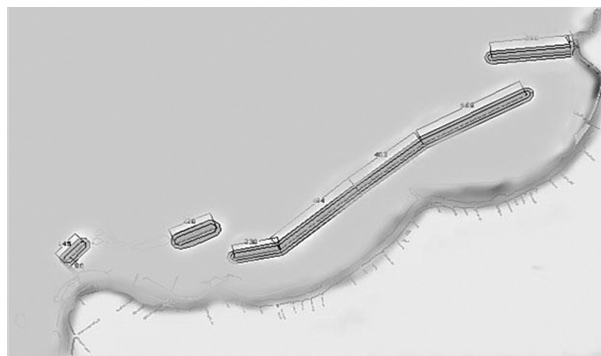
Source: Satellite image analyses and field work

Shatby area has been protected by a high sea vertical wall since this area is 3-5 meter above sea water level. Small sand beach is in the lea ward of that wall. Groins having been selected for the protection of Gleem area. Miami to Montaza beach. Suffered severe erosion in 2003 storm. With time, the beach width decreased and vanished in some locations. The waves attacked

the road itself after washing all the sand In order to stabilize the eroded beach, a long, wide crest, and deep submerged breakwater has been constructed. The breakwater system consists of one main parallel breakwater and two overlapping parts (El-Sharnouby and Soliman, 2011). As shown in. Figure 2.



A- Satellite image for some groins in Geleem beach



B- Layout of submerged breakwater were constructed between Miami and Montaza beaches

Figure 2: Some types of protection structure (El-Sharnouby and Soliman, 2011).

3- Conclusions:

- During the last few years, significant erosion occurs along most of Alexandria's beaches as a result of sediment starvation, coastal processes and sea level rise.

-The coastline has been changed, first by marine erosion second by the protection structures.

- The protection structures failure with adverse results during storm seasons such as December 2010, hit Alexandria city, and directly attacked its shoreline, Figure 3.



Figure 3: Wave flooding due the sea level rise at Alexandria coastline, 2010.

4- References:

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