AQUARES
Interreg Europe

European Union
European Regional
Development Fund

ACTION PLAN

Water reuse policies advancement for resource efficient European regions

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OOWV
Oldenburgisch-Ostfriesischer Wasserverband

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1 General Information

Project: AQUARES. Water reuse policies advancement for resource efficient European regions

Partner organisation: Waterboard of Oldenburg and Eastern Frisia (Oldenburgisch-Ostfriesischer Wasserverband, OOWV)

Other partner organisations involved:

1 Regional Government of Murcia, Ministry of Water, Agriculture, Livestock and Fisheries, Spain (Lead Partner)

2 Ministry of Environment and Energy, Special Secretariat for Water, Greece

3 Lódzkie Region, Poland

4 The Regional Development Agency of the Pardubice Region, Czech Republic

5 Energy and Water Agency, Malta

6 Lombardy Foundation for the Environment, Italy

8 Euro-mediterranean Water Institute Foundation (FIEA), Spain

9 Association "Baltic Coasts", Latvia

10 The Municipality of Trebnje, Slovenia

Country: Germany NUTS2 region: DE94

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1.1 The project AQUARES

The "Water reuse policies advancement for resource efficient European regions" (AQUARES) is an INTERREG Europe project, which brings together ten partners from nine countries (Czech Republic, Germany, Greece, Italy, Latvia, Malta, Poland, Slovenia, and Spain) to achieve efficient water management through water reuse, green growth, and improved environmental performance. AQUARES provides a platform for its members to cooperate, exchange best practices, and address territorial problems. One of AQUARES´ goals is to develop an action plan in each region to improve selected policy instruments concerning water reuse. Thereby, AQUARES supports public authorities to implement efficient water reuse practices and reduce inefficient use of water, to benefit from EU financing tools, and to overcome conflicting interests by promoting public dialogue. AQUARES assists partner regions to save water through improved policies and better planning, to promote new business models that involve revenue streams from reusable water resources, to attract investments in more innovative and efficient water management technologies, and to mitigate the risks associated with volatile global economy and resource depletion.

AQUARES contributes to the EU 2020 strategy targets, according to which water reuse is one of the five priority areas of work of the European Innovation Partnership on Water, as well as to the discussions on the implementation of the EU regulation on minimum requirements for water reuse in Germany.

1.2 The OOWV

The OOWV is a body governed by public law, situated in the North-West of Lower Saxony close to the North Sea and the Dutch Border. The OOWV is the largest water provider in Lower Saxony and one of the biggest water providers and waste treatment organization in Germany in terms of area (7.832 km²). Drinking water is delivered to more than1 mil. people. The OOWV operates 15 waterworks. With 46 sewage treatment plants, it treats wastewater for around 508.000 people which is around 35,5 Mio. m³ of sewage per year.

As a customer-oriented, efficient and competent service supply company since 1948 the OOWV is firmly anchored in the region and ensures the responsible supply with drinking water as well as the environmental friendly sewage disposal for fair prices and with high quality awareness. According to its statute the OOWV is working without the intention of making a

profit. All surpluses are invested in the optimisation of operating, management and technical equipment.

Groundwater is the main source for drinking water in the OOWV provision area. Thus, the OOWV is highly committed to protecting groundwater and has got decades of experience in monitoring and modelling groundwater as well as in protecting groundwater. It operates around 2500 groundwater monitoring wells. It is confronted with climate change, which causes hot and dry summer periods with increasing water demand in various sectors. Furthermore, emissions from agriculture affect the usability of water resources for drinking water purposes.

The OOWV is recognised and in demand as an innovative company both as expert in the drinking water sector and in wastewater treatment. The OOWV ensures a sustainable supply through very good networking in Germany and Europe with other companies and research institutions to find answers, for example, to the effects of climate change, demographic changes, possibilities of new technologies and for the sustainable protection of water as a resource.

