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D6.2. Handbook of best practices in water



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Handbook of best practices in water

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Executive summary

The LIFE GreenMe5 project involves the organization of thematic events, called Green Innovation Camps (GIC), in each of the partner cities and of each of the 5 pillars of the Green City Accord (biodiversity, air quality, waste management, water and noise). In those GIC, members of the partner cities (Transnational Expert Team) and local stakeholders, together with external experts in the specific thematic field, identify and exchange innovative actions to improve environmental management in the area to be addressed.

This report reflects on the discussions of the GIC held in Murcia on 12-13 November 2024, focusing on water, and presents some of the good practices exposed in the event.





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Introduction



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1. Introduction

LIFE GreenMe5 and Green City Accord

The Green City Accord (GCA) is a movement of European cities committed to environmental conservation. The signatory city authorities agree to take action to make their cities greener, more resilient and healthier.

The agreement includes five pillars related to the most important areas of urban environmental management: water, air quality, waste, noise and biodiversity. The initiative was launched by the European Commission in October 2020 and already involves more than 100 cities across Europe.

LIFE GreenMe5 aims to facilitate the implementation of the GCA in five municipalities. The philosophy of the project is based on the idea that the exchange of experiences and cooperation between the participating cities will serve to improve their capacities and find solutions to common challenges.

The project will establish a multi-governance approach to the implementation of the Agreement, integrating all municipal departments and stakeholders. For this purpose, interdepartmental, supra-municipal and local working structures have been set up. LIFE GreenMe5 will support the participating cities in the elaboration of the mandatory reports that are part of the political commitment.

This project, co-financed by LIFE funding, involves the Federation of Municipalities of the Region of Murcia, leader of the project, the municipalities of Murcia, Cieza (Spain), Arezzo (Italy), Vilnius (Lithuania) and Helsingborg (Sweden), and the company specialized in developing sustainability and environmental projects through European funding EuroVértice (Spain).

Under LIFE GreenMe5, pilot actions will be implemented to improve indicators in the five GCA areas - biodiversity, air quality, waste management, water and noise - with the aim of transferring them as good practice for implementation in other European cities.

These actions include measures in streets to reduce noise pollution and improve air quality, a manual to reduce food waste in schools, measures to improve green coverage or a door-to-door collection system for high-value and high-risk waste.





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What are the Green Innovation Camps?

Along the LIFE GreenMe5 project, coinciding with the meeting of the Steering Committee, each partner country will organise a Green Innovation Camp (GIC). These two-day thematic workshops will focus on one of the five pillars of the Green City Accord: biodiversity, air quality, waste management, water and noise.

The GICs involve members of the Transnational Expert Team (members of the partner cities) and local stakeholders, together with external experts in the specific thematic field. The objective of each GIC is to identify and exchange innovative actions to improve environmental management in the area to be addressed in each of the cities. For municipal technicians, it is an opportunity to explore other geographical contexts and share good practices and ideas to improve together the implementation of the Green City Accord.

Innovative methodologies and techniques of design thinking will be applied in the Green Innovation Camps, such as the SCAMPER method, graphic brainstorming, character charts, mind maps, infographs and diagrams.





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Introduction to the series of handbooks of best practices produced by the LIFE GreenMe5 project

This is the second of a series of handbooks in which you can find in an agile way the best practices shared by the partners of the LIFE GreenMe5 project. The aim is to compile the learnings and experience of the Green Innovation Camps.

This second volume is the result of the meeting held in Murcia on 12th November 2024, focusing on water.

The 12th of November, in Murcia, in addition to speakers from the five municipalities, other entities and partners presented their expertise working with water. The event started with an institutional welcome, led by politicians of the Municipality of Murcia, representatives of the FMRM and from the municipal water company (Aguas de Murcia – EMUASA) (Figure 1).



Figure 1. Participants in the institutional welcome of the Green Innovation Camp in Murcia.

Rocío Méndez from the FMRM continued presenting the LIFE GreenMe5 project and the Green City Accord. Alfonso Alcolea, responsible for the European Green Capital and the Green City Accord at Directorate General for Environment of the European Commission, joined the event online to reflect on the importance of sustainable and efficient water management and to inform about future opportunities. Marta Reguilón (EuroVértice) participated presenting an overview of the legal framework and upcoming challenges on water in Europe. The session was then continued by water experts of multiple entities, that presented different best practices carried out in European cities.





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On the afternoon of 12th, project partners moved to a wastewater treatment plant in east Murcia, the WWTP Murcia-Este. There, Elena de Vicente, innovation technician of Aguas of Murcia, guided the visit through the treatment plant facilities. She explained its different phases and the route that wastewater follows from its entry through collectors to its discharge, once treated and clean, into the Segura River.

Over the next year and a half, three more GIC will take place in which the focus areas of the Green City Accord will be discussed:

- HELSINGBORG(M20): noise prevention.
- AREZZO (M26): waste management.
- CIEZA (M32): nature and biodiversity.





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What will you find in this document?

In this document you will find an overview of water aspects in Europe, including its current situation, the legal framework and commitments and indicators of the GCA for this pillar, as well as the best practices discussed of the Water GIC that took place in November 2024.

The structure of this document mirrors the organization of the Water GIC, which was specifically designed to address the various indicators of the GCA. Five thematic areas were chosen to ensure that the event provided actionable insights and practical examples for municipalities to improve their water management practices and meet GCA commitments. Therefore, each section of the document corresponds with one thematic area and includes a summary of the issues discussed at the conference on that topic and sheets of the best practices presented. The five categories are:

- Restoring nature´s flow: urban water quality and biodiversity
- Rainproofing cities: sustainable urban drainage systems
- Water efficiency
- Water re-use
- Water consumption campaigns





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Water in Europe

2. Water in Europe

Current situation

Water is an essential and irreplaceable resource. Over the years, Europe's demographic growth, rapid industrialization, intensification of agriculture and urban development have generated increasing pressure on this resource.

Europeans use billion of cubic meters of water every year. About 80% of the freshwater consumed for human consumption and other uses comes from rivers and groundwater, making these sources extremely vulnerable to the threats mentioned previously (pollution, over-exploitation and climate change). Agriculture is the largest net consumer of water with 59% of EU water consumption (EEA, 2023). Others important sources of consumptions correspond to human consumption, households, industry and energy. Establishing better practices in agriculture, through changes and new technologies, allows for reduced pollution and less water use, while maintaining productivity.

Today, this pressure has been exacerbated by climate change, which is associated to an increased risk of water stress (Figure 2) and of severe flooding. Therefore, it is essential that water resources are managed efficiently and intelligently. This can be accomplished by implementing policies and regulations to safeguard and manage its use, fostering research and innovation, developing new solutions to ensure compliance with regulations, and facilitating the exchange of experiences among relevant sectors.

