

## EARTH OBSERVATION AND THE COASTAL ZONE: FROM GLOBAL IMAGES TO LOCAL INFORMATION

*Copernicus helps to harness the potential of foreshores to be used as part of nature-based solutions towards reducing coastal flood and erosion risk.*

### The challenge

Achieving fully integrated and sustainable coastal zone management is one of the greatest challenges facing European Union Member States. Sea level rise, climate change and increasing coastal pressures, intensify this challenge, demanding innovative approaches towards coastal management, including flood and erosion risk reduction. This increased risk will necessitate increased investment in flood defence infrastructures. To reduce costs and to limit negative impacts on ecosystems, interventions that integrate natural vegetated foreshores within flood defence schemes are now being actively explored. However, to advance in such flood management approaches a better understanding of natural flood/erosion protection and robust scientific observations are needed.

### The space based solution

A way forward is to use a combination of remote sensing and field data from foreshores to map vegetated foreshores and how their specific characteristics affect wave energy and erosion. This will result in novel ways of extracting relevant information from satellite images and thus to help predict the shoreline protection provided by those foreshores.

This approach thus makes use of scientific innovations to derive evidence and actionable information from Earth Observation (EO) resources, with a particular focus on the capabilities of the European Copernicus programme. By aligning a wide range of disciplines, this approach resulted in the generation of the MI-SAFE platform of services. On a global scale, we produce brand new open source and unique EO-based information on coastal status and flood risk parameters filling in gaps in existing datasets. At local level we

deliver tailor-made highest resolution information and training relevant for coastal managers and engineers who want to integrate natural features in cost-effective Nature Based Solutions.

To generate and demonstrate MI-SAFE services, we have gathered, reclassified and produced open format layers of information on elevation, vegetation, water level and wave statistics; using EO resources (Sentinel satellite images), numerical models, but also data collected in situ. To obtain this information, enormously large datasets were digested that are open for public use. All continents are included, highest level of detail is generated for European saltmarshes. See <http://fast.openeearth.eu>

### Benefits to Citizens

Worldwide coastal coverage allows citizens to become informed on the importance of their natural coastline for reducing flood risk. The comprehensive dataset and modelling tool is contributing to the assessment of the status of regional coastal zones for managers and policymakers. For managers and engineers, the interface is a way forward towards utilising the vastly increasing



"The intricate network of channels and creeks contrasts with the regular shapes of transformed saltmarsh (right of picture)," writes Edward P. Morris, Sentinel-2 'Colour vision' photo competition. Credit: Contains modified Copernicus Sentinel data [2017]

Thematic Area



CLIMATE, WATER AND ENERGY

Region of Application



EUROPEAN COASTS (UK, SPAIN, ROMANIA, NETHERLANDS)

Sentinel mission used



S1  
S2

Copernicus Service used



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Usage Maturity Level

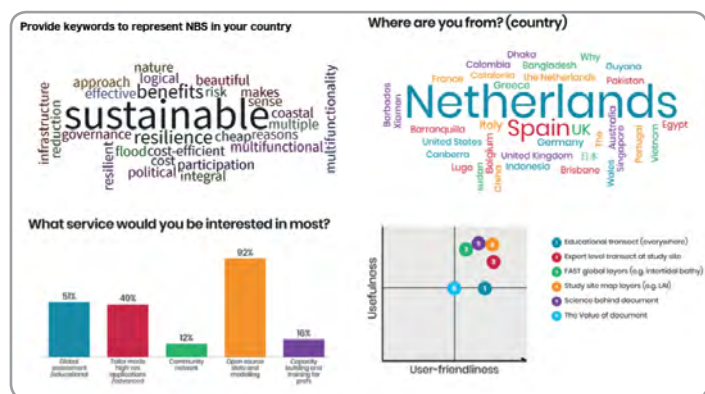


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quantities of high resolution data for producing information relevant for finding nature-based flood safety solutions. The platform's shared information provides input for effective communication around nature-based coastal management options between stakeholders around possible managed realignment projects or coastal wetland restoration schemes. Its open data approach offers opportunities for 'data-collaboration' within existing open source communities. This was tested in four different European countries, hands-on training sessions and during webinars.

“This tool provides very relevant information on the coastal status and delivers this in a format beneficial for use by managers and coastal engineers helping them to design cost-effective sustainable flood safety solutions.”

*Prof. Dr. Ir. Stefan Aarninkhof,  
Delft University of Technology*



Characteristics of MI-SAFE platform end-users

Increasing the temporal resolution (seasonal and annual) is a valuable next step that exploits the new high-resolution sensors for the detection of coastal changes that are impacting flood safety. This requires progress on data fusion with other sensor platforms, image mining and algorithm improvements that deliver high quality information on coastal status. Together with engineers and coastal managers, the platform could be developed into a management tool that keeps observing and quantifying coastal safety and threats for whole regions of coasts in relation to increasing the impact of climate change and sea level rise.

## Outlook to the future

The MI-SAFE platform is unique in its combination of modelling and EO capability. We believe that we have created a flexible platform to further evolve and adapt to accommodating new developments in data-availability and requests from users for adapted functionalities in advanced modalities through training and cooperation.

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## ABOUT COPERNICUS4REGIONS

This Copernicus User Story is extracted from the publication “**The Ever Growing use of Copernicus across Europe's Regions: a selection of 99 user stories by local and regional authorities**”, 2018, Edited by NEREUS, the European Space Agency and the European Commission.

The model cases focus on local and regional authorities who successfully applied Copernicus data in 8 major public policy domains. The views expressed in the Copernicus User Stories are those of the Authors and can in no way be taken to reflect the official opinion of the European Space Agency or of the European Commission.

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