1.3 Water reuse in Germany

In May 2020 the EU regulation No. 2020/741 on minimum requirements for water reuse for agricultural irrigation entered into force. This regulation is a response of the European Commission (EC) to the issue of growing water scarcity. Water scarcity has increased across the European Union in terms of quantity (e.g. limited access to new conventional water resources) and quality (e.g. contamination of water resources). In the next decades, water stress is likely to continue to intensify due to various reasons such as climate change (leading to changes in precipitation patterns, higher frequency and severity of droughts, higher irrigation water demand) and regional economic and/or population growth (leading to increased water demand for industrial and municipal purposes). According to the EC, it can be estimated that water scarcity currently affects at least 11% of the European population and 17% of the EU territory. The Mediterranean region is particularly affected by water scarcity with approximately 20% of the population living under constant water stress. In the Mediterranean area- but also selected other EU regions- freshwater resources are often not sufficient with regards to quantity and water quality to satisfy a populations water needs. Thus, alternative water resources, such as reclaimed water from treated municipal wastewater, are more and more considered as reliable alternatives to satisfy water demand.

Water reuse in Germany is currently limited to two Wastewater Treatment Plants (WWTPs) with the end product being used for irrigation. There is no data on the number of end users. Water reuse is not accompanied by a risk management framework, but there exist descriptions of the reuse system and operational procedures for monitoring. Monitoring procedures are based on DIN 19650, category IV, which defines physical water quality parameters and indicators, manual and verification monitoring. Data is documented in internal data files. Weekly data on nutrient contents of the reclaimed water are provided to the farmers for needs-oriented fertilisation. Sampling is automated. Monitoring is judged as effective; however, the lab equipment could be updated to include the possibility to analyse emergent pollutants.

2 Policy Context

2.1 ERDF in Lower Saxony 2014-2020

With AQUARES the OOWV mainly addresses the Lower Saxony Regional Operational ERDF/ESF Programme ("Das EFRE- und ESF-Multifondsprogramm") 2014-2020, run by the Lower Saxony State Chancellery ("Niedersächsische Staatskanzlei"). Water as an issue is part of investment priority no. 3 "Reducing CO2 emissions" in this programme – although water reuse has not high relevance for Lower Saxony ERDF policy yet. Thus, no concrete water reuse project was funded by the Lower Saxony Regional Operational ERDF/ESF Programme yet (although that was not even a concrete purpose).

Nevertheless, the AQUARES project was a helpful instrument already for the OOWV to demonstrate the water reuse challenge against the Lower Saxony government. But furthermore, the focus of this Action plan will be more on the next Lower Saxony Regional Operational ERDF/ESF Programme for the funding period 2021-2027.

2.2 Regional Strategy - Regionale Handlungsstrategie

In the Smart Specialisation Strategy of Lower Saxony according to the funding period 2014-2020 (in fact running until end of 2021) the water issue was not placed as prominent as it should be regarding the increasing water challenges. The water issue in this "old" strategy is mainly mentioned in connection with the regional priority of "agriculture & food industry".

However, there are chances that the water issue will be placed more prominent in the new Smart Specialization Strategy of Lower Saxony for the new funding period 2021-2027. The OOWV as the largest water provider in Lower Saxony has made efforts to increase awareness of the challenges of water supply and water management. Thus, the purpose is to include water also as an innovation issue in the new Smart Specialization Strategy of Lower Saxony.

As a specific situation in Lower Saxony, the federal government runs also sub-strategies for Smart Specialisation for its four sub-regions (NUTS 2). Here we also have the "old" strategy for the funding period of 2014-2020 and we have the new strategy for the funding period 2021-2027 that recently has been published. As the OOWV is situated in the sub-region of Weser-Ems this sub-strategy is relevant here.

