D.1.3.2. Plan of Operation

Document Control Sheet

Project number:	10048765
Project acronym	ASTERIS
Project Title	Adaptation to Saltwater inTrusion in sEa level RIse Scenarios
Start of the project	January 2019
Duration	24 months

Related activity:	3.1 – Technical network's set up and operation
Deliverable name:	Plan of Operation
Type of deliverable	Survey template
Language	English
Work Package Title	Modelling present and future salt ingression in Adriatic coastal aquifers
Work Package number	3
Work Package Leader	University of Urbino “Carlo Bo” – (UNIURB)

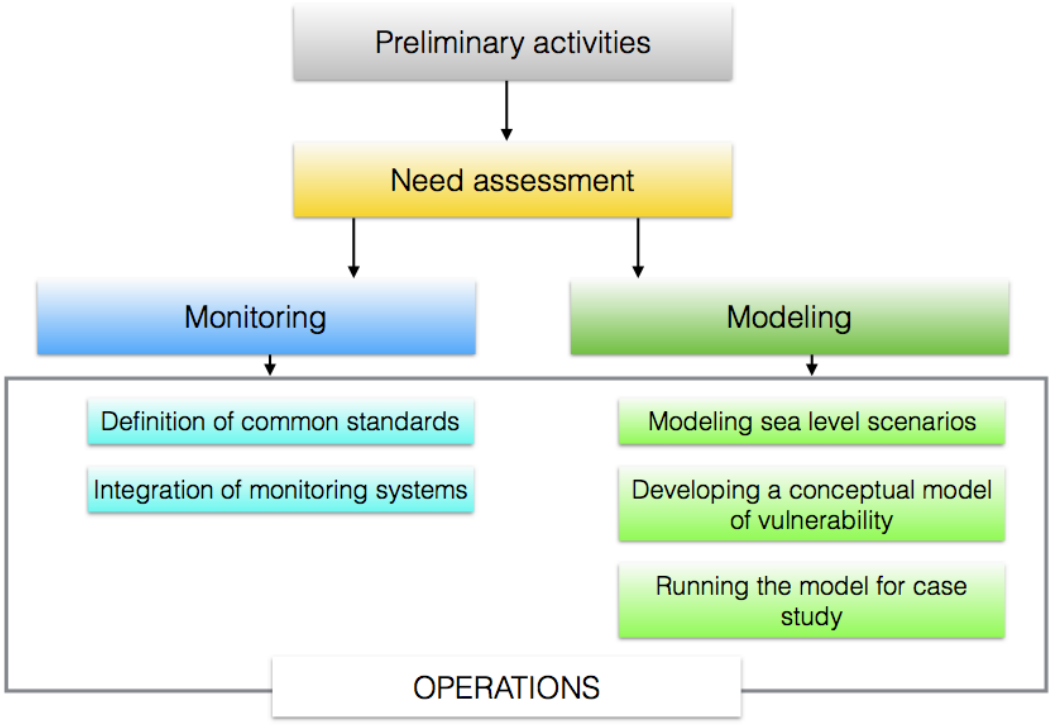
Status	Final
Author (s)	Simone Galeotti (UNIURB) Giorgio Spada (UNIURB) Gaia Galassi (UNIURB) Luca Lanci (UNIURB)
Version	1
Due date of deliverable	30 June 2019
Delivery date	31 July 2019

INDEX

1. INTRODUCTION

The ASTERIS project pursues a multidisciplinary approach to deal with the complex problem of salinisation of coastal aquifers. As illustrated in deliverable D.3.1.1 “network design”, the scientific activities (WP3 and WP4) will be implemented trough a functional collaboration between partners. The preliminary activities (network design and preliminary survey) have allowed to assess the needs and to identify the operations required for the fulfilment of the project.

Operations are related to two main field of activities: monitoring and modelling. In the following sections the specific operation will be described in detail.



The operations are included in specific activities of WP3and WP4. Activity 3.1 is finalised to set up the network and to define common standards for the monitoring. The basis for integration of monitoring systems is started in activity 3.2 with the production of a general vulnerability map and finalised in activity 3.5. The modelling of future sea level scenarios is the scope of activity

3.3 whereas hydrological cycle will be modelled in activity 3.4. The conceptual model of vulnerability will be developed in activity 3.5. The analysis of case studies is at the basis of WP4 (activities 4.1, 4.2 and 4.3).

2. OPERATION RELATED TO MONITORING

Definition of standards

With particular reference to the monitoring of coastal aquifers in the three surveyed case studies (Fano Municipality, Ravenna Municipality and Neretva Delta) the partners in charge of WP3 and WP4 agreed on a minimal list of information and data to be gathered for all the sites.
This includes an inventory of information on already available time series for specific parameters derived from the selected areas, which might be limited in some cases. As far as the monitoring of the case study areas during the course of the project is concerned (activities 4.1, 4.2 and 4.3), the following list of information to be gathered has been deemed sufficient for the successive step of building a flow and transport model:

- Regional and local data available from literature, technical reports, local authorities,
- Topographic data,
- Stratigraphic data of borehole and geologic/stratigraphic cross sections to geometrical reconstruction of the aquifer system,
- Hydraulic tests with observation well for the hydraulic characterization (hydraulic conductivity in xyz direction, effective porosity, specific yield, specific storage),
- Piezometric map, preferably with seasonal variations,
- Meteorological data (precipitation and temperature) collected in weather stations inside or nearby the basin (recordings should be available for a minimum of 10 years, with data on a

daily or monthly basis),

- Land use definition and soil cover for evapotranspiration parameter settings and for estimates of infiltration coefficient,
- Estimates of the characteristics (materials, thickness, hydraulic conductivity) of river, stream and lake beds,
- Hydrometric level of river, stream and lake (recordings should be available preferably for a minimum of 10 years, with data on a daily or monthly basis),
- Measures of streams discharge along different sections, to define the surface-groundwater relationships (at least one measure for each season),
- Location and estimate of flow rate of groundwater sinks (e.g. public and private wells),
- Location and estimate of flow rate of groundwater springs/source (e.g. feeding component from adjacent aquifer),
- Isotopic analyses of stable isotopes for the estimate of recharge elevation, especially if more than one aquifer is present,
- Measures of hydraulic heads taken with monthly or daily frequency,
- Identification of chemicals of concern in existing or potential contaminant plume,
- Vertical and horizontal extent of contaminant (e.g. Electrical Conductivity or Cl for marine intrusion),
- Measures of contaminant concentration taken at a frequency coherent with the scopes of the model.

3. OPERATION RELATED TO MODELING

Developing a conceptual model of vulnerability

A map of hazard to salt intrusion in coastal aquifers will be produced to account for intrinsic characteristics of aquifers and anthropic pressure on them. The map will provide a large-scale definition of aquifer vulnerability for different areas within the northern Adriatic basin.

A survey (D 3.2.1) involving al the partners will be to a pre-requisite to gather uniformly

available information and sharing the main aspects of the methodological approach, choose the physical variables to be include in the model and their specific weight to be used in the model run.

Modeling sea level scenarios

The long-term sea-level variations at a given place and time result from the combination of several contributions, as those associated with mass exchange, the component due to the ocean response (including the ocean circulation contributions and thermosteric and halosteric effects), and other factors (as post-seismic deformations and tectonic effects).

The response of the solid Earth and gravitational field to the change in mass loading will be modelled with the sea-level equation solver SELEN (Spada and Stocchi, 2007). The modelling would account both for the glacial isostatic adjustment ongoing effects and for the expected melting of current ice glaciers.

The other sea level component will be obtained from external sources (territorial agencies, ENEA, other) and add to the model.