

Use of reclaimed water in urban applications – a quick European survey

To collect information for a Swedish webinar in December 2023 on the use of reclaimed water in urban applications, I mailed the following questions to the members of EurEau 2.

(Reclaimed water means urban wastewater treated according to the UWWTD 91/271 that is further treated for specific uses.)

- How common is it to use reclaimed water in your country/region – wastewater or/and stormwater - for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes?
- How are water & wastewater utilities involved in the solutions for the use of reclaimed water into practice? What are the drivers for the water & wastewater utilities?
- What are the drivers for the use of reclaimed water - from a customer point of view?
- Are there economical advantages to invest in solutions to use reclaimed water? To whom?
- Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view?

Many thanks to all of you who had the possibility to mail me your replies. I got replies from the following countries:

Belgium (Flanders), Denmark, England (Scotland), France, Ireland, Italy, the Netherlands, Poland, Portugal, Spain and Sweden.

Please see their full replies on the following pages.

Belgium (Flanders) (contact: Jo Severyns jo.severyns@aquafin.be)

- How common is it to use reclaimed water in your country/region – wastewater or/and stormwater for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes?

Today, around 0,75% of the total treated UWW in Flanders is reused (60 mio. m³/y out of 800 mio. m³/y) , mainly for industrial use and drinking water production.

By 2030 – as we have some huge projects for industrial use and drinking water production in the pipeline – this share will increase to approx. 4%.

In the long run, this will probably rise above 10%.

- How are water & wastewater utilities involved in the solutions for the use of reclaimed water into practice? What are the drivers for the water & wastewater utilities?

We (WW utility) act as a facilitator. Our driver is sustainable water use. There is always a third party involved, namely a technology provider that offers “water as a service”.

- What are the drivers for the use of reclaimed water - from a customer point of view?

In case of industry: mainly economic drivers, i.e. water that is cheaper than drinking water, and on the long term: assurance of water availability.

For drinking water utilities: assurance of water availability and saving groundwater resources.

- Are there economical advantages to invest in solutions to use reclaimed water? To whom?

Yes, for all partners involved: WW utility, technology provider and customer, i.e.

- as a WW utility, we charge a modest fee, which we devote to research on water reuse

- for the technology provider “water as a service” is their business plan

- for the customer, the first driver is economical advantage, although on the long-term assurance of water availability will gain importance

- Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view?

We see most benefit in the use of reclaimed water for industrial use and drinking water production and this works quite well today.

The opportunities for agriculture and other irrigation or amenity purposes are much lower, because of economic feasibility (expensive infrastructure versus relatively low water use) and the the risk analysis (cf. Reuse regulation). The risk analysis on itself is an obstacle, as it is not clear what exactly needs to be done and which level of risk is acceptable. Our government tends to be so strict that it becomes very difficult to realize a project – regardless of the other obstacles (costs of piping, pumping station, disinfection, micropollutant removal, sampling, maintenance,...).

Denmark (contact: Anders Hansen ah@danva.dk)

- How common is it to use reclaimed water in your country/region – wastewater or/and stormwater for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes?

As far as I know virtually non-existing, but the interest is quite large among a number of wastewater utilities in Denmark.

- How are water & wastewater utilities involved in the solutions for the use of reclaimed water into practice? What are the drivers for the water & wastewater utilities?

Currently very little. Aarhus Vand is involved in the project in “Nye”, a new village North of Aarhus, where *rainwater* is reclaimed for use in clothes washing, toilet flushing etc.

A key driver among those companies looking seriously into reclaimed wastewater is water scarcity combined with high consumption.

- What are the drivers for the use of reclaimed water - from a customer point of view?

Among private customers (i.e. individuals) there is some interest in reusing rain water for flushing toilets, clothes washing etc. However, this is done privately and essentially without the involvement of the wastewater utility.