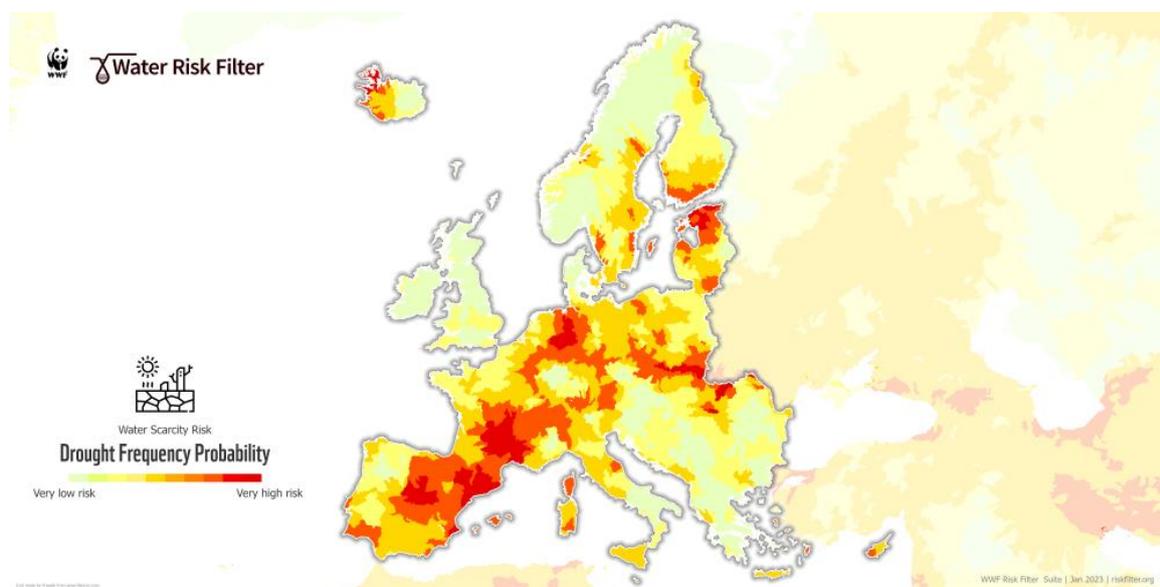


Figure 2. Drought frequency probability

The last report of Europe's state of water in 2024 (EEA Report 07/2024), points out that pollution, over-exploitation, physical alterations to water habitats and climate change continue to impact Europe's water bodies and life dependent on them. Water stress affects



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20% of Europe's territory and 30% of the population every year. Having up to date data on the quantity and quality of water is key for Europe to manage the resource efficiently.

Regarding the status of water in Europe, only 37% of surface water bodies achieved a good or high ecological status and the 29% achieved a good chemical status. According to data reported by member countries, the main pressures on surface waters come from pollution from diffuse sources as atmospheric deposition (52%), change to the physical features and natural flow of rivers, lakes, transitional and coastal waters (51%), agriculture (29%) and point sources such as from wastewater discharges (13%).

About groundwater bodies, 91% are in good quantitative status and 77% are in good chemical status. This chemical affection over Europe's bodies water is caused predominantly by atmospheric pollution and diffuse pollution from agriculture, resulting from the intensive use of nutrients and pesticides.

To ensure sustained improvement and safeguard against any potential decline, the European Commission prioritizes the protection of this invaluable resource through the implementation of various policies.

Legal framework

The main legal instrument for water protection in Europe is Directive 2000/60/EC of the European Parliament and of the Council of the 23 October 2000 establishing a framework for Community action in the field of water policy.

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Commonly known as, the **Water Framework Directive**, it aims to achieve good chemical status for European water bodies by controlling and reducing pollutant levels in surface and groundwater. Together with the Environmental Quality Standards Directive and the Groundwater Directive, it applies to inland, transitional and coastal surface waters, as well as groundwaters. It details the **quality elements that need to be taken into account in assessing ecological status (Annex V)**. It also covers **surface water pollutants of greatest (EU-wide) concern** by identifying them as so-called priority substances, including a subset of priority hazardous substances (Annex X). Environmental standards are set for them in the **Environmental Quality Standards Directive**.

It establishes coordination of administrative provisions in the hydrographic demarcations and the development of a program of measures to achieved the environmental objectives (Article 4) for surface water, groundwater and protected areas.

Moreover, **Directive 2006/118/EC** of the European Parliament and of the Council of 12 December 2006 relating to the protection of groundwater against pollution and deterioration, lays criteria for assessing the good chemical status of groundwater and criteria for determining and reversing significant and sustained upward trends. In addition, the Directive establishes provisions to prevent and limit the entry of pollutants into groundwater and to avoid its deterioration.





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The **Drinking Water Directive** (Directive 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption) is also a key policy for water management. The revised version of the Directive entered into force in January 2021.

This revised Directive enforces stricter water quality standards, targets emerging pollutants like PFAs and microplastics, and promotes a risk-based approach to reduce pollution at its source. It also introduces measures to improve water access for vulnerable groups, encourages tap water use to cut plastic waste, harmonizes standards for water-contact materials, reduces water leaks, and boosts transparency in the water sector. Member States had to transpose the rules of the Drinking Water Directive into national law and comply with the provisions by 12 January 2023. Moreover, it introduces two new PFAS (perfluoroalkyl and polyfluoroalkyl substances) and it establishes methods of analysis for their monitoring under the parameters “PFAS Total” and “Sum of PFAS”. Member states have to respect their limit values respectively 0,5 µg/l and 0,1 µg/l, by 12 January 2026.

The **Urban Wastewater Treatment Directive** has been also recently revised for the Commission, and has been adopted in 2024. It aims to protect the environment from the risks of urban wastewater discharges and ensure efficient management of urban and industrial wastewater. It sets the requirements for the collection, treatment, and discharge of urban wastewater and mandates effluent quality parameters depending on plant size and receiving water sensitivity. Member States must promote the reuse of treated wastewater from all urban WWTPs where appropriate, especially in water-stressed areas.

Quaternary treatment will be mandatory for all plants treating a load over 150 000 p.e. and for agglomerations over 10.000 p.e. based on a risk assessment, by the end of 2045, with intermediate targets and deadlines to address pharmaceuticals and cosmetic products.

In addition, the **Water Reuse Regulation** is applying since 26 June 2023 and it aims to improve and facilitate water reuse in the European Union. It lays down minimum requirements for water quality and monitoring and provisions on risk management, for the safe use of reclaimed water in the context of integrated water management. The regulation allows Member States to decide not to practice water reuse in their territory or to limit it in certain areas.

