WATER RESCUE

Water resources efficiency and conservative use in drinking water supply systems

Interreg
Greece-Bulgaria
WATER RESCUE
European Regional Development Fund

EUROPEAN UNION

The project “WATER RESCUE” is co-funded by the European Regional Development Fund (ERDF) and by national funds of the countries participating in the Interreg V-A “Greece-Bulgaria 2014-2020” Cooperation Programme

WATER RESCUE in brief

WATER RESCUE project aims at sustainable drinking water supply management through the increase of water use efficiency and the monitoring & improvement of water quality throughout the whole water supply chain. The project not only safeguards water resources quality and quantity from natural and human pressures but, more importantly, it assures the water consumers safety and health as well as their quality of life.

WATER RESCUE is conceptualized on the basis of recognized cross - border problems related to water supply in the Greece – Bulgaria cross border area. The shared cross - border water resources, necessary for drinking water supply & also effective adaptation to climate change resilience is the core issue.

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WATER RESCUE action plan

Current Status Analysis and Assessment for water use efficiency, water quality and climate change impacts
Joint methodologies and tools for - cross border water resources vulnerability assessment - water use efficiency - water quality
Targeted pilot actions addressing water use efficiency and water quality
Joint Policy Recommendations on water use efficiency and water quality

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"Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such

WFD 2000/60/EC

COOPERATION PROGRAMME

Interreg V-A "Greece—Bulgaria 2014-2020"

FUNDED BY :

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PROJECT DURATION :

November 2017 - December 2021

Beneficiaries

- Municipal Water Supply and Sewerage Company of Komotini - DEYA Komotinis **Greece (Lead Beneficiary)**
- Municipal Water Supply and Sewerage Company of Thermi - DEYA Thermis **Greece**
- University of Thessaly-Special Account Funds for Research - Department of Civil Engineering **Greece**
- Municipality of Kardzhali **Bulgaria**
- Municipality of Gotse Delchev **Bulgaria**
- Municipal Water Supply and Sewerage Company of Thermaikos—DEYA Thermaikou **Greece**

Specialization Network

WATER RESCUE partnership is a well harmonized set of stakeholders from the Greece - Bulgaria area, primarily focused to the main actors in the field: 3 Water Utilities, 2 Municipalities and 1 Research Institution.

The results affect the entire area, providing practical guidelines, methodologies, tools & policies, addressing a wide spectrum of issues, which should be determined & maintained in the case of cross - border cooperation.

Current Status Analysis and Assessment

Climate Change Impacts

The climate change is already a fact worldwide. At local level expectations are for increase of annual temperatures and decrease of annual precipitation. The weather is going to become hotter, the rains will happen less frequently, but most probably with heavy intensity. The change in intensity, duration and abnormal climate phenomena could result in unpredictable floods and droughts at close future.

Water use efficiency

Common problems have been identified all water supply networks:

- Lack of modern and well-developed monitoring systems;
- Lack of strategies for zoning and pressure management;
- Aged pipeline networks;
- No strategy for development of hydraulic model.

As a result, water losses are high and urgent measures must be taken.

Water quality

Regular monitoring and pollution prevention are important for water quality assessment and control. The water utilities follow strictly the national and European legislation. Natural and manmade activities jeopardize water resources quality.

Joint methodologies and tools

Water Resources Vulnerability Index is an index deriving from the combination of water availability indices (such as WEI), water quality indices, climate characteristics, and adaptive capacity (consisting of socio-economic and natural indicators). Water resources vulnerability index is very important as it shows how vulnerable water resources are and this information can be an input for policy makers in order to design strategies and take measures on time.

WATER RESCUE water utilities use both surface water and groundwater bodies for drinking water supply. Some of the water resources are found in good status regarding their availability, while there are some water resources are over-exploited. The European and national legislation safeguards water quality especially when it is intended for human use. There are national strategies for the adaptation of climate change in both countries, Greece and Bulgaria. There are also local measures taken.

Predictive methods to ensure safe water are risk assessment tools such as the Water Safety Plans and the implementation of HACCP and ISO 22000. Corrective actions are the well-known methods used for water treatment.