In this sub-strategy ("Regionale Handlungsstrategie Weser-Ems") the water issue has already played a bigger role than in overall Lower Saxony strategy. And, more important, water will play an even bigger role in the new "Regionale Handlungsstrategie Weser-Ems 2021-2027". In the document different water challenges are addressed and water reuse is part of it. That is a preliminary success of the OOWV efforts (on September 11th 2019 the OOWV sent its input to the Office for Regional Development Weser-Ems), and the outcomes and experiences from the AQUARES project were quite helpful for it. In the draft strategy document water is mainly placed under the new regional priority of "Overcoming the challenges of climate change, reducing CO^2 emissions and protecting the natural resources of water, soil and natural spaces".

2.3 ERDF in Lower Saxony 2021 – 2027

The Lower Saxony Regional Operational ERDF/ESF Programme 2021-2027 is currently under preparation. Next to other stakeholders the OOWV was asked to contribute to the new program. It is not for sure yet which role the water sector will directly or indirectly play in the new program (as it is under development). But the relevance should grow and the OOWV has delivered relevant topics on strategy level, thus also the water reuse topic (also as an outcome of the AQUARES project).

Besides the Lower Saxony Regional Operational ERDF/ESF Programme the OOWV also addresses the next INTERREG A program Germany/Netherlands 2021-2027. So, the OOWV has started to develop the water reuse issue on cross border policy level, as the Dutch border region is facing similar challenges. Cross border water cooperation will become most likely a

strong topic in the next INTERREG A program Germany/Netherlands. Here the OOWV was a promoter, even by implementing a preparation project ("WaterStart") to elaborate future cross border water cooperation and projects. So, it is possible that the cross-border cooperation and next Interreg A program might even become more important for the water reuse issue than the next Lower Saxony ERDF/ESF program.

2.4 The Environmental Innovation Program

The Environmental Innovation Program (UIP) is a funding program of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. As a top funding program, the Environmental Innovation Program supports outstanding projects that advance the state of the art in an industry and demonstrate to other companies in the same industry or across industries how innovative technology can lead to environmental relief.

The Environmental Innovation Program is demand-driven. The open range of funding is regularly supplemented by funding priorities in order to provide targeted new impetus in subject areas relevant to environmental policy and environmental technology.

The findings from successfully implemented projects are used to further develop the state of the art. In this way, the Environmental Innovation Program makes a significant contribution to shaping German and European environmental policy.[1]

3 Goals and Objectives

Through our experiences and especially the knowledge exchange within the AQUARES project, we have developed the OOWV position on water reuse as follows:

- The aim is to achieve integrated water management in which all available water resources, consisting of groundwater, surface water (which may not be directly suitable for drinking water treatment) and internal company and municipal wastewater treatment plant effluents, are used as optimally and efficiently as possible.

[1] https://www.umweltinnovationsprogramm.de/ueber-uns

- Water must be used as sparingly as possible. When used for communal, industrial and agricultural purposes.

- No water reuse in extraction areas and priority areas for drinking water supply.

- No assumption of costs by wastewater disposal.

- Water reuse only with appropriate risk management and national regulations for monitoring and control (including chemical parameters incl. anthropogenic trace substances), liability, responsibilities and corresponding extensive official monitoring.

We will represent these positions within the framework of our activities in the associations (e.g. DVGW, VKU and DWA).

And significantly, the action described below will contribute to the implementation in our association area (see chapter 4).

4 Action planned

4.1 Large-scale implementation of a water reuse plant at the Nordenham site

4.1.1 Description – Nature of the action

In order to protect groundwater as a resource, the OOWV is striving for innovative water reuse of municipal wastewater for industrial purposes. By mid-2023, an innovative service water plant is to be built at the wastewater treatment plant in the town of Nordenham in the Wesermarsch district to supply local commercial and industrial companies with industrial service water from municipal wastewater via a separate network of pipes ("fit-for-purpose"). By reusing the wastewater, a considerable share of the annual industrial water demand can be covered, which is associated with a permanent protection of the groundwater and a corresponding benefit for the environment.