Lastly, **Directive 2007/60/EC** of the European Parliament and of the Council of 23 October 2007 on flood risk assessment and management is aimed to reduce the risks associated with floods and the negative consequences for human health, the environment, cultural heritage and economic activity. According to this Directive, every six years, Member States must carry out a preliminary assessment aimed at determining river basins and coastal areas at risk of flooding, and develop flood risk maps and management plans.

Reviewing this legislation is essential, as it forms the foundation for addressing many of the challenges the water sector faces. These challenges were deeply discussed during the event.





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GCA commitments and indicators on Water

In the Green City Accord, cities **commit to achieving progress in improving the quality of water bodies and the efficiency of water use**. The municipalities involved in the agreement are pledged to ensuring a future where citizens can enjoy clean water, to improve ecological and chemical status of local water bodies and to protect water sources by 2030, through these commitments:

- Take action, implement policies and enforce regulations to improve the quality of water and the efficiency of water use in the cities.
- Integrate water actions in other relevant policies and plans.

Additionally, the **agreement proposes them to carry out the following actions and measures**:

- Identifying water as a critical determinant of sustainable environmental urban planning, for example, by driving green infrastructure for the mediation of urban runoff.
- Retaining rainwater and managing and controlling storm water overflows including utilizing natural retention measures.
- Addressing contaminants of emerging concern (micropollutants, pharmaceuticals and microplastics), by using targeted measures and innovative approaches including modern treatment technologies and nature-based solutions where possible.
- Supporting the circular economy by reducing pollution at source, via the technical demonstration of energy-neutral wastewater networks and wastewater treatment plants, by reducing leakage along the networks, and reusing treated wastewater.
- Restoring the functioning of aquatic ecosystems to achieve good ecological status of water bodies.
- Improving monitoring to establish better links between the quality of water bodies and the treatment process.
- Contributing to the effective coordination of water management policy throughout the region as relevant for the city's water supply and for reducing pressures on water.
- Building awareness and utilizing citizen science to ensure that citizens understand the importance of water for human health and well-being and its role in the circular economy, and are aware of the costs and effort needed to ensure its safety.

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The indicators used to check and evaluate the progress and improve the quality of water bodies and the efficiency of water use are:

- Household water consumption (litres/capita/day)
- Infrastructure Leakage Index (ILI)
- Percentage of urban wastewater meeting the requirements of the Urban Wastewater Treatment Directive (UWWTD) regarding collection and secondary treatment.





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**Best practices discussed in the
Water Green Innovation Camp -
Murcia -November 2024**



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3. Best practices discussed in the Water Green Innovation Camp – Murcia - November 2024

The event included different presentations that were structured according to the following sections:

- Restoring nature´s flow: Urban water quality and biodiversity
- Rainproofing: sustainable urban drainage systems
- Water efficiency
- Water reuse
- Water consumption campaign





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Restoring nature's flow

What was discussed?

The first part of the event focused on the restoration of natural water flows as a strategic approach for municipal authorities to improve environmental management and meet Green City Accord water indicators. Participants discussed the critical role of restoring aquatic ecosystems in mitigating flooding risks, enhancing biodiversity, and improving water quality. Such efforts were framed not only as environmental necessities but also as opportunities for municipalities to integrate sustainable practices into urban planning and water management policies.

An illustrative example was shared from Helsingborg, where the loss of 95% of wetlands due to agricultural intensification and urbanization has left the landscape vulnerable to recurrent flooding and ecological degradation. In response, the municipality implemented a two-stage ditch system, which increased the area available for water retention while promoting biodiversity and maintaining agricultural productivity. The action is part of LIFE GreenMe5 and also includes community engagement, creating recreational spaces that foster local ownership and align with broader urban development goals.

In Murcia, the restoration of the Vivillo meander in the Segura River exemplified how municipalities can tackle the disconnection between rivers and their floodplains caused by historical channelization. This project is employing bioengineering techniques to stabilize riverbanks, reintroduce native vegetation, and restore traditional irrigation channels, thus addressing both ecological and water management challenges.

Both presentations emphasized that successful restoration projects require a holistic approach, combining technical solutions with proactive community engagement.





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Best practices presented

Helsingborg, two stage ditch to improve water quality

Presented by:

Anna Olsson (Water planner at the urban planning and technical service department in Helsingborg municipality)

Implemented in the framework of the project:

LIFE GreenMe5

Year: 2023-present

More info:

<https://helsingborg.se/trafik-och-stadsplanering/planering-och-utveckling/natur-och-kultur/vatmarker/vi-skapar-ett-slingrande-dike-i-odakra/>



DESCRIPTION:

The landscape of Helsingborg is densely cultivated, with 75% of the land being agricultural. The region experiences recurrent flooding, especially in the village of Ödåkra, where there used to be numerous wetlands. However, 95% of the wetlands in Helsingborg municipality have disappeared during the last century. The hardened surfaces with streets and buildings have at the same time increased, making the water situation in the landscape even harder. The agricultural area is currently characterized by narrow, deep channels, and its lack of biodiversity means that only 9% of the landscape remains natural. Another notable issue is the presence of pollutants from roads, traffic, and waste generated by urban activity.

As a result of these factors, the water streams have a poor ecological status. To address this, a two-stage ditch has been created by adding a second level to a 300 meter stretch of the channel to the channel. This measure is particularly suitable for agriculture land, as it perseveres the drainage, increases biodiversity, provides more space for water, and maintains the channel for water flow.

In terms of planning, the old channel was filled in to restore the water flow, and the ditch was designed to form a meander, with areas for controlled flooding, thus achieving a greater resemblance to a natural stream.





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The preliminary studies and design took place between December 2023 and June 2024, with a budget of 15.000 euros. The restoration of the watercourse, developed between August and September 2024, costed 140.000 euros. Previously, the channel was devoid of fish and challenging to manage. However, just a few months after the completion of the works, the project is already showing promising results. During a monitoring visit by the municipality, a pike was observed in the area. Naming it Gärda served as a way to highlight its importance as a symbol of the recovery of biodiversity

Additionally, the project involves the creation of a local action group with the people in the area. On the 22nd of October 2024, a meeting was held with local residents, where the new water area was presented by the city's project leaders. The lack of recreational opportunities was highlighted. The changes made with the project have created a new area that will contribute also to those purposes, but the main purpose is biodiversity and water quality.