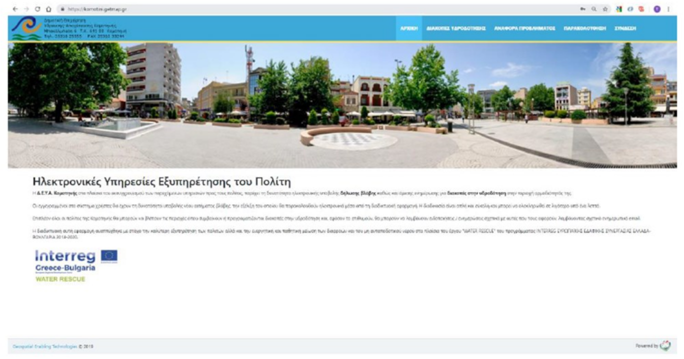
Integrated methodology towards water use efficiency

- Water Audit: to identify Non-Revenue Water (NRW)
- Use of Water Balance (IWA Standard International WB and its modifications)
- Use of Performance Indicators: 170 IWA PIs
- Identify the NRW causes
- Design a NRW reduction strategy
- Define NRW reduction measures

DEYA Komotinis (Greece)

Problems identified

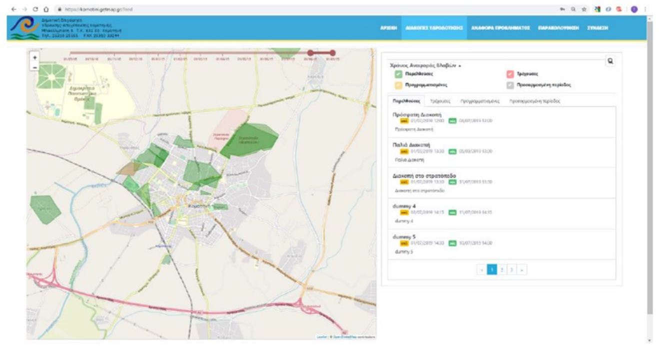
Komotini is situated close to the borders' area and share a common international river basin with Bulgaria. The water supply network suffers from high Non-Revenue Water levels and excessive use of surface and groundwater resources.



Application interface

Pilot action highlights

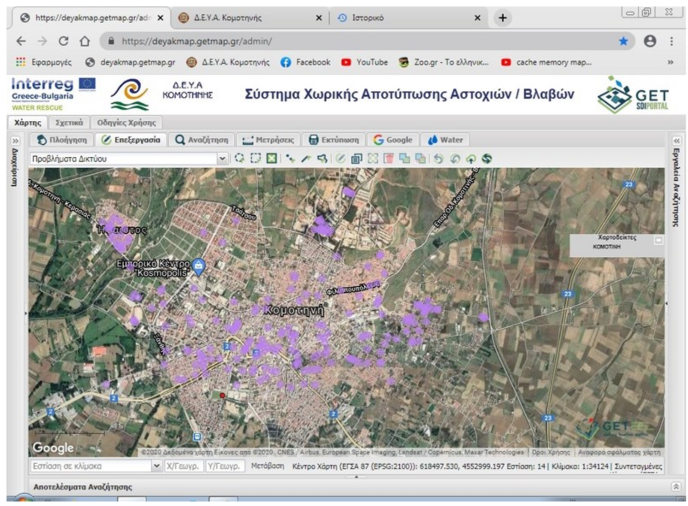
The pilot action is the development of IT applications to directly support the water utility operations and indirectly contribute to the water use efficiency (by reducing NRW). DEYA of Komotini targeted "speed and quality of repairs" pillar for the reduction of real losses in its water distribution network.



Water supply interruptions map

Results obtained

The IT applications developed reduced the total time for the repair of failures in the distribution network and at the same time provided a decision-making tool to the utility managers. This tool is valuable as the managers can monitor the evolution of the failures both spatially and temporally and can localize the parts of the network where interventions are needed. Additionally, the IT applications developed will improve the quality of service to the consumers as they can be informed in real time for any water interruptions, and they can also report any unusual event that is due to a failure in the water distribution network.

