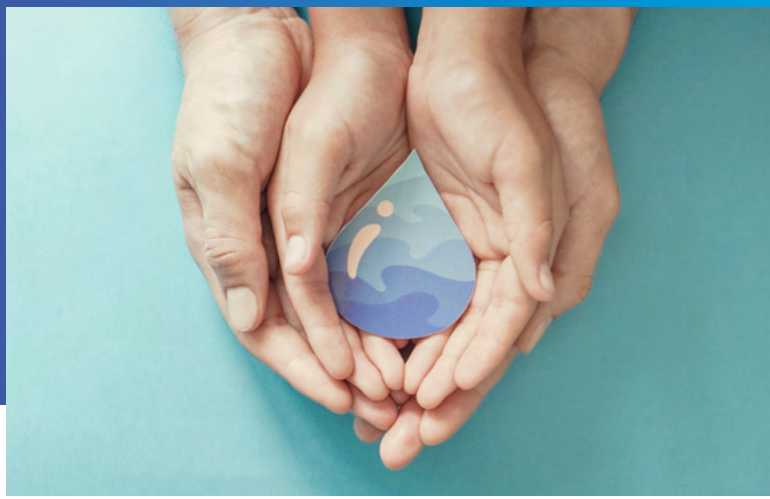
Issue 1 | b-watersmart.eu

B-WaterSmart magazine

Enabling water-smart European societies and economies

Content

What is the aim of the project?



The water sector in coastal areas is facing a couple of challenges such as water scarcity and increasing water demands due to economic and population growth. This can lead to overexploitation of resources, quality deterioration and regional imbalances in the availability of water resources. To tackle these challenges, the European research project **building a water-smart society and economy**, short B-WaterSmart, develops and demonstrates smart technologies and circular economy approaches.

In order to implement those solutions more strongly in the practice of the water sector, technical and digital solutions as well as new business models are jointly developed by the project partners. The aim is to accelerate the transformation to water-smart economies and societies in coastal Europe and beyond by **reducing the use of freshwater resources,** improving the **recovery and reuse of resources**, and **increase water use efficiency**.

"This project has a lighthouse character. We consider the water cycle to be a holistic system of nature, technology and society. In cooperation with various interest groups, innovative solutions are co-developed and tested at six sites, called Living Labs, spread across Europe. These are intended to support water companies and municipalities in making their water systems and services sustainable, water-smart and more resilient to climate change," explains project coordinator David Schwesig.

The research therefore is based on specific problems in six European coastal cities and regions that have great ambitions to tackle their challenges and opportunities by implementing water-smart technology and management solutions. Water companies from Alicante in Spain, Bodø in Norway, Flanders in Belgium, Lisbon in Portugal, East Frisia in Germany and Venice in Italy develop and demonstrate solutions as Living Labs, together with research partners and local technology providers.

