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CHANGES OF BULGARIAN COASTAL DUNE LANDSCAPE UNDER ANTHROPOGENIC IMPACT

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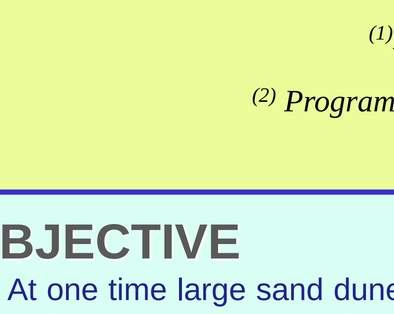
OBJECTIVE

At one time large sand dune formations were widely distributed along the Bulgarian coast. However, due to increased urbanization in the coastal zone, the areas of total dune landscape has been constantly reduced. Dunes presently comprise only 10% of the entire 412 km long coastline of Bulgaria: they embrace a total length of 38.57 km and a total area of 8.78 km^2 (Fig. 1). Important tasks in dune protection are identification of landscape changes for a certain period of time and accurate delineation of sand dune areas.

The present research traces sand dune changes along the Bulgarian Black Sea coast over a 27 year period (1983-2010). This period includes also the time of expanded tourist boom and overbuilding of the coastal zone, and respectively presents the largest dune changes and reductions.



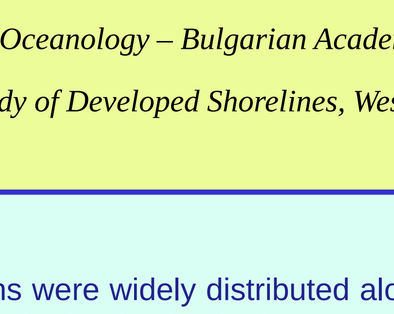


Figure 1. Location map of the Bulgarian Black Sea coast

RESULTS

Based on results obtained the dunes along the Bulgarian coast were divided into three main groups with relation to the general factors responsible for their alterations:

i) Dunes that have decreased in result of shoreline retreat and erosion of the beach itself;

ii) Dunes that have been reduced/damaged and lost due to expanded tourist and housing infrastructures/developments and due to afforestation activities;

iii) Dunes located at still undeveloped coastal sections: yet they are naturally preserved and unthreatened by human pressure boom.

DATA AND METHOD USED

To detect and assess dune changes during the last 3 decades, we used data for sand dunes derived from several sources at different time periods in order to compare changes in shoreline positions, dune contours and areas:

i) Topographic maps in 1:5,000 scale from 1983;
ii) Modern Very High Resolution orthophotographs from 2006 and 2010;
iii) QuickBird Very High Resolution satellite images from 2009;
iv) Statistical information for population and tourist infrastructure is also used to consider the influence of human pressure and hotel developments on the dune dynamics.

We used landscape change analyst in GIS environment the study also aims to explore the importance of different natural and human factors in driving the observed dune alterations and destruction.

- ✓ In 1983 dune areas along the entire coast constitute circa 10.28 km2
- ✓ This area has decreased to 8.8 km^2 (or by 15%) in 2010.
- ✓ On the other hand the area of infrastructure built over the dune fields has significantly grown:
- ✓ from 0.22 km^2 in 1983 to 1.18 km^2 in 2010, or more than 500%.

