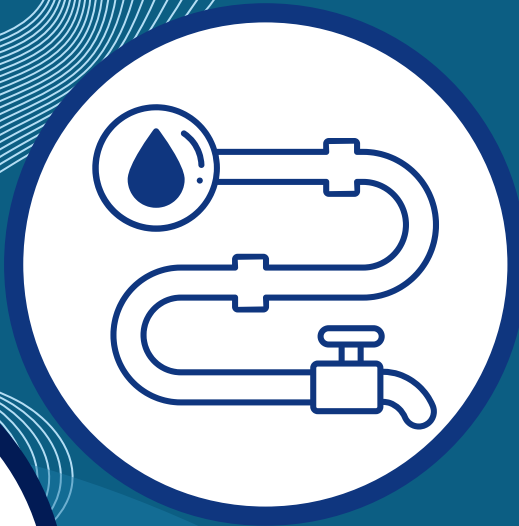


SMAT Research center

Research activities

2024 | 2025



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Research activities

YEAR 2024/2025



ISO 22000
BUREAU VERITAS
Certification



The SMAT Research Center: A Knowledge Infrastructure for the Challenges of the Integrated Water Service

At a time when the integrated water service is called upon to face and manage increasingly complex challenges—climate change, water security, digital transformation, and environmental sustainability—the SMAT Research Center positions itself as an engine of development and innovation, and above all, as a strategic bridge between the needs of business operations, the scientific knowledge generated by the academic world, and the technological solutions offered by the innovation ecosystem.

The Center's activities range from the development of new processes and technologies for the protection of water resources, to technical support for infrastructure modernization, to the digitization and modeling of water and sewer systems, and to the study of emerging pollutants and the design of solutions for climate change mitigation and adaptation.

Through constant interaction with universities, research centers, and startups, the Research Center not only helps transfer knowledge into the corporate system, but also generates new expertise, bridging the gap between innovation and its practical application in the field.

Moreover, it strengthens the ability to anticipate regulatory and technological developments, thereby contributing to the formulation of corporate strategies grounded in scientific evidence and aimed at long-term resilience and sustainability.

This publication is intended not only as a report on the activities carried out, but also as a testament to our commitment to creating value for the region and the community, promoting a development model in which environmental protection is not a constraint, but a driver of smart, inclusive, and shared growth.

Armando Quazzo

CEO

Paolo Romano

President

May, 2025

Index

Projects completed in 2024

01 ENERGY/ENVIRONMENT/CLIMATE CHANGE

SUPERTORET: reuse of Toret's wastewater for irrigation purposes

Climate risk analysis and adaptation plans

Determination of the storage capacity of groundwater bodies in accordance with the introduction of the new technical quality macro-indicator M0.

Resource recovery and consumption reduction

06 ANALYSIS/QUALITY

Extension of Legionella Risk Assessment to all SMAT workplaces

08 WATER NETWORKS

Monitoring and remote control of wastewater network connected to Castiglione Torinese wastewater treatment plant

AdV modeling: pressure reduction, optimization, and expansion of the water network in the Municipality of Bardonecchia

11 DISTRIBUTION NETWORK

Follow-up of the Octopus platform for the automatic calculation of technical and operational performance indicators

Development of enterprise data governance for technical data necessary for calculation of technical-operational performance indicators

Ongoing projects in 2024

16 ENERGY/ENVIRONMENT/CLIMATE CHANGE

Bio-hydrogen

FUTURCLESP - The FUTURe of CLimatic Extreme eventS and their impacts in Piedmont

INOPIA: customisation of a water crisis early warning and decision support tool

IRRISAFE: from use to re-use: development of a model for an urban wastewater Risk Management Plan

Seasonal-to-decadal climate predictability in the Mediterranean: process understanding and services (MEDUSSE)

LIFE CLIMAX PO: CLIMate Adaptation for the PO river basin district

PrecipiTO: monitoring and nowcasting of high-impact precipitation phenomena

Enhancement of mitigation and climate change adaptation activities through the recognition of Science-Based targets and the completion of CDP questionnaire

25 ANALYSIS/QUALITY

IIN2AQUAS: Human footprint on water from remote cold areas to the tropical belt. INTEGRated Approach TO secure water QUALity by exploiting Sustainable processes

27 TREATMENT

BioEnPro H₂O

iMERMAID: Innovative solutions for Mediterranean Ecosystem Remediation via Monitoring and Decontamination from Chemical Pollution

Interaction between sludge pre-treatment and thermal oxidation

Membrane PoliTo: Hydrodynamic methods for reducing fouling in cross-flow membrane filtration processes

Biological phosphorus removal

Sewage sludge thermal oxidation

33 DISTRIBUTION NETWORK

Smart Meter Big Data: Statistical Analysis and Modeling for the Analysis and Prediction of Data Collected from Water Users in the Metropolitan City of Turin.

Technological scouting of water meters with integrated leak detection system

36 PARTNERSHIP AGREEMENT FOR ADVANCED RESEARCH (APRE)

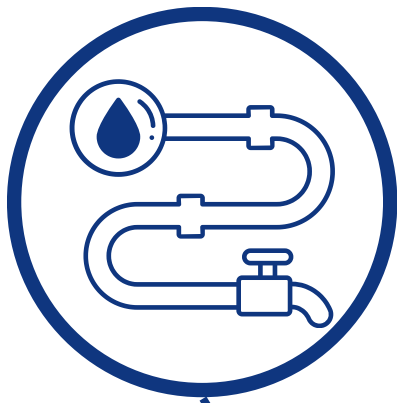
Partnership agreement introduction

Definition of guidelines for the calculation of the M0 macro-indicator

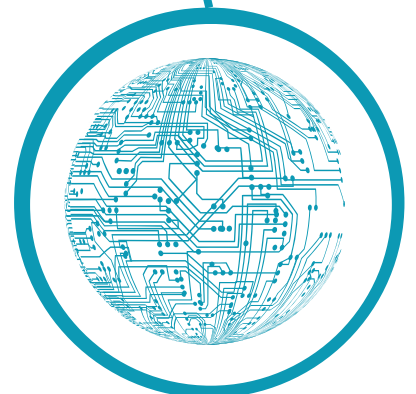
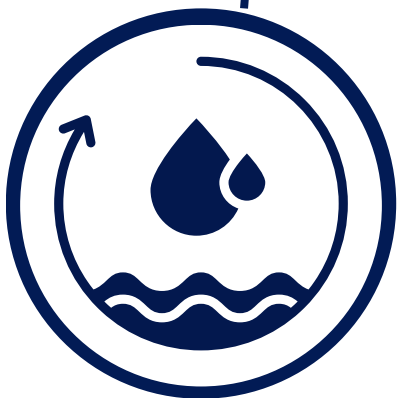
Pilot study on the use of monochloramine in distribution networks with high water residence times and elevated temperatures

Characterization of wastewater and management of abnormal discharges for effective plant protection and environmental safeguarding

Energy neutrality in wastewater treatment plants: guidelines for defining achievable targets for self-production of energy from renewable sources



Projects completed in 2024



**ENERGY
ENVIRONMENT
CLIMATE CHANGE**



Projects completed in 2024



SUPERTORET: reuse of Toret's wastewater for irrigation purposes



	STATUS	Completed
	STARTING DATE	february 2023
	DURATION	24 months
	FINANCING	-
	PARTNER	City of Turin

The project aims to recover the unused water from some Toretts (typical public fountains in Turin) for irrigation purposes. The initiative is carried out in collaboration with the City of Turin, which has been awarded European funding for soil de-impermeabilization, including activities for greening some urban areas.

Currently, the drainage from the Toretts is connected to the sewer system, resulting in the water being reintroduced into water bodies. The project involves the construction of a storage tank near the Toret, into which the unused water from the fountain will be channeled.

The overflow from the tank will be connected to the sewer system, restoring the hydraulic cycle of the system. The storage tank will be used to supply a low-water-consumption irrigation system (drip irrigation) for the surrounding area of the Toret, thereby avoiding the use of additional water for public greenery irrigation.

The project includes the implementation of one pilot sites, envisioned in districts 4, which can easily be replicated in other areas of interest. The City of Turin will cover the cost of the works, which will be carried out with the support of SMAT technicians.

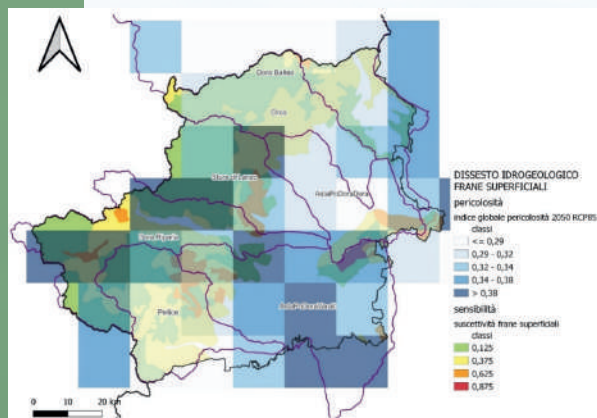


“ The project aims to recover the unused water from some Toretts (typical public fountains in Turin) for irrigation purposes.”

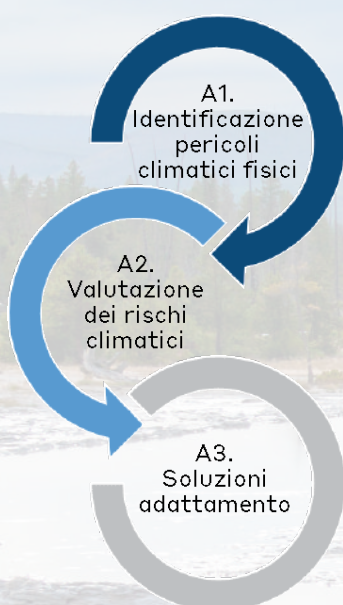




Climate risk analysis and adaptation plans



	STATUS	Completed
	STARTING DATE	june 2022
	DURATION	18 months
	FINANCING	-
	PARTNER	CMCC (Centro Euro-Mediterraneo sui Cambiamenti Climatici)



The Mediterranean is now widely recognized by the scientific community as a climate change hotspot.

Climate projections indicate that this region will face increasingly severe climate conditions, including more frequent and intense extreme weather events and altered hydrological patterns. These changes pose real threats to the availability and quality of water resources, as well as to the resilience of infrastructure and water management systems.

Such shifts are already affecting—and will continue to affect—the continuity and efficiency of the Integrated Water Service (IWS), with serious consequences for the environment and for people's quality of life.