The project

Enables systemic innovation through Communities of Practice and Living Labs

Creates water-smart coastal regions

Exploits the potential of smart resource allocation

Fosters resource recovery, circular economy, and ecosystem regeneration

Facilitates a water-smart culture

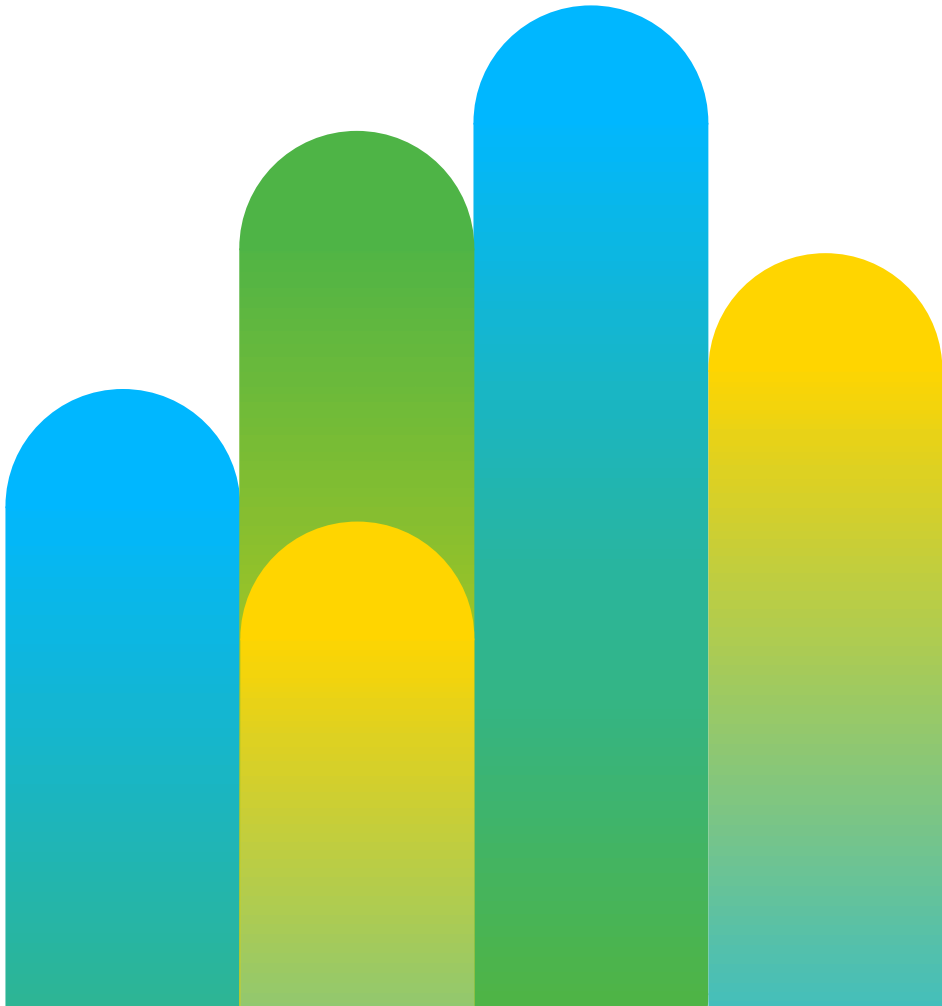
Demonstrates the gain in water-smartness as a novel and holistic concept

Stimulates new business opportunities

Boosts EU and international accessibility and replication, exchange and uptake of innovations

The B-WaterSmart Living Labs

The research in B-WaterSmart is based on six Living Labs in Spain (Alicante), Norway (Bodø), Germany (East Frisia), Belgium (Flanders), Portugal (Lisbon) and Italy (Venice). Each of the Living Labs (LL) has its own specific conditions and problems. The Living Lab owners answered some questions about their participation in the project.



Ignacio Casals | Alicante

What was your motivation to join the B-WaterSmart project as a Living Lab?

The Living Lab approach proposed by B-Watersmart completely matched our objectives for the future of the water cycle in Alicante. The project gave us the chance to accelerate the validation and implementation of new technologies in our processes, exploring new chances for circularity in our region with the participation of local stakeholders. It will also provide us with tools to assess and improve our future strategy in terms of efficiency and sustainability, according to the project's concept of water-smartness. We also knew that we shared many of the concerns and goals of the other Living Labs in the project, and we felt that there was a big potential for collaboration there.

What are the specific challenges you are facing in your country/region?

Alicante is a semi-arid area, one of the driest in Europe, with only 200-300mm of annual rainfall. There are no local water resources. Sea water desalination can guarantee the drinking water supply, but it is not a sustainable source for agriculture irrigation. For these reasons, water reuse is a critical need for the region, and it has actually been in place for more than a decade, both for agriculture and for non-potable urban uses. Nevertheless, even though it initially grew at a fast pace, the use of recycled water has found several barriers that hinder its progress; currently, roughly 40% of treated water is reused, but we aim at reaching 100% of reuse. These barriers are both technical and governance, and thus require an integrated approach. The environmental impact of waste water treatment is an added challenge. We want to reduce the environmental footprint of the waste water treatment process to the minimum, going further than the current European requirements in this respect. The Mediterranean is a fragile ecosystem that must be carefully preserved in order to ensure its optimal environmental condition. In order to achieve this, we need to implement technologies that will allow us to cut waste generation and energy consumption, by creating added value products from waste, and improving the plant capacity to generate its own power, turning it into a self-sufficient facility.