Although the work has been completed, complementary actions are planned to enhance the project's impact

- A meeting with a nature conservation association and an ornithologist group to plan vegetation strategies.
- Planting various types of vegetation to support biodiversity.
- Ongoing monitoring and evaluation of the implemented methods.
- An inauguration event scheduled for spring 2025, featuring a name-giving ceremony where locals will be invited to propose names for the new water area.
- Showcasing and spreading the measure to other stakeholders and landowners.

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The water quality has started to be monitored, so it will also be possible to quantitatively assess the impact of the action on it.





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Restoration of the old Segura riverbed in the Vivillo meander

Presented by:

Antonio Miguel Ruiz Pérez (Civil engineer in Murcia, expert in water management, such as water networks, flooding studies and dams)

Implemented in the framework of the project:

The project is supported by the Biodiversity Foundation of the Spanish Ministry of Ecological Transition and Demographic Challenge, within the framework of the Recovery, Transformation and Resilience Plan (PRTR), funded by the European Union - Next GenerationEU

Year: 2022-2025

More info: https://fundacion-biodiversidad.es/proyecto_prtr/restauracion-fluvial-del-antiguo-cauce-del-rio-segura-en-el-meandro-de-vivillo-vivillo/



DESCRIPTION:

This project is based on previous works with the Technical University of Cartagena (UPCT), University of Murcia (UMU) and the municipality of Murcia.

Murcia is located in the lower part of the Segura River basin. The lower area is 50 km long and has a gradient of 0.07%. Between 1970 and 1980, there were severe flooding events, particularly the one in 1973, which resulted in 90 casualties. This led the government to decide to channel the Segura River with a Defence Plan in 1977. The river channelization resulted in the disconnection between the riverbed and its floodplain. The canalization shortened the total length of the river by 28.5% (from 70 km to 50 km), reducing the number of meanders and the morphological diversity of the riverbed.

The former Vivillo meander is an example of an area where channelization works straightened small curves of the river's natural course. The modification of the riverbed left numerous fragments of expropriated plots on the banks, which caused the abandonment of productive land uses, as well as the loss of vegetation and new slopes that hinder the growth of natural vegetation.

The project aims to reconstruct the riparian ecosystem with hydraulic and environmental improvements to the meander; to return this section to a state closer to that it was



before the works of the 1990's. To achieve this, gravel will be placed to hold the riverbed until it self-stabilizes. In addition, soft bioengineering techniques will be applied to the riverbanks and slopes. The new riverbank allows for the proper growth of vegetation.

An artificial reconstruction, based on biomimicry (practice that learns from and mimics the strategies used by living organisms to solve human challenges), will be carried out to create a river ecosystem that resumes its natural cycles, self-regulating correctly. New banks have been created, divided into several zones: the flooded margin, the wet margin, and the dry margin, where specific vegetation will be planted.

The project includes:

- Riverbank consolidation
- Paths, trails and recreational areas
- Revegetation and removal of reeds (*Arundo donax*) with cleaning from September to March and covering with polyethylene sheets, during two years. For revegetation, new species were selected according to criteria established by different authors.
- Vivillo brazal connection restoration. This irrigation channel was diverted due to canalization, but now has been restored.

The project costed 1.726.018,44 euros and some indicators are being monitored:

- Length and width of riverbed restoration (km)
- Length of setback of banks (km)
- Number of inhabitants protected against flood risks, disaggregated by sex
- Number of tree trunks planted
- Length of riparian vegetation improvements (km)
- Area of invasive plants removed (m2)
- Survival rate of planted species (%)
- Number of access path to the fluvial area
- Length of the riverside paths created (m)
- Number of citizen participation activities carried out under the project





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Rainproofing: sustainable urban drainage systems

What was discussed?

Sustainable urban drainage systems (SUDS) can help municipalities address the dual challenges of managing stormwater and adapting to the impacts of climate change. The second thematic section of the meeting highlighted the importance of integrating green infrastructure into urban planning to reduce flood risks, improve water quality, and create multifunctional public spaces that enhance community well-being. By adopting SUDS, municipal authorities can make significant progress toward the Green City Accord’s goals of improved water efficiency and ecological health.

One key example came from Murcia, where a comprehensive guide to SUDS has been developed to support their implementation across the municipality. The guide emphasizes the importance of tailoring solutions to local conditions and includes methodologies for designing, maintaining, and monitoring SUDS systems. These systems offer a range of hydrological functions, from retaining and filtering runoff to promoting infiltration and biodiversity. The guide serves as a valuable tool for municipal technicians, enabling them to incorporate sustainable water management practices into urban development projects.

The CARDIMED project was also presented as an example of how Mediterranean cities can adapt to climate change by combining SUDS with nature-based solutions and digital technologies. In Murcia, this approach will be applied to the Zairaiche garden, where flood-prone areas will be transformed into adaptive spaces that collect and reuse stormwater for irrigation. This initiative not only reduces flood risks but also enhances urban green spaces, contributing to a cooler and more livable city environment.

By prioritizing these sustainable systems, municipalities can address immediate water management challenges while aligning with long-term sustainability targets, improving their Green City Accord indicators and demonstrating leadership in urban resilience.



Best practices presented

Sustainable Urban Drainage Systems (SUDS) Guide	
<p>Presented by: Pedro Soriano Pacheco, Civil Engineer and leader of Planning and Construction Department at Aguas de Murcia, guiding the future of urban water management</p>	
<p>Implemented in the framework of the project: N/A</p>	
<p>Year:</p>	
<p>More info: Basic Design Guide of SUDS in the Municipality of Municipal District of Murcia https://www.apirm.es/wp-content/uploads/2024/07/Guia-B%C3%A1sica-de-dise%C3%B1o-de-Sistemas-Urbanos-de-Drenaje-Sostenible-del-municipio-de-Murcia.pdf</p>	
<p>DESCRIPTION: Aguas de Murcia and Murcia municipality have developed a practical area for Sustainable Urban Drainage Systems. Having a guide like this is considered an essential good practice to start the way in improving urban permeability and therefore improving surface water and runoff management. The Guide is divided into five sections: Conceptual section, tools, technical design block, maintenance and regulatory section.</p> <ul style="list-style-type: none"> - Conceptual section. New trends in urban water management. It covers aspects related to the challenge of climate change, the transition to a circular economy, sustainable development goals, nature-based solutions (NbS) and urban drainage. - Tools. Sustainable Drainage Measures. This section explains the benefits and objectives of SUDS, focusing on water quantity and quality control, and the description of SUDS techniques. SUDS can be classified into structural and non-structural measures. - Technical design block. This block presents the characterization, sizing calculations (definition of volumes, emptying time and other criteria) and the main national and international design references. 	