Among companies a key driver seems to be a matter of ensuring sufficient supply. Those of our members that are looking into it, are primarily doing so from a supply point of view.

Then there is PtX. Since it seems to be a key element for the Danish Climate goals there is great interest in PtX, and reclaimed wastewater may be one of the main sources of water for PtX.

- Are there economical advantages to invest in solutions to use reclaimed water? To whom?

Difficult to answer. The current Danish regulation of wastewater utilities means they cannot make a profit (understandable since they are monopolies) but the regulation regarding setting up treatment of wastewater for PtX, process water etc. are so strict that creating a setup for reclaiming wastewater for industrial purposes and using the profits from that endeavour to keep water tariffs down in general is difficult.

- Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view?

No. DANVA is working together with our authorities and those of our members who are furthest in the process of setting up reclamation of wastewater to identify the regulatory barriers and how to work through them. But there are plenty of issues.

England (Scotland) (contact: Sarah Gillman Sarah.Gillman@scottishwater.co.uk)

- How common is it to use reclaimed water in your country/region – wastewater or/and stormwater for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes? [There is no precedent in Scotland but there is now one clear opportunity for wastewater reuse. This has come from the expansion of an UWWTP being co-located with a golf course, where the water would be of value.](#)
- How are water & wastewater utilities involved in the solutions for the use of reclaimed water into practice? What are the drivers for the water & wastewater utilities? [There is a political driver in Scotland for the utility to support the economic activity in Scotland.](#)
- What are the drivers for the use of reclaimed water - from a customer point of view? [The golf course is motivated to ask Scottish Water about this possibility, as the east side of Scotland is very dry during the summer these days.](#)
- Are there economical advantages to invest in solutions to use reclaimed water? To whom? [We are just beginning to explore this.](#)
- Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view? [No, we will need them in Scotland. This first example will allow us to learn a lot.](#)

France (contact: Muriel Chagniot muriel.chagniot@veolia.com)

- How common is it to use reclaimed water in your country/region – wastewater or/and stormwater for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes?

Not common. Few experiences have taken place for the last ten years. For the last 18 months, many projects have been carried out in response to water scarcity. Some onsite industrial reuse (cooling, automotive, paper industries...). Bergerac community for hydro cleaning of waste waters networks. Narbonne Ville for road washing and hydro cleaning WW networks

- How are water & wastewater utilities involved in the solutions for the use of reclaimed water into practice? What are the drivers for the water & wastewater utilities?

Water & wastewater utilities are deeply involved in the implementation of these projects. The main driver is to answer to a local political need and/or business need (reclaimed water used for golf course irrigation,...). One of the drivers is the risk of water scarcity and the need to preserve natural resources. In France the new governmental Water Plan (2023) encourages the reuse practices and has set a target of 10% reuse in 2030.

- What are the drivers for the use of reclaimed water - from a customer point of view?

Preserve the resource, ecological pressure and the fear of water missing. Most of the customers are the municipalities themselves for uses such as gardening, streets cleaning, sewage hydro-cleaning. For golf courses owners, it is a real need as they are facing opposition from the public to maintain their business during drought periods. Some industries also consider securing their access to water in case of drought restrictions.

- Are there economical advantages to invest in solutions to use reclaimed water? To whom?

Yes for economic activities hydro linked such as golf courses or horse race track activities, watering of sport fields, urban garden /parks, trees & plant production for urban uses. Except "political choices", the economical advantage comes when water resources are not sufficient to provide enough drinking water, and 'fit for use' water is available without ecological impact on water bodies / rivers quantity and quality, mainly coastal places near the sea. But on a regular basis, investments are usually too high regarding the affordability to pay.

- Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view?

Since March 2022, we have clear guidelines through our national regulation. It has been recently modified in order to facilitate projects (less administrative burden). A new decree released in August 2023 should facilitate the reuse practice, due to withdrawal of the 5 year duration of the authorisation. But the administrative burden is still heavy (one autorisation for each type of use).