What are your goals inside the project?

We want to set the basis to reach our circularity goals, with a special focus on water reuse. Furthermore, as I already mentioned, we want to reduce the footprint of the waste water treatment process. The project will allow us to review our strategy in terms of water-smartness, involving the relevant stakeholders, identifying

Mr. Ignacio Casals
R&D Manager, Aguas de Alicante, Spain

new opportunities and testing the innovative technologies that will make us progress in this journey. I do not want to fail to mention the importance of the exchange of different experiences between the Living Labs during the project. I strongly believe that we have a lot to learn from each other, we are already doing so. So, the contact of diverse contexts, challenges and strategies will surely be one of the most valuable outcomes of B-WaterSmart.

How does your ideal water-smart future looks like?

It is a future in which the urban water cycle has a clearly positive impact on the society and the environment. We already left behind the time in which we just cared to fulfil the regulations, and now we also move ahead from the goal of just reducing our footprint to a point in which we reach the full potential of circularity, renewing the resources and positively protecting the environment. It is also a future in which water plays a key role to make more liveable cities, and cities are sustainably integrated in their territories. And finally, a time in which we are able to communicate all of this to the society.

Silje Ulriksen Lyngstad | Bodø

What was your motivation to join the B-WaterSmart project as a Living Lab?

Bodø was in the beginning of a large urban development project due to a military base moving their operations away from Bodø and therefore freeing space for developing the city in a compact way. The project, which includes moving the airport, has high environmental ambitions. Bodø was already collaborating with NTNU (Norwegian University of Science and Technology) on water related issues and the B-WaterSmart project was a great opportunity to get both national and international expertise and input on our water-related innovation processes.

What are the specific challenges you are facing in your country/region?

Several places in the country are experiencing results of climate change with heavier rain in shorter amounts of time, which in cities typically is causing capacity problems in the pipelines because the infrastructure is unable to handle the amounts of water. Another issue is that a lot of the water and wastewater infrastructure is aged, and there is a lot of inefficiency due to water leakage. 50% of the produced drinking water is lost on the way from the water plant to the end consumer. The infiltration of water from unknown sources into the wastewater system is also an issue because it increases the amount of wastewater that runs through the sewage treatment plants.

What are your goals inside the project?

Our two main objectives are to become a low-emission society and a sustainable city, and develop the city's resilience to climate change. Inside the project that includes goals like developing sustainable cost-efficient water supply systems and find a way to use our relatively small amounts of sewage as a cost-efficient source of energy.

How does your ideal water-smart future looks like?

Besides ensuring clean water for all, Bodø emphasises on the environmental perspective of water-smartness. Not to use more resources (i.e energy) than necessary on for instance producing drinking water. To be sustainable in a way that minimizes the disturbance to the natural cycle of water. Not to take more water out of the cycle than we need and to manage wastewater in an environmentally friendly way. Also using natural, resilient open systems for handling surface water, not just leading water away in bigger and bigger pipes.

Silje Ulriksen Lyngstad
Urban planner for the municipality of Bodø

Julia Oberdörffer | East Frisia

What was your motivation to join the B-WaterSmart project as a Living Lab?

The Living Lab East Frisia faces significant challenges with regard to drinking water supply. The B-WaterSmart research project offers the opportunity to work on important issues together with international research and practice partners. Thus, a great potential of creativity, new research approaches and experience is brought into the region. Together with the local and regional stakeholders, new solutions will be developed and important impulses for the future of the region will be generated.

What are the specific challenges you are facing in your country/region?

With an area of 7,860 km², the Oldenburg East Frisian Waterboard (OOWV) is the largest water supplier in Germany in terms of area and supplying drinking water from groundwater sources to private, industrial and agricultural customers (and treating wastewater in ~50% of the area).

Within the OOWV supply area, water demand has been steadily increasing in the past in various sectors. Future demand scenarios assume that this trend will continue. Limited water abstraction capacities and increasing hot and dry summer periods due to climate change are shifting the focus towards alternative water supply concepts.

What are your goals inside the project?