The IWS is a critical infrastructure for society, involving a complex network of components, processes, and stakeholders. It is increasingly exposed to a range of risks, including the direct and indirect impacts of climate change.

In this context, it becomes essential to conduct an in-depth analysis of climate-related risks specific to the IWS, with the goal of identifying vulnerabilities and developing targeted adaptation strategies.

The ability to anticipate and manage these risks—through scientifically sound assessment tools and effective adaptation measures—is key to ensuring the long-term sustainability and reliability of the service.

This research project has provided SMAT with the tools needed to develop its Climate Change Adaptation Strategy and draft an Adaptation Plan aimed at identifying risk mitigation actions, in line with EU directives and the EU Taxonomy for climate adaptation.

In collaboration with the Euro-Mediterranean Center on Climate Change (CMCC), the climate hazards to which SMAT's operations are most exposed have been identified. Future projections of these phenomena were analyzed using specific climate indicators, based on an ensemble of EURO-CORDEX models for the three CMIP5 emissions scenarios (RCP2.6, RCP4.5, and RCP8.5), and two time horizons (2050 and 2065).

These projections were integrated with SMAT's internal data and spatial vulnerability maps to produce a detailed climate risk assessment.

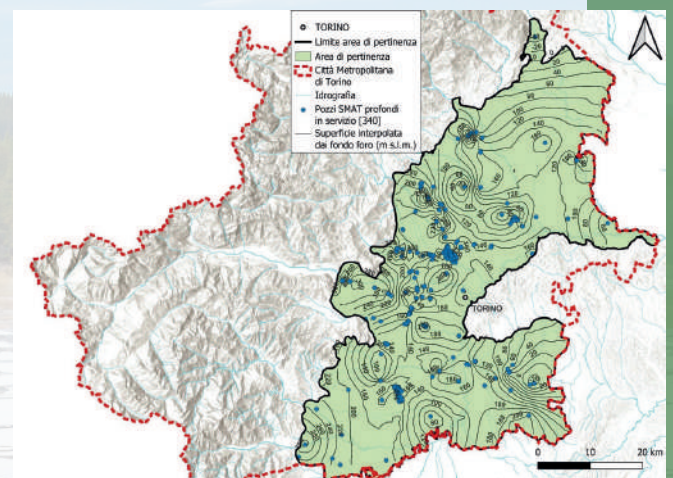
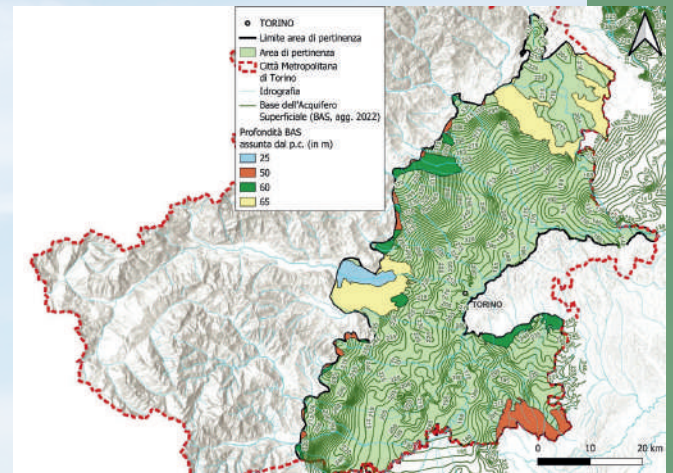
The specific actions identified in the Climate Change Adaptation Plan will be implemented through targeted corporate improvement plans.

"To provide the necessary elements to support SMAT in defining its Climate Change Adaptation Strategy, by identifying specific actions included in the Adaptation Plan aimed at risk reduction."

Determination of the storage capacity of groundwater bodies in accordance with the introduction of the new technical quality macro-indicator M0.



	STATUS	Completed
	STARTING DATE	october 2024
	DURATION	4 months
	FINANCING	-
	PARTNER	Polytechnic of Turin University of Turin



As part of the actions undertaken by SMAT to safeguard groundwater resources used for drinking water purposes—and in light of the introduction of ARERA's new macro-indicator M0 - Water Resilience — it has become increasingly necessary to quantify, as accurately as possible, the available water resources.

In this context, groundwater accounts for approximately 70% (by volume) of SMAT's total water supply. Despite its vital and strategic importance, groundwater remains one of the least monitored and least understood resources, largely due to its "invisible" nature and the challenges in accessing it directly.

To address the objectives of this research project, a working group was established involving the Polytechnic University of Turin, the University of Turin, and SMAT, through its Research Center.

The project was structured into the following activities:

- literature review and data analysis: identification of the relevant areas and data collection; bibliographic review to identify suitable approaches for assessing key parameters;
- hydrogeology and aquifer engineering: definition of the regional hydrogeological framework encompassing the areas of interest;
- development of a methodology for evaluating stored volumes in aquifers: preliminary estimation of water volumes stored in shallow and deep aquifers within the identified groundwater bodies, as well as analysis of climate change trends and their potential impacts on the studied parameters.

To provide an estimate of the stored volumes in the aquifers used within SMAT's operational area, the lower boundary of the deep aquifer was defined as the interpolated surface of the bottom elevation of SMAT's wells tapping into this aquifer. Based on this assumption, the total gravitational water volumes (from both deep and shallow aquifers) were estimated using different values of effective porosity sourced from literature, assuming homogeneity across the area for simplicity.

As a result, minimum, average, and maximum estimates of gravitational water stored in the aquifers under SMAT's management were provided, ranging from 12 to 38 km³.

"To provide an estimate of the volumes stored in the aquifers exploited within SMAT's area of operation, also in light of the introduction of ARERA's M0 macro-indicator."





Resource recovery and consumption reduction



	STATUS	Completed
	STARING DATE	september 2022
	DURATION	24 months
	FINANCING	-
	PARTNER	-

This research project, following two parallel research/experimentation lines, is focused on studying plant and process solutions to optimise chemical use for phosphorous removal in wastewater treatment plants and nutrient recovery (struvite crystallisation) coupled with biological phosphorous removal.

The first part of the activities was devoted to optimising the dosage of chemicals used to remove phosphorus. Aluminium-based coagulants were also tested in the laboratory as an alternative to the ferric chloride traditionally used. The experimental results have led to the implementation, at the Castiglione T.se plant, of a ferric chloride dosage in the sludge dewatering reject water. In fact, the recent introduction of biological phosphorous removal in the plant's water line had led, as expected, to an increase in phosphorous released during anaerobic digestion by the phosphorous-accumulating bacteria (PAO).

The new location of the reagent dosage proved to be very effective due to the high phosphorous concentrations in that stream and led to a reduction in the consumption of phosphorus-removal chemicals in the water line.

Furthermore, the residual flocculant in the flow returning to the water line upstream of the sedimentation, allowed a significant improvement in the suspended solid separation performance (chemically assisted primary sedimentation), removing organic load from the biological compartment without affecting denitrification performance.

The second phase of the project was dedicated to studying the introduction of a crystallisation process for the recovery of phosphorous in the form of struvite (phosphorous and ammonium salt) from sludge after anaerobic digestion. On the basis of the results of an in-depth analytical monitoring campaign of the individual digesters and wastewater carried out in collaboration with the Chemical-Biological Laboratory and the Plant Management Service, it was possible to select the most suitable crystallisation technologies for struvite recovery. Finally, the feasibility of introducing the process into the sludge line of the Castiglione T.se plant was assessed from a technical-economic point of view.



"The research project is focused on studying solutions for optimising the use of chemicals and nutrient recovery"

ANALYSIS QUALITY



Projects completed in 2024



Extension of Legionella Risk Assessment to all SMAT workplaces

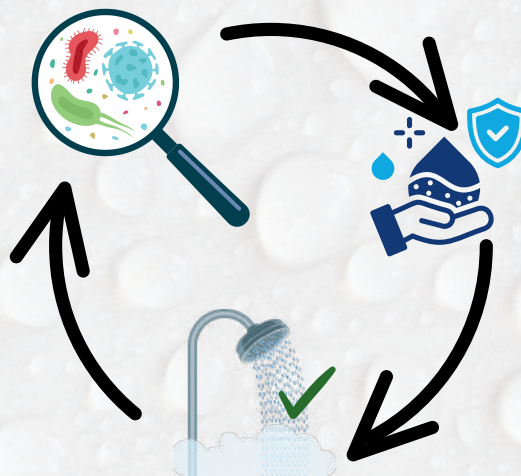


	STATUS	Completed
	STARTING DATE	may 2022
	DURATION	24 months
	FINANCING	-
	PARTNER	-

Legionella is the waterborne pathogen that causes the highest health burden in Europe, according to the WHO. In the context of legionellosis prevention, risk assessment is the first step to identify and evaluate critical aspects in order to manage them appropriately and select appropriate preventive and corrective measures to limit the risk.

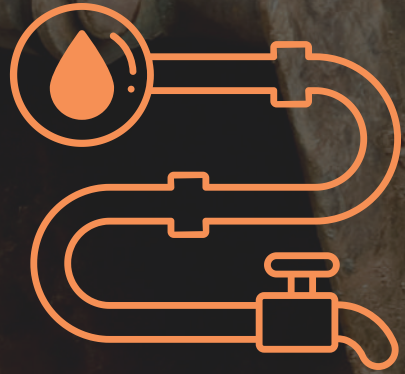
A first project, "Legionella risk assessment in the workplace" (LRC_AC_2021_07), had the objective of defining a method for risk assessment and management to be applied progressively to all SMAT workplaces. The methodology, initially defined and applied to a pilot case, proposes a risk assessment based on three factors: 1) the proliferation potential of the facility, which is assessed by taking into account the characteristics of the water supply, the presence of any incoming water treatment systems, the characteristics of the water system (both cold water and domestic hot water), the maintenance activities already in place and the presence of a monitoring plan; 2) the potential for aerosol exposure; 3) the potential of the susceptible population.

This method was progressively extended to all SMAT manned sites and in 2024 all 22 Risk Assessment and Management Protocols have been drafted. Within each protocol, the preventive and corrective measures to be applied for proper risk management were defined (ordinary and extraordinary maintenance measures) and the monitoring and sampling plan was redefined. A better knowledge of the system and a progressive application of the foreseen measures will lead to better management of Legionella risk in SMAT workplaces.