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- The maintenance and monitoring block covers the maintenance of SUDS types, instruments and measuring equipment for monitoring, sample analysis and reporting.
- The last section covers the regulatory framework, which includes local, national and European regulations.

The four pillars for the design of SUDS are runoff quantity control, runoff quality control, design for the citizen and design for biodiversity.

SUDS can perform a variety of hydrological functions, detention, retention, infiltration, filtration and treatment. Depending on their function, they can reduce the velocity and slow the flow of water, retain and store runoff for later use or evapotranspiration, promote infiltration of water into the ground and purification of runoff, retain sediment through a filter medium, and promote physical and biological processes to reduce pollutants in runoff water.

The Guide presents a **technical description of SUDS**, covering various typologies. Depending on the constructive nature, they can be classified into structural measures, referring to solutions that require constructive elements to manage runoff, and non-structural measures, which correspond to legislative, educational and informative actions, without requiring physical and structural contributions. The Guide includes a selection of the types of SUDS that best suit the physical and urban conditions of the city of Murcia.

It also includes the methodology **to be followed for the design of SUDS**, divided into 5 blocks. The first step is the definition of objectives, followed by the macro-scale characterisation, including the study of rainfall, soil types and hydrological aspects, and the micro-scale characterisation, with the analysis of the area of action, the permeability of the terrain in-situ, the water table and the identification of the opportunities for its implementation. After that, the selection of SUDS types and sizing is carried out, where the generated runoff volumes and the required storage volumes are defined, along with the structure's emptying times and the modeling requirements for verifying the compliance with the emptying requirements.

Maintenance and monitoring are essential for the proper implementation of SUDS, by means of an active maintenance policy that allows problems to be identified preventively, from the early design phases, and a correct monitoring plan. Such a plan includes instrumentation, data collection and analysis of samples and data to quantitatively assess SUDS performance, water quality and quantity. Maintenance should include visual checks, care and cleaning to prevent any problems and records to keep track of the activities carried out. The Guide lists, indicatively, the activities that are carried out depending on the type of SUDS, indicating the frequency of execution of the tasks and the type of maintenance (preventive, corrective and adaptation).

Finally, SUDS align with the sanitary engineering objectives: hygienist, protectionism and environmental objectives. This pyramid contributes to the increase of life expectancy.



CARDIMED Project – Replicability Case in Murcia

Presented by:

Elena de Vicente Aguilar, Chemical Engineer who joined Aguas de Murcia as an Innovation Technician

Implemented in the framework of the project:
CARDIMED (Horizon Europe)

Year: 2023-2028 (54 months)

More info: <https://www.cardimed-project.eu/>



DESCRIPTION:

Climate Adaptation and Resilience Demonstrated in the Mediterranean Region (HORIZON-MISS-2022-CLIMA-01) is a project funded by the Horizon Europe Programme. The project started on the 1st of September 2023 and ends on the 29th of February 2028, involving 51 partners across 14 countries. The main objective is to achieve climate adaptation and resilience in the Mediterranean region, with a systemic transformation and linking Nature Based Solutions (NbS) and engineering infrastructures. It is based on four pillars:

- Digital technologies for Climate Adaptation
- Socio-economic Resilience
- Water-Energy-Food-Ecosystems (WEFE) nexus
- Nature-based Solutions

The project actions have been implemented in 9 demonstration sites in Europe: North and South Aegean regions and Central Greece region (Greece), Sardinia and Sicily regions (Italy), Region Sud (France), Alentejo region (Portugal), Aragon region (Spain), Izmir Metropolitan municipality (Turkey) and Nicosia (Cyprus), comprising 32 NbS. In addition, the Cardimed project includes 5 transferability cases.

A case of replicability of the CARDIMED project in Murcia has been developed, with the participation of Murcia City Council, Aguas de Murcia and AQUATEC. They have studied the viability of SUDS in the Zaraiche garden. The area is a point of periodic flooding, as there is a rapid accumulation of rainwater. The objective is the adaptation and mitigation of the effects of flooding, derived from climate change, focusing on the channeling and collection of water from the Espinardo Stream.

Regarding the environmental aspect, they want to enhance the green space and make Murcia cooler, allowing the reduction of head island risk. The actions are intended to use the water collected for the irrigation of green areas and the supply of the city's network of irrigation ditches. In conclusion, the project will reduce the risk of flooding, increase



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the amount of water available to promote green areas and replace irrigation water consumption (1 hm³/year).





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Water efficiency

What was discussed?

This section of the event addressed the critical role of water efficiency in municipal water management, emphasizing its importance especially in regions facing water scarcity and increasing demand. The discussions highlighted strategies for reducing water losses, optimizing water use, and integrating technology to improve infrastructure performance.

Murcia was presented as a leading example, showcasing the comprehensive approach of Aguas de Murcia to water efficiency. The city operates an extensive monitoring system with real-time control of over 500 data points and 43,000 signals, ensuring continuous oversight of water supply and wastewater systems. Strategies such as dynamic sectorization (dividing distribution areas into smaller sectors) enable precise identification and management of leaks, significantly reducing water losses. These efforts have helped Murcia achieve efficiency levels above the national average, although continued investment in infrastructure renewal and digital tools remains essential.

Aguas de Alicante shared its experience with diversifying water sources, combining desalination, groundwater, and surface water to mitigate the impacts of irregular rainfall and growing demand, particularly during peak tourism seasons. Advanced asset management systems and smart metering have further enhanced water efficiency, with 90% of consumption points monitored in real time. The city's innovative approaches, including rainwater harvesting and the use of reclaimed water for green spaces, have reduced water supply requirements despite a growing population.

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NSVA in Helsingborg provided another innovative example, demonstrating the importance of integrating fieldwork, technology, and customer engagement in water efficiency efforts. Their use of pressure-reducing valves in pilot areas reduced leaks by 15%, showcasing the potential of small-scale solutions to generate impactful results. NSVA's initiative also highlighted the role of customer cooperation, addressing private service pipe leaks through direct communication and support. Their target of reducing the Infrastructure Leakage Index (ILI) to 2 by 2028 exemplifies a structured, goal-driven approach.

The discussions also highlighted the barriers municipalities face, such as the cost of advanced technologies and the need for skilled personnel. However, the benefits of these investments make them essential for forward-looking municipal strategies.