The mode of operation of the planned large-scale service water plant is based at its core on the processes of ultrafiltration and reverse osmosis and is supplemented by optimised pre- and post-treatment processes, as can be seen in Figure A. In this way, a high-performance process chain is formed that begins with the prefiltration of the conventionally treated wastewater to remove coarser particles and suspended matter in the first step. Via the pre-filter, the wastewater reaches the intermediate storage tank for load balancing between the treatment plant and service water production, which keeps it ready for ultrafiltration.

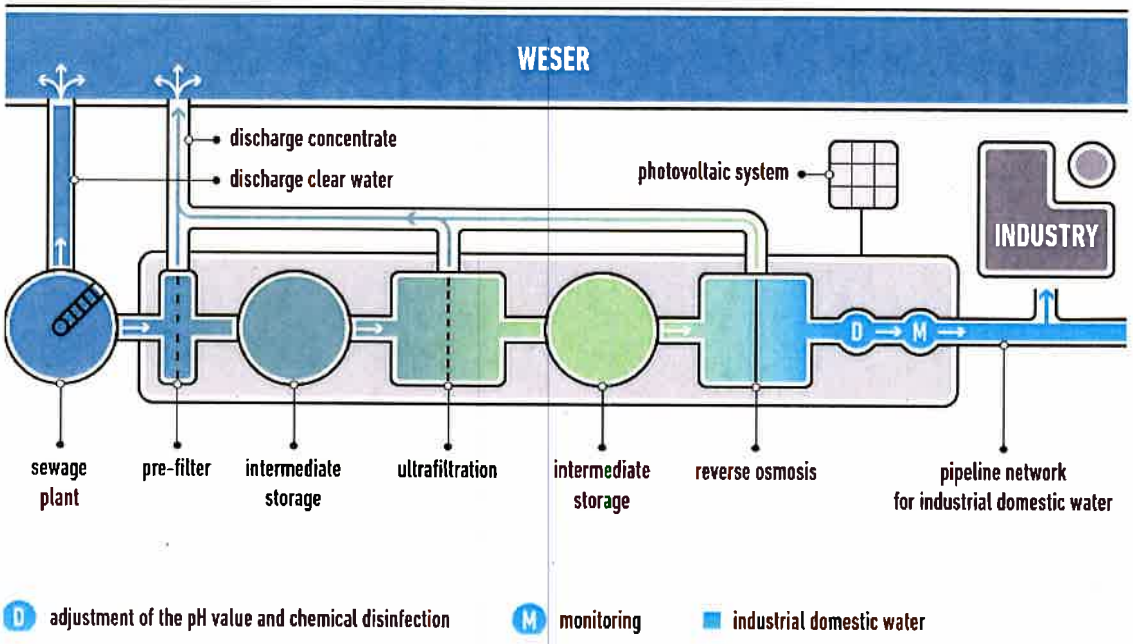
To pre-treat the wastewater for ultrafiltration, a flocculant is added. This combines the finest suspended or colloidal solid particles in the wastewater into larger flocs so that they can be effectively filtered out of the water in the subsequent ultrafiltration.

Once ultrafiltration is complete, the wastewater enters another intermediate storage tank, which makes it ready for the subsequent reverse osmosis process. To stabilise the reverse osmosis process, antiscaling and antifouling are dosed to counteract the accumulation of particles and organisms on the membranes. Otherwise, this would lead to blockage of the membrane surfaces, which would be associated with increased energy consumption and even irreversible damage to the membrane.

As the second and final membrane technology in the process chain, reverse osmosis partially desalinates the wastewater in order to adapt it to the industrial requirements for salt content.

The residual substances filtered out by the treatment process form a concentrate that is discharged into the Weser as a residual flow in an environmentally neutral way (compared to the previous situation).

Figure A:



However, before the treated wastewater is discharged into the separate service water network as industrial service water to supply the industries, it is pH-adjusted and chemically disinfected with a depot effect. This has the advantage that germs and viruses are killed immediately and existing biofilm is effectively broken down. The depot effect supports this process because it creates a longer-lasting effect in the pipe system.

