

Methods of Coastal Conservation as viewed by Engineering Geology with examples from the Hormozgan Province.

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Abstract

Coast is an area between the sea and the land. The important types of coast are: primary and developed, sedimentary and structural, biological and glacial, sandy and stone. The most important items affecting on the coastal area are: waves, tides, winds, marine streams, manmade effects. Conservation of the coastal area is made with the aim of taking care, fixation and improvement of the situation of the area against destructive natural and artificial factors and is among important topics in the engineering geology. Methods of coastal conservation are divided in two groups: 1- structural, 2- non-structural. Conservation structures are usually in the following three groups: 1- structures perpendicular to the coast, 2- structures parallel to the coast, 3- Offshore structures. The most important conservation structures are: 1- gabions, 2- coastal walls, 3- groins, 4- revetment, 5- water breaker, 6- wedges. From the most important methods on non structural conservation, must be included to: 1- sandy fences, 2- artificial reduction, 3- plant cover and 4- management methods. The length of shorelines of the Hormozgan province extends to more than 800 km. In this scope, considering features such as types of coast, geotechnical properties of the shorelines, different development plans such as tourism, economic- social conditions, kinds and properties of waves, tides, winds and marine currents, kinds of coastal conservation methods are chosen, designed and constructed. The best examples about this case can be observed in cities such as Bandar Abbas, Bandar Jask, Islands especially Kish and Ghesm, and harbors such as Shahid Bahonar and Shahid Rajaei in the Hormozgan province.

Introduction

In view of civil activities, coastal areas are so important. These areas are so effective in stable development of countries enjoying from coasts. Iran has near to 3000km coastal lines, which 814km of it is placed on the Hormozgan province. This province has 14 big and small islands [1]. In this area, kinds of coastal structures with different uses are made or are making. Of course, coastal changes (natural and artificial) are very high in the banks of the Hormozgan province. The subject of this paper is considered of coastal conservation methods with especial view of this province.

Discussion

1- Generalities

Bank is an area between sea and land with relatively low dip. It consists to parts: coastal pool and embankment. The important types of coast are: primary and developed, sandy and stone, plain and orographic, structural, biological and glacial. Erosion and sedimentation, manmade effects are factors which change banks gradually and continuously on the coastal area, are: waves, winds, marine stream and artificial factors. Effects of these items can be seen at point, local, regional, national and international scale.

2- Common properties of the Hormozgan province's coasts

This province is located at north of the Hormoz strait and in contact with the Persian Gulf and the Oman sea. This province has complex geology and composes from parts of folded Zagros, Makran and Sanandaj- Sirjan sedimentary structural units [2]. The most primary (structural, orographic, stone) coasts are concentrated on the western part and more developed (sandy, plain) coasts are concentrated on the eastern part of this province. The height of banks and tides change in order 0-20m and 0.2 - 4.3m. The main marine current is parallel to coast from the Oman sea toward the Persian gulf and direction of majority wind is between west north – east south or reversed [3]. Danger of seismicity and liquefaction in coasts of this province is high.

3- Coastal conservation methods

Safeguarding of the beaches is made with the aim of taking care, fixation and improvement of the area against destructive natural and artificial factors. This subject is among important topics in the civil engineering, geology engineering coastal management. Methods of coastal conservation are divided in two groups: 1- structural, 2- non structural.

Conservation structures are usually in the following three groups: 1- structures perpendicular to the coast, 2- structures parallel to the beach, 3- offshore structures. The most important conservation structures are: 1- gabions, 2- coastal wall, 3- groins, 4- revetments, 5- water breakers, 6- wedges [4].

Gabions are structures which more applied in sides of coastal rivers and low depth beaches. They are made by borrow materials (especially concrete and rock blocks). This structure is suitable for coastal rivers and beaches of areas such as Bandar Abbas, Babdare Charak, and the north of Qeshm Island. Coastal walls or retaining walls are parallel to shoreline. They reduce energy of tides, waves, marine currents and especially prevent from liquefaction of upstream sediments. This structure is seen in locations such as Bandare Lengeh and Hormoz Island. Groins are narrow structures and are made perpendicular to the beach. They have different height and are composed of wood, rock, concrete, asphalt and or steel. This structure is seen in areas such as Kish Island, Bnadare Jask. Revetments are parallel to bank and consist of rock blocks and steel plates. The kinds of them are vertical, ordinary rock mass and etc. This structure is seen at places such as Qeshm island, Kish island and Bandare Khamir. Water breakers are offshore structures. They reduce power and velocity of tides, waves, marine currents, settlement of sediments in upstream. They have different types, for example parallel to beach, convergent and inclined [5]. The best kinds of this structure are seen at Shahid Bahonar and Shahid Rajee harbors. Wedges are made for fixation of debauchers and prevention of sedimentation. They are made from different materials, such as wood, pile, shield, asphalt, gravel. This structure is seen in very points of the Hormozgan's coasts.

Existence of different suitable rock, especially sedimentary (such limestone), pyroclastic (tuff) and volcanic (andesite) rocks in near shore lands of this province, is a most important factors in making of types of conservation structures.

The most important methods of non-structure, can be induced 1- sandy fences, 2- artificial reduction, 4- management methods. Sandy fences are made by wood or metal for fixation of coastal sediments. This method is suitable for areas such as around regions of Bandare Jask, Bandare Khamir and Bandare Maghoiyed. In artificial reduction, crushed rock, borrow materials, sand gravel from local sources are accumulated at coasts, and then are surfaced [6]. This method is very applied in areas such as Bandar Abbas, Kish island and Qeshm island. Plant covers such as halophyte, tree- brake, grass are very effective in fixation of sediments and conservation of coast in opposite of eresional factors. The Harra forest is the best example in this case, and is located at the northwest of Qeshm island. By to write and to execute suitable laws and orders can be helped to related local organizations such as harbours and navigation offices and municipalities. This process is a serious management necessity for the Hormozgan province.

Conclusion

In the Hormozgan province such as everywhere, considering features such as types of beaches, geotechnical properties of these areas, differential developed plans, economic- social conditions, characters of wind, wave, tide and marine currents, kinds of coastal conservation structure methods are chosen, designed and constructed [8]. The best examples about this case can be seen in long of the Hormozgan province's shorelines. In otherwise, non structure methods are very necessary for this area, especially for future.

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