

Projet REUT'O'SUD : Filière de réutilisation des eaux usées traitées en région Sud : Regards croisés techniques, réglementaires et sociaux – état des lieux et des potentialités, échanges de bonnes pratiques

REUT'O'SUD project: Water Reuse in the Region SUD-PACA: A cross-sectional view of technical, regulatory, and social aspects – current situation and potential, sharing of best practices

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ABSTRACT

In the SUD-PACA region, water is an essential but fragile resource [1]. Recovering wastewater treatment plant discharges is one solution to reduce pressure on water resources and aquatic environments. Given the effects of climate change and the region's economic and demographic growth, this is a key issue for the regional territory, particularly in the scarcity areas. However, despite potentially representing a significant opportunity, less than 1% of treated wastewater is reused in France. The REUT'O'SUD project, however, holds immense potential to change this, as other countries have already harnessed this potential.

Given this situation, with the support of the SUD-PACA Region as part of its "OR BLEU" plan (2023) [2], the Société du Canal de Provence (SCP) and Aix-Marseille University (AMU: FR ECCOREV and CISAM+) have partnered to implement the REUT'O'SUD project. This initiative aims to address these issues by launching a regional dynamic around the reuse of treated wastewater (REUT).

Through a territorial and deeply collaborative approach, the project aims to study and support the development of water reuse (REUT) in the Southern Region. The goal is to assist REUT stakeholders in the region (project leaders, solution providers, potential users, funders, etc.) in drafting a roadmap to overcome current obstacles, particularly regarding social acceptability [3], project financing, regulatory and administrative hurdles, and technological innovation.

Based on an analysis of the legal, legislative, regulatory, and normative framework and a review of REUT practices, the REUT'O'SUD project focuses on four key areas:

- Conducting an assessment and estimating the reuse potential of the region's more than 1,000 wastewater treatment plants,
- Building a database of the region's resources, uses, and projects,
- Configuring and implementing interdisciplinary Living Labs based on REUT objectives (agricultural, urban, recreational), involving all current and future project stakeholders to support and assist project leaders,
- Identifying funding opportunities and access conditions.

In the work, we present the methodology developed to evaluate and estimate the potential of water reuse in the regions for different uses: (i) agriculture irrigation, (ii) irrigation of golf courses, and (iii) urban uses.

1 - Evaluation and characterisation of the treated wastewater resource:

The treated wastewater resource refers to treated wastewater from urban wastewater treatment plants (WWTPs) in the regional territory. The database is provided by the Water Agency RMC (2021)¹ and takes into account only WWTPs with a treatment capacity greater than 200 eq.inh. The following elements for the assessment and characterisation of the treated wastewater resource in the regional territory has been studied: number, size (treatment capacity), geographical distribution, type of treatment, age of the WWTPs, volumes and quality of the treated wastewater, as well as the nature and quantitative pressure of the receiving environment for WWTP discharges.

There are 705 active WWTPs in the territory, with a capacity of over 200 eq.inh. Their treatment capacities range from 200 to 1,860,000 eq.inh. The largest WWTP in the region is the Géolide WWTP, located in Marseille. 74% of WWTPs have a treatment capacity of less than 5,000 eq.inh, and 5% have a treatment capacity of more than 50,000 eq.inh. They are mainly located in four areas (Figure 1) : (i) along the Rhone, (ii) along the Durance river, (iii) along the coast and (iv) in the Aix-Marseille metropolis.



Figure 1 : Location and treatment capacities of WWTPs in the SUD-PACA region

The total volume of treated water from all WWTPs is about 390 Mm³ per year, and the ten largest WWTPs, all located in coastal areas with discharge into the sea, produce 50% of this volume. The treated volume varies greatly in summer in the coastal region and winter in the mountain areas. 50% of WWTPs were constructed before 2000, and 75% before 2010. Since the 2000s, an average of 16 new treatment plants have been serviced each year. The average age of WWTPs in the region is 27 years; this indicates an interesting potential for renewing many WWTPs in connection with future REUT projects. It is also important to note that 98% of the volumes of wastewater are treated by a biological treatment, with 28% including an additional nitrification-denitrification treatment. Finally, regarding discharges into the environment in continental areas, 64% of the volumes are discharged into a water system with a quantitative status considered as good, and 11% are discharged into critical water systems.

2 – Evaluation of the potential of REUSE :

¹ Table of data characterising the Région Sud PACA's WWTPs, Water Agency Rhône Méditerranée Corse, 2021

To realise this quantitative assessment of the reuse potential, we considered the potential uses located near a WWTP and examined how a reuse project could meet these water needs. Scenarios of reuse in agriculture, golf courses, and urban uses have been considered. The discharge areas (continental or marine), the issues regarding water resources (deficient basins)², and the existing infrastructure, particularly for irrigation, have been taken into account. It is important to say here that this evaluation is a global and general approach and could not be applied directly to a new reuse project, which will systematically require a more detailed and specific local study.