Ireland (contact: jcasey@water.ie)

- How common is it to use reclaimed water in your country/region – wastewater or/and stormwater
- for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes?

Not common – I am not aware of any example of the use of reclaimed water from WWTPs in Ireland.

- How are water & wastewater utilities involved in the solutions for the use of reclaimed water into practice? What are the drivers for the water & wastewater utilities?

As the water utility, we are not yet involved in developing solutions, but we have a strong driver to reduce demand on water resources for example in the Dublin region.

- What are the drivers for the use of reclaimed water - from a customer point of view?

Not manifested yet, but could be cost and sustainability.

- Are there economical advantages to invest in solutions to use reclaimed water? To whom?

We are also thinking that quaternary treatment obligations under the new UWWTD may make it easier and more economical to supply reclaimed water to industry in some cases.

- Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view?

We have not looked into this yet.

Italy (contact: f.pizza@mmspa.eu)

- How common is it to use reclaimed water in your country/region – wastewater or/and stormwater for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes?

In Italy, the reuse of water for agricultural, urban and industrial use is subject to a national law which is Decree 185/2003. For the part relating to agricultural reuse, this decree is replaced by EU regulation 2020/741 while it is not yet clear whether there will also be changes to the urban and industrial reuse part.

In any case, since the requirements of this decree are very restrictive in terms of quality of the reclaimed water, the diffusion of reuse in urban and industrial practices remained limited to very few cases.

- How are water & wastewater utilities involved in the solutions for the use of reclaimed water into practice? What are the drivers for the water & wastewater utilities?

In relation to the practice of agricultural reuse, the main driver for the development of this solution is undoubtedly the scarcity of water sources in a certain area and/or the existence of an irrigation network which can act as a distribution system for the reclaimed water.

Water utilities are involved in the entire process of the reuse scheme, starting from the “decision-making” part, asking for the required permits, managing the administrative and technical part of the whole process. In many cases, the operational managers of the WWTPs use to maintain contact with the farmers, to establish the periods and quantities of reclaimed water intended for irrigation. The drivers for water & wastewater utilities, currently, are mainly related to elements of social benefit and positive impacts on the sustainability and resilience of the territories managed by the water service. Therefore, such “drivers” are actually part of the public service mission covered by the water operators.

- What are the drivers for the use of reclaimed water - from a customer point of view?

The availability of guaranteed volumes of water throughout the year, even in case of drought (a WWTP can guarantee a constant flow of reclaimed water, even in dry seasons)

- Are there economical advantages to invest in solutions to use reclaimed water? To whom?

Difficult to give an answer... currently in Italy the costs of water reuse in agriculture are covered by the tariff and do not bring real economic advantages to water operators. For farmers, however, it can be advantageous as the costs for reusing reclaimed water are generally very low or even zero.

- Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view?

It is still very heavy/confusing work from an administrative point of view.

the Netherlands (contact: Michaël Bentvelsen mbentvelsen@uvw.nl)

- How common is it to use reclaimed water in your country/region – wastewater or/and stormwater for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes?

We have a few examples (approx. 5 on national level) where reclaimed urban wastewater is used in industry. See www.efgf.nl

Urban irrigation with run off, collected via separate sewers, so water that is supposed to be clean, and on the scale of blocks of houses, small neighbourhoods, usually we call them wadi's (arab word). We have a few examples where a golf course uses reclaimed water

- How are water & wastewater utilities involved in the solutions for the use of reclaimed water into practice? What are the drivers for the water & wastewater utilities?

Reclamation for industrial purposes is on commercial basis, so the operator (waste water authority or drinking water company) is paid for the service. There are no legal drivers. The driver is to safe clean groundwater or surface water from being used and to avoid shortages, receding ground water levels or intrusion of salt water

- What are the drivers for the use of reclaimed water - from a customer point of view?

