With a Focus on What Is Feasible

The bad news is this: in the medium to long term, the Berlin-Brandenburg metropolitan region is heading towards major challenges in water supply. The good news is that there are many possible ways to respond. Municipal wastewater recycling in particular holds considerable potential – for the rural surroundings as well as for the city itself. That is the conclusion of a feasibility study carried out by Berlin water experts at the Kompetenzzentrum Wasser Berlin (KWB), the Berlin Centre of Competence for Water, within the WaterMan project.

A closer look at the water situation in the Berlin-Brandenburg metropolitan region – and at the forecasts for the future – gives the term "feasibility study" a particular weight. With its many lakes and several rivers, the German capital and the surrounding federal state of Brandenburg only appear to be a water-rich region. Long before human-induced climate change became a headline issue, forecasts were already pointing to a strained long-term water situation in Berlin and Brandenburg, including the prospect of significant water shortages in some areas. The flow of the Spree, which runs through the heart of Berlin, has long been artificially increased by large volumes of groundwater pumped from the Lusatian lignite-mining region in southern Brandenburg and Saxony into surface waters. But as part of the phase-out of coal-fired power generation, lignite mining there is due to end by 2038 at the latest. That will have consequences for the region's water balance.

WWTP Ruhleben in Berlin / Germany

Berlin obtains a considerable share of its drinking water through bank filtration from the Spree, while demand continues to rise as more people move to the metropolitan region. Already today, 4.7 million people live in the wider urban area.

These developments underline how important it is to adapt planning assumptions in good time and to consider new options for action.

The Focus Quickly Turned to Ruhleben: One of Germany's Largest Inner-City Wastewater Treatment Plants

So, what is feasible? How can Berlin's water supply be secured in the medium to long term without compromising quality or quantity? This is one of the questions explored within the WaterMan project by the team at the Kompetenzzentrum Wasser Berlin (KWB), a non-profit research institution.

For the KWB team, it had long been clear that water recycling could form part of the solution for Berlin and Brandenburg, alongside reduced water consumption, groundwater recharge and water storage. The early discussions within WaterMan confirmed that view. To cushion shortages during periods of peak demand, it will become increasingly important to use drinking water only where drinking-water quality is genuinely needed – and to explore suitable alternative water resources for other purposes. Different uses require different qualities of fit-for-purpose water. Municipal wastewater can provide a reliable source. With this in mind, attention quickly turned to the Ruhleben wastewater treatment plant. Every day, it produces 247,500 cubic metres of treated wastewater, which is discharged into the Spree and the Teltow Canal – an enormous resource that has so far remained unused for water recycling. At the same time, the area surrounding Berlin's only inner-city wastewater treatment plant is home to many commercial businesses that might have a use for fit-for-purpose water. That, at least, was the initial assumption. KWB took this as its starting point and developed detailed plans for water treatment, risk management and transporting the water to potential users.

One Case Examined in Concrete Terms: Cooling Water for the Neighbouring Power Plant

Many of the treatment steps needed for water recycling will have to be introduced at wastewater treatment plants in Berlin and Brandenburg by 2045 in any case, as a result of the new EU Urban Wastewater Treatment Directive. KWB's feasibility study builds on these planned investments. At Ruhleben, the planned processes include ozonation, coagulation filtration and UV disinfection. "What we are planning is therefore not an additional project for some distant future, but an intelligent use of transformations that are going to happen anyway," emphasises Pia Schumann, environmental engineer at KWB.

From there, the research team went a step further, moving from a theoretical study towards possible practical implementation. The Berlin water experts identified around 200 businesses within a radius of five kilometres around the

treatment plant and approached just over 20 businesses thought to have particularly high water demand. The question was simple: which companies might have a concrete interest in using fit-for-purpose water? The response was rather reserved. A car wash and the nearby power plant were ultimately examined more closely as theoretical use cases. The study also considered other urban applications carried out by the municipality or municipal utilities, such as irrigating sports grounds and green spaces and cleaning streets and sewers.

Another Case in the Rural Surroundings – with a Focus on Agricultural Use

The situation in Stahnsdorf was quite different. This municipality, located south of Berlin in rural Brandenburg, had expressed an interest in water recycling on its own initiative. “For us, that was an exciting extension of the feasibility study,” Schumann explains. “Because in Stahnsdorf, the focus was very clearly on agricultural use.” More broadly, the rural area – where several years of drought and poor harvests have already been experienced – showed strong interest in the issue. This was true of the municipal administration, utilities and farmers alike. Together, the partners examined how water recycling could be implemented technically in Stahnsdorf – both in the short term at the existing treatment plant and at the future plant planned for the site. A new wastewater treatment plant is due to replace the existing one by 2037.