The technical completion of the service water system is a continuous monitoring system that ensures compliance with the contractually defined transfer parameters of the service water with the customers.

4.1.2 Relevance to the project

The AQUARES project partners from Spain and Malta have reported in AQUARES on their successful experiences of water reuse with the ultrafiltration/reverse osmosis process chain. Malta in particular has extensive experience in the planning, construction, operation and monitoring of large-scale membrane-based reuse plants through "New Water". Furthermore,

Malta has accompanied the implementation of New Water technologies with a well-planned communication concept. OOWV will also be a good example of this.

The type and design of the plant is very similar to what the AQUARES partners in Malta have presented as a good example. Within AQUARES there was a very fruitful and informative exchange with the partners on technical issues as well as questions about the operation and monitoring of the plant. Also, the visit of the plant in Milan and the technical exchange with the Spanish partners have contributed to the fact that the OOWV will consider interesting aspects from the AQUARES project in the planning of this plant.

The construction of such a large plant requires some planning steps and large investments. Therefore, it is good to be able to build on already existing experiences of the partners.

4.1.3 Specific measures to be implemented

Especially the following aspects from the good example of Malta will be considered in the implementation in the OOWV region:

- Financing through the cost of drinking water (calculations on economic viability).

- Reverse osmosis and ultrafiltration

- New Water - Highly Polished Treated Effluent (Malta has a four-barrier water reclamation process)

- New Water - Automated Distribution System (cost sharing by companies to ensure continued water efficient behavior)

- Sewer Discharge Control Unit (The stability of the ReUse plant depends on the high treatment capacity of the wastewater treatment plant. And this is strongly influenced by the influent quality, among other things. Here Malta has implemented an innovative monitoring system, which we will use as a model for monitoring our sewer system).

The action will consist of the following steps:

- Preparation and submission of an application for funding of the investment measure to national funding body

- Call for tenders for engineering services

- Technical and structural design of the plant
- Awarding the contract for the design and construction
- Start of construction
- Completion of construction
- Commissioning of the plant

4.1.4 Stakeholders involved

In particular, the representatives of the Wesermarsch district, the Lower Saxony State Agency for Water Management, Coastal and Nature Conservation (NLWKN) and the town of Nordenham are directly involved in the preparation of this project and will continue to be important players during the construction approval and implementation of the project. Due to the model nature of the project, it is expected that many interested parties will make site visits to see the technology. In addition to the positive ecological effects resulting from the reduction in the use of drinking water, this will also enhance the image of the town of Nordenham.