For industry: the lack of an alternative: for instance industry that is located in a an area where ground water is relatively scarce or expensive (and they can not get a permit to abstract groundwater) in combination with the availability of a reasonable priced alternative.

- Are there economical advantages to invest in solutions to use reclaimed water? To whom?

See above: in some "niche" situations there is simply no alternative. Normally, when groundwater is available, it is always much more cheaper to use. We see in the Netherlands due to increasing population growth and increasing economy, an acute lack of enough available ground water in the coming 5 -10 years (you can ask Vewin!) ins some regions. Note that agriculture is also increasing their water demand by using ground water, due to the occurrence of dry hot summers.

- Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view?

For industrial purposes, there are no legal guidelines, normally the industry themselves sets their standards, these are usually very strict, as no industry wants to take any risk to have production problems with their factories because of water quality problems in their factory.

For agricultural uses, the Netherlands government has implemented the Reuse directive. However, no guidelines for micropollutants are available, let's hope the 80 % removal as envisaged in the UWWTD will be sufficient.

Poland (contact: t.kowal@wodociagi.katowice.pl)

. Answering only some of the first questions:

How common is it to use reclaimed water in your country/region – wastewater or/and stormwater for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes?

The only one in Poland that I know. Treated urban wastewater as cooling medium at combined heat and power station. Katowice – town in southern Poland, capital of Silesian Voivodship is operated since year 2000.

What are the drivers for the water & wastewater utilities?

What are the drivers for the use of reclaimed water - from a customer point of view?

Opportunity cost (price to pay), physical scarcity of drinking water or water for agricultural irrigation, and sustainability goals for some companies.

Are there economical advantages to invest in solutions to use reclaimed water? To whom?

The only driver for heat and power station was economy. They covered investment costs, and they purchase treated wastewater for 11% of the water price from wholesaler.

Katowickie Wodociągi KW accepted it because they did not lose a customer. There is specific situation in region of Uppesilesia. There is lack of surface and underground water sources. So, water intakes and treatment plants were built in south of region, and mains for all towns. They belong to Uppersilesian Water Company – a wholesaler. Katowickie Wodociągi as also Heat and power station Katowice used to buy water from wholesaler.

Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view?

There are no guidelines nor support from authorities for reclaimed water use.

I am attaching information about our positive example, see below:

Treated urban wastewater as cooling medium at combined heat and power station

Katowice – town in southern Poland, capital of Silesian Voivodship

Katowice in numbers: 266 000 - inhabitants (2022), 80 000 - students, 122 000 - people coming daily to work.

Katowickie Wodociągi S.A. (Water Works Katowice) Core business of the company:

Water supply and wastewater collection services at Katowice town area. Treated water is purchased from wholesaler: Uppersilesian Water Company which owns water treatment plants in south of Silesia and mains to Silesian towns.

Daily average water consumption is 39 000 m³ on average.

Katowice town is located at the 4 rivers catchments: Rawa, Brynica, Mleczna and Kłodnica, so 4 Waste Water Treatment plants were built.

Dąbrówka Mała-Centrum plant works in activated sludge technology. Nitrogen and phosphorus removal are provided biologically with additional chemical phosphorus precipitation. Precipitation is required only for few weeks a year. Average flow is about 21 000 m³/d (till year 2022 -17 000 m³/d). Catchment of the plant covers: two districts of Katowice: Dąbrówka Mała and Szopienice, towns: Siemianowice Śląskie and Czeladź and one district of Sosnowiec town – Milowice.

Taking under consideration convenient locations of WWTP and combined heat and power station, already at the end of previous century Katowickie Wodociągi S.A. recognized opportunity for cooperation: to use treated urban wastewater for cooling in heat production process.



Combined heat and power plant **Zakład Wytwarzania Katowice** has been designed at seventies XX century as less harmful to environment than many small and medium size local heating plants. It belongs to **Tauron Ciepło Sp.z o.o. Enterprise**.

