

STORING TREATED WASTEWATER: (DE) LIMITING AND DEFINING POSSIBLE FUTURES FOR IRRIGATION IN AREAS WITH STRUCTURAL WATER SHORTAGES (SOUTH-WEST FRANCE)

STOCKAGE DES EAUX USEES TRAITEES : (DE) LIMITER ET DEFINIR LES AVENIRS POSSIBLES DE L'IRRIGATION DANS LES ZONES SOUFFRANT DE PENURIES HYDRIQUES STRUCTURELLES (SUD-OUEST DE LA FRANCE)

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ABSTRACT

The construction of infrastructure to provide more water is ongoing, but this is becoming increasingly controversial. An increased supply can generate greater demand, thereby exacerbating the shortage, while new storage facilities can hinder the search for alternative solutions. Against this backdrop, the use of so-called unconventional water sources is increasing, particularly in regions experiencing chronic shortages linked to prevailing practices. In southwestern France (Mont-de-Marsan, Landes), a reuse project intends to irrigate 1,000 hectares with water from the Conte wastewater treatment plant. If the project goes ahead, five reservoirs will store the wastewater produced throughout the year, preventing its discharge into the river while ensuring a consistent water supply for those who withdraw water from the river for irrigation purposes. This article analyses the effects of defining water as “waste” or “resource” when negotiating and legitimising the project. The findings underscore a nuanced prioritisation of quantitative and qualitative concerns, despite their inherent interconnectedness. First, the debate surrounding authorised and withdrawn volumes for irrigation was feared, but anticipated and planned for. This illustrates how infrastructural imaginaries that aim to ensure a stable water supply influence the idea of water conservation or efficiency. Conversely, negotiating the local implementation of European and national regulations could raise issues of commensuration that are generally overlooked in France, particularly with regard to the quality of conventional irrigation water. Consequently, the visibility or invisibility of a potential public problem may become a source of tension within the irrigation sector with regard to these new infrastructures designed to secure agricultural production.

Keywords: Storing treated wastewater; Water supply; Wastewater treatment plant; Conventional irrigation water; Agricultural production.

RÉSUMÉ

La construction d'infrastructures visant à augmenter l'approvisionnement en eau se poursuit, mais elle fait l'objet de controverses croissantes. Une offre accrue peut générer une demande plus forte, aggravant ainsi la pénurie, tandis que de nouvelles installations de stockage peuvent entraver la recherche de solutions alternatives. Dans ce contexte, le recours à des sources d'eau dites « non conventionnelles » se développe, en particulier dans les régions confrontées à des pénuries chroniques liées aux pratiques en vigueur. Dans le sud-ouest de la France (Mont-de-Marsan, Landes), un projet de réutilisation vise à irriguer 1 000 hectares avec les eaux provenant de la station d'épuration de Conte. Si le projet voit le jour, cinq réservoirs stockeront les eaux usées produites tout au long de l'année, empêchant ainsi leur rejet dans la rivière tout en garantissant un approvisionnement en eau constant à ceux qui prélèvent l'eau de la rivière à des fins d'irrigation. Cet article analyse les effets de la définition de l'eau comme « déchet » ou « ressource » lors de la négociation et de la légitimation du projet. Les résultats mettent en évidence une hiérarchisation nuancée des préoccupations quantitatives et qualitatives, malgré leur interdépendance inhérente. D'une part, le débat autour des volumes autorisés

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et prélevés pour l'irrigation était redouté, mais anticipé et pris en compte. Cela illustre comment les imaginaires infrastructurels visant à garantir un approvisionnement stable en eau influencent la notion de conservation ou d'efficacité de l'eau. À l'inverse, la négociation de la mise en œuvre locale des réglementations européennes et nationales pourrait soulever des questions de proportionnalité qui sont généralement négligées en France, notamment en ce qui concerne la qualité de l'eau d'irrigation conventionnelle. Par conséquent, la visibilité ou l'invisibilité d'un problème public potentiel pourrait devenir une source de tension au sein du secteur de l'irrigation concernant ces nouvelles infrastructures destinées à garantir la production agricole.

Mots-clés : Stockage des eaux usées traitées; Approvisionnement en eau; Station d'épuration; Eau d'irrigation conventionnelle; production agricole.