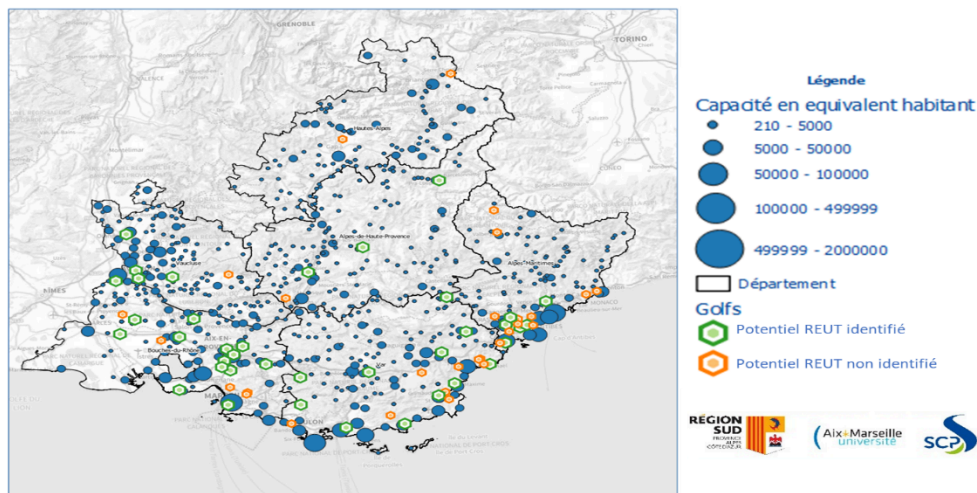
For agriculture and golf course irrigation, the main parameters used are the water needs for four months (May to August), the types of culture, and the distance relative to an existing WWTP.

Regarding agricultural irrigation, 225,000 hectares of land are eligible for a REUT project due to their proximity to a WWTP. The total irrigation needs for this surface are estimated at 406 Mm³ per year (worst-case scenario where all water needs are provided through irrigation), and existing WWTPs could provide 39 Mm³, so a global coverage of needs of about 10%. However, agricultural activity is not evenly distributed across the region; it is primarily concentrated in its western part (table 1). It is clear that in certain areas, REUT projects in agriculture could help reduce pressure on resources, particularly during periods of high tourism activities.

Department	Water needs (Mm ³ /year)	Reuse potential (Mm ³ /year)	Coverage of needs (%)
04	21.4	2.6	12
05	10.6	2.3	22
06	4.2	2.3	54
13	271.2	12.6	5
83	18.9	8.2	44
84	79.4	10.5	13
TOTAL	405.7	38.8	10

Table 1: water needs and reuse potential in the six departments of the region SUD-PACA

In the region, SUD-PACA, 65 golf courses are currently located, and only three are linked to a water reuse project. We can estimate a volume of 11.6 Mm³/year for the irrigation of these golf courses. With the dedicated parameters of distance, elevation, and needs, a potential of 39 golf courses irrigated by reuse has been identified. That represents a total volume of 4.3 Mm³/year or 37% of the current needs. The other ones are generally to far from an existing WWTP, but depending on the local characteristics, it could be changed for some of them. Interestingly, 65% of these potential golf courses are not located in a coastal area (figure 2), where we could have a use conflict with urban uses.



² Table of data characterizing the rivers - Pressures causing the risk of not achieving good status by 2027, Water Agency Rhône Méditerranée Corse, SDAGE 2022-2027

Figure 2: Golf reuse projects identified for golf courses (green), projects not identified (orange)

Two main ways are identified for the urban use of treated wastewater: street cleaning in all cities and villages and irrigation of parks and gardens. The second one is currently in progress, but for the first one, 11,000 hectares have been identified for this use in the region SUD-PACA. That corresponds to a current need of 4,2 Mm³ per year, and 100% could be provided by the existing WWTP. Reuse projects are currently set up in the cities of Cannes / Mandelieu la Napoule and Antibes on this topic. The next assessment of water needs for the irrigation of parks and public gardens will increase this potential for treated wastewater reuse in urban areas in the region.

CONCLUSIONS :

The first phase of the REUT'O' SUD project demonstrated a really interesting potential for reusing treated wastewater, whether for agricultural, urban, or leisure uses, especially during dry summer periods, in relation to current needs.

The global analysis used needs to be confirmed and improved at a local level. A specific and detailed analysis that takes into account all the technical and socio-economic parameters and involves all the shareholders and stakeholders is needed.

To identify and remove all the technical and sociological obstacles to future projects in a holistic and shared approach, a living-lab configuration is proposed and set up according to the type of reuse envisaged: (i) agricultural, (ii) urban and (iii) leisure. These living-labs will be based on current projects and concrete pilot case studies to validate the methodologies developed and then successfully transpose them to other sites and projects.

REFERENCE

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[2] Le Plan Or Bleu : La région trouve des solutions lorsque l'eau se fait rare (mai 2023), <http://www.maregionsud.fr/actualites>

[3] Favoriser le recours aux eaux non conventionnelles – Analyse des freins et leviers et recommandations, Groupe de Travail Astee, 2023