Together with our Living Lab partners Deutsches Milch Kontor (DMK), EnviroChemie and IWW, we will develop and operate a pilot plant for water reuse. In particular, water extracted from milk during certain processing operations (cow water) is treated to reach drinking water quality. The aim is to make alternative water resources usable as an equivalent to drinking water. In addition, we will develop and test digital applications for modeling and assessing water cycles. Based on a spatial multi-criteria GIS approach, short- to medium-term water demands of individual consumer groups will be identified and compared with regionally available water resources. Furthermore, with the installation of smart meters in the pipeline network, flow measurements will be installed for selected areas. Thereby, we can establish short-term forecasting models for peak water demand. These tools will be used to identify sustainable new water management options and provide a basis for operational and strategic decision support.

Julia Oberdörffer
Asset Management and Strategic Planning,
OOWV, Germany

How does your ideal water-smart future looks like?

In a water-smart future, enough water will be available for everyone in good quality and desired quantity, despite climate change. This can be achieved by all stakeholders and user groups working together on solutions and strategies to protect water as a resource. In the future all available water resources will be used. Next to groundwater reserves this also includes the use of alternative sources such as brackish water, rainwater, clear water from wastewater treatment plants, process water, and industrial wastewater. Thereby, an integrated water management system will be established. The methods and instruments developed in B-WaterSmart, as well as the technical knowledge gained in the field of water reuse technologies, provide an important stepping stone for this transformation.

Han Vervaeren and Joris De Nies | Flanders

What was your motivation to join the B-WaterSmart project as a Living Lab?

In Flanders, we live in a strongly urbanized and densely populated area with a high living standard and an active industry and agricultural sector. This means that we need to be continuously creative to make sure co-existence is possible without impacting the system and its inhabitants, in a very broad sense. Related to water and the area of the Living Lab, the challenges are multi-fold since a lot of stakeholders are competing for the same resource. Water for all should be the moto, meaning that both quantity and quality are suited for the purpose. Agriculture, industry, ecology and civilians occupying the municipalities all are entitled for their share.

What are the specific challenges you are facing in your country/region?

The region we focus on is very limited for groundwater resources for drinking water. That makes us dependent upon river systems, which are intensively used in many ways. This creates challenges towards the quality of the water we can address by improving the performance of our drinking water installations. Especially in summer times, the quality risk is high. On the other hand, we could also look for alternative water resources besides river water to contribute to the drinking water supply. Another challenge we face in the region is the fact that we have a lot of soil sealing due to urbanization. Rainwater will not infiltrate in the soil but will be directed to the sewer systems, not contributing to the local water need, while being valuable. Moreover, in case of winter storm events the decision to direct water to sewer systems potentially creates risk for flooding and mayhem, since a lot of water needs to be discharged in a short timeframe. Finally, climate change with increasing extremities of drought and rainfall, depending on the season, just reinforces the already existing challenges.

What are your goals inside the project?

As a drinking water company, De Watergroep wants to address the water quality and quantity issue to provide drinking water at all times and of excellent quality. Improving the existing drinking water installations of De Blankaart with a highly efficient purification system (reverse

Han Vervaeren
Programme manager optimal drinking water, De Watergroep, Belgium

Joris De Nies
Researcher water & soil, research station for vegetable production, Belgium

osmosis) allows us to remove salts from the water. Fact is that high salt concentrations are the dominant factor that hampers the use of river water in the summer as a drinking water source. A second solution De Watergroep aims for is using alternatives for the river water, like wastewater effluent. Therefore, we closely cooperate with Aquafin, the local wastewater treatment utility, to test what options we have to produce clean and safe drinking water from it. Another challenge the Living Lab tackles is related to the storm water run-off. Instead of discharging it towards ditches, we try to create a win-win situation by buffering stormwater run-off. By allowing the water to sub-infiltrate into agricultural fields, we restore groundwater levels that are too low and avoid flooding risks. The innovation is in the smart control of the buffer basin and the sub-infiltration toward the fields. To realize this, the Research Station for Vegetable Production, Aquafin, and the city of Mechelen closely collaborate. Finally, to better understand the impact of water flows in our Living Lab and to help us realize these solutions, local as well as regional water models are developed by VITO and KWR.

How does your ideal water-smart future looks like?