INTRODUCTION

Climate change is leading to more frequent and intense periods of both rainfall and drought. There is a growing sense of unease about the future, particularly regarding the scarcity of water resources in terms of both quantity and quality, as well as the absence of solutions to address this issue. Water infrastructure now seems unable to fulfil the long-standing promise made in its name: to meet ever-increasing water needs. Several authors have spoken of a shift from the governance of water abundance to that of scarcity. Although the reality of reduced water availability is not disputed, the social and political construction of situations of scarcity is now well documented. The construction of new infrastructure aimed at providing an ever-increasing water supply continues, but it has become increasingly controversial. New storage facilities could lead to “supply-demand cycles” (increased supply generates greater demand, exacerbating the shortage), or a “reservoir effect” (hinder efforts to devise and develop other adaptation strategies). The environmental impact of such infrastructure has been heavily criticised.

Against this backdrop, there has been an increase in the use of so-called non-conventional water sources, such as desalination to (costly) produce fresh water, or the reuse of wastewater, which was previously considered hazardous from a health perspective. In light of the urgent need to address climate change, advances in wastewater treatment have made it possible to reuse wastewater in sectors with high water demand. However, these choices are not neutral: presenting and re-presenting possible futures is deeply political, which is addressed by scrutinising dominant futures that sideline and delegitimise alternative futures. Treated wastewater is now being exploited as a new resource for irrigation, including, on occasion, to “ensure the development of water-intensive agriculture” or, at the very least, to maintain it.

With less than 1% of its wastewater currently being recycled, a new discourse has emerged in France about the country's “lagging behind” other European countries in this respect. This suggests that the issue is now on the political agenda. On 30 March 2023, the government's plan for resilient and coordinated water management was announced at the Serre-Ponçon dam. Known as the “Water Plan”, it identifies wastewater reuse as a key innovation for addressing water scarcity in France and achieving the target of reducing water consumption by 10% by 2030. The ambitious national target of 1,000 wastewater reuse projects by 2027 has been broken down at regional and basin agency levels. The Adour-Garonne Water Agency (AGWA), for instance, aims to implement 200 projects by 2030, with the goal of achieving a 0.3–2% reuse of wastewater and rainwater. This equates to 60 million cubic metres of water per year.

However, several obstacles stand in the way of these projects. According to advocates of these solutions, these constraints are primarily regulatory, but also relate to social acceptability issues involving the “yuck factor”. This article aims to address issues associated with the reuse of wastewater for agricultural irrigation. Rather than identifying what constitutes good or bad wastewater quality, the aim is to understand how different stakeholders develop their perceptions of water as “waste” or as a “resource”, and the associated socio-technical constructs. The article therefore explores the relationship between the development of reuse projects at the planning stage and the construction of perceptions of water.

First, it questions the conditions for the development of reuse projects and, above all, the future of irrigated agriculture if it is shaped by specific infrastructural imaginaries. Second, the emergence of these new socio-technical imaginaries and the subsequent attempt to implement them ultimately highlight another public issue that is regularly overlooked in France: the quality of both treated wastewater and conventional irrigation water. To this end, the imaginaries and practices of those involved in a project to reuse wastewater for agricultural irrigation in Mont-de-Marsan in southwestern France are examined. This project aims to irrigate 1,000 hectares using water from the Conte wastewater treatment plant (WWTP), and it has two distinctive features. First, for the first time in France, five reservoirs would be built to store the wastewater produced by the plant throughout the year, thereby enabling the discharge of wastewater into the river to be stopped completely. Second, the project is presented as a “substitution” project, replacing the use of water resources deemed to be at risk with other resources. In the Conte project, this means that irrigators who benefit from these secure supplies will no longer be allowed to pump water from the river.

The project is being planned in the context of recent changes in European and national regulations, and the implementation of which is being negotiated locally by its promoters. It will be seen how, while some may consider new requirements to be technically and financially restrictive, they can also provide reassurance to other stakeholders. The research approach is presented to shed light on the technical and political perceptions surrounding the reuse of treated wastewater for irrigation and on the specific features of the Conte project in Mont-de-Marsan. The results of this research are presented in two phases. First, it will be shown how a dual representation of the quality of WWTP waters, as waste and as a resource, influence the future prospects of irrigated agriculture. Second, the strategies adopted by stakeholders to address regulations deemed “restrictive” will be discussed. The aim is to discuss the technical and political construction of a “new” water resource, which will influence the legitimacy and credibility of different agricultural futures.

UNCONVENTIONAL PERSPECTIVES ON UNCONVENTIONAL WATER

Beyond project feasibility and the “yuck factor”: studying the process of technological legitimization

There is a vast amount of literature on the reuse of treated wastewater. However, much of this research has been conducted within the field of engineering sciences, assessing the barriers and enablers of such projects and their prospects and challenges. Their objective is to emphasise the conditions for success and suggest proper guidelines to guarantee feasibility. Historically, wastewater has been associated with health risks and environmental pollution due to the presence of pathogens. Many authors identify the yuck factor, health risk concerns, and cost considerations as key obstacles to wastewater reuse. Consequently, a substantial body of research has examined the social acceptability of reuse, with a particular focus on socio-psychological factors of risk perception.