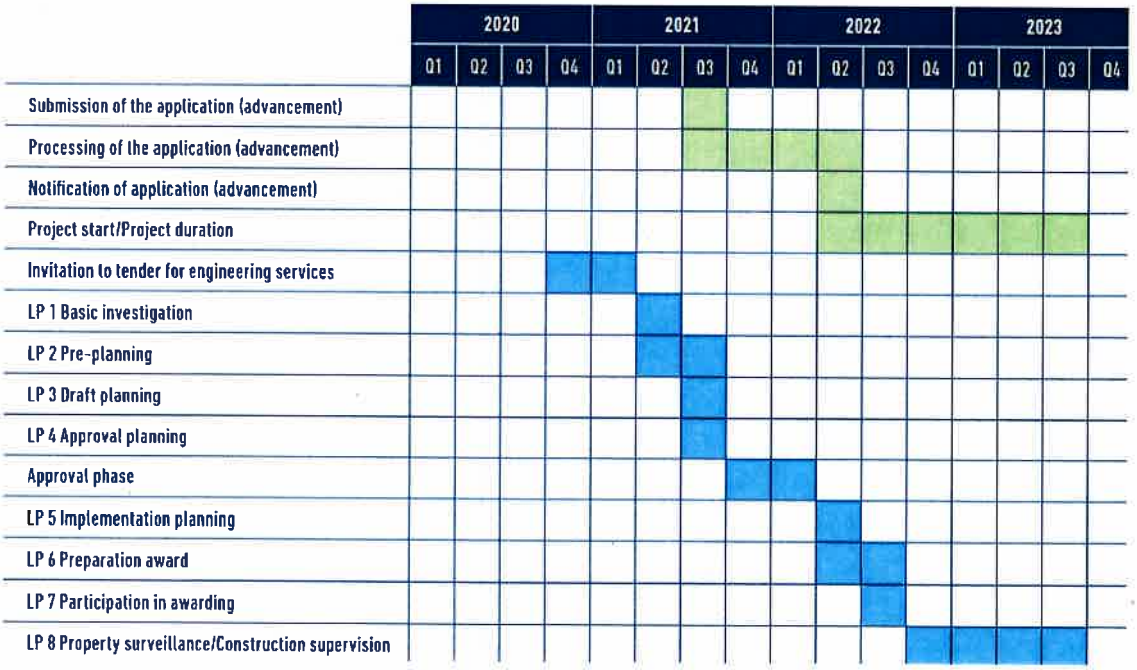
The IWW Center for Water is one of the leading institutes in Germany for research, consulting and further education in water supply and is an affiliated institute of the University of Duisburg-Essen. It was involved as a stakeholder in AQUARES and will also accompany the implementation of the new facility. Like the Oldenburg Chamber of Industry and Commerce, it will support the project's communication strategy through outreach in its own networks in industry and professional associations.

The implementation will also be supported by the Office for Regional Development Weser-Ems.

4.1.5 Time frame

The planning services as well as the approval documents will be prepared in the first half of 2021. If approval is granted as planned, the contract will be awarded in the first two quarters of 2022 and the construction phase will begin afterwards. Commissioning of the ReUse facility is planned for summer 2023. Further details can be found in Table B.

Table B:



4.1.6 Indicative costs and funding sources

The total expected estimated costs of the ReUse project are about 6 million Euros. The first steps of the preliminary planning have already been started. OOWV is applying for investment funding from national "Umweltinnovationsprogramm" (Environmental Innovation Programme of German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety). Further details can be found in Table C.

Table C:

FINANCIERS	PROPORTION	TOTAL/PROPORTION
OOWV	70% personal contribution	4.182.430 €
KFW-Bank	Targeted grant: 30% advancement	1.792.470 €
Total/Financing		5.974.900 €

OPERATING COSTS	REMARKS	TOTAL/YEAR
Staff	1 FTE incl. additional costs	70.000 €
Energy	-	250.000 €
Change of the membrane	Ultrafiltration + Reverse osmosis	36.000 €
Maintenance/Insurance	1 - 2,5% Invest	70.000 €
Chemicals	-	30.000 €
Discharge of the concentrate	in clarifying	50.000 €
Lease	in clarifying	20.000 €
Backoffice (engineer, OOWV-infrastructure etc.)	-	- €
Total/Operating costs		526.000 €

5 Outlook

The OOWV wants to - and must - face the foreseeable future challenges in the field of water. This concerns climatic, social, digital, ecological and economic challenges around the future supply and disposal of water as well as the protection from and of water. Within the framework of the AQUARES project, the OOWV has benefited greatly from the exchange with international partners and will continue to maintain these contacts in the future. In addition, the OOWV aims to carry out further exchanges of experience with European actors of the water industry in connection with the good experiences in the project. In the near future, it is planned to establish a cooperation with the Baltic States on topics such as rainwater utilization, efficient water use and transformation processes in water management through the contacts made in AQUARES. In addition, the OOWV will continue to work on the topic of water reuse beyond the actions described above. In particular, cooperation with partners from industry is planned here. First promising talks have already taken place. Last but not least, the OOWV also plans to expand its position as an innovation player in the field of water in northwestern Germany. To this end, the establishment of a cross-sector network with partners for water research and innovation in northwestern Lower Saxony is being considered.

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