

Monitoring coastline changes in Amirabad Port by surveying coastline and sea level

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ABSTRACT: The process of erosion and desertification affects social communities, agricultural lands and natural resources in coastal areas. The rapid coastline changes would cause social and economic issues in the coastal areas. In this study, Miankaleh coasts and the eastern coastlines of Amirabad port have been surveyed due to existing benchmarks since June 2013 until December 2015 in order to analyze the coastline changes in Amirabad port. Then the surveyed lines were compared with sea levels at the time of surveying. The sea level data has been used (to calculate the beach slope) in order to monitor the sedimentation and erosion processes in the coastlines movements. The results of this comparison show that coastline changes are irregular and they may not follow the seal level changes. Therefore the coastline changes in these areas are influenced by erosion and sedimentation units.

Keywords: *Coastline changes; sea level; erosion; sedimentation; Amirabad port*

INTRODUCTION

Amirabad port is located in the eastern part of Mazandaran province and 51km distance from Sari, with longitude "22 22 °53 and latitude" 25 51 °36. This port has the neighborhood of Sadrabasin in the west side and Miankaleh gulf in the east side. The Miankaleh Peninsula is also an important area with more than 68000 hectares which is an intact zone. The Fig. 1 shows the position of this port and Miankaleh peninsula in the Caspian Sea, and Fig. 2 shows the monitoring area.

On the Other hand, Neka pond and breakwaters of the North Oil Terminal Company have a great role in preventing from any shifts of littoral sediments from western parts of Neka to the coasts between Neka and Amirabad port and it may hold this role for years. In this research the

aim is to evaluate the sedimentation and erosion process and the rate for coastline changes in the area using measured sea level and sediment profiles. Satellite images have also been used for final verification.

The effect of coastline and sea level changes on sediments in the surf zone have been discussed in many researched. Bruun (1962) considered the effect of sea level rises on coast erosion. The equations only took into account the cross shore sediment transport and adaptation of bed profiles with new sea levels. Cooper and Pilkey (2004) studied the restrictions of Brunn equation and evaluated the influence of other forces like irregular long shore sediment transportation, not having enough resources from rock beaches for beach nourishment and active nautical depth uncertainty.

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Fig. 1: The Geographical position of Amirabad port



Fig. 2: Position of Amirabad port and Neka and Coastal dyke (Pictured by satellite in 2006)

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MATERIALS AND METHODS

The using data of this research includes coastline changes of Amirabad zone since June 2013 until December 2015, sea levels at the time of coastline surveying and onshore profiles of Amirabad area. In order to monitor the coastlines at Amirabad in a particular time study, topographical processtarted in a calm weather and minimum wave. Surveying starts from the

first line to the last one in the end of each season in order to study about retreating or advancing of water in comparison with previous researches. All of the places were surveyed due to previous existing benchmarks. These surveys have been done via Total Surveying Cameras (TC 4 07 Leica). Then the following procedures were done in order to analyze the erosion and sedimentation processes of the coastline changes in the area of coastline surveying:

- The maps of coastline changes in Amirabad at 2013, 2014 and 2015 provided.
- The number of coastlines of each year has been shown in two maps. The first one is related to changes of sea levels and coastline positions, and the other one is about adaptations between these factors.
- Two coastlines which had the most different ranges of sea level in the surveying process

have been specified in order to determine the sedimentation and erosion units. Then the expected range of coastline change was determined due to coastal slope and it was compared with the real coastline and at last, the sedimentation and erosion units were extracted.

DISCUSSION AND CONCLUSION

The coastline maps of each year showed adaptations of sea level changes (e.g. [Fig.s 3](#) and [4](#) show the adaption and lack of adaptation for coastline changes and sea level changes in 2013). In other words, in some coastal areas, the coastline changes are influenced by sea level changes ([Fig. 3](#)) and not in some other coastal areas ([Fig. 4](#)) and there may be another reason that needs to be analyzed.