That is a tough question to specify, but an easy to answer. The ideal water-smart future is one where the water is optimally provided to all stakeholders involved, both humans with their activities and nature as the main supplier and acceptor. Moreover, this future needs flexibility to adapt to challenges as climate change and who knows what comes next, thus making it a robust and resilient system. Therefore, innovation and creativity will be part of the solution and cooperation will be necessary with our companions throughout the journey towards this ideal situation. But personally, I don't believe that technical solutions alone will do the trick. Although I am not a social scientist, I believe we need to adjust and innovate as a society as well. To reinvent ourselves and question our current economic growth model might create the paradigm shift we need to become part of a truly sustainable water smart future.

Sofia Cordeiro | Lisbon

What was your motivation to join the B-WaterSmart project as a Living Lab?

For more than a decade, Lisbon has implemented a climate change mitigation and adaptation strategy, establishing ambitious targets aligned with international commitments. Central to the adaptation strategy, the consolidation of the city's green infrastructure organised in 9 green corridors has represented a 15% increase in green areas since 2008. This green growth is essential for Lisbon's adaptation to climate change and to improve quality of life in the city, but it cannot put additional pressure on drinking water strategic reserves. For that reason, Lisbon has been implementing strategies for water efficiency and water reuse in its policy instruments as a means for the overall objective of improving quality of life in the city, whilst sustaining a growing population and economy. B-WaterSmart presented an opportunity to share our experience, learn and engage with others, and improve our actions.

What are the specific challenges you are facing in your country/region?

Lisbon is a growing city in which water demand is expected to grow, both in terms of population and economy. And Portugal is very much affected by water scarcity, with most of the country affected by drought every year, in large parts reaching severe to extreme drought. We will always need to use water for human existence, so efficiency and circularity are key to allow for sustainable growth. Reclaimed water is a sustainable water source, largely independent of climate uncertainty, because regardless of climate change and droughts, human consumption will always be prioritised and wastewater will be available as a result. Therefore, it can contribute to reduce pressure on strategic drinking water resources and tackle the frequent droughts in Portugal. Water reuse has been hindered so far by regulatory issues, which derive from lack of clarity in existing regulation and legislation and lack of local urban reuse projects in conditions where risk mitigation is more challenging, since Lisbon is the first national permit applicant for unrestricted urban irrigation, in the vicinity of housing and other facilities, such as schools and playgrounds. In addition to the great potential for municipal water reuse in Lisbon, it is expected that the investment in the reclaimed water distribution network will also contribute to reduce the consumption of fresh- and groundwater by other users. These include transportation services (for vehicle washing), large retail facilities and sport clubs, for irrigation/washing, and also for heating/cooling systems or other industrial uses.

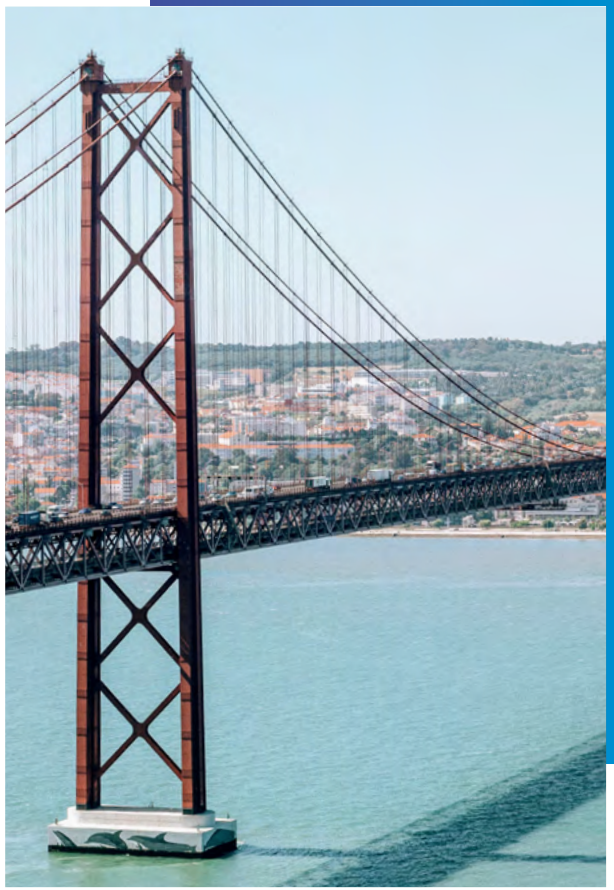
Sofia Cordeiro
Biologist, Advisor to the Deputy Mayor for Environment, Lisbon Municipality

What are your goals inside the project?