Zakład Wytwarzania Katowice is a basic source of heat energy for towns: Katowice, Siemianowice Śląskie, Sosnowiec and Czeladź. The plant works as Cogeneration Heat and Power Station (CHP). It consists of BCF-100 heat unit with CFB-134 fluidized bed boiler and steam turbines 135 MW electrical energy / 180 MW heat energy, as also gas-oil water boilers 3x38 MW heat energy.

Treated wastewater supply system to CHP Station (Zakład Wytwarzania Katowice) has been operated since February 2000. All investment costs were covered by CHP Station.

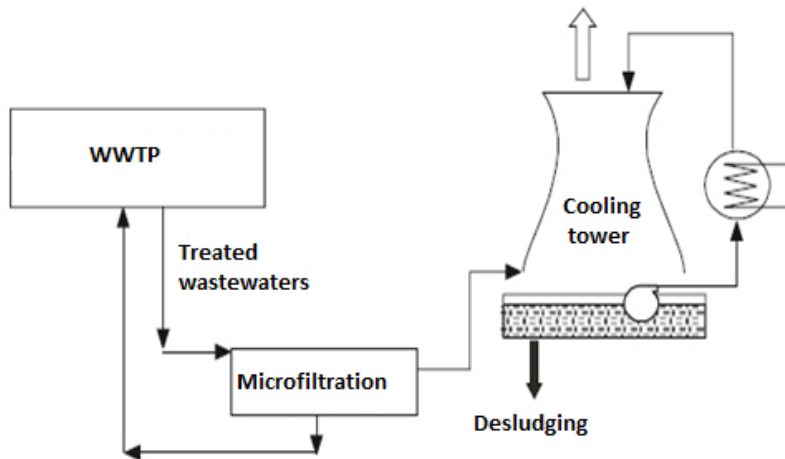
According to the contract Katowickie Wodociągi S.A. is obligated to deliver **1 500 000 m³ of treated wastewater per year.**

- summer seasons maximum – 220 m³/h, 2000 m³/8h, 6000 m³/d
- low temperatures seasons maximum - 200 m³/h, 1000 m³/8h, 3000 m³/d

Technical parameters of the installation.

- Pressure pipe: DN400 PE, Length 1130 m

- 2 submersible pumps (P =160 kW, H = 7,36 bar, Q = 111,11 l/s)
- Current flow is regulated from control panel located at the CHP Station
- Flow meter is installed at WWTP
- Energy consumption is measured at WWTP



Wastewater treated at urban WWTP still need further treatment. In spite that physical and chemical parameters of delivered waste water are not constant, the product after microfiltration process meets all requirements for cooling medium.

At the water treatment plant located at CHP Station, under pressure microfiltration process, based on capillary membranes is used.

Filtrate from this process is used to cover cooling water loses. The filtrate is free of bacteria, algae and suspended solids. Concentration of iron and nitrogen is reduced, but salinity stays at the same level.

Efficiency of microfiltration process

Parameter	Unit	Concentration in treated wastewater	Concentration in filtrate

COD (KMnO₄)	mgO₂/l	42,6	30,2
Total Iron	mg/l	0,163	0,048
Organic Nitrogen	mg/l	1,34	0,97
Amonia	mg/l	0,15	0,04
Ether extract	mg/l	1,65	0,89
Suspended Solids	mg/l	4,6	0,10
Bacteria	number/l	11320	0
Fecal Bacteria	number/l	Typical for wastewaters	0
Algea and Rotifers	number/l	1520	0

The project brings following profits:

The profit for CHP Station Katowice (Zakład Wytwarzania Katowice):

CHP Station use for cooling process well treated waste waters with quality parameters guaranteed in contract. The price of 1 m³ is 0,35 PLN (0,08 €).