However, this research has often failed to go beyond the perspectives of users and consumers. Some authors therefore critically argue that advocates of wastewater reuse assume an emotional response is the primary determinant of people's attitudes towards reuse and despair of them accepting rational arguments about its merits. They argue that there is a need to shift towards explanations based on the analysis of “the sociotechnical systems of providing water and handling waste”. It is believed that, to understand various reactions to reuse, it must be “situated within an overall process of technological legitimization”. To achieve this, it is necessary to study wider social processes and representations, including those of stakeholders and other actors involved in projects

Construction of a resource: relationships and strategies of actors

Beyond the social acceptability of individual projects, an increasing amount of research is now examining society's broader relationship with wastewater. For instance, researchers are studying the controversies surrounding the narratives and perceptions that are emerging around such technical solutions. In order to move beyond the dominant techno- triumphalist narratives that prevail in relation to these technologies, it is necessary to study the processes of (de)politicisation in the associated

discourse. Research demonstrates how the perception of wastewater is evolving from that of undesirable waste to a resource to be exploited in view of the urgency of climate change and its impact on the variability of access to water. Reuse appears to be a new technical response to water shortages, intended to differ from traditional infrastructure such as dams. However, there is continuity in the construction of an image of water as ultimately always available and secure. In this vein, the views of various stakeholders involved in reuse projects must be taken seriously as they place these projects within broader debates on water governance and irrigation that now permeate public and political spheres. Studying wastewater imaginaries is interesting from a relational perspective, focusing both on actors' relationships with the resource and on power relations between actors around the resource. Water involves processes of access, distribution, and management that evolve over time. Any change to the resources used, the infrastructure, or the social rules reconfigures the physical reality of irrigation and the existing social arrangements. This approach is particularly relevant in the context of reuse, given that much social science literature on water reuse focuses on problems of acceptance and economic problems, while the spatial and political dimensions remain under-researched.

However, some studies have emphasised the social and political impact of interventions aimed at accessing and sharing wastewater. Others emphasise the different actors, management activities and practices that shape wastewater collection, transfer, treatment, discharge, and/or reuse in different social, technological, and environmental contexts. In summary, this article addresses wastewater reuse for irrigation by analysing ongoing projects and the discreet, everyday arrangements that ensure their success despite the controversies surrounding them. This enables the redefinition of what constitutes a resource: how discourse and practices determine who needs water, what is deemed an adequate quantity and quality of water, when, and for what purpose. The technical and political construction of this "new" resource therefore determines what will be considered legitimate and credible in the future management of agricultural water.

THE CONTE WWTP PROJECT: A PROMISE OF WATER STORAGE

A structural imbalance between the quantity of available water and its usage

Conte WWTP is located in Mont-de-Marsan (Landes department). The Landes department has 102,372 hectares of irrigated land out of 210,461 hectares of cultivated land. Maize crops account for around 60% of the department's irrigated agricultural production, followed by vegetables (around 20%) and oilseed crops (around 10%). There is also some fruit production, with Label Rouge certification for kiwis from the Landes region. The project under study is located on the Ludon River, a tributary of the Midour and subsequently the Midouze, within the Adour watershed. The Ludon and Gaube inter-municipal Water Association manages two small resupply structures on the Ludon to ensure pumping into the river. Although up to 1.5 million cubic meters can be drawn from the river, the actual volume is rarely more than 1 million cubic meters.

Indeed, the Ludon is located in the Water Distribution Zone of the Adour basin, an area that is chronically under water shortage. Therefore, a Single Collective Management Organisation (OUGC) is responsible for applying for a single, multi-year authorisation covering all withdrawals by irrigators. The OUGC then distributes the authorised water volumes. In this context, a "Territorial Project for Water Management" (PTGE) was developed for the Midour basin between 2016 and 2020 to achieve a better equilibrium between water needs and available resources. The PTGE seeks to offset the estimated water deficit of between 5.5 and 7.5 million cubic meters using solutions such as water savings, changes in agricultural practices, and 3.15 million cubic meters through the reuse of wastewater for agricultural irrigation.

A water storage and substitution project

The project under study aims to irrigate 915 hectares across 24 farms using treated wastewater from the Conte WWTP. Initially scheduled to begin in 2024, with delivery planned for 2027, the project is currently behind schedule in the pre-project phase. It is being run jointly by several local water authorities and the Chamber of Agriculture, and it is part of the Midour PTGE.