Between 2014 and 2018, Lisbon Municipality achieved 50% water savings, reducing the total municipal consumption from 8,2 to 4,2 million m3 per year, 75% of which (around 3 million m3) spent in non-potable uses. These water savings were accomplished mainly with faster detection and repair of leaks, refurbishment of fountains and artificial lakes, conversion of traditional irrigation systems to weather forecast informed systems, and also with the support of digital data do identify the opportunities of water efficiency. Within B-WaterSmart, we are consolidating our approach to pursue a more holistic view of urban water use, in which Lisbon Municipality is not only continuing the water efficiency strategy (namely in building standards and certification), but also with a strategy to replace fresh or groundwater with reclaimed water, when appropriate. Together, these approaches will reduce the pressure on the strategic reserve for the city (Castelo de Bode reservoir, 150 km away from the city) and on the use of sensitive groundwater reserves within the city. The contribution of B-WaterSmart will be to develop technologies and tools that support these strategies.

How does your ideal water-smart future looks like?

The water smart future is a future where water is used wisely but available for all the needs of growing urban populations and economies, on a basis of a fit-for-purpose use. It's also a future where society recognizes the value of water and emphasizes its environmental protection. It's a future of decentralized systems, increasing efficiency and circularity, while creating new business opportunities and value from water.



Patrizia Ragazzo | Venice

What was your motivation to join the B-WaterSmart project as a Living Lab?

The main motivation has been the opportunity to be part of a European community to face together common challenges associated with water scarcity and territorial imbalances in the availability of resources. Even though Circular Economy (CE) is a wide accredited concept, the reality is that we still have to face several barriers for pursuing the resource valorization and closure of cycles, especially in the water sector. Therefore, the opportunity of opening the vision and building alliances in the EU is fundamental for realizing synergies and a more stable change in every field! In our case, the B-WaterSmart project gave us the opportunity for addressing certain issues related to wastewater process management, that in fact have so far somehow prevented or slowed the pursuit of resource enhancement goals, be it effluents from wastewater treatments plants (WWTP) or other potential resources associated (nutrient and sludge).

What are the specific challenges you are facing in your country/region?

The challenge is to create the conditions for exploiting an important reuse potential that is currently untapped. As with other situations, for us the limits and slowdown of the virtuous path towards resource recovery and circular economy are due not so much to the absence of suitable technologies but rather to the lack of a stable and shared knowledge on the state of the art of quality, opportunities and risks linked with the reuse itself. Therefore, in addition to the effort to identify innovative techniques for extracting value from water the real challenge is the importance to act in exact sequence on the priorities that prevent the transformation of the value into a usable and, where appropriate, saleable product: i.e. knowledge (on risks and opportunities), and a participatory governance model (all stakeholders of the supply chain included). We believe that if the change is based on this, it will be possible to overcome the regulatory ambiguities and prejudices that result from it, which are barriers that most strongly hinder the closure of EC cycles.

What are your goals inside the project?

With B-WaterSmart we took several opportunities and have several goals. One is the contribution to complete the reuse goals envisaged (but not still reached) by another important funded regional project (the Integrated Fusina Project PIF) which,

Patrizia Ragazzo
LL owner from Veritas, Italy

alongside other important reclamation goals for an industrial area, provides for the reuse of the effluent of the municipal treatment plant (WWTP) Fusina for "non-drinking" purposes. For this goal, we demonstrate the opportunity to address the effluent toward industrial reuse through the application of a specific pilot plant, whereas we build an IT platform to be used as a support for more extensive assessments/decisions of reuse opportunities. Another goal is to tackle the tough issue of the management of sludge produced by municipal WWTPs, still profoundly conditioned by a prejudicial vision that prevents its most natural enhancement: the physiological destination to the environment and to the soil. In this case, we build an IT platform to be used as decision support system in order to enable clarifying the state of the art of contexts and support regulators, producers, and end-users in individuating the most sustainable and suitable management (economically and environmentally) among the several potential pathways of sludge management. Last but not least, through the comparison of two different technologies of ammonium stripping, we try to recover nitrogen from wastewater processes which, in the absence of the "natural recovery" of sludge, is instead lost and not without environmental and economic impacts.