The profits for Katowickie Wodociągi S.A.:

Income from sold treated waste water. Katowickie Wodociągi did not lose a customer. Previously, both companies purchased water from a wholesaler: Uppersilesian Water Company

Lower electricity cost because amount of treated waste waters which have to be pumped to the river is reduced.

This project allows every year to reduce an intake of 1,5 mln m³ of limited resources of drinking water. Additionally lower production of water, treated to the drinking water quality is required.

Portugal: (contact: Alexandra Sousa asousa@smasalmada.pt)

1. How common is it to use reclaimed water in your country/region – wastewater or/and stormwater - for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes?

- The storage of rainwater and its use is not common in urban areas (there are individual uses in countryside). As the hydrological regime varies greatly in the various regions (northern, southern, coastal, and interior regions) there are (still) no national guidelines.
- The applications of reclaimed water are (still) mainly for uses inside the WWTP – national report from the Regulator (2022) states that in 2021, only 30 utilities produce and use reclaimed water, corresponding to 8.2 million cubic meters, i.e. only about 1.2% of the treated wastewater in treatment plants (there are 4372 WWTP in Portugal). From this 1.2%: 85% for internal uses of the utilities/producers of ApR and only 13% for external users/uses.
- The projects and ongoing projects are:
 - a. Irrigation of Golf courses (mandatory irrigation with reclaimed water, even before Decreto-Lei nº 119/2019)
 - b. Urban irrigation
 - c. Other Urban uses - equipment and street washing
 - d. Industrial uses - HVAC circuits (an example with IKEA, nearby Lisbon)
 - e. Several Agricultural irrigation projects are being born
 - f. Several pilot projects, mostly in the neighbourhood of WWTP

2. How are water & wastewater utilities involved in the solutions for the use of reclaimed water into practice?

In 2019, a challenge from the Ministry of the Environment was launched to the utilities of the 50 largest WWTP to draw up Action Plans for production and use of reclaimed water. The aim is to achieve national targets of reclaimed water use of 10% in 2025, and 20% in 2023.

3. What are the drivers for the water & wastewater utilities?

In some cases, water scarcity, in others legal obligation, and also, I&D projects.

4. What are the drivers for the use of reclaimed water - from a customer point of view?

Opportunity cost (price to pay), physical scarcity of drinking water or water for agricultural irrigation, and sustainability goals for some companies.

5. Are there economical advantages to invest in solutions to use reclaimed water? To whom?

To go further there is the need to make many investments in WWTP and distribution networks. In addition, in Portugal, the places where ApR is produced (the biggest WWTP) are usually distant from the places with a major potential use (agriculture or dry regions).

The recommendation from the Regulator (ERSAR) states:

- The need for the preparation of technical and economic feasibility studies
- The need for COST RECOVERY (CAPEX/OPEX) and among others:
 - a) *To incentivise the use of ApR to the detriment of other sources, with a view to achieving the defined environmental objectives, subsidisation of investment and/or exploitation may be justified in order to make the tariff competitive – for utilities/producers of ApR. It didn't come yet into practise.*

b) It is recommended that the variable ApR tariff should be less than or equal to the water supply tariff (applicable to non-domestic users) in the territorial area covered by the ApR service provider or the lower tariff if the ApR producing managing entity provides services to several municipalities.

c) A single variable tariff shall be applied in each system, calculated by means of the quotient between the expenses considered efficient for regulatory purposes, and the estimated volume of ApR to be invoiced, according to given formulations

6. **Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view?**

We have the following legislation and guidelines (we can send you these documents, although they are in Portuguese):

- Legislation: “Decreto-Lei nº 119/2019, 21 de august” – which have already adopted *Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 for Agricultural irrigation*, and go further on other uses

- A guide from Ministry of the Environment concerning the risk assessment methods – this guide was/is very complete, but too much complex, making the licensing process difficult (although the methods were not mandatory)

- A recast “Decreto-Lei nº 11/2023, 10 february” which **simplifies administrative process** – and **transfers responsibility** from Licensing Entity (APA, Portuguese Environment Agency) to the producer and the user