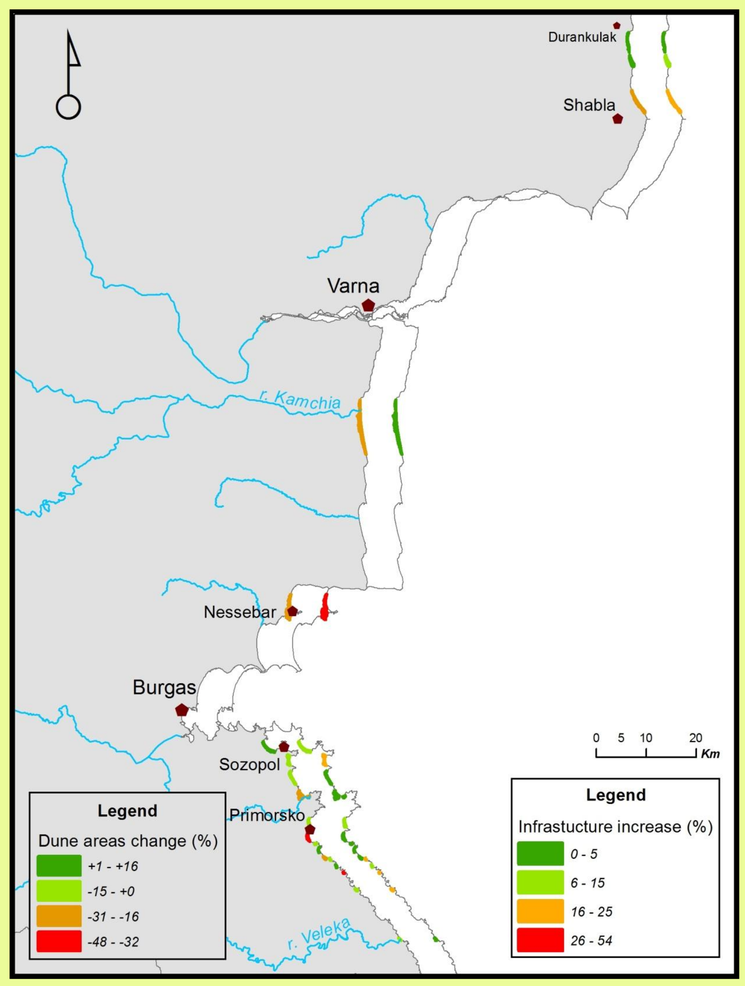
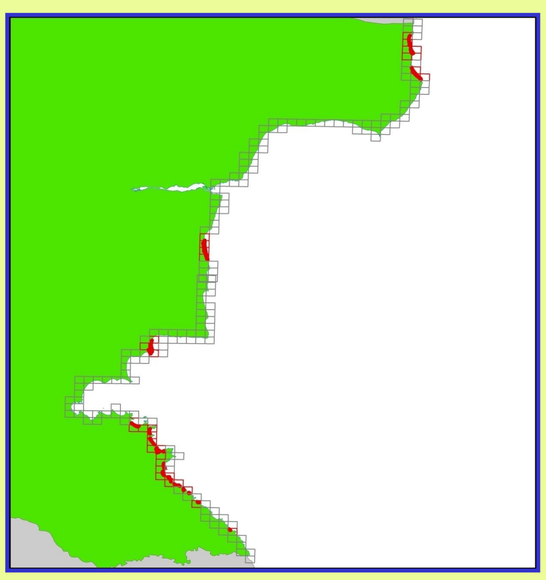
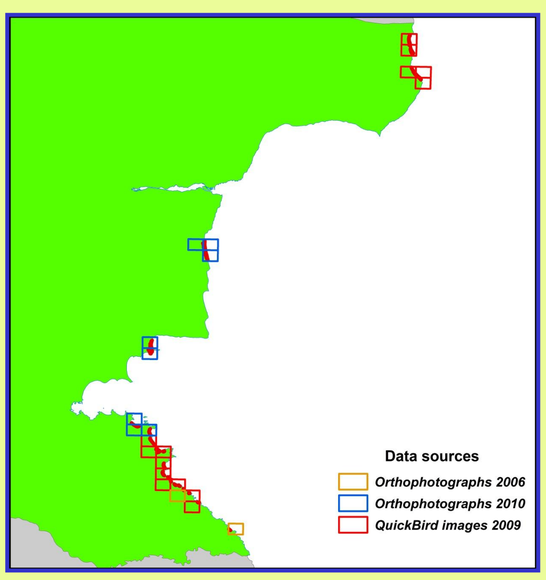


Fig. 2. Identified dune changes over a 27 years period (1983-2011)

Topographic maps in 1:5,000 scale



Modern VHR orthophotographs from 2006/2010 & QuickBird satellite images from 2009



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Although sand dunes in Bulgaria are protected areas and national reserves they have been exposed to large anthropogenic pressure in particular over the last decade. There is an increased demand now of proper management and urgent conservation activities. Such measures first require an accurate understanding of dune properties/behaviour, assessment of anthropogenic factors affecting dune persistence and identification of coastal areas most sensitive to risk of destruction.