"Risk assessment is fundamental in the prevention of legionellosis"

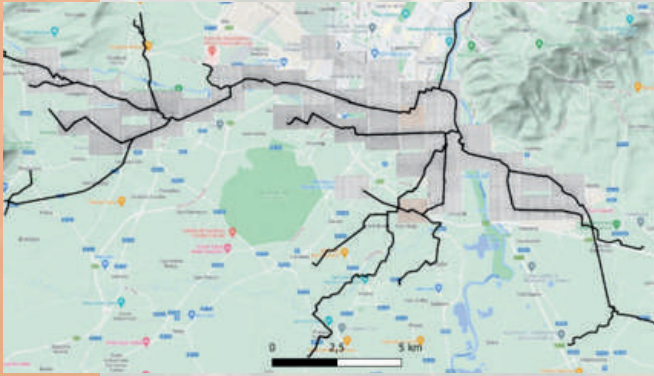
WATER NETWORKS



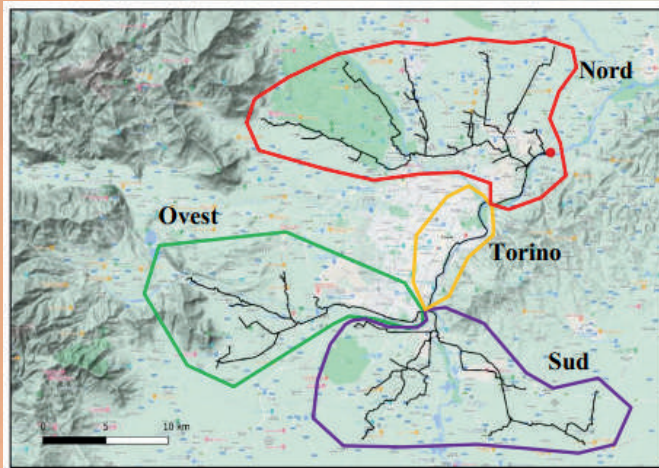
Projects completed in 2024



Monitoring and remote control of wastewater network connected to Castiglione Torinese wastewater treatment plant



	STATUS	Completed
	STARTING DATE	december 2021
	DURATION	36 months
	FINANCING	-
	PARTNER	DIATI – Polytechnic of Turin



The project aims to analyze and improve the management of the waste water network (WWN) connected to the waste water treatment plant located in Castiglione Torinese. The WWN analyzed in this study allows the transport of wastewater produced by users distributed in 48 municipalities in a safe and controlled manner.

The aim is to improve the management of the collector system, which is made up of three main branches (North, West and South), in addition to the central canal that runs through the city of Turin, through an approach that allows the state of all the physical variables involved to be known in real time, so that operational management decisions can be made in an efficacy manner.

This will be achieved by using the data collected by the flow and water level monitoring stations installed along the collectors and by integrating the measurements with the results of the mathematical modelling of the entire system. The mathematical modelling will also make it possible to verify the functionality of the whole system by simulating certain situations in order to anticipate possible criticalities.

The project, has involved the Hydraulic Research Group of the Polytechnic University of Turin, which is responsible for the mathematical modelling aspects, as well as the Research Centre, which is responsible for coordinating the various activities, the Operations Centres and the Central Technical Services.

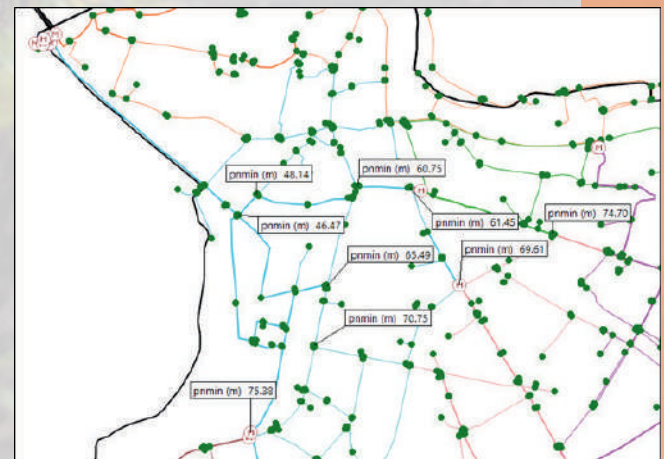
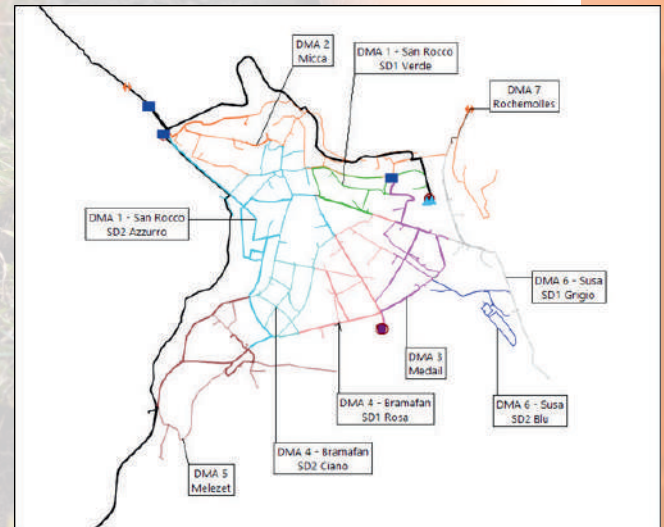
During the first two years, the data for the North, West and South collectors were implemented.

“ The project aims to analyze and improve the management of the waste water network that allows the transport of wastewater produced by users distributed in 48 municipalities in a safe and controlled manner”

AdV modeling: pressure reduction, optimization, and expansion of the water network in the Municipality of Bardonecchia



 STATUS	Completed
 STARTING DATE	august 2023
 DURATION	18 months
 FINANCING	-
 PARTNER	-



The project aims to model the new aqueduct for the Susa Valley and the municipalities connected to it through dispatches along the main adduction line. The mathematical modeling of a complex network offers numerous advantages, including optimizing operations, diagnosing issues, planning maintenance, managing emergencies, and supporting system expansion or upgrades.

The Municipality of Bardonecchia hosts the intake structure and the water treatment plant of the aqueduct and is the primary focus of the study. In the analysis of this water network, mathematical modeling serves a triple purpose:

- verification of the pressure reduction project in the city network;
- evaluation of the operation and optimization of the pumping station at the intake of the water treatment plant;
- sizing of a new pumping station to serve two sub-networks not yet supplied.

The first point involved the using of the model to verify the minimum guaranteed pressure for the most disadvantaged users after the division of the network in district metered areas (DMAs), resulting in a reduction of operating pressures through pressure-reducing valves. The verification yielded positive results, and through the model, it was possible to optimize the project by adding an additional sub-district to alleviate pressure in an area subject to high stress due to its depressed geographical location.

For the second point, a separate model of the first pumping stage of the water treatment plant was developed. Through this model, the plant characteristic curve was obtained, which will be used to verify the operating point of the pumps currently in use. Their replacement with machines capable of ensuring greater efficiency at the identified operating point will also be evaluated.

The third point involved the modeling and project validation of a new booster pumping station in the network, dedicated to serving two sub-networks that will be included in the SMAT management in the coming years.

"Mathematical modeling enables the optimization, timely diagnosis, and efficient management of a complex aqueduct such as the one for the Susa Valley."



DATA

Projects completed in 2024

Follow-up of the Octopus platform for the automatic calculation of technical and operational performance indicators



 STATUS	Completed
 STARTING DATE	January 2023
 DURATION	24 months
 FINANCING	-
 PARTNER	-



Octopus is a versatile corporate platform that automates various operations, including data extraction and analysis from multiple databases, importing information from other systems, creating interactive maps for external applications, and publishing charts, tables, and reports.

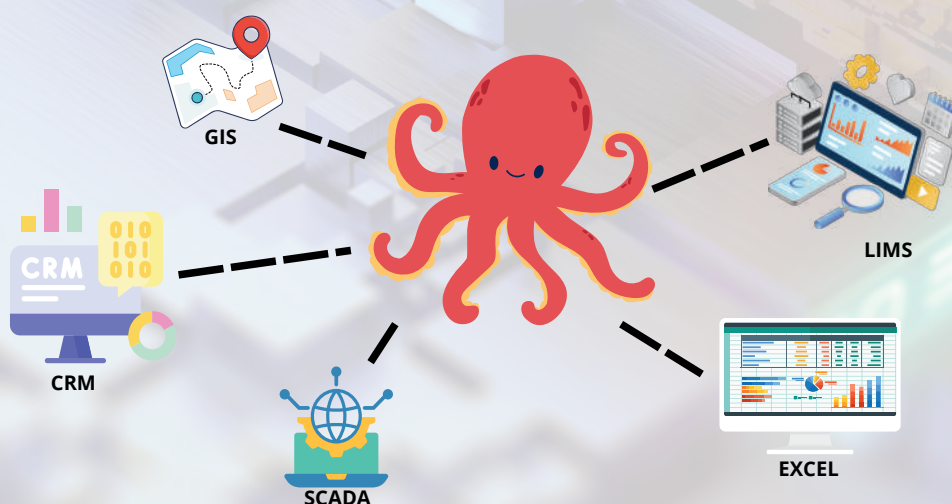
These resources are accessible both through SMAT's intranet and via the company's cloud platform.

Octopus was developed in-house by the Research Center as part of the project "*Development of an open-source platform for the integration, analysis, and publication of corporate data*", using only internal resources and open-source tools. Thanks to this technological approach, the platform is entirely free from licensing costs and can be adapted to various functions based on user needs.

As the platform has been rolled out across the company, new features have been introduced, including the calculation of specific energy consumption (kWh/m³) during the water abstraction, treatment, and distribution phases—both at the network district level and for individual facilities. These data are essential for guiding investments in energy efficiency and supporting the analyses required by the EU Taxonomy for the evaluation of eligible revenue, operating costs, and investments.

To ensure widespread adoption, greater reliability, and easier scalability, the platform has been enhanced with advanced software technologies, including a microservices architecture, APIs for text-based data exchange, an orchestrator, and a data visualization and sharing environment based on open-source tools.

After the development phase was completed by the Research Center, the platform and its future updates were handed over to the SMAT Technical Quality team.



"The platform leverages advanced software technologies, including a microservices architecture, APIs for text-based data exchange, and a visualization and sharing platform based on open-source tools."