- A recommendation from the Regulator (ERSAR) for the preparation of technical and economic feasibility studies and for the definition of the tariff (rate)

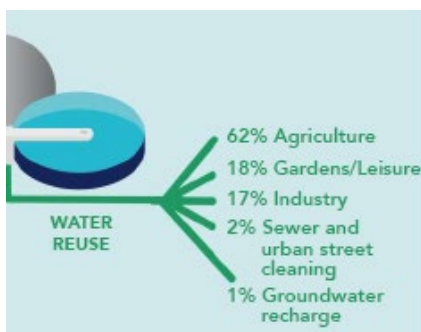
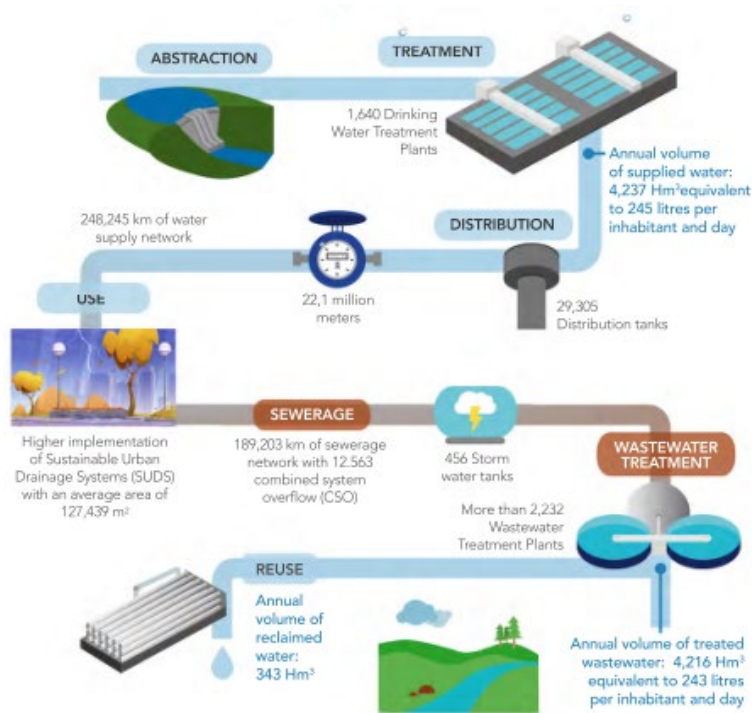
The main principles are: Reclaimed water = ApR (água para reutilização)

- a. A fit-for-purpose approach which advocates the development of a reuse project based on the use of ApR with quality appropriate to the purpose for which it is intended, with a guarantee of health and environmental protection.
- b. Quality and safety guaranteed by multiple barriers.
- c. Mandatory risk assessment (which can be done using ISO 16075, ISO 20426, ISO 20468).
- d. Production and quality licence up to the point of delivery – producer responsibility (production permit).
- e. Licence of use and quality from the point of delivery to the uses - responsibility of the user (utilization permit).
- f. Centralized Systems (Urban Wastewater Treatment Plants) and Decentralized Systems (collective or private system, managed by a collective or private entity, which can only produce ApR for its own uses).

Spain: (contact: Elena Aspichueta easpichueta@consorciodeaguas.eus)

I am sending you some information and figures about regeneration and use of reclaimed water from our association AEAS.

In these screen shots you can find the total volume of reclaimed water produced, together with the share of different uses in Spain.



Depending on the geographical areas, one or another type of use is more abundant. In the region of Murcia, 99% or more of the reclaimed water is used for agricultural irrigation and only some golf courses have a concession for this or a small amount for a municipality for street cleaning, but it is negligible.

However, in the Madrid region urban and industrial uses are abundant, so the answer to some of your questions refers to the Community of Madrid.