WWTP Stahnsdorf south of Berlin / Germany

For the existing treatment plant, the study identified the additional process steps needed to further treat the available effluent, including filtration, activated carbon treatment and disinfection. These processes were designed by an engineering firm, which also compared different options for the filtration stage. The aim was to achieve the most stable possible water quality and availability while keeping treatment costs as low as possible. Depending on the crop, intended use and irrigation method, the resulting water would be suitable for agricultural irrigation. EU Regulation 2020/741 defines different quality classes for treated municipal wastewater. These are supplemented by further requirements in the draft DWA-M 1200 guidance sheet. The feasibility study

selected quality class B-1 under the DWA guidance. Among other applications, class B-1 is suitable for processed food crops, fodder crops and non-food crops. For the future treatment plant, the study likewise examined which additional processes would be needed for water recycling beyond the treatment already planned. Because the new plant is intended to include advanced treatment to comply with the Urban Wastewater Treatment Directive, only an additional disinfection stage would be required for water recycling. This was the option assessed in the feasibility study

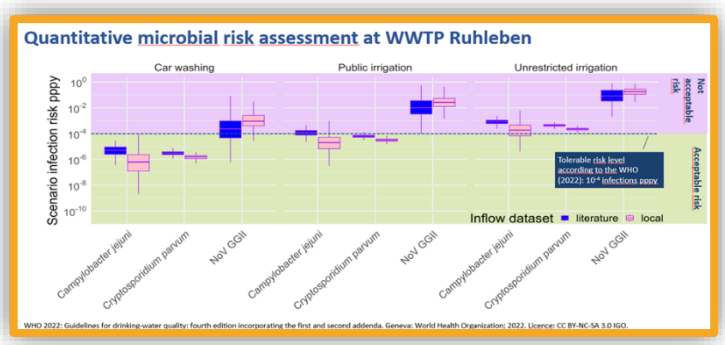
Transporting the Water to Its Users Is the Biggest Cost Factor

Over the course of the study, the project lead's perspective changed and became more focused. The large number of potential users scattered across the area around Ruhleben proved too fragmented and costly to connect. Transporting the water to where it is needed is the largest cost factor. It has the greatest impact on pricing and makes viable business models more difficult to establish. Technically, water recycling is entirely feasible, and the neighbouring power plant also requires large and continuous volumes of fit-for-purpose water for its cooling tower. At present, however, the operator does not use drinking water for this purpose. It draws cooling water directly from the river. In other words, switching to recycled wastewater would currently create no tangible additional benefit for the regional water balance.

In Stahnsdorf, by contrast, there is agricultural water demand that could increase in future. The business case is therefore more tangible, even though the feasibility study showed that it is not yet economically viable. The study asked a very specific question: under what conditions would the use of recycled water make economic sense for farmers? It also provided an answer: only once the new wastewater treatment plant has been built. The challenge is to strike a robust balance between water quality, economic viability and proximity to potential users. Even in rural areas, water recycling only makes sense if transport requirements remain limited. "Proximity is a key parameter. Pipelines over longer distances only make sense for very large users," says Schumann. Another important issue that still needs to be addressed is pricing. Regular water prices in Berlin and Brandenburg are currently so low that recycled water is not genuinely competitive, especially for private companies. Operating models also need to be clarified: who builds and operates the additional treatment facilities? Who pays which share? And who bears which risks? These unresolved questions may also be contributing to the caution shown by potential users. One possible model is the Oldenburgisch-Ostfriesischer Wasserverband in Nordenham, which supplies utility water produced from treated wastewater to a major industrial customer for use in industrial processes.

What Comes Next? More Research, More Dialogue and Pilot Measures on the Ground

So what happens next? “We are doing what we do best: continuing the research,” says Pia Schumann. At the same time, networks are being developed and dialogue with decision-makers is continuing. The findings need to be communicated on an ongoing basis to policymakers, public administrations and water utilities so that they can support informed decision-making. Technically, water recycling is no longer new territory for many applications. Even so, Schumann stresses that local pilot measures will be essential. The precise legal framework will also need to become clear once the EU Water Reuse Regulation has been implemented in German law. Work on this is currently under way.



Visualisation of the fountain

So what is feasible when it comes to strengthening water resilience in Berlin and Brandenburg over the coming years? The answer KWB can now give on the basis of the study is cautiously optimistic. Technically and logistically, wastewater recycling is a realistic option for many applications. Whether it leads to concrete uses, however, will depend largely on costs and the legal framework. Viable financing models, clear responsibilities and reliable permitting pathways will be needed. Practical pilot measures can play an important role here, says Schumann. “Water is not all the same, and technology does not work in the same way everywhere. Before more demanding water recycling projects are implemented, preliminary investigations of local conditions are essential.”

Helping Things Flow in the Right Direction

The feasibility study developed within the WaterMan project has helped create favourable conditions for exactly this. It is not a pilot measure involving pumps and pipes, but a strategic tool. It shows which technical solutions are possible, which requirements need to be met, and which framework conditions must be clarified if water recycling is to succeed in practice. Water recycling can become a central building block in safeguarding the water resources of an increasingly dry region. The study also raises valuable questions that can make the necessary follow-up projects and stakeholder dialogues more focused and productive.

About the WaterMan project

WaterMan promotes a region specific approach to water recycling, which intends to use the alternation of too much and too little water that has become typical in the Baltic Sea Region to make the local water supply more resilient, and supports municipalities & water companies in adapting their strategies.

More information: *https://www.eurobalt.org/WaterRecyclingToolbox/*
http://interreg-baltic.eu/project/waterman

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