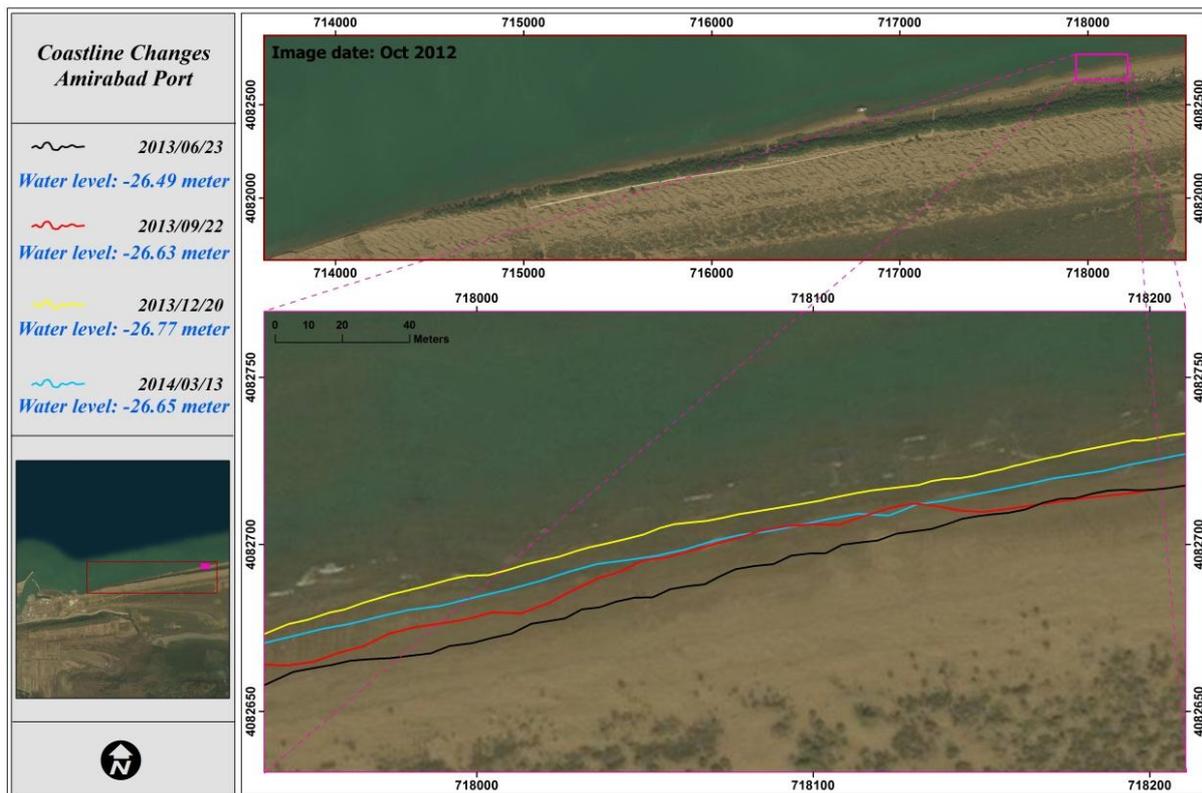


Fig. 3: Coastline changes on Amirabad Port in 2013 (adaptation of coastline changes and sea level changes)