Development of enterprise data governance for technical data necessary for calculation of technical-operational performance indicators

DATA GOVERNANCE AZIENDALE



	STATUS	Completed
	STARTING DATE	January 2023
	DURATION	24 months
	FINANCING	-
	PARTNER	-

One of the main challenges for water utilities is the effective management of the data at their disposal. Ensuring data security and completeness is essential to maximize its informational value. Cross-analysis of data not only enables the calculation of required KPIs but also supports faster, more effective decision-making, provides an objective and up-to-date view of asset conditions, and facilitates the development of digital twins.

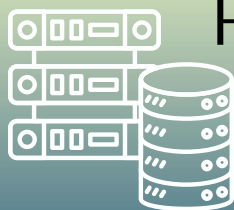
Structured data management is becoming increasingly central to companies, which are adopting targeted strategies to improve data usage across the entire value chain.

One of the key obstacles is not data collection or storage, but rather the fragmentation of data into isolated silos tied to the services that generate them. This compartmentalization limits the integration of information and makes it difficult to correlate data, increasing the risk of errors and redundancies. The absence of a unique reference key across different databases further exacerbates the issue, preventing a consistent and reliable overall view.

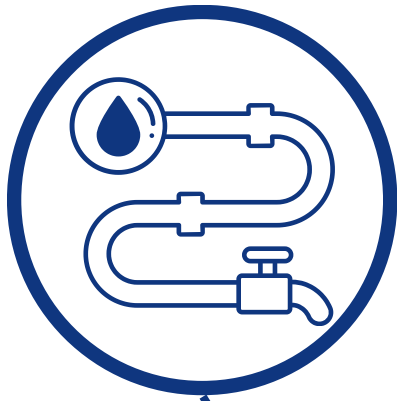
To address these challenges, the project pursued two main goals. The first was the engagement and training of internal data owners to raise awareness about the importance of data governance and promote more coordinated data management. The second focused on the creation of a centralized archive, where a subset of technical and operational data from various company databases was consolidated to improve usability and integration.

At the end of the project phase carried out by the Research Center, the archive was integrated into the company's operations and handed over to the SMAT Technical Quality team. In addition to supporting more effective data use, this tool also helps streamline reporting processes for calculating the technical quality macro-indicators required by ARERA.

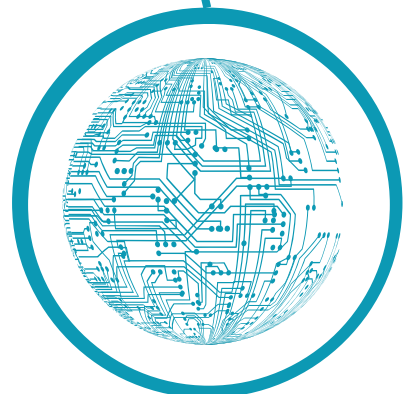
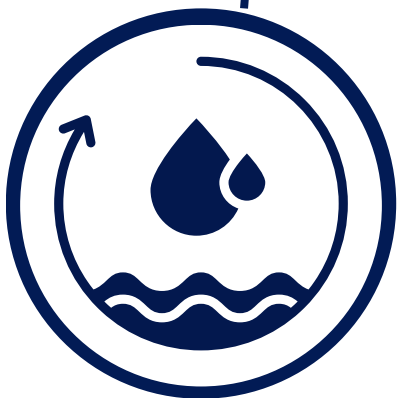
PostgreSQL



"To strengthen the core principles of data governance and create a centralized archive to aggregate technical and operational data from company databases."



Ongoing projects in 2024



**ENERGY
ENVIRONMENT
CLIMATE CHANGE**

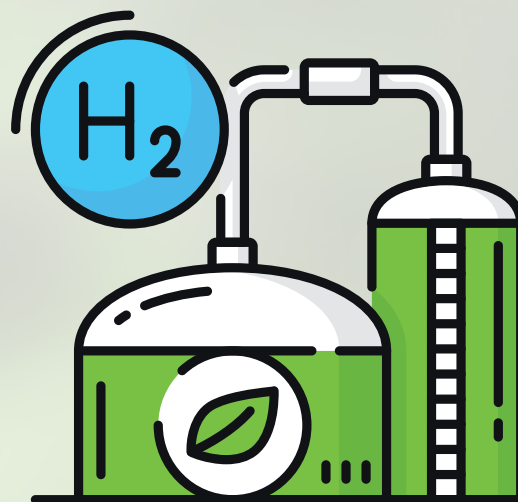


Ongoing projects in 2024





 STATUS	Ongoing
 STARTING DATE	october 2023
 DURATION	20 months
 FINANCING	-
 PARTNER	University of Turin



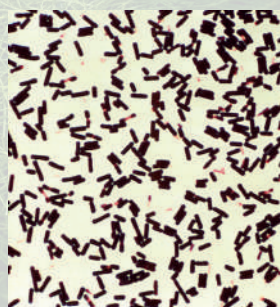
The project aims to develop and test an environmentally friendly hydrogen production process based on the biological conversion of organic substances contained in municipal sewage sludge, as an alternative to classical production methods based on the electrolysis of water or the reforming of fossil organic substances. The study focuses on the enhancement of dark fermentation, a biological process dedicated to the production of hydrogen through the fermentation (in an anaerobic environment) of organic substances.

Unlike traditional anaerobic digestion aimed at biogas production, the fermentation process is characterised by very limited hydraulic retention times (2-4 days). This ensures that the transformation of organic substances into volatile fatty acids (VFA) and hydrogen is promoted and, at the same time, their transformation into methane is "blocked", inhibiting the growth of methanogenic organisms that have much longer growth times and are therefore unable to maintain themselves inside a reactor characterised by such short retention times.

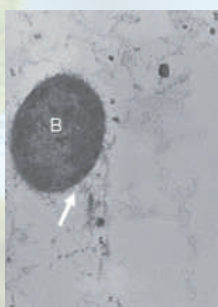
The project aims to optimise dark fermentation hydrogen production through an approach based on the most modern metabolic and biological engineering techniques aimed at the genetic modification of specific microorganisms of the genus *Clostridium*.

During the last year of activity, the selection of the most suitable microorganisms from the various candidates (*C. perfringens*, *C. tyrobutyricum*, *C. beijerinckii*) was completed, based on productivity results and fermentation capacities measured in laboratory-scale cultures on sewage sludge. The most efficient *Clostridia* strains were then genetically modified (an activity that is still ongoing) in order to optimise their metabolism and increase their hydrogen production yield.

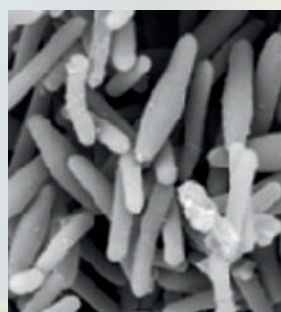
During the final stages of the project, sludge fermentation processes will be conducted in order to verify/optimize the process conditions and assess their stability in a future perspective of sustainable application on an industrial scale.



Clostridium perfringens



Clostridium tyrobutyricum



Clostridium beijerinckii

"The study will focus on hydrogen production through the biological fermentation of sewage sludge."





FUTURCLESP - The FUTURE of CLimatic Extreme events and their impacts in Piedmont



	STATUS	Ongoing
	STARTING DATE	march 2023
	DURATION	20 months
	FINANCING	Yes
	PARTNER	UNITO, ARPA Piemonte, ISAC-CNR, CentroScienza, Regione Piemonte

The FUTURCLESP Project, selected for funding by the CRT Foundation, has three main objectives:

- to study changes in extreme weather events in the Piedmont region,
- to understand how the region's complex orography affects climate projections for precipitation indices,
- and to provide the most up-to-date climate projections for Piedmont, supporting socio-economic impact assessments and climate adaptation strategies.

In the coming decades, Piedmont will face a sharp rise in temperatures and a shifting pattern of rainfall across both geography and seasons, shaped by the competing influences of the Mediterranean and Central Europe. Adaptation efforts will be made more challenging by the intensification of extreme events, such as heatwaves and changes in the hydrological cycle, including prolonged droughts alternating with increasingly intense rainfall. The year 2022 offered a tangible preview of this future scenario in the absence of strong mitigation actions, demonstrating how climate change can affect society as a whole.

Science can play a vital role in informing decisions by providing reliable and region-specific climate projections, and by translating those into practical insights for stakeholders and users across various sectors.

FUTURCLESP focuses on studying the evolution of extreme weather and climate events in Piedmont through internationally recognized indices (ET-SCI/ETCCDI indices) and software tools endorsed by the IPCC.

From an operational perspective, the SMAT Research Center directed its work toward analyzing selected ETCCDI precipitation-related indices of particular relevance (used in corporate climate hazard and risk assessments).

So far, the study has examined a selection of indices using data from CORDEX CMIP5 models (1961–1990, 1991–2020), CMIP6 models (1991–2020), and ERA5 reanalysis datasets (1961–1990, 1991–2020). The results show that CMIP6 models more accurately reproduce ERA5 reanalyses and confirm that bias correction remains essential to achieving performance levels comparable to ERA5.



"Support policy-making by providing updated and reliable regional-scale climate projections, processing them to extract useful information for decision-makers and stakeholders."

INOPIA: customisation of a water crisis early warning and decision support tool



 STATUS	Ongoing
 STARTING DATE	june 2022
 DURATION	36 months
 FINANCING	-
 PARTNER	CNR-IRSA, Protezione Civile, Arpa Piemonte



In the last twenty years, both the national and regional territories have faced numerous water crises, which have impacted the main sectors of water use, exacerbating conflicts among them

regarding the management and prioritization of water allocation. In many cases, the situation required the adoption of emergency measures to mitigate the impacts.

A water crisis refers to a situation in which water scarcity reaches a level of severity that requires specific interventions for managing the emergency. The identification of early-warning indicators for the risk of water scarcity, understood as the inability of a system to meet the demand of its connected users, must take into account the variability of weather conditions, medium- to long-term climate trends, and the specific infrastructural and managerial characteristics of each system.

For this purpose, the decision-support tool INOPIAQGIS, developed under the Collaboration Agreement between the Civil Protection Department and the Water Research Institute of the CNR, allows for a rapid assessment of the risk of water shortage due to a significant reduction in resources following extended periods of anomalous precipitation.

INOPIAQGIS is designed to analyze complex water systems characterized by multiple supply sources and different types of users. The model allows for the representation of any water system structure that uses heterogeneous resources (surface reservoirs, groundwater, springs, drinking water plants, etc.) and serves multiple users. It also integrates the guidelines from ISPRA on Drought and Water Scarcity Indicators, which are adopted by district observatories for water resource management.