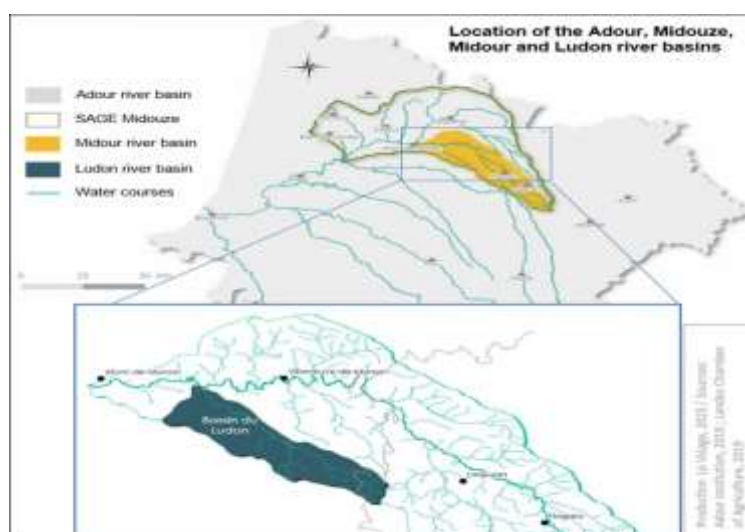


Figure 1. Location of the Adour, Midouze, Midour and Ludon river basins

Compared to other reuse projects, this project has two specific features. First, it involves constructing five reservoirs (with a capacity of between 165,000 and 473,000 cubic meters each) to store the wastewater produced by the treatment plant throughout the year. This will result in 1.4 million cubic meters less wastewater being discharged into the environment, while ensuring the same volume of water is available for agricultural use during the irrigation season. Second, it is a substitution project: farmers benefiting from the project will no longer be allowed to draw water from the river. Consequently, 40 pumps are expected to be eliminated during the irrigation season, representing 1.4 million cubic meters of water consumption.

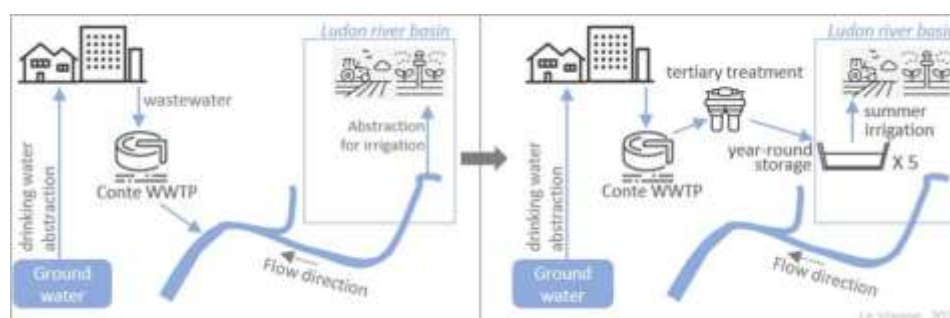


Figure 2. The Conte wastewater treatment plant project: year-round water storage and replacement of river withdrawals in summer

Defining wastewater reuse as a substitution practice requires two non-neutral prerequisites: treated wastewater must not be viewed as a withdrawal from the environment, and it must not be used to meet new demands. This questions the performative effects of reuse in terms of how the future of water is considered. Similarly, presenting the wastewater storage project in Mont-de-Marsan as a substitution project raises questions about the needs it is supposed to meet, and therefore how it is shaped by and shapes in return local stakeholders' thinking about water management

Methodology

The research approach was based on a dual perspective: (i) studying the implementation of reuse policy at the European, national, and regional levels, in order to better understand the regulatory and socio-political tensions arising from its application at the local level; and (ii) a focus was chosen on the actors involved in the project to reuse wastewater for agricultural purposes in order to analyse their different

perceptions of wastewater when planning the project and seeking to make it viable. Using a case study approach, the aim is to follow the trajectory of the Mont-de-Marsan project over several years, from planning to implementation.

This article is based on three methodological approaches. The first is the analysis of technical documents relating to the Conte WWTP project, primarily the pre-feasibility study produced by the Landes Chamber of Agriculture. The second approach involves several phases of fieldwork conducted between 2024 and 2025. Interviews were conducted with representatives from institutions supporting the project, farmers, and various state and regional authorities. Finally, observational work was conducted during the REUSE EUROMED international conference in 2024, and during the OneWater Days in 2025.