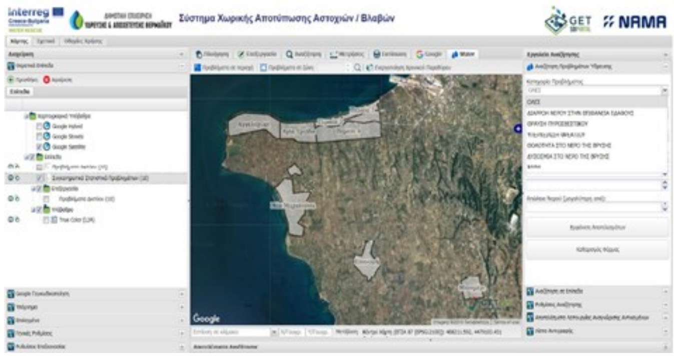


Failures' map

DEYA Thermaikou (Greece)

Problems identified

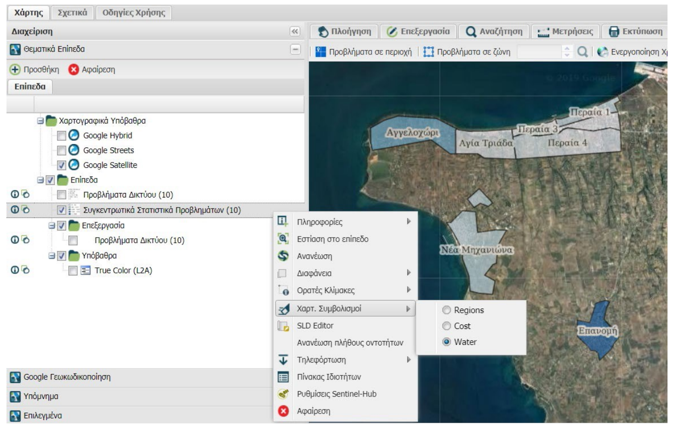
The Municipal Water Supply and Sewerage Company of Thermaikos serves many permanent inhabitants but also many tourists during the summer season. The water demand presents seasonal variations and the distribution network suffers from high NRW values (appr.40%) causing excessive use of water resources and salinization phenomena.



Spatial maps for failures

Pilot action highlights

DEYA Thermaikou developed IT applications for water distribution network management to localize the areas affected by water interruptions etc. and mapping failures history. The applications will be developed in a GIS environment and the water utility installed the GIS software.



Thematic maps

Results obtained

The water distribution network management application gathers all the necessary data for the water distribution network and at the same time serves as a decision-making tool. The failures mapping application gives the possibility to the water utility to reduce the total repair time for failures and also act as a decision-making tool for the managers in order to decide whether a specific part of the network needs further actions.

Municipality of Kardzhali (Bulgaria)

Problems identified

Kardzhali is situated in the borders' area and share a common international river basin with Greece. The municipality's water distribution network faces high NRW values and as there are no reliable registrations, the water volume entering the system is estimated inaccurately. New equipment is necessary for the laboratory to perform reliable monitoring of drinking water quality and wastewater quality.

Pilot action highlights

The pilot action refers to the supply and installation of 4 flowmeters and supply of a mass spectrometer with inductively coupled plasma ICP-MS to perform water and wastewater analyses.

Ultrasonic flowmeters installation

Results obtained

Four ultrasonic flowmeters are installed in the water supply network of Kardzhali to accurately measure flow rates and locate water losses. The water utility will implement permanent operational monitoring of drinking water and wastewater quality. The spectrometer allows the implementation of timely and prompt measures for improving water quality and providing safe water to its customers and make sure that the treated water effluent from the wastewater treatment plant is at the proper quality to return to the environment.

