Geophysical Research Abstracts
Vol. 13, EGU2011-6873, 2011
EGU General Assembly 2011

Coastal zone management and changing character of shore processes - a story about Kiipsaare lighthouse.

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Since the beginning of the 1990s, one of the most favourite sights for visitors of Saaremaa Island, Estonia has been a local „Pisa Tower" – the Kiipsaare leaning lighthouse on the NW coast of Harilaid Peninsula. The 25 m high black and white striped ferroconcrete Kiipsaare lighthouse was erected in 1933. Armas Luige, a civil engineer who saw its building was sure that the lighthouse was erected in the middle of Cape Kiipsaare, at a more or less equal distance from the NE and SW shorelines. According to the knowledge about the development of seashores at that time, the distance from the shorelines was considered sufficiently safe and stable for building. Later measurements on the aerial photographs from 1955 in 1:10 000 scale showed that the distance between the lighthouse and the shorelines was approximately 110 m. So, we can conclude that without knowing the shore processes, the location was safe according to all legal regulations. Due to an increase in storminess over the last decades, Cape Kiipsaare has been in a stage of rapid development. The area being a subject to storm waves' destruction had reached near the base of the lighthouse already by the beginning of the 1990s.
Comparison of maps and aerial photographs from different times shows remarkable changes on Cape Kiipsaare, where the leaning lighthouse is located. On the map from 1900, the width of the cape in the location of the beacon is nearly 300 m. The distance from the beacon to the shoreline was about 110 m according to the aerial photograph from 1955. The mean annual velocity of shoreline retreat at Cape Kiipsaare has been about 2 m/y over the period from 1955-1981. A more rapid retreat is revealed when comparing the aerial photographs from 1981 and 1990. During that decade, the beacon had "shifted" from a safe distance near to the erosion scarp. The shoreline retreat during these ten years made up 30 m (3 m/y in average). By 1995, the lighthouse was in the middle of an active sandy beach and was tilting 7o towards the sea. Even more severe storm damages occurred over the period from 2001-2010 when the shoreline receded approximately 50 m (5 m/y in average). Today the lighthouse is in nearly vertical (1o) position again standing in the sea, about 30 m off the shoreline.
Series of beach ridges covered with dunes, which have formed in a more distant past, explicitly show the position of earlier shorelines of the western coast of Cape Kiipsaare. These shorelines are not parallel to the current one as it would be typical of sandy beaches in general, but a 45o intersection of the current shoreline with the axis of the former beach ridges is clearly visible in freshly formed scarps. It is an evidence of rapid changes in the direction of shore processes on Cape Kiipsaare.
The coastal zone management plans should consider a rapidly changing character of shore processes. The quick changes in shoreline contours and position on Cape Kiipsaare during the last decades has been the most important lesson that we have learned.