

D.3.1.2 – Development of WATERCARE WQIS



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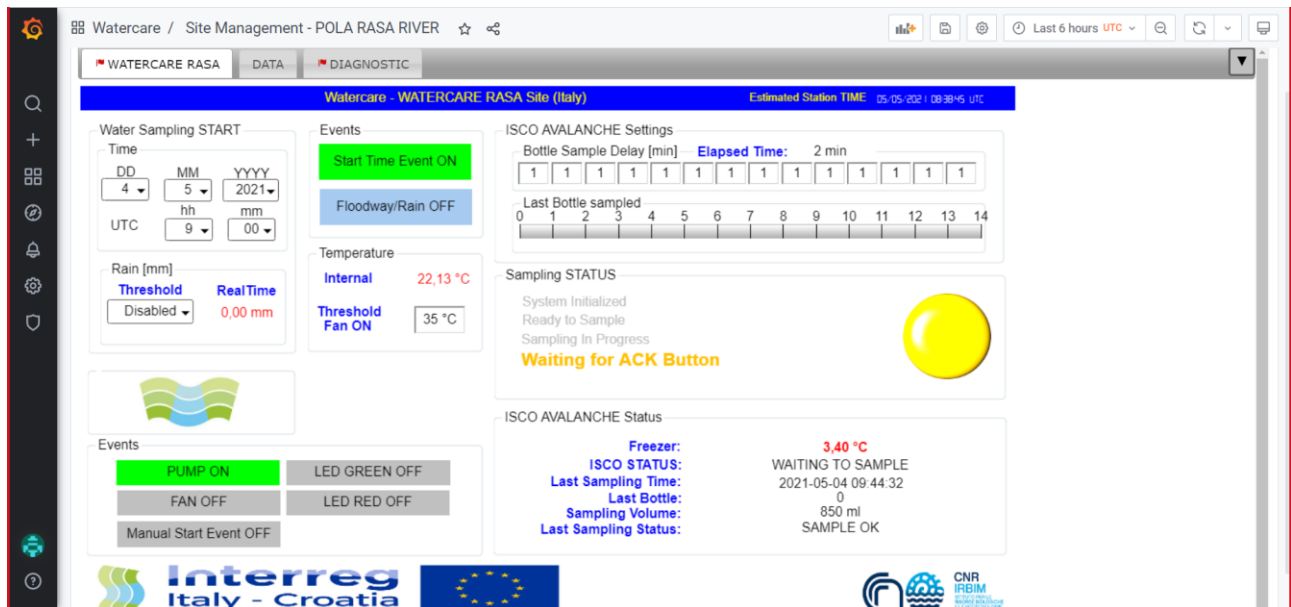
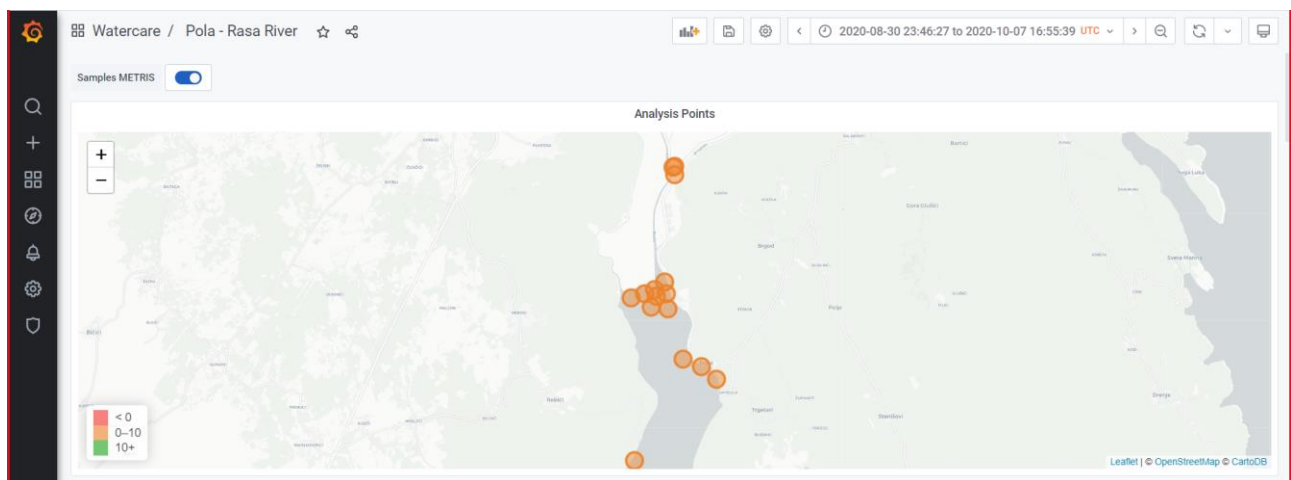
- WATERCARE Quality Integrated System User Manual

1. INTRODUCTION

Development of the WATERCARE WQIS to operate in the pilot (Fano) and target areas (Dubrovnik, Pescara, Split and Istria). The WQIS development will consist of (i) design and implementation of the hydro-meteorological monitoring network for the areas in sewers, riverines and rivers; (ii) collection of meteorological/hydrological and bacteriological data; (iii) implementation of the FOM in the pilot and target areas; (iv) implementation of the freely accessible database

2. Report of the activities

After the tests and installation of the Watercare Pola, Rasa River site, the Grafana dashboard was implemented and updated for viewing data and the web tools for managing the site and for entering analysis data.



