the territory

Emilia-Romagna low and sandy coastline, stretching for 130 km from the Goro Po mouth to the Gabicce headland, is one of Europe's busiest tourist destinations, welcoming over 28 million visitors annually.

The coast and sea are home to natural eco-systems of inestimable value and also support manufacturing activities that make a vital contribution to the regional economy.

Nonetheless, this territory is rendered extremely fragile by marine weather dynamics, considerable anthropic pressure and climate change. **Beach erosion**, which today still affects over 30 km of the region's coastline, is the most evident problem. In the past the problem was fought with the construction of breakwaters and groynes which have let to a more rigid coastal system.

Post-war urban expansion led to the fragmentation and levelling of the coastal dunes that previously constituted the principal defence against storms. Reckless use of the territory and its resources also led to an increase in levels of **subsidence** and **saltwater intrusion in coastal aquifers**.

To tackle these critical issues, the Region has an ongoing commitment to monitor and promote innovative strategies and defence interventions such as beach nourishment with offshore sand and the protection and reconstruction of dunes.

The **role** of the **Geological, Seismic and Soil Survey** in the field of coastal studies and defence is to **support institutional activities** through the organization and updating of knowledge relating to the sea and coast information system and to develop **mapping and tools which are essential for intervention planning and for plan drafting**.

coast and sea in the european projects

SHAPE
2011-2014

The aim of this project, involving the entire Adriatic region, is to develop an integrated coastal and marine management system, using a systemic, interdisciplinary approach. The project objectives include the creation of an innovation management tool: a Gis Atlas of the entire Adriatic sea.

MAREMED
2011-2013

The aim of this project is to strengthen coordination between regional maritime policies, both national and European, regarding Integrated Coastal Zone Management. The project focuses on a number of key themes, including marine pollution, adaptation to the consequences of climate change, fisheries, marine research, transport and maritime safety.

MICORE
2009-2011

The main aim of the project was to set up an early warning system (EWS) for sea storms in support of Civil Protection intervention strategies. In addition, hazard thresholds were also established for each study site, based on historical sea storms data.

COASTANCE
2009-2012

Launched after the encouraging results of previous European projects, its main objective was to create new tools for coastal protection policies and for the development of detailed studies of coastal flooding.

PLANCOAST
2006-2008

The aim of the project was to provide all coastal European countries with a range of tools and useful recommendations for correct and effective planning of coastal areas and maritime space, in line with the principles of Integrated Coastal Zone Management.

CADSEALAND
2004-2006

The project tackled problems linked to coastal erosion and the complex interactions between the coastal environment and river basins within the context of an integrated land-sea management approach (ICZM). Participation in the project was a compelling factor behind Emilia-Romagna's implementation of SIC.

RegioneEmilia-Romagna

Assessorato sicurezza territoriale, difesa del suolo e della costa, protezione civile
Direzione generale difesa del suolo e della costa

servizio geologico sismico e dei suoli
Viale della Fiera, 8 - 40127 Bologna
Tel: +39 (0)51 5274792 Fax: + 39 (0)515274208
segrgeol@regione.emilia-romagna.it

ambiente.regione.emilia-romagna.it/geologia

coast and sea

RegioneEmilia-Romagna

knowledge

studies and mapping

The main objective of studies, research and monitoring activities is to develop a knowledge system of coastal dynamics for the mitigation of hazards, for the integrated coastal zone management and for the maritime space planning.

Studies of **shoreline and seabed change** together with those on **the evolution of river mouths** and land use were essential for establishing a knowledge framework for the current phenomenon of beach erosion, and for the creation of regional maps of **vulnerability to coastal erosion**.

The reconstruction of a **geological model of the subsurface**, now extended to include the submerged beach, provided the basis for detailed studies on the geotechnical and hydrogeological characteristics of recent deposits to tackle many specific studies such as those on land subsidence in coastal areas and salt-wedge intrusion in acquifers.

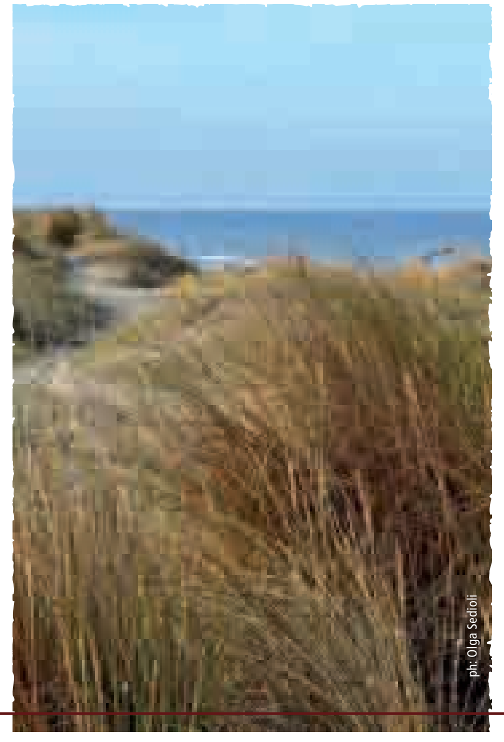
Studies of storm impacts led to the production of **hazard maps used to develop** new methods for the identification of coastal **areas susceptible to flooding**, as required by the "Flood Directive" EU 2007/60 and by the Italian Legislative Decree 49/2010. Moreover, **the catalogue of historical marine storms (1946-2010)** was used in support of the creation of the above mentioned hazard maps. The catalogue collects all the information of meteo-marine events that had an impact on the Emilia-Romagna coast between 1946 and 2010.