THE PROMISE OF MAINTAINING THE LOCAL AGRICULTURAL LANDSCAPE

Reusing treated wastewater involves putting it back into circulation to create value again. The justification for the Conte project is based on specific socio-technical constructs that frame the debate in both environmental and economic terms. While these constructs enable its proponents to emphasise the anticipated environmental advantages, the primary goal is to guarantee the future irrigation of an agricultural region experiencing a chronic water shortage.

Creating a “new” resource: irrigated area or nutrient spreading zone?

One aspect of the waste/resource dichotomy concerns the interplay between the risk of environmental eutrophication and the potential for fertilisation. The project to reuse wastewater for irrigation originated from the Conte WWTP in Mont-de-Marsan not complying with regulations due to excessive phosphorus quantities. Following a study, two solutions emerged: upgrading to meet the required standards, or stopping discharges into the river and reusing the wastewater for irrigation. The reuse project resulted from a political and economic choice strongly supported by the Chamber of Agriculture, whose primary objective is to secure water volumes for agriculture. The use of wastewater for irrigation is subject to specific regulations, and the nutrients (including phosphorus) contained in the wastewater are considered a source of pollution due to eutrophication risks, but also a potential resource for fertilising crops. "Fertigation" is an agronomic argument regularly put forward in scientific circles to promote wastewater reuse.

Securing irrigation: authorised volumes or withdrawn volumes?

A second aspect relates to water circulation. The reuse project at the Conte WWTP is primarily intended to secure water volumes for irrigation and is based on the idea of maintaining the local agricultural economy. The main argument relates to the region's frequent droughts, which lead to drought decrees progressively limiting water use. Securing water resources for farms will facilitate negotiations with cooperatives and processing industries, ensuring the cultivation of higher-value crops. The very idea of maintaining a specific agricultural economy is at stake, heavily reliant on maize cultivation.

One recurring area of tension is the difference between authorised and actual volumes withdrawn. The project would guarantee irrigators higher volumes than those currently withdrawn during low water periods under drought restrictions. This raises concerns that agriculture could consume more water than at present in a region with a structural water deficit. Furthermore, the implementation of a wastewater reuse project does not require farmers to adopt water-saving techniques such as drip irrigation or to change their practices.

DISCUSSING THE FUTURE QUALITY OF IRRIGATION WATER

Reassuring the agricultural community about the quality of treated wastewater

Securing the support of agricultural stakeholders for the project hinges on guaranteeing the high quality of treated wastewater. In order to fulfil the promise of secure irrigation, the aim is to guarantee sufficient

quantities of high-quality water in the near future. New French regulations modelled on European ones now impose strict water quality standards, which were used to show that the water was safe to the agricultural sector. Negotiating the application of standards at the local level Direct negotiations between project leaders and regulatory authorities focus on regulations governing the quality of water. A key topic is the establishment of one or more points of compliance where the quality required for a specific use is verified. According to the project promoters, the cost of these checks would render the project uneconomical if compliance points were required for each water storage facility. Promoters highlight the contradictions between ambitious public policy objectives and quality standards that they deem unattainable, calling for greater flexibility.

Which waters will be measured for quality in the future, and which will not?

Looking at what constitutes 'good' treated wastewater challenges certain preconceptions and highlights quantitative and qualitative issues of the interconnections between surface water and groundwater. There is tension surrounding the fact that the same controls are not applied to treated wastewater and conventional water withdrawals from rivers, including those downstream of WWTPs. Highlighting the issue of compliance and measurement of WWTP water discharges can be used as leverage to bend the rules for the Conte WWTP project. Behind the construction of the image of high-quality treated wastewater for agriculture lies the fear of future controls on the quality of irrigation water more generally. While knowledge gained through measurement serves to control the environmental risk of "waste" water, maintaining some ignorance on the subject is essential to ensure the support of those who will benefit from the new "resource".

CONCLUSION

Imagining futures is not an innocent or neutral affair. Tensions are emerging over the solutions chosen to address the scarcity of water resources, as well as over the very definition of what makes water a resource. In the context of climate change, infrastructure projects aimed at providing more water are becoming increasingly controversial due to the risks associated with supply-demand cycles and the reservoir effect. This paper has examined how reuse projects involving unconventional water sources are perceived, revealing tensions between projects primarily designed at the local level and the inclusion of reuse on the political agenda at the national level.

The local implementation of national regulations is under negotiation, but this risks exposing a public issue that is often kept under the radar in France: the quality of both treated wastewater and "conventional" irrigation water. Whether this potential public issue is visible or invisible thus becomes a source of tension for the irrigation sector itself with regard to these new infrastructures, designed to secure agricultural production.

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