Municipality of Gotse Delchev (Bulgaria)

Problems identified

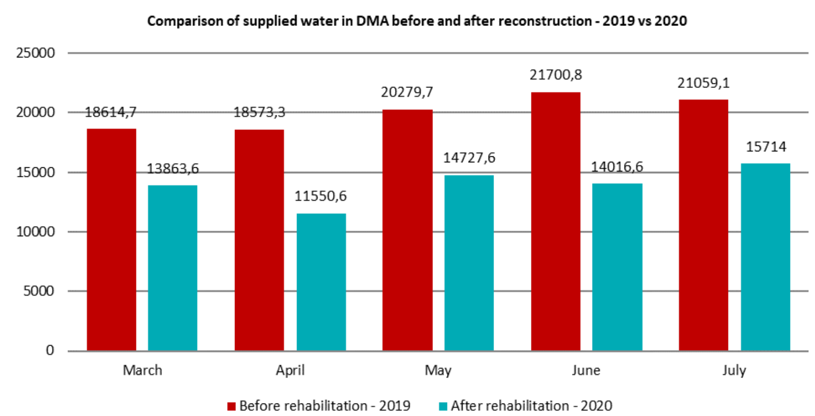
Gotse Delchev is situated in the borders' area and share a common international river basin with Greece. The municipality's water distribution network suffers from high NRW values up to 65% of the water entering the system mainly due to the pipes failures and the deteriorated water distribution network.

Pilot action highlights

The pilot action includes the design of a DMA, the construction of a manhole, the installation of measuring equipment and data analysis and the rehabilitation of water main in DMA Dunav.

Results obtained

The pilot action in the water distribution system of Gotse Delchev resulted in water supply reduction ranging from 25% to 38%. Average night flow reduction ranged from 43% to 57.9%. ILI values after the implementation of the pilot action range from 46.98 to 57.73 compared to 94.65 to 124.14 before the pilot action implementation.

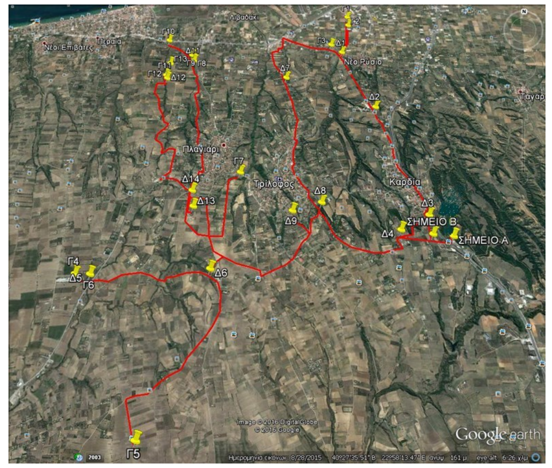


Reconstruction of pipelines

DEYA Thermis (Greece)

Problems identified

Thermi is situated next to Thessaloniki (the 2nd most populated city in Greece). The water distribution network faces Non-Revenue Water problems. As water volumes are not systematically recorded. the exact estimation of water losses was not possible, not allowing for the proper measures to reduce water losses to b taken. Water quality parameters are in accordance with the limits set by the legislation. Chlorination takes place in water tanks. However, as chlorination is important to maintain the right residual chlorine concentration, automated chlorination devices are necessary.



Location of boreholes and tanks in the municipal district of Mikra

Pilot action highlights

The pilot activity includes the supply and installation of flowmeters in 45 boreholes (out of the 54 used for water abstraction). The supply and installation of automated chlorination systems in 6 water tanks (out of the 29 chlorination points) took place. The installation of the equipment was concluded on 16/12/2019.

The hydraulic simulation model of the water distribution network is developed by University of Thessaly (PB3).