This research project aims to apply and customize INOPIAQGIS on a pilot case study, with the goal of developing an early warning system for water crises and improving the forecasting and risk management capabilities in the Turin area. In collaboration with IRSA-CNR, the Civil Protection Department, and Arpa Piemonte, the possibility of integrating precipitation deficit indices, already calculated by Arpa and used in monthly hydrological bulletins, into INOPIAQGIS will also be evaluated.

The chosen case study focuses on one of the water supply chains for the City of Turin, characterized by high complexity and an approach based on multiple sources. This choice will allow for testing the system's effectiveness in a complex context, verifying its operational and application potential.



"The numerous water crises in recent years have affected the main sectors of water use, requiring the implementation of emergency procedures to manage their impacts."



IRRISAFE: from use to re-use: development of a model for an urban wastewater Risk Management Plan



	STATUS	Ongoing
	STARTING DATE	december 2023
	DURATION	24 months
	FINANCING	-
	PARTNER	UNITO Regione Piemonte

The sustainable management of water resources becomes an increasingly concrete necessity in a climate change scenario. In this scenario, wastewater reuse is emerging as one of the useful solutions to meet the growing demand for water and to reduce the burden on natural water ecosystems, although this practice is currently limited both in Italy and in Europe.

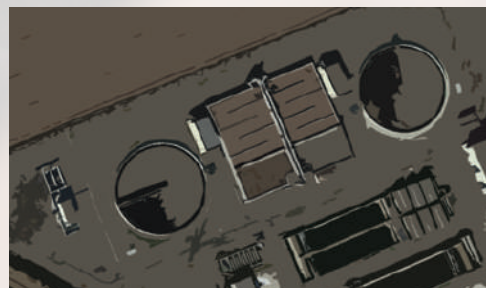
The IRRISAFE project aims to support the competent authorities and managers, who will have to take on new roles and activities, by developing two aspects in particular:

1. the construction of a model for the preparation of a Risk Management Plan (RMP) for the reuse of treated wastewater in agriculture, applying the theoretical guidance provided by the regulations in a practical case study.
2. study of refining techniques for the reduction of specific pollutants.

The first part of the work focused on the selection of the treatment plant to be used as a case study (based on the needs of the farmers and according to the treatments already present in the SMAT plants) and on the preliminary analysis of the existing information, focusing mainly on the analysis of water quality data at the plant outlet over a period considered representative. The analysis covered both analyses that are routinely performed and additional analyses that were performed specifically to assess the suitability of the plant for reuse).

The specific needs of the crops in the areas surrounding the wastewater treatment plant that could use this water were then assessed and, based on the type of crop and irrigation techniques used, the quality that the water must possess in order to be reused was defined.

Initial assessments, carried out taking into account the parameters and legal values stipulated in the various regulations regarding reuse, show that the quality of the water leaving the purifier is in general already high and, at least from a microbiological point of view, already better than that which is currently taken from a canal for irrigation use.



“Wastewater reuse is emerging as one of the useful solutions to meet the growing water demand and reduce the burden on natural water ecosystems”



Website



Follow on

Seasonal-to-decadal climate predictability in the Mediterranean: process understanding and services (MEDUSSE)



 STATUS	Ongoing
 STARTING DATE	october 2024
 DURATION	48 months
 FINANCING	Yes
 PARTNER	University of Barcellona, CNR-ISAC, CMCC, CIMA Foundation, University of Siviglia and others



The MEDUSSE project, selected for funding through the European COST-ACTION program, which finances interdisciplinary research and innovation networks, aims to enhance the production, availability, distribution, and application of climate forecasts and climate services, by creating a network of researchers and users.

The goal is to ensure that climate knowledge and information meet the operational needs of managers and decision-makers, supporting the adoption of policies and plans tailored to climate challenges. MEDUSSE aims to build a European network of experts on climate variability and predictability (MedFOR), seasonal and decadal climate forecasting (useful for operational applications, such as estimating expected snow heights near mountain reservoirs), and climate services.

The project is structured into three Working Groups (WG1: Climate Variability and Predictability, WG2: Climate Forecasting, WG3: Climate Services) to foster a continuous flow of information, skills, and knowledge among researchers, stakeholders, and end-users.

The main actions of the project are:

- development of seasonal and decadal climate forecasts: improve the capacity for climate prediction over the Mediterranean area, addressing challenges related to the predictability of regional anomalies and understanding the factors influencing regional-scale climate;
- support for climate risk management: provide useful climate information for managing risks (droughts, floods), creating climate products and forecasts useful for decision-making processes;
- creation of a network of experts: establish a network of experts to address scientific and social challenges related to climate variability and forecasting, coordinating trans-disciplinary research groups with diverse skills to tackle regional climate issues;
- training and collaboration: enhance capacity and awareness in the climate field, promote cross-disciplinary training, collaboration, and dialogue among researchers, meteorological agencies, and stakeholders.

The SMAT Research Center actively participates within WG3 on climate services, providing a harmonized identification of target socio-economic areas and specific fields of application for seasonal-decadal climate forecasts, indicators, approaches, and methodologies, as well as the effective use of these forecasts for the decision-making process.

"Forecast and manage water crises through a bottom-up approach based on the analysis of the risk of water supply failure for potable use."



LIFE CLIMAX PO: CLIMate Adaptation for the PO river basin district



	STATUS	Ongoing
	STARTING DATE	march 2023
	DURATION	108 months
	FINANCING	Yes
	PARTNER	AdBPo, AIPO, ARPAE, Arpa Piemonte, CMCC, UniBo, ANBI, Polito, Regione Piemonte, others

Climate change adaptation is one of the most significant environmental challenges, both globally and locally.

The LIFE CLIMAX PO project was conceived with the goal of promoting adaptation to climate change through "*climatically intelligent*" management of water resources at the level of the Po River Basin, supporting the implementation of the National Adaptation Strategy to Climate Change and working in cooperation with the National Climate Change Adaptation Plan (PNACC).

CLIMAX PO is a strategic integrated LIFE project involving 25 partners, including entities and companies responsible for managing water resources across all governance levels, national, interregional, regional, and local public bodies, research institutes, environmental associations, and environmental consultancy firms.

The specific objectives of CLIMAX PO include:

1. improving climate adaptation governance
2. promoting shared production of climate knowledge
3. building capacity and climate awareness, particularly regarding adaptation measures
4. enhancing water security and climate resilience

Institutionalizing climate adaptation, making it a permanent part of the governance of the river basin through the establishment of a multi-level governance platform

Among the expected outcomes of the project are:

- the creation of an observatory dedicated to climate adaptation
- the development of a platform for climate information and knowledge
- the creation of a climate risk index at the sub-basin level

Within the project, SMAT participates in several cross-cutting work packages focused on adaptation governance and stakeholder engagement as well as more technical work packages aimed at improving the resilience of urban drainage networks to climate change. In this context, SMAT contributes the expertise of the Research Center for forecasting extreme meteorological events affecting urban drainage infrastructures and for defining and sharing intervention strategies and risk reduction measures.



"The Life ClimaX Po project was created with the aim of promoting adaptation to climate change through climatically intelligent management of water resources at the scale of the Po River Basin."



Website



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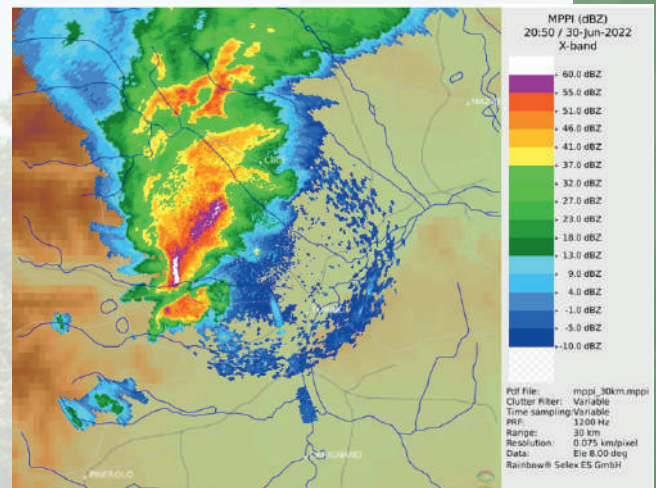


Follow on

PrecipiTO: monitoring and nowcasting of high-impact precipitation phenomena



	STATUS	Ongoing
	STARTING DATE	october 2022
	DURATION	36 months
	FINANCING	-
	PARTNER	Arpa Piemonte



Vertical scan of the atmosphere recorded by the Druento radar during the thunderstorm event of June 30, 2022.



The metropolitan area of Turin, due to its unique geographical location, is particularly exposed to intense meteorological phenomena, such as convective precipitation and hailstorms, whose frequency and intensity are increasing due to climate change.

Such events, which are becoming more frequent in a changing climate and a heavily urbanized territory, put pressure on the urban drainage system and are harder to predict, requiring high and very high-resolution models to develop truly effective early warning systems.

In this context, SMAT manages some particularly critical infrastructures for intense and localized rainfall events, such as underpasses. In order to improve the management and safety of these infrastructures, the PrecipiTO system aims to provide the company with a warning system to better manage meteorological-hydrological issues related to high-impact and rapidly evolving rainfall events, through the integration of data from rain gauges, meteorological radars, and nowcasting models.

In particular, the radar data and the nowcasting model to be developed will be calibrated using an extensive network of rain gauges (ARPA Piemonte and SMAT network) to simulate the behavior of the drainage system under extreme rainfall conditions. This analysis will help identify the main issues of the existing infrastructure in managing the most intense weather events, highlighting the most vulnerable areas to localized flooding and potential impacts on urban infrastructures.

The study will also explore the potential of nature-based solutions (Nature-Based Solutions, NBS) to strengthen urban resilience. Through appropriate simulations, the effectiveness of interventions such as increasing permeable surfaces, creating attenuation basins, and incorporating green infrastructure into urban planning will be assessed in terms of their impact on the drainage network's response in critical conditions.

The integrated approach that combines advanced meteorological monitoring, predictive modeling, and nature-based strategies represents a key element in addressing the challenges posed by the increasing frequency and intensity of extreme weather events.

So far, an initial nowcasting algorithm has been developed based on the operational radar mosaic of ARPA Piemonte, integrated with research radar data. This has allowed for a more stable and accurate estimate of the vector movements of storm phenomena, with a spatial resolution of 750 meters and a temporal resolution of 5 minutes (reducing the current prediction time from 8 minutes). Model data are collected in the company database and will be integrated into the remote control system.

