

*Archive of SID****The Prediction of Annual Rate of Shoreline Change in the Caspian Sea,
Gorganroud River Delta*****Ghasem Lorestani***

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Extended Abstract**Introduction**

The coastal zone is one of the greatest environmental and economic assets of each nation. In coastal regions the natural forces that cause shoreline changes are embodied in waves, currents, wind and other factors. Gorganroud River Delta is located in 53°57' to 54° 1' E and 36°56' to 37° N in Southeast part of Caspian Sea. In this study, gibbosity of Gorgan River delta has been studied at the river mouth. The Gorganroud River basin from the Caspian Sea catchment basin is covering a large part of it in Golestan Province. The total flow rate of Gorgan Bay River Catchment is about 500 cubic meters and total of their discharge is 3.5 million tons per year. With average slope less than 0.1 percent, the study area is very low slope.

Material and Methods

The aim of this study is to evaluate the rate of change in coastline and its predictions with two different methods. The reason of selection of Gorganroud coastline is a very large amount of change over different periods of time. This research is mainly based on an analytical method using mathematical and statistical tests. Topographic maps 1:250000 and 1:50000 of the study area have been used for the analysis. Initially, the satellite images of TM, MSS, and ETM sensors were obtained from Landsat and the images of the coastline in 2005 and 2013 were extracted from Google Earth. The shorelines were extracted by digitization of the images and converted into linear files in ARCGIS 9.3. To investigate the rate of annual change in the coastline, two methods have been applied. The methods used to evaluate the rate of annual change in shoreline and to predict the rate of change in the next years was based on the use of transect. According to the curved coastline, the cuts perpendicular to the coastline are at even intervals of 500 meters. This is to analyze the rate of change within Gorgan River Delta. The first method used is End Point Rate (EPR). The End Point Rate is calculated by dividing the

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distance of shoreline movement by the time elapsed between the oldest and the most recent shoreline. The major advantages of the EPR are the ease of computation and minimal requirement of only two shoreline dates. The major disadvantage is that in cases where more data are available, the additional information is ignored. The second method to predict the rate of changes is The Average of Rates (AOR). The Average of Rates method calculates separate end point rates for all combinations of shorelines when more than two are available. A minimum time criterion is introduced to filter the available shorelines and it is a function of measurement errors and the magnitude of the rate of change. The main advantages of this method are that all “good” data that pass the minimum time criterion are used and the method is sensitive to substantial shifts in trends and data variability. The main disadvantages are that small time differences between the shorelines produce a long minimum time span and there is not a computational norm for modeling of the minimum time span equation.

Results and Discussion

The results of the EPR method show that most of the changes in the coastline are in the middle of Gorganroud river delta. The changes are ranged from 63.7 to 84.2 meters per year. Minimum changes by EPR method is ranged from 18.6 to 12.9 meters per year in the southern part of the study area. In the entire study area, Average annual changes by the EPR method is 40.2 meters. The minimum changes by AOR method is between 32 to 35.7 meters per year in the southern part. The maximum changes by this method are ranged from 60.4 to 90.8 meters per year. Average changes in AOR method is equivalent to 61.1 meters per year.

Conclusion

Since 1882, according to the measurement data of sea-level stations in Baku and Anzali, changes in water level are more than 3 meters. These changes had a significant impact on coastline profile and its surrounding landuses. Evaluation methods used implies that EPR and AOR methods are considered as cyclical changes. According to the Delta jut into the sea and annual average rate of change of 40.2 meters, with EPR method, gibbosity Gorganroud River at the mouth of the river have been added to the coastline in the past 112 years. www.SID.ir

Keywords: *changes rate, coastline, Gorganroud River, prediction transect.*