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Furthermore, remote support is provided for all implementation phases and complete sampling (river and sea).

CNR staff has developed a user manual of the WQIS in such a way as to have a guide both for the use of the WQIS and for the operations in the field (e.g. management of automatic sampling).

The guide contains also instructions on using, maintaining, and troubleshooting devices and software tools used for the purposes of the project. This guide includes SOP - STANDARD OPERATING PROCEDURES, a flowchart showing the step-by-step activities to be carried out to complete a sampling activity (from setting of a trigger event to viewing the collected data). In the next figure is showed the index of the manual (draft version).

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Within previous periods until 30.6.2020. PP8 has collected and delivered to PPs information about the Raša river site: network of sewers, river line and rivers meteorological/hydrological and bacteriological data.

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During this reporting period, location (pilot site River Raša) was visited 5 times for performing testing and optimization of project equipment, rain simulation and first sampling for bathing season 2020 (normal weather and heavy rain conditions). Travel reports were designed and all information were included in the 4th Partner Activity Report.

As part of preparation of WQIS trip to Dubrovnik was organized by DNR partner. It was a working meeting on Neretva river where METRIS showcased DNR experiences with WQIS system from Raša to Neretva pilot site with examples and instructions. All was documented (agenda, invitation, signature list) by organizer DNR. Following are the clippings from our presentation giving an overview of what was presented, and it is all in the PP8 PR4 report.

3. Implementation of the FOM in the pilot and target areas

A finite element hydrodynamic model was applied to five study areas in the Adriatic Sea, which differ for urban, oceanographic and morphological conditions. With the help of transport-diffusion and microbial decay modules, the distribution of *Escherichia coli* was investigated during significant rainy events. The numerical investigation was supported by detailed in situ observational datasets. The numerical model simulates the water circulation field, the water temperature, and the salinity by representing the physical processes occurring in the coastal areas of the Adriatic Sea, for example, tidal propagation, wind-induced currents and set up, water, heat and salt fluxes, thermohaline stratification, and vertical mixing. The simulations were performed for selected summer periods of 2019 and 2020.

In all cases, the numerical domain considers the area of interest and a larger part of the coastal and shelf seas. To adequately resolve the river-sea continuum, the grids also include the lower part of the considered river. The bathymetry interpolated onto the numerical grids was obtained by merging high-resolution site-specific datasets covering the area of interest with the composite EMODnet dataset (EMODnet Bathymetry Consortium, 2020) for the outer open sea (Figure 1).

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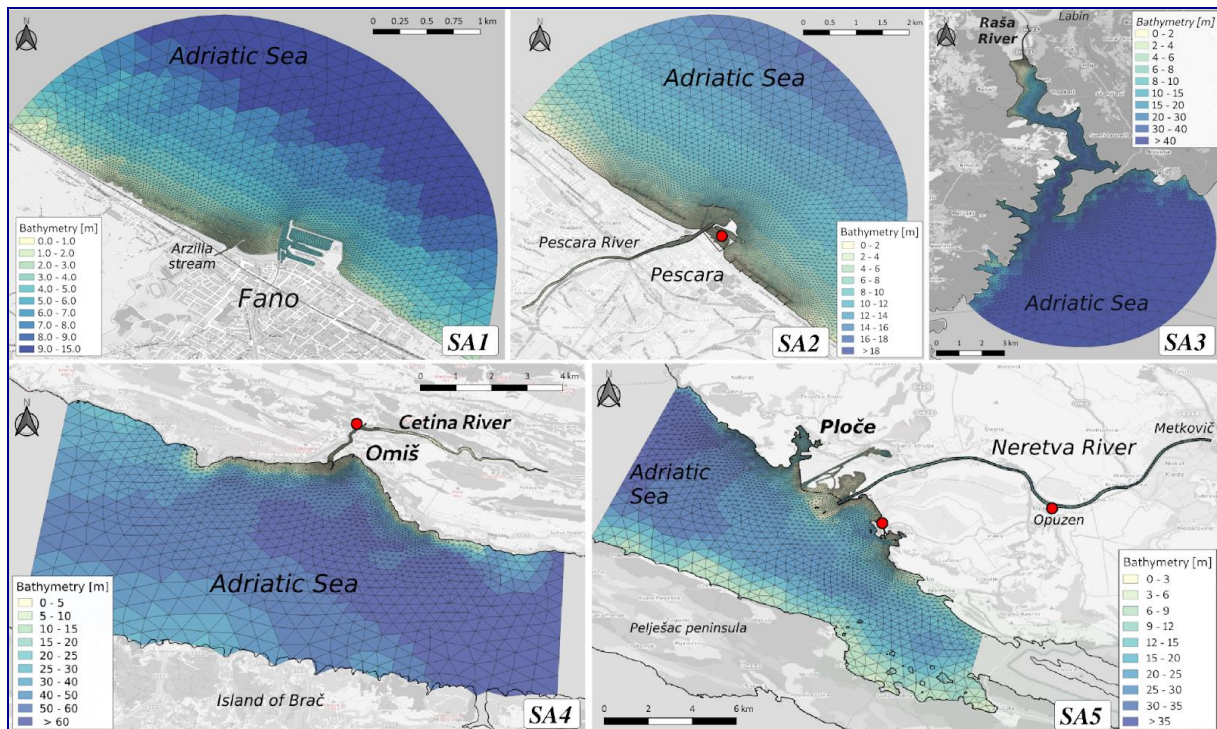


