

The Naples Research Unit project will work to achieve two different goals.

#### Objective 1 – Problem of the "optimal design" of Water Distribution Systems

The first goal of the research is the development of a methodology capable of solving the problem of the "optimal design of water distribution network", by considering as economical as reliability aspects. The problem of the stochastic Water Distribution System (WDS) design will take into account solving an optimization problem.

The model will be able to search an objective function for either one of these cases:

- minimization of the installation and operating costs (appropriately capitalized) for a given level of system reliability;
- maximization of system reliability for a given value of installation and operating costs, intended as the capability (in probabilistic terms) to ensure the random quantity of water required by the consumers by imposing minimum head constraints.

#### Objective 2 – Problem of the "safety" of water distributed by a Water Distribution System

In relation to the "Safety" of WDSs, two procedures will be developed for the optimal positioning of pre-fixed sets of monitoring stations, located in order to promptly detect intentional contamination of the municipal water network.

Both procedures will be capable to take into account the spatial-temporal variability of water quantity required by the consumers.

In particular, the first procedure will be capable to allocate the optimal position of a single monitoring station at the time. The second procedure is an extension of the first: this procedure will be capable to allocate a set of monitoring stations for the prompt detection of intentional contaminations.

Both procedures will be applied, in order to show their feasibility, to two real case-studies, characterized by different number of inhabitants and different network extension: the water distribution network of the Municipality of Grumo Nevano (Naples) and the water distribution network of the Municipality of Piedimonte San Germano (Frosinone). For the second case-study, the analysis will be realized in collaboration with U.R. of Cassino University.

For further information, visit the [webpage of Prof. Domenico Pianese](#) who is the scientific responsible of the Naples research unit (R.U.).