How does your ideal water-smart future looks like?

As a system in which water management is conceived as a sequence of interconnected processes that should be kept balanced in relation to the environment and humans. A system in which the rationalization of water management constitute the base of the decision-making processes that in turn are developing by considering and integrating all main referents of the water management chain. That will enable to create value and to adopt circular patterns of resources utilization and the bio-economy where there is the opportunity to do them. Of course, this entails innovative technologies and solutions, but also and especially scientific knowledge and awareness of the strategic players in the supply chain, who in turn can change the vision of society (through regulations and a correct dissemination of information). So, a water-smart society as we see it, has a governance which knows actual risks and makes decisions with knowledge and open vision, in a participatory functioning system that discourages disinformation and prejudice, often main levers on which barriers are built.

B-WaterSmart LIVING LABS

1 Alicante

Challenges
Water scarcity, limitations to water reuse due to high salinity/nitrates, limitations to water reuse due to low acceptance.

Innovation & Demonstration
Improve water-smartness in the municipality of Alicante by incrementing water reuse and boosting circular economy opportunities.

2 Bodø

Challenges
Growing resident population and economy, increased pollution, untapped efficiency potential.

Innovation & Demonstration
Zero emission urban development, improved management of the wastewater stream, improved air quality.

3 East Frisia

Challenges
Increasing water demand in supply area by growing sectors (households, industry, agriculture), limited groundwater resources, locally untapped water reuse potential.

Innovation & Demonstration
Increasing the carrying capacity of water supply: Identification of alternative resources, intelligent protection strategies for groundwater bodies and improved treatment of process water for reuse in milk production.

4 Flanders

Challenges
High drinking water demand due to dense population, high water demand for agriculture, groundwater overexploitation, water quality deterioration, water scarcity due to droughts, climate change and urbanisation.

Innovation & Demonstration
Development of regional concept for improving and monitoring water-smartness and a more robust water system, with a focus on safe water reuse.

5 Lisbon

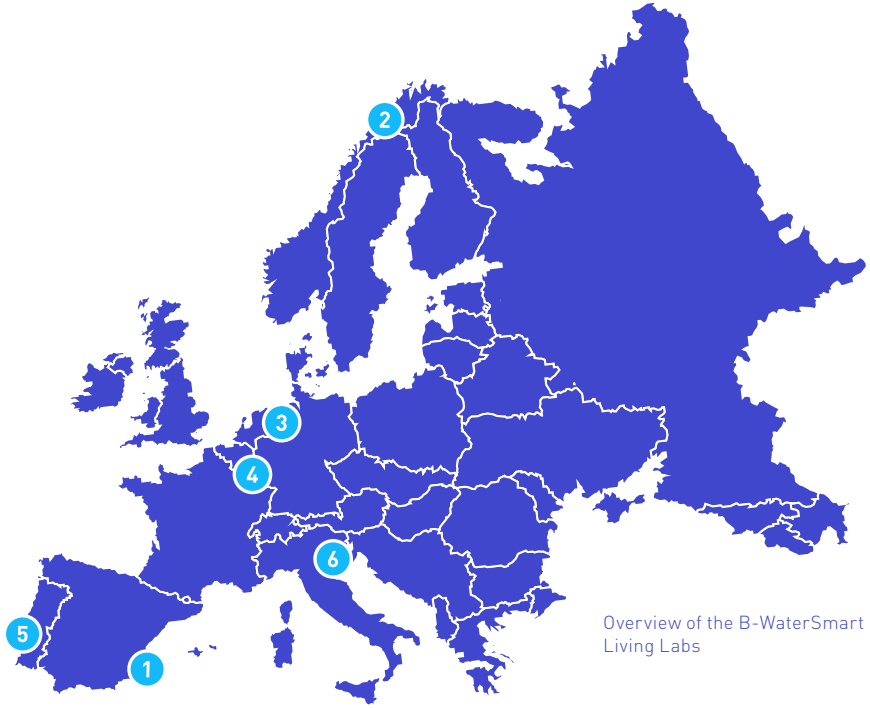
Challenges
Growing population and economy depend on distant freshwater resources with increasing climate challenges (e.g. droughts and floods). This demand must be balanced with the need to increase urban green areas to ensure the quality of life of citizens and the sustainability of urban life.

