



## ASTERIS - ADAPTATION TO SALTWATER INTRUSION IN SEA LEVEL RISE SCENARIOS

The ASTERIS project has been financed at the Call for proposal 2017 Priority Axis Safety and resilience of Interreg V Italia-Croazia 2014-2020 Programme.

### THE PROJECT DURATION HAS BEEN EXTENDED OF 6 MONTHS UNTIL 30.06.2021

The surge of cases of COVID-19 in Italy and Croatia and the consequent strict measures that Italian and Croatian National authorities started imposing since late February 2020 led to impossibility of performing some of the planned activities (especially the sampling activities within WP4 on Italian and Croatian sites, which were supposed to be carried out last spring).

The partnership was also forced to cancel live public meetings and events for 2020, turning them into on-line meetings.

In light of these restrictions and blockades, the partnership jointly decided to submit a prolongation request. Relying on 6 additional months will be the only way to achieve all the project objectives and attain both the scientific and dissemination expected results. The request was officially approved in early October 2020.

#### PARTNERSHIP:

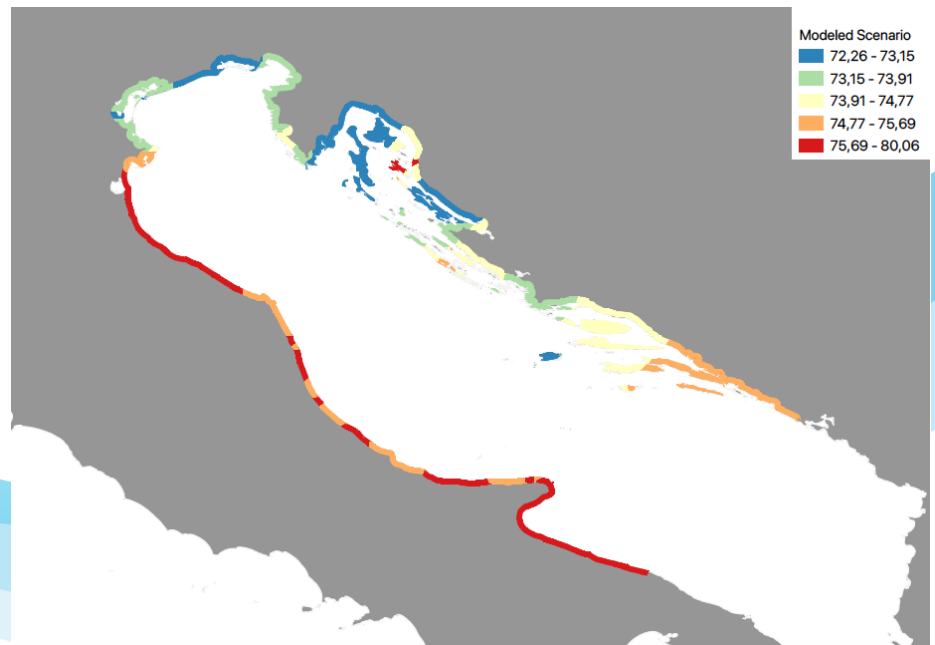
- UNIVERSITY OF URBINO
- INSTITUTE OF GEOSCIENCES AND EARTH RESOURCES (CNR)
- MUNICIPALITY OF FANO
- MUNICIPALITY OF RAVENNA
- METRIS RESEARCH CENTRE
- INSTITUTE FOR ADRIATIC CROPS AND KARST RECLAMATION (JACKR)
- CROATIAN WATERS

#### BUDGET:

€ 1.026.244,20

#### PROJECT DURATION:

January 2019 – June 2021



### FUTURE SCENARIOS FOR SEA LEVEL IN ADRIATIC BASIN

Sea level is currently rising and it is expected to increase from 25 to 100 cm (global average) by the end of the century. Sea-level rise is not uniform but affected by a strong spatial variability. The Mediterranean Sea, due to its characteristic of semi-enclosed basin, has not been well represented in global ocean circulation models so far developed, which consider the Mediterranean as a closed Sea, without exchange with the Atlantic Ocean across the Gibraltar Strait. Here sea-level changes are modelled by taking into account all the interrelated physical mechanisms that characterize glacial isostatic adjustment processes, and taking regional variability into consideration. Three scenarios have been developed.

The first considers RCP8.5 (the “worst” Representative Concentration Pathway on greenhouse gas concentration adopted by the IPCC) to estimate a possible upper bound of future RSL variation in the study area: both steric and current ice melting component of sea level, have been modelled according to the RCP 8.5.

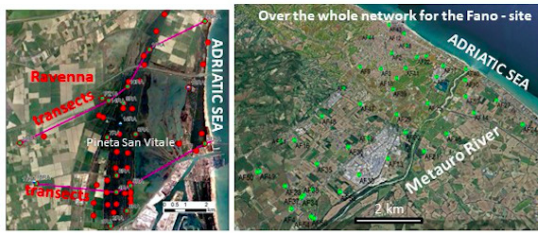
The scenario so obtained is compared with other two scenarios resulting from different approaches:

A low-hand “business as usual” scenario that has been developed based on a projection “business as usual” of sea-level trend detected during the last decades at tide gauges located in Adriatic basin;

A “semi-empirical” scenario, obtained following the approach described by Rahmstorf (2007), based on the relationship between temperature and sea-level rise: this has been obtained adopting the highest temperature scenarios for Mediterranean Sea at 2100.