Chlorination device installed

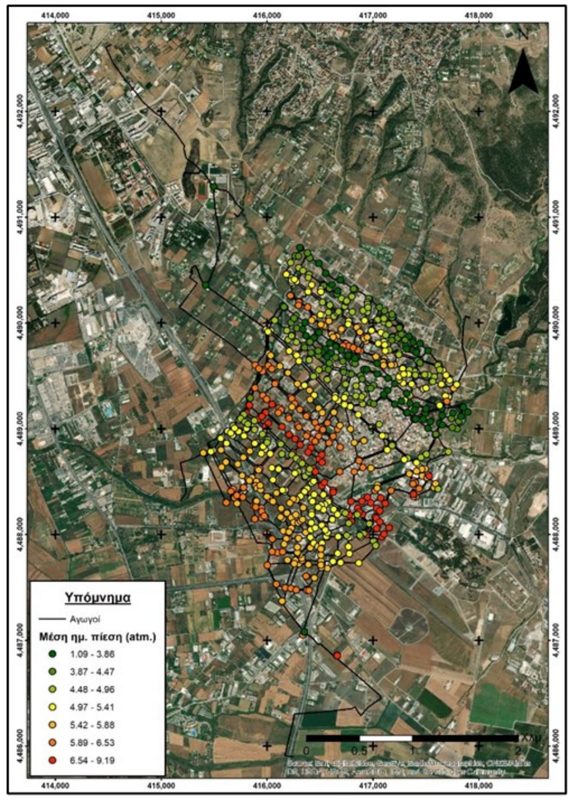
DEYA Thermis & University of Thessaly (Greece)

Hydraulic simulation model

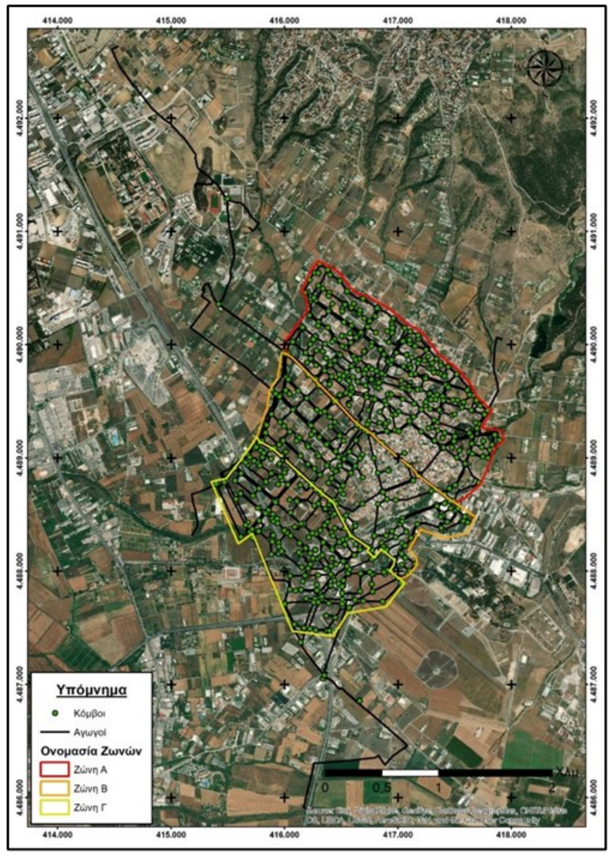
The hydraulic model of the network is developed. The results show that the smaller / local pipes show the lowest flow rates, while the main water distribution pipes show the highest average daily flow. Given that pressure is not regulated through pressure reduction valves, the results showed that the nodes at the highest altitudes of the network have low pressure, while as altitude decreases pressure increases to quite high pressures. Three pressure zones are developed (virtually) using the hydraulic model and using combinations of altitude and pressure.

Results obtained

The flowmeters installed in the boreholes of the water utility contributed to the accurate and reliable recording of the water volumes abstracted. This activity results in an accurate elaboration of the water balance to estimate NRW and its causes and then develop a strategy to reduce them. The 6 automated chlorination devices installed in selected water tanks results in accurate chlorination to ensure safe water for the consumers. Also, the development of the hydraulic model of the water distribution network and the virtual development of pressure zones showed that pressure is reduced in all zones, with the maximum reduction up to 58% while the minimum reduction is 4%. The model showed that if zoning takes place the water volume entering the network is reduced by 3.44%.