"Predict and manage water crises through a bottom-up approach based on the analysis of the risk of inadequate supply for potable water use."





Enhancement of mitigation and climate change adaptation activities through the recognition of Science-Based targets and the completion of CDP questionnaire



	STATUS	Ongoing
	STARTING DATE	june 2023
	DURATION	36 months
	FINANCING	-
	PARTNER	-



Participating in the Science-Based Target Initiative (SBTi) and the Carbon Disclosure Project (CDP) is a strategic choice for a company aiming to remain competitive and credible during the climate transition. By joining the SBTi, a company sets science-aligned emissions reduction targets consistent with the Paris Agreement, showing a concrete commitment to tackling climate change.

The CDP, on the other hand, allows for transparent reporting of environmental impact, addressing the growing demand for accountability from investors, customers, and stakeholders. Together, these tools strengthen corporate reputation, improve access to capital, and support proactive management of climate-related risks.

This project is structured into five phases:

1. Strengthening of corporate climate governance and strategy;
2. Definition of science-based targets for emissions reduction;
3. Third-party verification of greenhouse gas emissions reporting (ISO 14064-1 certification);
4. Completion of the CDP Climate Change questionnaire;
5. Identification of additional improvement actions (stakeholder engagement and biodiversity).

As part of its greenhouse gas emissions reduction strategy, SMAT has committed to the Science Based Targets initiative, which provides guidance for emission reduction pathways. After submitting its Commitment Letter, SMAT received approval in June 2023 to proceed with the development of emissions reduction targets, which will later be submitted for validation (within 24 months).

The SMAT Research Centre has also updated the greenhouse gas emissions inventory (Carbon Footprint) in accordance with the latest revision of the UNI EN ISO 14064-1:2019 standard. In 2024, the inventory underwent an internal audit, with plans to carry out an external audit by an accredited body—likely in the second half of 2025—for certification purposes.



“The project aims to strengthen and effectively communicate to stakeholders SMAT's commitment to reducing its greenhouse gas emissions.”

ANALYSIS QUALITY



Ongoing projects in 2024



IN2AQUAS: Human footprint on water from remote cold areas to the tropical belt. INTe grated Approach TO secure water QUALity by exploiting Sustainable processes



	STATUS	Ongoing
	STARTING DATE	september 2023
	DURATION	48 months
	FINANCING	Yes
	PARTNER	UNITO and others 18 international partners

The IN2AQUAS project aims at developing innovative technologies against water pollution, with a strong focus on sustainability (in a circular economy vision), through water reuse, nutrient recovery and green synthesis of functional materials.

The developed technologies will be adapted to different scenarios, focusing on three case studies: aquaculture, arid areas and cold (remote) areas.

The overall research objectives involve three main steps:

- Assessing water quality and predicting its response to increasing environmental stresses;
- Creating new materials using 'green' approaches;
- Developing green water treatment technologies and integrating them into processes.

The project activities are carried out by 15 Doctoral Candidates (DCs). Experts from 10 universities, 4 national research centres, 1 associate university and 4 companies collaborate on the training programme, which will enable the DCs to obtain a double PhD in two different countries. SMAT, being an associate partner, will host 4 PhD students in its laboratories and will avail its state-of-the-art instrumentation to enable their specific analytical studies by offering an "on-the-job" training. In 2024, in the premises of Castiglione Torinese wastewater treatment plant, SMAT organized a training session concerning environmental sustainability in water services management. In 2025 a second training session will cover the topic of risk-based water monitoring practices. In 2025, SMAT will also host the first two students. Both, within their own research projects, will Search for PFAS and pesticides in raw waters and wastewater.



"SMAT offers doctoral students the opportunity to use state-of-the-art laboratory equipment providing them an "on-the-job" training opportunity"



Website



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TREATMENT



Ongoing projects in 2024



The BioEnPro H₂O project, funded under the Nodes Spoke 2 research call, is based on the principles of the circular economy with the main objective of extracting and valorising renewable energy, products and water from various types of residual resources and wastes, by means of technologies and

	STATUS	Ongoing
	STARTING DATE	december 2023
	DURATION	24 months
	FINANCING	Yes
	PARTNER	Sea Marconi, CIDIU, Orchestra

processes developed and assessed within the project. The project partners will share their industrial and research skills and experiences with the aim of studying, building and testing industrial prototypes of innovative technologies for the treatment of residual materials and wastes to be valorised such as municipal sewage sludge, biomass, leachate, urban organic wastes and sanitary absorbent materials. The aim of the mechanical-physical-chemical treatments developed will be to obtain material and water flows for recovery/reuse.

During the last year of activity, the project partners verified a number of treatment technologies of substrates (mainly sewage sludge and compost), aimed at extracting water for reuse, and a plasma technology aimed at oxidising the organic substances contained therein.

SMAT Research Centre and Laboratories took care of the chemical and biological analysis of the water resulting from the treatments tested and are currently defining and evaluating the chemical-physical-biological processes and refining technologies that may be used to make water suitable for various types of industrial and agricultural reuse.



“The project is based on the principles of the circular economy with the aim of extracting and valorising renewable energy, products and water from various types of residual resources and wastes”



Website



Follow on

iMERMAID: Innovative solutions for Mediterranean Ecosystem Remediation via Monitoring and Decontamination from Chemical Pollution



 STATUS	Ongoing
 STARTING DATE	june 2023
 DURATION	36 months
 FINANCING	Yes
 PARTNER	26 international partners



iMERMAID is a project funded by the European Union through the Horizon Europe programme aimed at developing innovative solutions both for water monitoring and treatment to safeguard and decontaminate Mediterranean Sea basin from Contaminants of Emerging Concerns (CoEC).

Within the project, innovative technologies were developed and adapted for the prevention, monitoring and remediation of Contaminants of Emerging Concerns.

Within the consortium, SMAT has an “end-user” role and will test two technologies developed within the project: an inorganic electrochemical sensor for Zn, Cd, Pb and Cu monitoring, developed by the University of Florence, and a treatment system for the removal of Zn, Cu and Al, developed by the finnish partner Weeefiner using 4D Scavenger technology.

As a first step, SMAT’s wastewater treatment plant in which technologies will be tested was defined and, within the chosen plant, the best installation point for the pilot plant was assessed, taking into account the requirements of the technologies to be verified. For the definition of the installation point, monitoring campaigns were carried out at different point of the plant, in order to evaluate the trend of some potentially critical wastewater quality parameters for the technologies; at the same time, technical partners performed preliminary laboratory experiments with real samples sent from SMAT.

Thanks to these evaluations, the best point to install the technologies was defined as the outlet of Brandizzo wastewater treatment plant, where the pilot will be installed and operational in spring 2025.

In addition, SMAT is transversally involved in all the project's Work Packages, which also include the drafting and dissemination in schools of a Workbook aimed at raising students' awareness of the conscious use of chemicals.



“ SMAT will install a pilot plant for monitoring and removal of heavy metals from wastewater in spring 2025”

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Interaction between sludge pre-treatment and thermal oxidation

During a previous research project in collaboration with Polytechnic University of Turin, a low-temperature thermo-chemical sludge pre-treatment technology was developed and tested upstream of anaerobic digestion in order to increase biogas production, improve sludge dewaterability and minimise the residual quantity.

	STATUS	Ongoing
	STARTING DATE	october 2023
	DURATION	18 months
	FINANCING	-
	PARTNER	Polytechnic of Turin

This research project aims to assess, from a technical, energetic and economic point of view, the interactions between a possible sludge pre-treatment section and the future thermal sludge oxidation plant at Castiglione T.se wastewater treatment plant. In the perspective of the future installation of the thermal sludge oxidation plant, for which the authorisation process of the final design is currently underway, it is very important to assess the advantages and disadvantages, in terms of mass and energy balance, that sludge pre-treatment would bring to the entire system. The analysis, which is currently being completed, therefore took into consideration the advantages brought by the sludge pre-treatment phase (increased biogas production in the anaerobic digestion phase and increased sludge dewaterability), its costs (thermal energy and chemicals) and the impact on the final thermal oxidation phase (decreased sludge flow to be treated and decreased calorific value).

The study therefore compares different plant and process configurations that include mechanised thickening, thermo-chemical pre-treatment, thermal pre-treatment, anaerobic digestion, dewatering and thermal oxidation in the different analysis scenarios. In particular, the mass and energy balances of the various configurations have been completed, which will allow the identification of the one that maximises the energy, environmental and economic advantage of the sludge treatment chain and, ultimately, the assessment about introducing sludge pre-treatment upstream of anaerobic digestion.

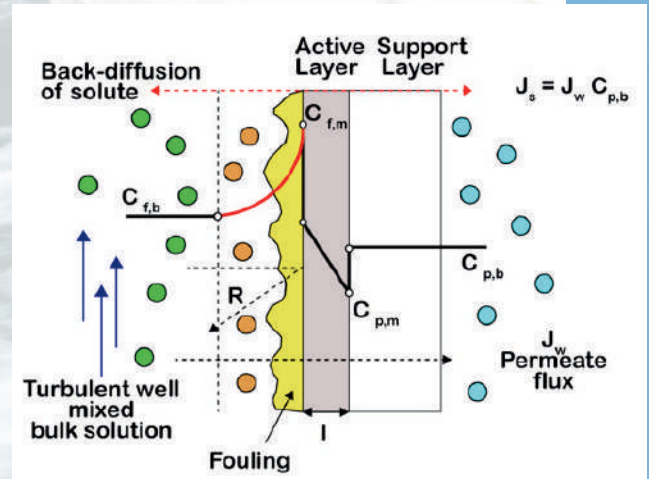


“Interactions between a possible sludge pre-treatment section and the future thermal oxidation plant will be assessed from a technical, energy and economic point of view”

Membrane PoliTo: Hydrodynamic methods for reducing fouling in cross-flow membrane filtration processes



 STATUS	Ongoing
 STARTING DATE	november 2024
 DURATION	36 months
 FINANCING	Yes (co-founding)
 PARTNER	DIATI - Polytechnic of Turin

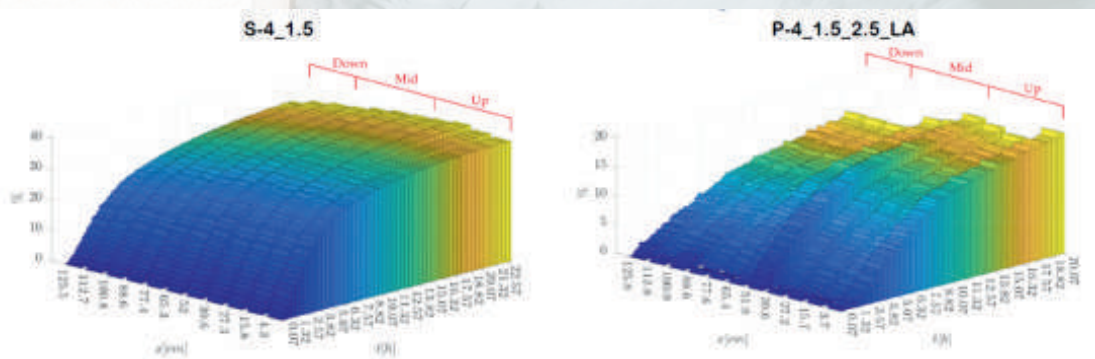


The project is an industrial doctorate co-financed by the Polytechnic University of Turin with the aim of continuing the research activities carried out in a previous doctorate by a SMAT engineer within the Clean Water Center of the Polytechnic University of Turin.

