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A protected natural area in the Emilia Romagna region, Northern Italy is threatened by hydro-meteorological hazards, particularly sea storms. In the last 50 years the northern part of the Bellocchio Park (Sacca Bellocchio II Nature Reserve, Site code EUAPP0072 - Ferrara, Italy) was interested by an intensive urbanization (Lido di Spina) with the realization of infrastructures, e.g. roads and residential settlements. This land use change led to the construction of embankments and to the conversion of wetlands. These modifications, in combination to even more frequent storm surge events increased coastal erosion. In addition, inland flooding caused by storm surges acts with the reduction of the lagoon and the increase of soil salinity. As an example, the last event occurred in December 2020 eroded a large portion of the Bellocchio beach.

Co-design, co-development and deployment of NBS solutions to reduce storm surge risk in the Bellocchio Park is one of the objectives of the H2020 project OPEn-air laboRAtories for Nature baseD solUtions to Manage environmental risks (OPERANDUM). BellocchioBellochio park is in fact one of the 10 Open Air Laboratories (OAL) where the evidence of mitigation of hydro-meteorological risk by NBS will be demonstrated by the combination of different models, approaches and data.

During the co-design process in the Bellocchio park, potential deployment locations of sand dunes have been identified in collaboration with local authorities devoted to the management of the natural area and to the coast defense (CB and ARSTePC-RER) and an environmental engineering consultant assisting Arpae (IRIS sas). Field visits were devoted to the analysis of the environmental features, strengths and weaknesses of candidate sites.

This work aims to explore the usefulness of the combined use of multisource remote sensing and modeling in decision making during the co-design process of a NBS. The impacts of the most intense extreme storm surge events in the last 30 years have been documented by delineating flooded areas along the coast using Synthetic Aperture Radar and Multispectral image data. Coastal erosion has been also described by means of change detection analysis and very high

resolution multispectral EO data. This screening has given a picture of areas at the risk, i.e. the area most likely to be affected by storm-surge events. Auxiliary data like Digital Terrain Models has been assimilated in a dedicated model to produce flood maps under different scenarios, i.e. different locations and size of NBS and different intensities of storm surge.

The integrated analysis was helpful in defining the priority sites, among the ones defined by the stakeholders and engineers, in term of effectiveness for storm surge risk reduction.