Innovation & Demonstration
Development of tools & processes to facilitate safe water reuse, improvment of water-energy-phosphorous efficiency in municipal non-potable water uses, improvement of households and buildings' climate readiness regarding water and energy with an assessment/certification tool developed locally but with an ambition for national/European adoption.

6 Venice

Challenges
Need for reuse and recovery schemes for wastewater & sludge, limitations to reuse and recovery due to low acceptance, water scarcity, untapped efficiency potential (water and resources valorisation).

Innovation & Demonstration
Enable and complete the water reuse (industrial, agricultural and urban) goal of a regional/national plan for lagoon protection, apply nutrient recovery technologies to waste water treatment plants (WWTPs) and develop shared evaluation model-tools for the sustainability of WWTP effluents and sludge valorisation.



Overview of the B-WaterSmart Living Labs

The overall vision of B-WaterSmart

Apart from the individual results at each Living Lab, B-WaterSmart will deliver a couple of overarching and transferable results to support the transition towards a more ‘water-smart society’.

To start with, we will make a substantial contribution to the definition and operationalisation of this very concept. For a couple of years, 'water-smart society' has been emerging on the agenda of the water sector and beyond, but a clear definition and criteria on how to measure the status or gain of water-smartness of society and economy are not yet available. B-WaterSmart has started to fill this gap by providing a clear **definition of this concept**:

Societies are water-smart when they generate societal well-being via sustainable management of water resources. In water-smart societies, well-informed citizens and actors across sectors engage in continuous co-learning and innovation to develop an efficient, effective, equitable and safe circular use of water and the related resources. This is achieved by adopting a long-term perspective to ensure water for all relevant uses, to safeguard ecosystems and their services to society, to boost value creation around water, while anticipating change towards resilient infrastructure.

The definition will be operationalised into the B-WaterSmart framework, which will support decision makers (European, national and local authorities) in their objective-oriented strategic planning process of realizing the vision of a water-smart society.

The B-WaterSmart framework therefore will be transformed into a dashboard with advanced visualization techniques and a gamified, immersive environment for users to interact with the framework. To train the end-users in a collective learning experience, we use an 'Innovation Alliance' approach of collaborative learning and testing, co-development of solutions, also as a means of capacity building of problem-owners.

Digital solutions and a smart use of data also play a crucial role in making a water-smart society and economy come true. As water systems are usually embedded into a broader urban or regional context and interconnected with other sectors (e.g., energy, transport, housing), exchangeability of data and interoperability of systems are key to fully exploit the potential of new digital tools. B-WaterSmart contributes to this objective by developing an interoperability approach building on FIWARE technology and its open specifications to increase acceptance and transferability of water-smart applications that are organised in two distinct toolkits:

- a water cycle modelling and assessment solutions toolkit
- a monitoring, negotiation and decision support toolkit

Circular Economy (CE) is one of the main building blocks of the European Green deal, but requires also new business models and sometimes mobilisation of additional funds. For each of our Living Labs, we will identify and test at least one new CE-based value chain and create an implementation roadmap and related business model.

Social Sciences and Humanities experts in B-WaterSmart will provide approaches and guidance for stakeholder involvement, the identification of drivers and barriers for the implementation of water-smart solutions, recommendations for improved governance models, and regulation & policy instruments that will be applicable beyond the specific conditions of our Living Labs.

The long-term legacy and impact of B-WaterSmart will be ensured through a web-based knowledge portal for information, training and a marketplace for water-smart CE solutions. We are developing a business model to have the portal operated and curated continuously by the European Sector organisation Water Europe beyond the lifetime of the B-WaterSmart project.

B-WaterSmart

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