Initial pressure at the nodes



Pressure zones suggested

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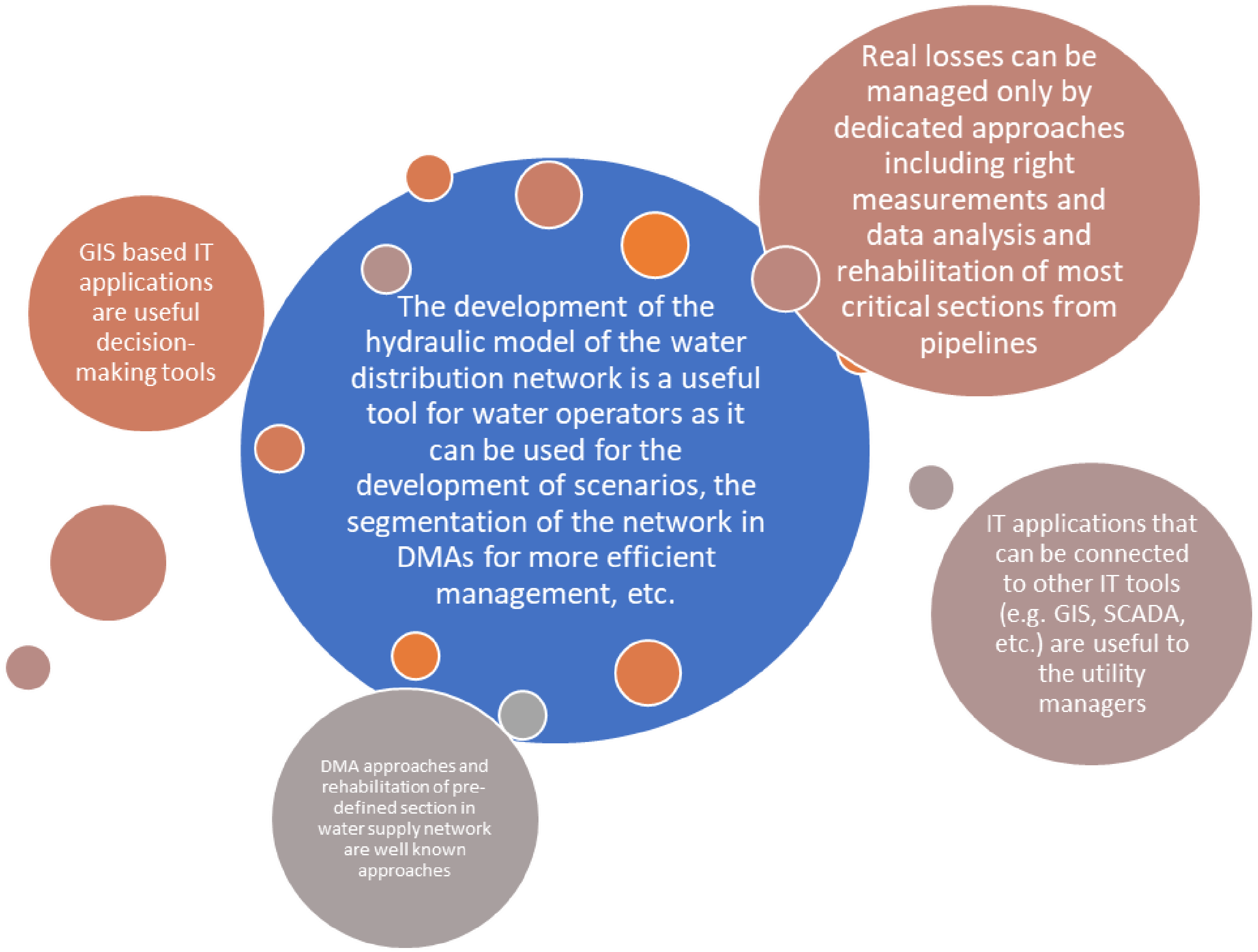
Lessons learnt



Policy Recommendations

◊ Provision of improved knowledge of water use and sustainability limits, and improved monitoring of water resources and uses at cross-border scale.

◊ Deliver socio-technical water management solutions for the water utilities.

◊ Consider and use economic instruments for water resources management (e.g. water abstraction charges).

◊ Provide know-how and funds for water use efficiency to the water utilities.