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Best practices presented

Harnessing technology: smart water management for a sustainable Murcia

Presented by:

Cristina Verdú Sandoval, Industrial Technical Engineer and Chemical Engineer. Head of the Water Networks Department at Aguas de Murcia

Implemented in the framework of the project: -

Year: -Ongoing

More info: - <https://www.emuasa.es/digitalizacion>



DESCRIPTION:

The municipality of Murcia spans 890 km² and experiences an average annual rainfall of 301 L/m², which is both limited and highly variable. Its unique and complex topography with irrigation networks make pumping necessary. Murcia has two networks: a supply system and a sewage system. For efficient water management, the city of Murcia has two system control centers located in two buildings, operating 24 hours a day, 365 days a year. In total, there are 548 control points and 43.711 real-time control signals.

The management of real losses is based on digitalization, control and data analysis, where improvements have been observed thanks to active management in installation, maintenance and renewal, the speed and quality of repairs, pressure supply management and dynamic sectorization. At a low cost, dynamic sectorization allows for the calculation and control of minimum night flows in small sectors without altering normal distribution conditions.

The strategies used to control water losses have achieved efficiency levels higher than the Spanish average. However, further work is needed to improve and invest in the renewal of networks and infrastructure. In 2024, the analysis of Non-Reused Water (NRW) and water efficiency obtained the following data on Key Performance Indicators (KPIs): 6,11 m³/km/d of Non-Registered Water (NRW), an RTH of 84,40% and an Infrastructure Leakage Index (ILI) of 1,72%. The leak detection efficiency was 61,3%. Moreover, the use of digitalization tools (SCADA, telereading) and digitalization at customer points is crucial as it allows for real-time readings of meters and demand, enabling the identification of anomalies in consumption due to possible leaks or over consumptions, as well as water efficiency KPIS. In conclusion, water efficiency is a major challenge, requiring human and technical resources, investments and the use of digitalization.





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Climate change and water resilience: “The case of Alicante”

Presented by:

Ignacio Casals, physicist and head of the I+D+i Department at Aguas de Alicante

Implemented in the framework of the project: -

Year: Ongoing

More info: <https://www.aguasdealicante.es/>



DESCRIPTION:

Alicante has a semi-arid Mediterranean climate and extremely irregular rainfall, with a 200-300mm of annual rainfall. The municipality's water resilience strategy is based on diversification of conventional water origins, a combined approach for water efficiency, and the search for alternative water sources. It has diverse water sources, which mainly come from desalination (52%), followed by groundwater (25%) and surface water (23%). To achieve water efficiency, Aguas de Alicante is focused on asset management, smart metering and demand management, among other key elements such as active leak control, pressure management and network sectorization. The combination of conventional and alternative water sources is a key to ensure water supply in long term.

Prevention and detection of leaks is essential. To achieve this, asset management is done intelligently, using decision support systems to select the networks that need renovation. It has been observed that more recent networks have a higher level of water efficiency. In addition, 90% of consumption points are metered through smart meters. Regarding municipal water demand, forecasting is carried out using the PALACE software, based on a hybrid model of time series and external factors. The NAIAD project has established a dashboard to provide information on consumption ratios, trends, alarms and corrective actions. However, it is necessary to reinforce the resources for controlling the 600 consumption points in the municipality.

Regenerated water for urban uses has proven to be an optimal alternative as a water resource in Alicante. The cost of investments in assets is covered with the drinking water rate. Irrigation water for 83% of green areas comes from recycled water. Thanks to reused water, green areas per inhabitant have increased threefold since 2003, from 3.5 m² per capita to 10 m² per capita in 2020. However, there are some barriers that hinder the increase in the potential of reused water:





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- Seasonal decoupling between supply and demand
- No rivers: Cost of storage and transportation
- High conductivity levels (especially in coastal areas)
- Energy cost of desalination and pumping

Another alternative resource hydric is the rainwater. Rainwater retention and storage tanks have been built in the La Marjal flood park, with a storage capacity of 45,000m³, and a retention reservoir that can store a volume of 60,000m³.

As a result of the evolution of the drinking water supply, the population has increased from 310,000 inhabitants in 2004 to 350,000 inhabitants in 2024, and the volume of drinking water supplied has decreased by 20% (from 31hm³ to 25hm³).

In the coming years, several strategies will be developed: The Integral Digitalization Plan, with a budget of 6.2 million euros, and the Zero Discharge and Circular Water project for Alicante, which aims to reuse 100% of treated wastewater.





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NSVA´s initiative for reduce water losses

Presented by:

Victor Pelin, expert on distribution of freshwater in NSVA (Nordvästra Skånes Water and Sewerage)

Implemented in the framework of the project: -

Year: Ongoing

More info: - <https://www.nsva.se/>



DESCRIPTION:

NSVA is a water distribution and sewage company owned by 8 municipalities in the northwestern part of Skåne, one of them is Helsingborg. Its pipe network has a length of 2,600 kilometers, half of which is plastic. The oldest parts of the pipe system are from the 1880s. They have water losses of 65 liters per person per day, and an Infrastructure Leakage Index value of 3. Their main objective is to avoid losses and reach an ILI of 2 by 2028. To achieve this, they have established an Action Plan with 4 components: field work, technology, planning and customers.

They have 2 technicians to find leaks through the use of microphones along the streets where they listen to the valves. With this methodology, they have found 100 leaks this year. Along with this field staff, they have an engineer for planning and checking the condition of the pipes through leak detection tools.

Technology is very important for leak control. They are developing a project in Kattarp, where they have installed pressure reducing valves. They are able to control the pressure and its effect on the water balance. They have achieved a pressure reduction from 5 to 4 bar and a 15% reduction in leaks. The work in Kattarp stands as a model for the work that will be carried out in the central parts of Helsingborg, where they expect the potential reduction of 200,000m³/year just by reducing the pressure. It has been observed that traditional leak detections methods don't work well for plastic pipes. Instead, they use fibre optic cables inside the drinking water pipe. These cables can sense vibrations, which are interpreted as leaks.

Now, and together with a Spanish company they develop a project and use a reinforced tool software to detect losses during the day and not only in the night flow.

Moreover, they systematically work with customers on their losses and leakages. 1/3 of leakage is expected to originate from private service pipes, so they have hired a manager to contact and deal with customers. This allows customers to be informed about their losses and they aim to connect more customers to the system.





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Water re-use

What was discussed?

The event continued discussing the critical role of water reuse in addressing water scarcity. The presentations emphasized the need for municipalities to adopt innovative approaches to treat and regenerate wastewater, thereby reducing reliance on freshwater sources.

Murcia exemplified this approach with its long-standing commitment to water reuse. The city's Murcia-East wastewater treatment plant reclaims 61% of its treated water for agricultural purposes, 32% for recreational uses, and 7% for urban applications. The Direct Reuse Plan, aimed at replacing potable water with reclaimed water for urban irrigation, includes the development of an experimental reverse osmosis plant and an expanded distribution network. These efforts showcase how municipalities can integrate advanced technology into their water cycles, promoting sustainability and reducing ecological pressures on natural water sources.