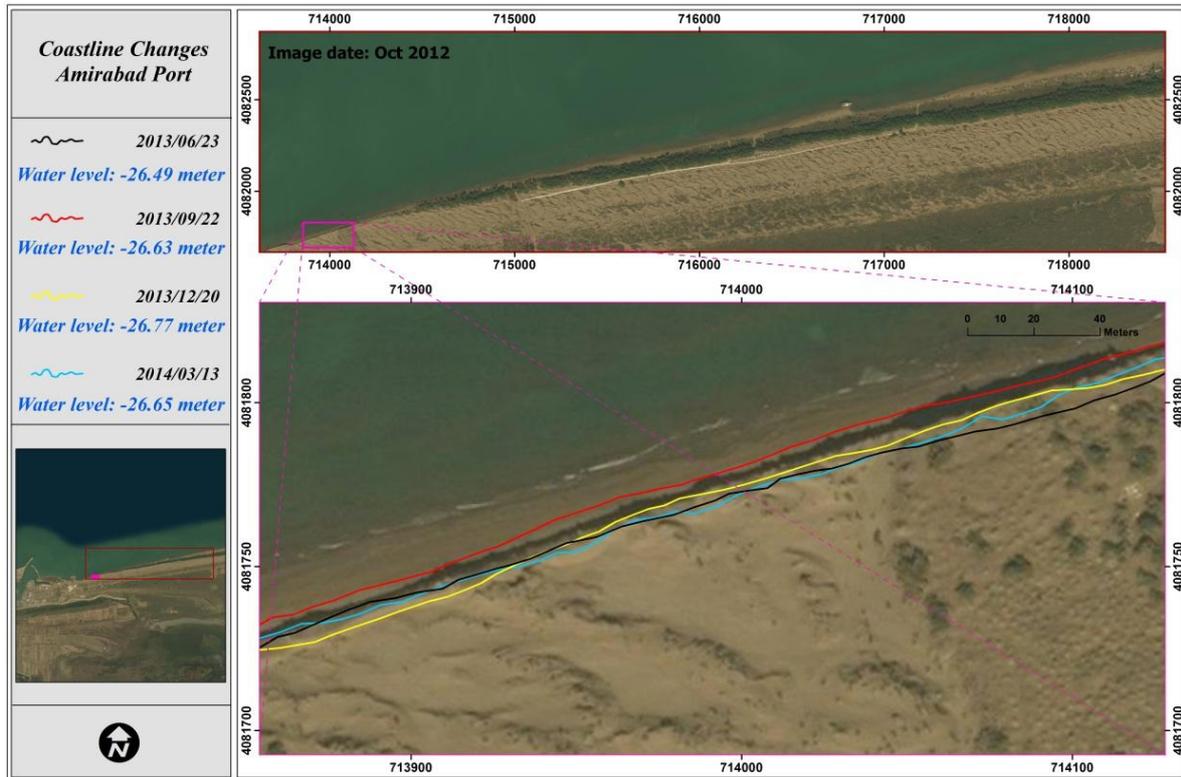


Fig. 4: Coastline changes on Amirabad Port in 2013 (adaptation of coastline changes and sea level changes)

Between these surveyed coastlines, the line on 19th Dec. 2015 and the line on 22th June 2013 have the most difference for sea level (0.81m). Considering the average slope of coastal profiles at Amirabad zone (3.5%), this difference may cause horizontal coastline change for 23.14m from July 2013 to December 2015. Due to total reduction of sea levels, the regression of coastline to the sea may become significant and this situation needs to be proved by surveying coastlines. But there is an opposite situation in a place near to protection wall and human structures. The coastline changes in these areas are not regression, and they have a reversal process (erosion) in some cases.

The sedimentation or erosion processes would be active if the regression or progression of coastline change may not follow sea level changes in the mentioned time period. Considering the coastal slope and expected

horizontal changes (due to sea level), the active places of sedimentation and erosion process were identified. As shown in the Fig. 5, the most eroded areas are the western part with 32m of coastal regression and the most sediment areas are in the eastern part with 48m progression to sea in this special period of time.

The following studies and researches would result to the effective elements on coastline changes in Amirabad port. The Sadra port may prevent any transfer of sedimentation. Therefore the flow starts digging and surveying. The sediments of Sadra port would move to Amirabad Port. Some parts would take place behind the port and in the western side, and some other parts would move through channels and deposit there. The eastern side of port would face with lack of sediments and this prevention would cause erosion to Miankaleh coasts and eastern sides of Amirabad Port.