◊ Encourage water utilities to perform water auditing in order to identify their major problems related to water losses and design targeted strategies and measures.

◊ Establish national targets and bonuses for water utilities that catch the targets (e.g. get priority in funding programmes, etc.).

◊ Establish national or regional NRW targets.

◊ Promote measures to report NRW and water losses data at regional and national level.

◊ Promote measures targeting NRW reduction for water utilities (both operational and financial).

◊ Provide financial tools to water utilities in order to use new technological solutions.

◊ Improve stakeholders engagement in following water use efficiency level.

◊ At European level encourage KPIs determination to assess real results from invested funds in water infrastructure in different countries.

◊ Install online monitoring stations at least at water resources providing water intended for human consumption.

◊ Develop appropriate water quality monitoring practices according to the needs and characteristics of the water utilities.

◊ Use the latest scientific knowledge regarding drinking water quality monitoring and chlorination.

◊ Encourage and provide funding to water utilities to apply proactive measures and develop risk management tools, such as HACCP and WSPs.

◊ Provide funding for pilot activities related to the continuous monitoring of drinking water from the source to the consumers' taps, installation of inline chlorination boosters, etc.

◊ Improve the water quality monitoring network at water resources in order to provide water quality data for all water bodies.

◊ Take measures to reduce water pollution in water bodies.

◊ Develop a water quality monitoring network specifically at drinking water sources and within the water distribution network.

◊ Fund pilot activities related to water quality online monitoring.

◊ Assess the investments necessary to achieve the desired level of water quality and to protect and restore water-related ecosystems, taking account of cost effectiveness related to human and ecosystem health benefits.

◊ Combine regulatory, voluntary and economic instruments to provide continuing incentives for polluters to reduce and control pollution of water resources.

◊ Establish efficient chlorination systems to avoid hyperchlorination phenomena or water without residual chlorine consumed by the people.

◊ Establish national educational programmes for water utilities in order to get training on water auditing.

◊ Educate water utilities staff to use technological advanced tools.

◊ Plan educational and training programs for the public.

Benefits

Environment

- Protection of a valuable natural resources "water"
- Reducing water losses, less water is taken from water resources
- Improve water quality
- Improve carbon footprint and reduce GHG emissions
- Water and energy saving
- Improve likelihood to comply with EU requirements and targets
- Water resources quality protection is closely linked to environmental benefits, as water resources are used for many uses including recreational use.

Society

- Water prices reduction
- Improve public awareness related to water saving and water demand control
- improved efficiency of water use at national level will increase credibility in water operators
- The provision of safe drinking water is of great importance for the public health

Economy

- Reduction in expenses related to water abstraction, treatment and distribution
- Reduction in water prices
- Reduction of apparent losses means direct economic benefits as larger water volumes are registered and water theft is reduced
- Protecting water resources from pollution avoids any financial consequences related to cleaning water from pollutants or paying fees due to pollution caused.
- Economic benefits relate with the reduced funds needed for ecosystems restoration and the achievement of better water resources quality.
- As the environmental cost is a part of the full water cost, reduced expenditures related to the improvement of water resources quality will benefit the public and the water users in general.

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Results

- Sustainable cross–border drinking water supply management aiming at **water resources efficiency and conservative use**
- Adaptation of a joint methodological framework for **water resources management** (qualitatively and quantitatively) in relation to climate change and the natural and human activities and **reduction of the water resources vulnerability**
- **Increase water use efficiency** through the **reduction of Non-Revenue Water** and water losses in the water supply networks by implementing measures tackling NRW causes
- **Improve water quality and safety** in the whole drinking water supply cycle, from the water resources to the water distribution network and back to the environment through the continuous monitoring of water quality parameters in real time and the in-line disinfection to reduce the risk of low chlorine residuals and excessive concentrations of THMs (toxic substances causing cancer)
- **Increase innovative technologies use** through the integrated management of water resources including GIS-based applications; hydraulic simulation models and decision support systems
- **Development of "green behavior"**, **increase water saving** and **reduce water consumption** through public awareness campaigns.

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Project Beneficiaries

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