Previous research investigated the response of a flat membrane in terms of fouling, as a function of the application of different pulsed flow regimes. What characterizes this study is the operation of the plant in a pulsed flow regime, therefore not in stationary motion conditions, but with speed variations characterized by controlled amplitude and frequency. The results obtained so far have highlighted a correlation between the frequency of the pulsed flow and the clogging of the membrane: low frequencies reduce clogging more than high frequencies.

The present study aims to create an industrial-scale pilot plant to replicate what has been achieved so far on flat membranes, to hollow fiber membranes under pressure. The optimization of the membrane filtration process would bring undoubted advantages in terms of reduction of energy consumption and consequently reduction of operating costs.

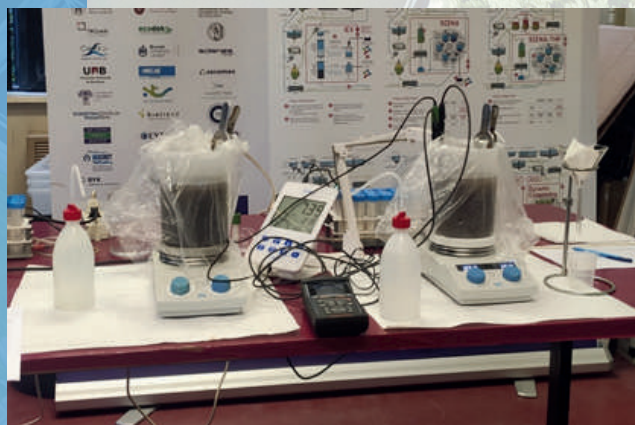
The knowledge gained so far on flat membranes will be exploited to immediately create a pilot plant scale. This will be followed by an empirical study on the pilot plant of various pulsed flow regimes and subsequent down-scaling to laboratory scale in order to deepen the fluid dynamic characteristics of the most promising pulsed flow regimes at plant scale, in order to fully understand the physical phenomena and be able to better intervene in the optimization of the operating parameters.



“ The optimization of the membrane filtration process would bring undoubted advantages in terms of reduction of energy consumption and consequently reduction of operating costs.”



Biological phosphorus removal



	STATUS	Ongoing
	STARTING DATE	june 2023
	DURATION	36 months
	FINANCING	-
	PARTNER	HERA, IREN, A2A, University of Marche

Phosphorous removal plays a major role in wastewater treatment processes for the protection of receiving water bodies. Besides the traditional process of phosphorous removal by chemical precipitation, increasing attention is being focused on biological removal process which, in addition to chemical savings, allows the recovery of phosphorous in the form of struvite that can be used as fertiliser in a circular economy vision.

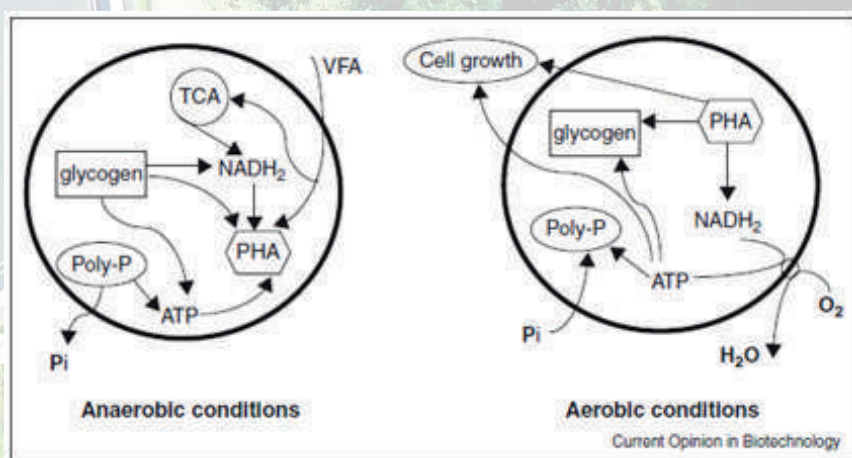
This research project, in collaboration with HERA, IREN, A2A and Polytechnic University of Marche, aims to study the configurations for the biological phosphorous removal in urban wastewater treatment plants, evaluating management, technical and economic aspects.

Particular attention was paid to monitoring and control systems and parameters, to limiting and inhibiting factors, and to the identification of strategies for optimal process management.

An initial phase of the project was dedicated to the identification and study of wastewater treatment plants to be subjected to feasibility assessments. For SMAT we analysed the wastewater treatment plants of Castiglione T.se and Chieri.

The assessment, which is currently being finalised, of the technical-economic feasibility of introducing this process into the treatment system of the selected plants was also based on mathematical modelling of the processes and on the experimental measurement, using respirometric techniques, of the specific characteristics of the wastewater and biological sludge.

The final stages of the project are currently dedicated to identifying the best plant configurations for the introduction of the technology, also considering the effects on the characteristics of the sludge line wastewater in order to recover phosphorous.



"This research project aims to study configurations for biological phosphorous removal in municipal wastewater treatment processes"

Sewage sludge thermal oxidation



	STATUS	Ongoing
	STARTING DATE	september 2024
	DURATION	6 months
	FINANCING	-
	PARTNER	Polytechnic of Turin

This research project, conducted in collaboration with DIATI - Department of Environmental, Territorial and Infrastructural Engineering - of the Polytechnic University of Turin, aims to coordinate the technical-scientific activities and studies required in the framework of the authorisation procedure, currently underway, for the sewage sludge thermal oxidation plant that will be installed at the SMAT wastewater treatment plant in Castiglione Torinese.

The first part of the project's activities have been dedicated to a campaign of odorimetric measurements coming from potentially significant sources within the wastewater treatment plant, which were found to be compliant with sector standards and guidelines and confirmed the values present in the Environmental Impact Study presented by SMAT.

The second part of the activities was devoted to the study of the presence of PFAS in wastewater and sewage sludge, and the behaviour of these micropollutants along the thermal oxidation and flue gas treatment process chain (presence in the various substrates: sludge, ash, flue gas treatment residues, and stack emissions). To this end, several sludge thermal oxidation tests were carried out at the laboratory scale, and an in-depth monitoring campaign of PFAS present in sludge, atmospheric emissions and residues (ash and flue gas treatment residues) was conducted at a sewage sludge thermal oxidation plant of similar size and technology located at the Zurich (Switzerland) wastewater treatment plant.

The results showed excellent abatements, highlighting the effectiveness of the thermal oxidation process for the treatment and destruction of PFAS (greater than 99%) in sewage sludge.



“The results highlighted excellent reductions, demonstrating the effectiveness of the thermal oxidation process in the treatment and destruction of PFAS”





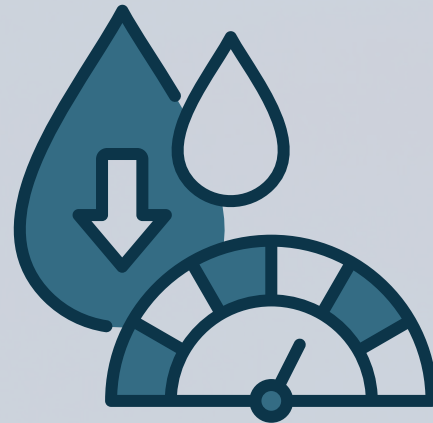
DATA

Ongoing projects in 2024

Smart Meter Big Data: Statistical Analysis and Modeling for the Analysis and Prediction of Data Collected from Water Users in the Metropolitan City of Turin.



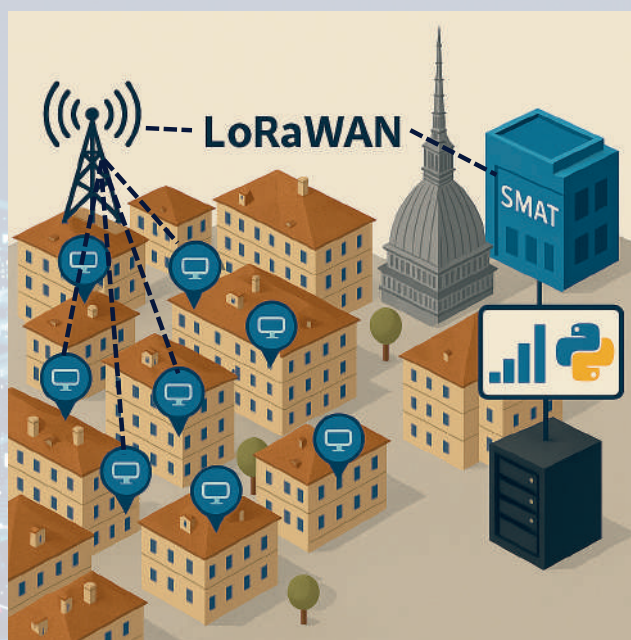
 STATUS	Ongoing
 STARTING DATE	november 2024
 DURATION	36 months
 FINANCING	Yes (co-founding)
 PARTNER	Polytechnic of Turin



The proposed research project aims to apply advanced statistical techniques to data from new smart water meters, which use the LoRaWAN protocol for high-resolution communication. These devices provide detailed consumption profiles with hourly resolution and alarm data, with the goal of improving water resource management, preventing leaks and anomalies in the system providing customers with insights into their consumption patterns.

The project will be developed in collaboration with the Department of Mathematical Sciences (DISMA) at the Politecnico di Torino, as part of a three-year industrial PhD co-funded by SMAT and the Politecnico. The PhD student, supported by experts from both institutions, will work on developing algorithms to analyze data collected from the smart meters, applying them to a real-world case study, and assessing the economic, social, and environmental impact of the project.