Another inspiring example was Helsingborg's RecoLab initiative, which combines innovative wastewater recovery systems with urban planning. Using a three-pipe system that separates blackwater, greywater, and organic kitchen waste, RecoLab extracts nutrients and produces energy-efficient biogas while recycling greywater into potable water. This system not only reduces greenhouse gas emissions but also serves as a replicable model for municipalities seeking to align urban development with circular water economy principles.

In Vilnius, the modernization of rainwater treatment systems further illustrated the potential for reuse in urban areas. By integrating digital technologies, such as digital twins and hydraulic modeling, Vilnius has improved system efficiency and water quality, enabling the reuse of treated rainwater in public spaces while reducing environmental impacts.

The session highlighted that adopting water reuse practices requires overcoming technical, economic, and social challenges. However, these investments yield substantial benefits, including greater water security, reduced environmental impact, and improved performance in Green City Accord indicators.





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Best practices presented

Recovery Laboratory (RecoLab) - Helsingborg

Presented by:

Amanda Haux, business developer at RecoLab in NSVA and Helen Wiklund, sustainable development strategist at the city of Helsingborg and 2030 Agenda and Green City Accord local coordinator

Implemented in the framework of the project: -

Year: Ongoing

More info:

<https://www.recolab.se/>

Amanda.haux@nsva.se

Source Separated Sanitation Summit 2025

info@recolab.se



DESCRIPTION:

Recovery lab is a cooperation between the energy company Öresundskraft, the waste management company NSR, the water and sewerage company NSVA and the city of Helsingborg, for the recovery of wastewater and its conversion into drinking water. The city is transforming the ocean harbour area into a central urban district with housing and offices, to be completed in 2030 and where RecoLab is located.

It has a system of separation and recovery of nutrients from the wastewater in 3 pipes, called 3 pipes out. One for blackwater from toilets, one for food waste grinder in the kitchens and one for grey water from washing and showering. The system is based on the same principles as in the waste separation processes. The business consists of three departments, an operation facility, a test bed for investigation and meeting and exhibition hall.

Recolab's wastewater treatment applied in the new district achieves:

- Nutrition: it recycles three times more phosphorus and seven times more nitrogen than conventional treatment.
- Clean water
- Recycling grey water into drinking water that can be returned to the city
- Production of 60-70% biogas per person and year, through a concentrated and separated flow of sewage and food waste.
- The system reduces the emissions of climate-affecting gases, nitrous oxide and carbon dioxide, and achieves energy efficient purification..

In June 2025, a conference will take place in Helsingborg, with a networking evening at the RecoLab testbed, interesting study visits and speakers from Europe.



Rain water treatment solutions in Vilnius

Presented by:

Anželika Jurkienė, water engineer and head of Digitalization Team of Vilnius Municipal company Grinda

Implemented in the framework of the project:

European Union structural funds project

Year:

More info: a.jurkiene@grinda.lt



DESCRIPCIÓN:

GRINDA is the company responsible of city service in Vilnius. The main areas of business activities are the maintenance and development of rain water treatment system, maintenance and repair of the Vilnius City streets and public places. Vilnius has 51 rain water treatment plants and 4 pumping stations, with a stormwater network length of 2183 km. Vilnius city has separated rain water network, where rain water is treated separately from sewer. This rain water is discharged after treatment into open water bodies, where water quality is ensured by sample testing and constant quality monitoring.

The rain water treatment system has been under renovation since 2016. A rainwater treatment system has been developed by installing water networks and treatment plants in multiple areas of the Vilnius city. The system is aimed at ensuring the efficiency of water engineering with the use of digitalization technologies, and the benefit to citizens. Therefore, automated monitoring systems for rain water pollution and a recreation area have been installed, with the aim of achieving integration into the city infrastructure.

- Rain water network and treatment plant in Ozo Street, with a catchment area of 897,8 ha and a storage capacity of 20,000m³ of water during heavy rainfall events. The project has a duration of 18 months and an investment of 18 million euros.
- Reconstruction of rainwater network in Narbuto-Saltoniškės streets. The water catchment area is 93.3 ha and 1,2 km long Rain Water network 1500 mm laid by closed microtunnelling technology. The project has a duration of 12 months and an investment of EUR 5 million.

The use of digital technologies is key to ensure the efficiency of the treatment system. Through LIDAR technology, 16,000 manholes were scanned. The 3D digital model and the digital twin have been created in the ArcGis utility network. The digital twin is a virtual representation of reality that creates dynamic models based on real data, which serves as a tool for strategic decision making.



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The hydraulic model of the stormwater network, built with Bentley Civil Storm software, is based on the data processed after the scanning of the network wells and allows to analysis the real parameters, simulate different scenarios, plan and optimization the system and prognosing of the critical situations of the network.





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The reuse of regenerated water in Murcia

Presented by:

Pablo Cascales, chemical engineer and responsible for Groundwater Captations at Aguas de Murcia.

Implemented in the framework of the project: -

Year: -

More info: <https://www.emuasa.es/reutilizacion>



DESCRIPTION:

In 1989, Aguas de Murcia was established as a mixed company between the Murcia City Council and HIDROGEA to ensure effective management of the integrated water cycle, providing service to 462,979 residents in 890km². The challenges to achieve water reuse include economic, social, legislative, environmental and technological aspects.

In the municipality of Murcia, the Murcia-East WWTP receives 38,955,00m³/year and its objective are the preservation of the ecological flow of the Segura River. 61% of the water reused is for agricultural use, 32% is for recreational uses, while 7% is for urban uses.

A Direct Reuse Plan has been developed to achieve the use of 4hm³ of reclaimed water from the Murcia-East WWTP to irrigate municipal gardens and avoid irrigation with tap water, as is currently the case. The Plan includes the construction of an experimental plant based on a reverse osmosis plant, which receives 150,00m³ of water per year, and the extension of the urban irrigation network to supply reused water to the coastal areas in the north and south of the municipality.





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Water Consumption Campaigns

What was discussed?

The last session explored the critical role of public awareness and behavioural change in promoting sustainable water use. Discussions emphasized the importance of well-designed communication campaigns to engage citizens, foster responsible consumption habits, and build trust in municipal water systems.

Vilnius presented an innovative campaign, “Vital Water for a Vital City,” which combined education, community engagement, and creative marketing to promote the use of tap water. The initiative included installing fixed and mobile water stations across the city and hosting live events to encourage interaction and awareness. These efforts have resulted in millions of litres of water consumed directly from public water stations, reducing reliance on bottled water and associated plastic waste. The campaign demonstrated that creative and community-focused approaches can effectively shift public perceptions and behaviours around water use.