Boundary conditions for climate and upper bound scenario for sea level, will be integrated with the territorial hazards identified for Northern Adriatic Basin, in order to predict the local response in terms of saline intrusion.

In-situ: T-pH-EC-Eh  
Piezometric and vertical physicochemical logs



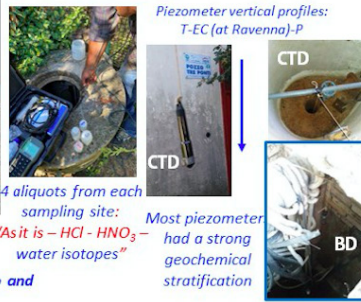
Monitoring: from June 2019 to September 2020

2 surveys for water sampling and physicochemical parameters at Fano and Ravenna

5 surveys for piezometric and physicochemical parameters at Fano

4 surveys for piezometric and physicochemical parameters along two main transects orthogonal to the coastline at Ravenna

Sampling strategy:  
Piezometers, wells and streams



Three multiparameter probes (CTD) and 1 baro-thermometer (BD) were installed at Fano

## SAMPLINGS IN FANO AND RAVENNA

Several samplings were carried out in two specific case studies of Central-Eastern Italy (Fano and Ravenna) for acquiring water level measurements and physicochemical parameters. Additionally, ground and surface water samples were also collected for chemical and isotopic analyses to define the compositional features and the main geochemical processes affecting the two groundwater systems.

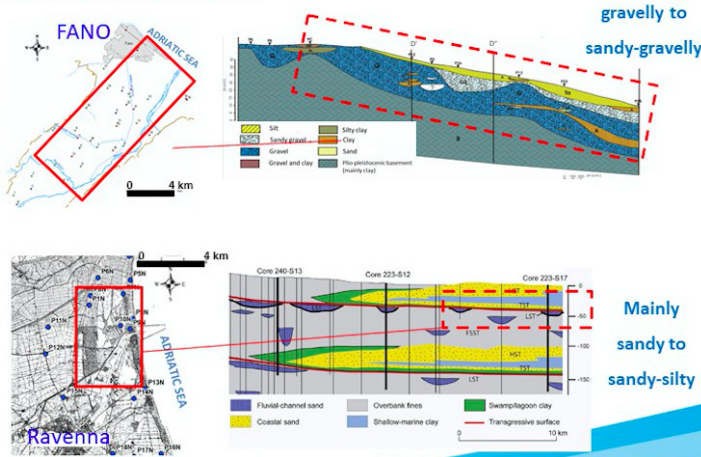
Preliminary investigations suggested that the Ravenna shallow aquifer is already strongly spoiled by a significant seawater intrusion (up to 80 %), whereas in that of Fano the presence of the saline wedge is practically negligible. This indicates that the aquifer system of Fano is to be regarded as a good proxy for evaluating

and simulating potential processes of saline-fresh water interactions by either the increasing demand of water exploitation and sea level rise due to anthropogenic pressure and climate change, respectively.

In order to simulate possible future ingressions of seawater in the Fano aquifer system, groundwater flow and transport models are currently under development. These models will be calibrated according to the hydrogeological and geochemical data collected within the framework of this project. The expected modelled scenarios, obtained through predictive simulations, are of pivotal importance for a correct management and protection of water resources, which can be exported to the other aquifers system along the Adriatic Sea.

### Case studies: Fano and Ravenna coastal areas

Two shallow "phreatic" aquifers



WP4  
Identifying needs and barriers in coastal aquifer management

4.1 Case studies physical investigations

## PUBLIC EVENT HELD ONLINE ON THE 21<sup>ST</sup> OF SEPTEMBER 2020 WITHIN THE REMTECH EXPO INTERNATIONAL EVENT IN FERRARA.

On September 21, 2020, ASTERIS activities and results obtained so far have been presented at the international scientific conference REMTECH EXPO digital edition 2020 under the topic, "Coasts, Ports and Sea". A total of 97 visitors from scientific institutions, local and regional authorities and private companies followed the activities on ASTERIS's virtual exhibition room. 51 attended the online conference. RemTech is a permanent international public event dedicated to protection and sustainable development of the territory, remediation of contaminated sites, coasts and ports, hydrogeological risk, climate changes, seismic risk, urban regeneration and sustainable chemical industry.

The event was focused on presentation of the project's progress within WP3 and WP4. The maps of the evaluation of the territorial hazards due to sea level rise were presented and results of the monitoring activities, carried out on the case study areas so far, were showed. The event included presentations by Luisa Perini from Emilia Romagna Region, that carried out researches on sea level rise scenarios and by Daniele Capitani from Cervia Municipality, that presented examples of adaptation planning on a coastal area, showing results of ADRIADAPT Interreg Italy-Croatia project.

The event was recorded and can be watched here upon registration:

<https://remtech.meeters.space/events/event-detail/jqXJl78xSpNCEkqWWqLB>

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