Figure 1. Numerical grids with the bathymetry superimposed of the five study areas. The red dots mark the location of the monitoring stations at the Pescara, Omiš-Cetina and Ploče-Neretva study areas. Background: OpenStreetMap

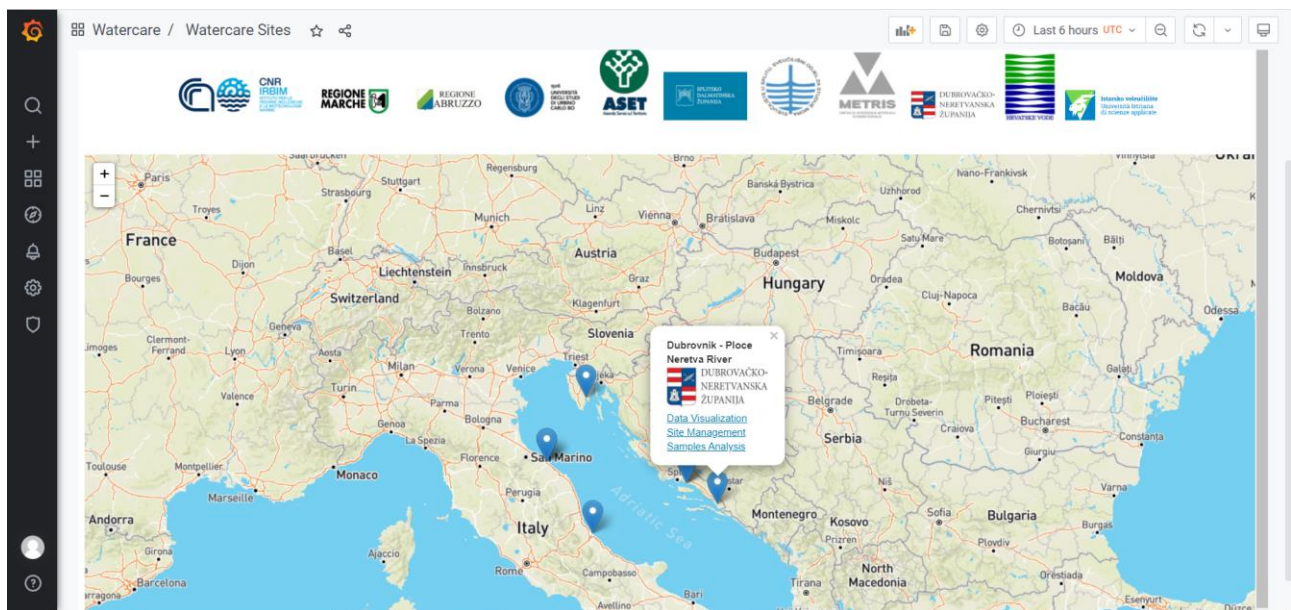
Model results were evaluated against water level, sea temperature, salinity and *E. coli* concentrations acquired in situ, demonstrating the capacity of the modelling suite in simulating the circulation in the coastal areas of the Adriatic Sea, as well as main transport and diffusion dynamics, such as riverine and polluted waters dispersion. Moreover, the results of the simulations were used to perform a comparative analysis among the different study sites, demonstrating that dilution and mixing, mostly induced by the tidal action, had a stronger effect on bacteria reduction with respect to microbial decay. Stratification and estuarine dynamics also play an important role in governing microbial concentration.

(i) Implementation of the freely accessible database.

In order to be able to easily and uniformly access the WQIS data, a web tool has been created. The screenshot shows a map with Watercare sites. By clicking in the window relating to the site, you can access 3 sections:

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1. data visualization: to visualize the data, various dashboards were implemented using a web solution provided by Grafana Labs. Grafana is open source visualization and analytics software. It allows you to query, visualize, alert on, and explore your metrics no matter where they are stored. It provides you with tools to turn your time-series database (TSDB) data into beautiful graphs and visualizations. It is reserved to Watercare Project users.
2. site management: This web tool has been designed to remotely activate the sampling cycle and to have a quick look at the events and the progress of the system. It is reserved to Scientific site manager, a core actor of the WQIS system planned for each study site
3. Samples Analyses: is a web interface with the task of acquiring manual monitoring data, such as data from chemical and microbiological analyses performed by the researchers. The user authorized to insert the results of the analysis, can view and manage the data related to site for which he is responsible.



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