As regards thematic cartography, a map of the **human use of the sea** was recently compiled that summarises the majority of the uses, restrictions and regulations of maritime activities.

The results of this work are a valuable aid in the programming and planning of interventions for coastal defence to be undertaken by the competent authorities.


ph: Nazario Spadoni


ph: Mario Vianelli


ph: Olga Sedioli

data

SIC - the sea and coast information system

First created by the Geological, Seismic and Soil survey (SGSS) in 2000, SIC collects, organizes and regularly updates a large amount of data acquired by the Region and other bodies over the last 30 years, so that the data can be used in a GIS environment. The original SIC, created to support **integrated coastal zone management** (ICZM), has expanded considerably thanks to the addition of a wealth of information obtained through recent spatial analysis, research and monitoring activities. Some of the SIC specialized databases are particularly innovative for the Mediterranean area and constitute a valuable operative tool for resource management and planning of maritime space along the Emilia-Romagna coast. Part of the SIC data is available on **the SGSS website** and can be consulted interactively through a web-gis interface.

in_Storm

Information system for **sea storm data management**.
This system organizes and manages data related to forecasting, monitoring and quantifying the damages induced by sea storms.

in_Sand

Information system for **offshore sand management** in coastal protection projects. Developed in collaboration with ISMAR-CNR, it contains an extensive database on geological and geomorphological aspects of offshore deposits.

in_Sea

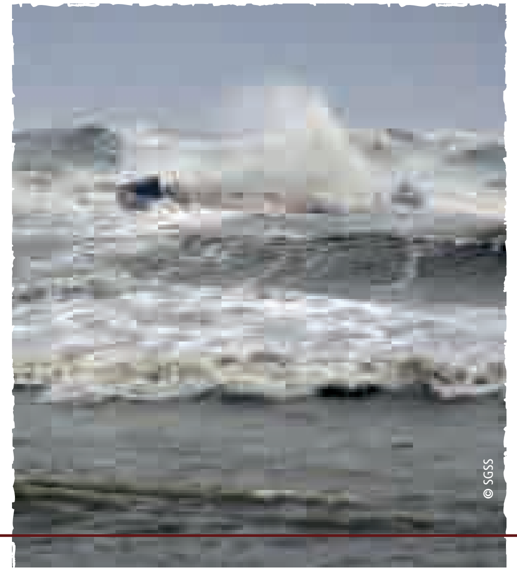
Information system of the sea use.
This system manages data concerning the main activities carried out at sea (fishing, defence, navigation, ports, hydrocarbon exploitation, etc.).

in_Defence

Information system for **coastal defence** and **beach nourishment** interventions. This system contains up-to-date mapping of hard coastal defence structures and data on nourished sand volumes placed along retreating stretches of the coastline.

in_Move

Information system on **land subsidence** in the coastal area, containing the geological and monitoring data that are necessary to understand this phenomenon.


© SGSS


© SGSS


© Fotolia

tools

monitoring

The Geological Survey has designed and created two important coastal **monitoring networks** concerning the topographic survey of **beach profiles** and the study of the **coastal aquifers**. Every six months a new survey updates beach profiles in the most critical areas of the coast, the depth of the water table is measured and the physical characteristics of the groundwater are analyzed. When major sea storms occur, inspections are carried out to assess the morphological impact on the beach. Several high resolution **morpho-altimetric surveys** have also been produced using the airborne laser scanner system (Lidar).

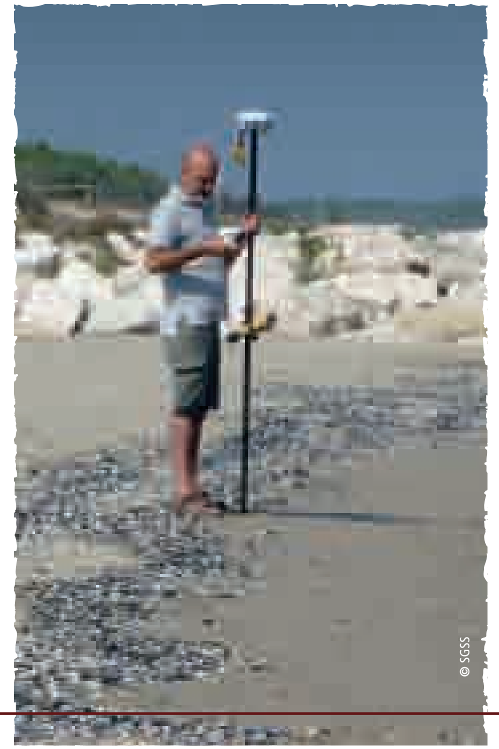
risk prevention

Thanks to a collaboration with the University of Ferrara and ARPA-SIMC, **threshold values** of marine storm parameters for use in coastal warning procedures have been established and a storm **impact forecast system** has been devised. The system, developed in an experimental area south of Ravenna, operates in tandem with wave and sea level forecasts managed by ARPA-SIMC and is available for online consultation. The final early warning system will include other 7 critical areas.
http://geo.regione.emilia-romagna.it/schede/micore/

working together

The Geological Survey works closely with various regional bodies dealing with the protection of the coastal area and the management of marine resources. It also cooperates with ARPA-SIMC and with the Civil Protection, with regards to coastal risks posed by sea storms. In the topic of mitigation of anthropic subsidence, it is part of a working group established under the Angela Angelina agreement protocol together with the Municipality and Province of Ravenna and eni s.p.a. There are also fruitful collaborations with the Universities of Ferrara and Bologna and with the ISMAR-CNR research institute of Bologna.


© Fotolia


© SGSS


© SGSS