Murcia shared its experience with educational campaigns aimed at addressing the city’s unique challenges of water scarcity and public skepticism about tap water quality. These campaigns used a variety of media, including videos and workshops, to dispel myths and showcase the benefits of drinking tap water. Moreover, by involving nearly 50 public organizations through the “Social Water Alliance,” Murcia has created a collaborative framework to address water management challenges, promote sustainable practices, and build public trust.

Arezzo participated in the discussion providing a reflection of how infrastructure investment, paired with public engagement, can significantly improve water management. The city faced high water losses and inefficiencies before embarking on a long-term program of system upgrades and public awareness campaigns. Over the past 25 years, substantial investments in infrastructure have reduced water losses to an Infrastructure Leakage Index (ILI) of approximately 20%, with a target of reaching 15% by 2025. Public campaigns have played a vital role in reinforcing these efforts, emphasizing the economic value of water and encouraging conservation behaviors. The link between water pricing and public understanding of water’s value has proven effective, as citizens directly associate improved services and reduced losses with their contributions through tariffs.

The session concluded that public awareness campaigns are vital for achieving sustainable water management. By fostering a culture of shared responsibility and integrating these campaigns into broader municipal strategies, cities can improve water efficiency, reduce waste, and enhance their Green City Accord indicators.





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Best practices presented

Water consumption and campaigns in Vilnius

Presented by:

Ernestas Mikulkis, Head of Strategy and Innovation at Vilnius Water

Implemented in the framework of the project:

Year:

More info:

<https://www.vv.lt/2024/09/25/vilniaus-vandenys-ikvepe-miesta-gyva-muzika-ir-vandens-kokteiliais/>

<https://open.spotify.com/user/31pincm3fudqry3r2rw6b2j2d7ii>



DESCRIPCIÓN:

Vilnius Vandens is the largest water management company in Lithuania, supplying drinking water and wastewater to 289,000 customers. In 2023, UAB Vilnius Vandens extracted 26% of all water abstracted in the country. The length of the water network pipelines is 1,811 km and is being extended every year. They have installed more than 142,000 meters with ultrasonic meter project to reduce water losses in apartment buildings, where intelligent data management and optimization of internal resources is carried out. Losses between the main meter and the flat meters are around 10%.

'Vital water for a vital city' is a campaign designed to raise awareness of the quality of water supplied in the city, promote tap water consumption and strengthen links between local communities. The aim is to demonstrate that water quality is good and to encourage citizens to contribute to and choose more sustainable, cleaner and healthier alternatives by reducing the use of plastic bottles. 48 fixed and mobile water stations have been set up, increasing their visibility in the city and reflecting their commitment to sustainability. They have organised live music events and interactive experiences at water stops, water trucks and mobile tankers. Thanks to the campaign, residents and visitors in Vilnius drank 4.2 million glasses of water from the water stations in the warm season.





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Moreover, they have opened a Spotify channel, contributing to the online community radio “Radio Vilnius”. The partnership is designed to increase the interacion between the city’s inhabitants and the Vilniaus Vandenyys brand.



Good practices in the use of drinking water in Murcia

Presented by:

Pilar Megía Rico, Head of Sustainable Development and CSR at Aguas de Murcia

Implemented in the framework of the project:

Year:

More info:

https://www.youtube.com/watch?v=dPb0qT_KR-I



DESCRIPTION:

Rainfall in the municipality of Murcia is scarce and irregular, with average yearly rainfall in the Segura basin being among the lowest in Spain (301 l/m²). The three sources of fresh water supply are the 400km Tajo-Segura water transfer (20%), desalinated water (50%) and the Segura river basin (30%). This water scarcity leads to the need for a change in the behavior of citizens.

Therefore, Aguas de Murcia have implemented awareness campaigns and educational programmes to raise awareness of the importance of drinking tap water. Many of them via YouTube videos, such as:

- 1 litre is not the same than 1 litre:
<https://www.youtube.com/watch?v=cX6FAJs-WMw>
- Sounds like an excuse: <https://www.youtube.com/watch?v=xyd-Z98L1ys>
- Debunking the hoax about how bad tap water is:
<https://www.youtube.com/watch?v=hckqQgQxvA0>
- Tap Water Citizen Listening Workshop:
<https://www.youtube.com/watch?v=chHU2cgAXTU>
- Water World Day: <https://www.youtube.com/watch?v=-Thgn3w9kyQ>

Moreover, Aguas de Murcia has strengthened their commitment with the “Manifesto of the Social Water Alliance”, signed by nearly 50 organizations to implement workshops, agreements and strategies related to the city's Sustainable Development, employment, solidarity and citizen awareness.

The basis of Aguas de Murcia's management is the dialogue, collaboration and co-governance with stakeholders, providing a personalized response and anticipating future needs, in order to meet Murcia's environmental and social challenges. The company also organizes visits to the facilities to raise awareness.



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Conclusions



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4. Conclusions

The discussions during the Water Green Innovation Camp highlighted the pivotal role that municipalities play in addressing water-related challenges and advancing the commitments of the Green City Accord. By adopting innovative solutions and fostering collaboration, cities can significantly improve water efficiency, restore aquatic ecosystems, and engage their citizens in sustainable practices.

The examples presented during the event demonstrated how technical advancements, such as dynamic sectorization, sustainable urban drainage systems, and wastewater reuse, can lead to measurable improvements in water management. Projects in Murcia, Alicante, Helsingborg, and Vilnius showcased the importance of integrating green infrastructure, digital technologies, and nature-based solutions to tackle issues like flooding, water scarcity, and pollution. These initiatives not only contribute to environmental resilience but also create opportunities for recreation, urban cooling, and enhanced biodiversity.

Public awareness campaigns were another recurring theme, illustrating the necessity of citizen engagement to achieve long-term sustainability. Cities like Murcia, Vilnius, and Arezzo have demonstrated how targeted communication efforts can foster behavioral changes, build trust in municipal water systems, and promote the value of water as a shared resource.

The importance of collaboration between municipal departments, local stakeholders, and international partners was also repeated in multiple occasions during the event. The exchange of knowledge and experiences enables cities to replicate successful practices and adapt them to their unique contexts, accelerating progress toward shared environmental goals.

As municipalities continue to face mounting challenges due to climate change and urbanization, the practices and strategies discussed at the Water Green Innovation Camp provide a roadmap for action. By investing in innovative water management solutions and fostering community involvement, cities can enhance their environmental performance, improve their Green City Accord indicators, and set an example for sustainable urban governance across Europe.