Key activities include data collection and analysis, development of open-source algorithms for detecting anomalies and leaks, validation on real-world cases, and dissemination of results through scientific papers. Expected outcomes include the development of solutions to reduce water losses, improve network efficiency and promote environmental sustainability, with economic benefits resulting from optimized water network management.



"Apply advanced statistical analysis techniques to data from new smart meters for water users to reduce water losses and improve network efficiency."

Technological scouting of water meters with integrated leak detection system



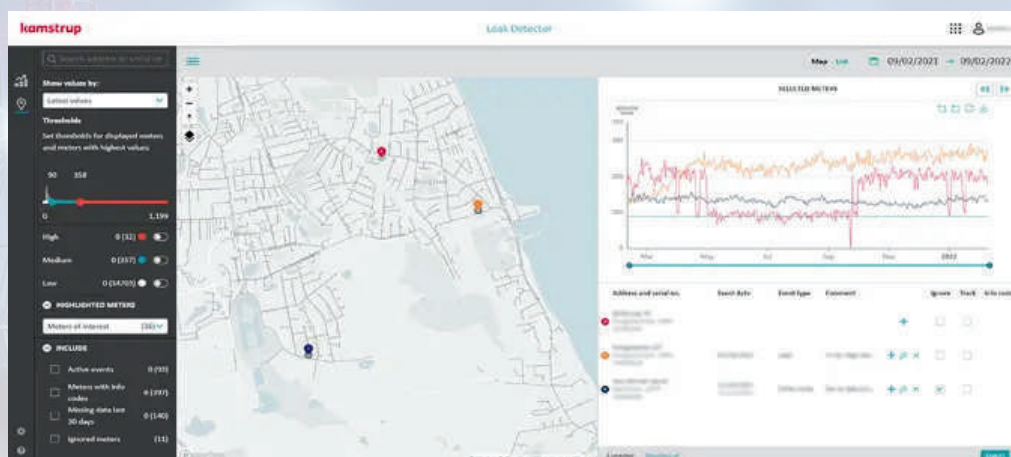
	STATUS	Ongoing
	STARTING DATE	november 2024
	DURATION	24 months
	FINANCING	-
	PARTNER	-

The project aims to technologically validate a new water meter launched on the market by the Danish multinational Kamstrup. It is a static ultrasonic meter that integrates a leak detection technology based on the recording of the noise recorded by each individual meter.

The technical validity of the proposed solution was investigated during the HISA project "*Optimization of leak detection plans and replacement plans for aqueduct networks*", where IREN and HERA gave positive feedback on the use of this tool. Further feedback came from a pilot project carried out by Lario Reti Holding.

During this project, the installation of 1000 units of smart meters is planned in 4 districts of the municipality of Ciriè. The study involves the replacement of traditional meters with smart meters on users with a socket diameter of 13 and 20 mm. The meters will be remotely read via the LoRaWAN network infrastructure that SMAT is implementing throughout the managed territory. The network districts were specifically chosen to represent the diversified presence of domestic, commercial and industrial users in the territory.

The data from these meters will also be analyzed within the research project relating to the advanced statistical analysis of data from the new smart meters of users, in order to obtain a leak detection algorithm calibrated on a SMAT-type network.



"It is a static ultrasonic meter that integrates a leak detection technology based on the recording of the noise recorded by each individual meter"

Partnership Agreement for Advanced Research (APRE)

During the event *"Water Resources, Renewable Energy and the Environment: Present and Future in Wastewater Treatment"*, held on Monday, July 15, 2024, at the SMAT Water Reclamation Center in Castiglione Torinese, a new agreement was presented to promote advanced research activities in the water sector. The agreement involves **A2A S.p.A., Acquedotto Pugliese S.p.A., HERA S.p.A., IREN S.p.A., MM S.p.A., Nepta (Italgas Group), and SMAT.**

The agreement, aimed at supporting development and guiding investments, was signed by **Tullio Montagnoli**, CEO of A2A Ciclo Idrico; **Domenico Laforgia**, President of AQP; **Orazio Iacono**, CEO of HERA; **Enrico Pochettino**, Director of Innovation and Internationalization at IREN; Francesco Mascolo, CEO of MM; **Claudio Peretti**, Project Management Office at Nepta; and **Paolo Romano**, President of SMAT.

The activities planned for the 2024–2029 five-year period build on a collaborative experience that began in 2014 between HERA, IREN, and SMAT, and was later expanded in 2018 with the inclusion of A2A for new research initiatives.

The expression of interest from all the utilities involved has led to the signing of an agreement that will give new momentum to research activities, with the aim of fostering synergies with universities, research institutions, and the business sector, as well as establishing international networks capable of creating new models and spreading high-tech knowledge within the economic and industrial landscape.

Technological innovation, training, and investment are the key priorities for the sector, underscoring the strategic importance of water resources—one of the top priorities at the European level—and ensuring citizens benefit from an increasingly efficient and high-quality integrated water service.



As part of a participatory co-design process carried out between July and October 2024, involving scientific coordinators and operational departments from the partner society, the first four joint projects were defined. Launched between January and February 2025, these initiatives are scheduled for completion between early 2026 and spring 2028.

1

Definition of guidelines for the calculation of the M0 macro-indicator

february 2025 - january 2026

The project aims to define a shared methodology for calculating the M0 macro-indicator, introduced by ARERA to assess the water resilience of water management systems in order to support decision-making related to water resource management. It also includes the evaluation of its sub-indicators: M0a (resilience at the integrated water service management level) and M0b (resilience at the territorial level). The initiative further seeks to identify critical issues in the current approach and to propose possible corrective actions.

Coordination



In partnership
with



2

Pilot study on the use of monochloramine in distribution networks with high water residence times and elevated temperatures

february 2025 - january 2026

The project aims to compare the experiences of Italian water utilities in the experimental use of monochloramine as a disinfectant, in light of climate change and the new Legislative Decree 18/2023. The goal is to harmonize experimental methods and results, in preparation for discussions with health authorities and the Istituto Superiore di Sanità (ISS).

Coordination



In partnership
with



3

Characterization of wastewater and management of abnormal discharges for effective plant protection and environmental safeguarding

february 2025 - april 2028

The project aims to develop reliable and sustainable monitoring practices for sewer networks, to support utilities in understanding and managing wastewater, which is increasingly variable in origin and characteristics. The initiative seeks to retain know-how within the companies and to identify the most suitable instrumentation solutions for the sewer environment and its operational constraints.

Coordination



In partnership
with



4

Energy neutrality in wastewater treatment plants: guidelines for defining achievable targets for self-production of energy from renewable sources

february 2025 - march 2026

The project aims to support the implementation of the new European directive on urban wastewater treatment, mandating the progressive fulfillment of the energy demand of plants with $\geq 10,000$ population equivalent through renewable energy sources. The initiative will provide legislators with technical, economic, and regulatory guidance based on concrete data, identifying feasible solutions, priority plants, and regulatory changes, all within a framework of dialogue with stakeholders.

Coordination



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The SMAT research number in 2024



Treatment

6

ongoing projects

7

national partners

26

international partners



Water network

2

completed projects

1

national partner



Quality

1

completed
projects

1

ongoing
projects

1

national
partners

18

international
partners



Energy | Environment | Climate change

4

completed
projects

8

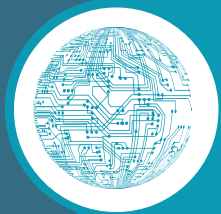
ongoing
projects

12

national
partners

4

international
partners



Data

2

completed projects

2

ongoing projects

1

national partner



Partnership Agreement for Advanced Research (APRE)

4

completed projects

6

Involved integrated
water utilities

Publications and proceedings

Cremonini, R.; Tiranti, D.; **Burzio, E.; Brussolo, E.** Studying Intense Convective Rainfall in Turin's Urban Area for Urban Flooding Early Warning System Implementation. (2024) *GeoHazards*, 5, 799–815. <https://doi.org/10.3390/geohazards5030040>

Irace, A., Marcelli, I., Fioraso, G., Festa, A., Catanzariti, R., Raco, B., Menichini, M., Masetti, G., **Brussolo, E.**, Vivaldo, G., Doveri, M. Subsurface geology of the Torino metropolitan area (Westernmost Po Plain, NW Italy). (2024) *Journal of Maps*, 20(1). <https://doi.org/10.1080/17445647.2024.2391963>

Brussolo, E., Tiranti, D., Cremonini, R., Barbarino, S. Climate risk assessment and adaptation plans for integrated water services in the Turin area. (2024) Oral presentation, MedCLIVAR-SISC Conference - 24 to 27 september 2024, Lecce, Italy

Brussolo, E.: Valutazione di rischio climatico, strategia e piano di adattamento ai cambiamenti climatici per il servizio idrico integrato. (2024) Oral presentation, Festival dell'Acqua 2024, 26 september 2024, Firenze, Italy

Oral presentation

Brussolo E.: River Café - *Pianificazione e gestione del rischio* - tavola rotonda Life Climax Po - 11 november 2024, Torino

Brussolo, E.: "L'acqua in città: tra cambiamenti climatici ed antropizzazione", tavola rotonda @ Urban Desires, 9 november 2024, Torino

Brussolo, E.: *Valutazione di rischio climatico, strategia e piano di adattamento ai cambiamenti climatici per il servizio idrico integrato*, 1° seminario per le autorità pubbliche in Piemonte - Life Climax Po - 26 june 2024, Torino

Brussolo, E.: "Integrated Urban Water Cycle in a Changing Climate: water crisis management", APE-Waterlinks, Resilience in Action: How Water and Sanitation Utilities Cope with Drought, 15 may 2024, online

Cecconi G. "Innovative solutions for Mediterranean Ecosystem Remediation via Monitoring and decontamination from Chemical Pollution", Oral presentation @ Notte Europea dei Ricercatori, Torino, 27 september 2024

Scibilia G. "Il recupero di risorse dalle acque reflue urbane", Oral presentation @ Notte Europea dei Ricercatori, Torino, 27 september 2024

Steffenino S. "Il riutilizzo delle acque reflue urbane", Oral presentation @ Notte Europea dei Ricercatori, Torino, 27 september 2024

Burzio E., Brussolo E. "CWC - City Water Circles: modelli di cooperazione urbana per migliorare l'efficienza idrica e l'utilizzo delle acque", Oral presentation @ Notte Europea dei Ricercatori, Torino, 27 september 2024

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CNR - ISAC
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