



Received: 2020.09.05

Accepted: 2021.03.02

## ***Analysis of Changes in the Range of Mangrove Forests in the North and East of the Strait of Hormuz Affected by Coastal Morphology and Hydrodynamics of the Persian Gulf***

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### **1- Introduction**

For thousands of years, mangrove forests have played a significant role in the economy and sustainable livelihoods of human societies. Therefore, identifying and measuring changes in the boundaries of mangroves over time can play an important role in planning and conducting effective protection measures and reducing the vulnerability of mangroves to natural and human hazards. This study aimed to investigate changes in mangrove forests and the relationship between these changes and marine hydrodynamics and coastal morphology in parts of the north and east of the Strait of Hormuz for 47 years.

### **2- Methodology**

In this study, Landsat satellite images, MSS, TM, ETM+, OLI sensors from 1972 to 2019 were used to monitor mangrove forest changes in the west of the Hormuz Strait. In the next step, the necessary preprocesses (radiometric and atmospheric corrections) were applied to the images in ENVI 5.3 software. And the classification of images was done by SVM, MLC, and ANN methods, and considering that to finalize the land use map, all classification accuracy indicators should be adjusted with one or more valid statistical indicators. The kappa index and general accuracy are among the statistical methods used. Post-processing operations also included the integration of classes that were applied to make the land use map more eloquent and eliminate single pixels on different classes. In the next step, the Change Detection method was used to detect changes and tell the results of the classifications. The next step is to convert the classified image to polygon and transfer it to the Arc GIS environment to manage the classes. Of course, the class that is most important to us here is the Mangrove Forest class, which was examined in the period 1972-2019. After the changes in the mangrove forests were identified, with the help of 1:25000 topographic maps, contours of 2 meters of the range were prepared and the slope

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map was prepared using DEM images of the area. Also, using the half-hour tide data, the minimum, maximum, and average tide rates of Jask, Shahid Rajaee, Hormoz, and Sirik stations were calculated and finally, these data and maps were prepared to examine the development potential of mangrove forests.

### **3- Results and Discussion**

Land use maps were developed using Landsat images using three pixel-based classification algorithms (MLC, SVM, ANN) and the accuracy of the results was assessed using random points. The results showed that the highest overall accuracy and kappa coefficient were 99.44 and 0.99 for region A, and 98.41, 0.97, for region B, for SVM, respectively. Our study showed that SVM could be the most appropriate classification method for this study area. Therefore, SVM land use maps were prepared for the study area for 1972, 1987, 2002, and 2019. After preparing the land-use change map, it was stated that mangrove forests in region A accounted for 55.84% and in region B for 36.18%, tidal areas in region A accounted for 27.63%, and in Area B is 36.58 percent, Water Areas A is 3.04 percent, Area B is 1.78 percent, dry land is 15.37 percent and region B is 99.99. 7% have changed over the past 47 years. To explore the potential for the expansion of mangrove forests, we examined the slope of the region and its relationship with the average tide in the region. Comparing the results of the increasing and decreasing trend of mangrove forests with curves corresponding to the average tidal level and morphological features of the region, we conclude that the study area is about the hydrodynamic characteristics of the sea such as the average tidal area and extent. The catchment area, the height of the waves, and the coastal morphology such as slope and sediments and the water entering the areas from the Hasanlangi River and the Gaz and Hivi rivers have a very high potential for further development of mangrove forests.

### **4- Conclusion**

The results show that in the northern part of the Strait of Hormuz, the area of mangrove forests has increased in all the years, but in the eastern part of the study, we have always faced a decreasing and increasing trend and we don't see this part significant development during these 47 years in mangroves. However, according to the study of the geomorphic features of the region such as slope, topography, and the presence of Sabkha and Firth and sediments from the rivers of Hassan Langi, Gaz, and Hivi, as well as the average tide of the region and the vast area it covers, The study has the potential to develop mangrove forests. The results of this study can provide significant information about the progress or regression of mangroves in different coastal areas, can significantly help to implement protection measures and rehabilitate Iranian mangroves.

**Keyword:** Coastal Geomorphology, Sea Dynamics, Mangrove Forest, East of the Strait of Hormuz, Hormozegan Province

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