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Early 21st century morphodynamics of the NW tip of the Tróia peninsula – 2004 to 2021 (SW coast of Portugal)

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Abstract

Planning of the TROIA RESORT at the turn of the 21st century, on the northernmost area of the 16 km long Tróia peninsula, between the Sado estuary and the Atlantic, integrated known decadal coastal morphodynamics in its design (based on available aerial photographs - 1948 to 1998), by including a *non-edificandi* buffer, whose width varied as a function of local coastal dynamics and the shifting of occupation loads from the most recent dynamic areas to older more stable ones.

Since 2004, large scale topographic surveys have been carried out at the tip of the peninsula, where natural coastal progression had locally exceeded 300m. These surveys cover the frontal dune system and the beach berm and face down to the low water mark, along an extension of c.a. 1800 m and were carried out first with a total Leica TCR307 station and since 2012, with an RTK GPS Leica Viva GS/CS15.

Chronological series of digital elevation models over this 18 year period show different patterns: a marked accretion (2006-2007) due to the beach fill operation using sands dredged for construction of the Tróia marina; continued general accretion along the W facing marine coast corresponding to the natural progression of large “sand waves” in a NW alongshore direction (2011-2021) leading to additional progression of the coast line in excess of 200 m, translating into a major gain of available beach area; basculation of the N facing coast with some gain of the local beach area and a corresponding SE retreat of the tip of the peninsula (2008-2021).

Installation and growth of pioneer and primary dune vegetation has allowed for these new areas to be very quickly stabilized and to be resilient e.g. to occasional overtopping, but their loss by erosion is also evident with local dune cuts exceeding 1.5 m in height.

Keywords

coastal morphodynamics, DEM time-series, Tróia (Setúbal, Portugal), frontal dune system