-How common is it to use reclaimed water in your country/region – wastewater or/and stormwater for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes?

In the Community of Madrid, reclaimed water has been produced for urban uses since 1999. Today this practice is tremendously implemented, reaching in 2022 a production of 17 Hm³ of regenerated water for urban uses (irrigation of green areas, golf courses, street washing, sewage cleaning, cooling of internal industrial processes in wastewater treatment plants...) and industrial processes (replacement of drinking water with reclaimed water for the largest consumer in the Community of Madrid, which is the largest paper mill in Europe).

-How are water & wastewater utilities involved in the solutions for the use of reclaimed water into practice? What are the drivers for the water & wastewater utilities?

Canal de Isabel II (utility in Madrid) manages the whole water cycle. Therefore, promoting the production of reclaimed water is a strategic issue since it generates the guarantee and availability of a new water resource for those uses in which supply water can be replaced by reclaimed water. In this way, the continuity of the service is guaranteed during the dry season and there is greater control of the water reservoirs for the supply of drinking water to clients.

-What are the drivers for the use of reclaimed water - from a customer point of view?

From the consumer's point of view, using reclaimed water is a plus in the sustainability of the resource since they are providing a new life to the wastewater, for a purpose whose quality is adequate. In addition, the consumer has a greater guarantee of availability of the resource, which will not be diminished in the event of drought or water restrictions since its origin provides a greater guarantee on availability.

-Are there economical advantages to invest in solutions to use reclaimed water? To whom?

Reclaimed water is a reality and an environmental objective, and in the context of water stress, the economic approach must be assessed globally in comparison with the savings it represents in the consumption of supply water. Furthermore, the point of delivery of reclaimed water is closer to the point of production of reclaimed water, while the distances from the origin of the supply water in water reservoirs are usually much greater. But it is important to note that the economic balance with the use of natural resources must take into account the topology of the networks because in a water stress scenario this can be secondary, but if the natural resource is available, this must be included in the economic balance.

-Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view?

These kind of procedures always require a lot of work from an administrative point of view and also take long periods of time to obtain authorization.

Sweden (contact: Anders Finnson anders.finnson@svensktvatten.se)

Use of reclaimed water in urban applications

(Reclaimed water means urban wastewater treated according to the UWWTD 91/271 that is further treated for specific uses)

- How common is it to use reclaimed water in your country/region – wastewater or/and stormwater
- for urban applications like urban irrigation or for industrial use in processes, for cooling or other industrial or urban purposes?

Sweden has only a few examples, typically performed as R&D projects but at least one full-scale project where treated wastewater will be used as cooling water for a battery factory.

- How are water & wastewater utilities involved in the solutions for the use of reclaimed water into practice? What are the drivers for the water & wastewater utilities?

Water utilities are providers of the solutions; for industrial solutions they are typically fully financed by the industry, but for irrigation purposes it is often provided on a limited basis to the municipalities for irrigation of parks and such. There are also solutions for agricultural irrigation, and solutions being developed to interchange fresh water use with reclaimed water for e.g. toilet flushing in dwellings.

The key driver is sustainable water use and risk of water scarcity, i.e. avoid shortages or ensure supply.

- What are the drivers for the use of reclaimed water - from a customer point of view?

Either there is a lack of alternatives (not permitted to use freshwater), or a genuine aspiration for a more sustainable water use.

- Are there economical advantages to invest in solutions to use reclaimed water? To whom?

No obvious economical advantages in the short run. In the long term reclaimed water offers the possibility to be an alternative at all to some industries, and for irrigation purposes. In the future, it could be a minor economical advantage, or an opportunity cost, to utilities.

- Do you have any clear guidelines or support from your local/regional authorities for consents and requirements – or is it very heavy/confusing work for you from an administrative point of view?

There are no guidelines from the authorities (except for water quality when used in agriculture). It is heavy and confusing work, and there are a lot of challenges that need to be resolved.