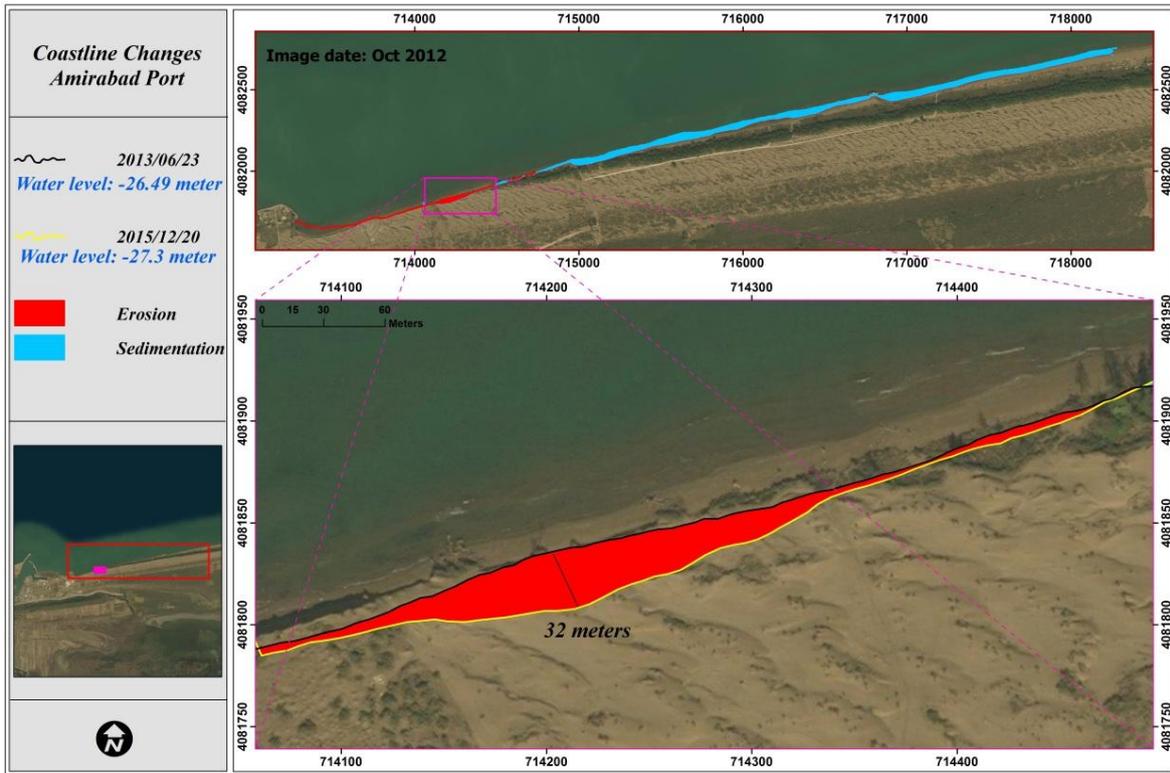


Fig. 5: Erosions on Coastal areas of Amirabad Port (July 2013 – December 2015)

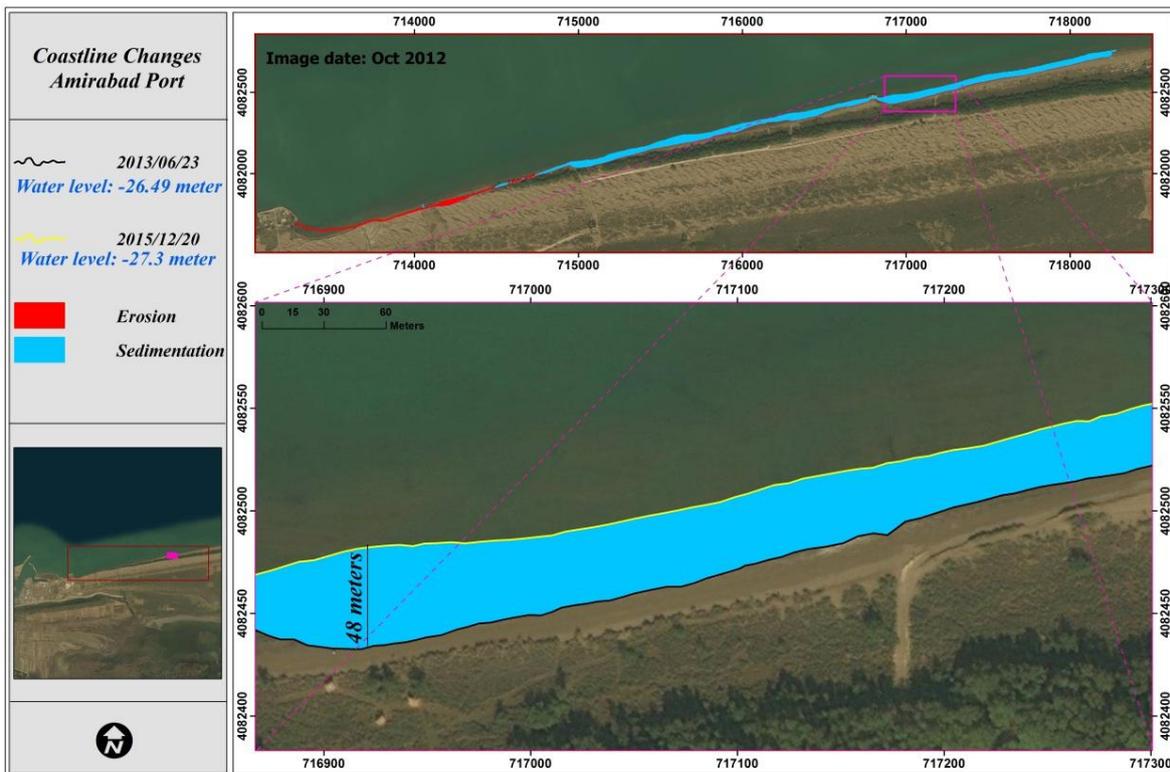


Fig. 6: Sedimentations on Coastal areas of Amirabad Port (July 2013 – December 2015)

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