



SUWANU
EUROPE

SWOT and PEST analyses for implementation of reuse practices in Occitanie, France

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Socio-economic characterization of the region

Occitanie is the second largest French mainland region with 72 724 km² and 5 830 200 inhabitants. This wide region has a rich variety of landscapes including mountains (Pyrenées and Massif central) and 220 km of Mediterranean coastline. Occitanie also rank second as French farming region. Agriculture is also different and specialized according to the territory landscape such as livestock in mountainous areas, grapes for wine production on the Mediterranean rim and cereals and maize in the Garonne plain. Some areas are already heavily irrigated (corn production in Garonne plain) while others experience a growing need for irrigation (vineyards production). There are only few reclaimed water reuse projects throughout the region, most of them are pilots or research based. However, with over 3 000 WWTP, Occitanie has a tremendous opportunity to promote reclaimed water reuse.

Full description of OCCITANIE and its reclaimed water existing initiatives is available in deliverable 1.1.

SWOT Analysis

The objective of this task is identifying impediments and factors of success of regional clusters through a SWOT analysis concurrently with the results from the previous tasks, focusing on the economical regional aspects, on research innovation potential and on market exploitation and penetration.

This analysis will expand the previous SWOT done under SUWANU 2012, when SWOT was limited to explore factors that influence the use of reuse technologies. The goal this time is to have a broader scope assessing a wider range of factors (e.g. social, legal, economic) including PEST analysis with political, economic, legal, socio-cultural and technological factors that might influence regulations, markets, creation of new businesses, etc. and AKIS analysis to understand knowledge and innovation process

Within **WP2**, SWOT and PEST analyses for water reuse will be carried out for the 8 regions. As a result, a stakeholders' matrix will be performed based on key actors' knowledge, interests, influence, existing and potential alliances and conflicts, impact of their activity, etc. and their effective communication channels. Based on the gained knowledge, a **general strategy (Action Plan) and later 8 specific Action plans** will be developed to overcome implementation problems/ barriers.

The following SWOT analysis has been carried out by **ECOFILAE's collaborators**. It has been completed and quoted by **3 regional experts**.

Each category of the SWOT (Strengths, Weaknesses, Opportunities and Threats) are subdivided into 10 specific aspects. Those aspects have been quoted from 1 to 10 according to their relevance.

In the first hand, ECOFILAE's collaborators have established a first draft of the SWOT (only attributes). Then Regional experts have been contacted to give their opinion on the chosen attributes. The following table gather initial attributes as well as corrections, adaptation and additional attributes from regional experts.

Intensities have been assessed by both intern (ECOFILAE) and extern (Regional experts) experts. The evaluation has been divided into two steps (¡Error! No se encuentra el origen de la referencia.)

Table 1 : Evaluation method

First step	Second step
Very high relevance	8 to 10
High relevance	6 or 7
Rather relevant	5
Low relevance	3 or 4
Very low relevance	1 or 2

Results of SWOT analysis is given in table 2. It gathers all attributes and intensity which have been evaluated at the scale of specific aspects.

Strength

General aspects	Specific aspects	Attributes
Market related	Economic aspects	S1.1 Pre-existing implemented disinfection technologies on some WWTP (for environmental and sanitary issues like potable water production, swimming areas and sea-food production) and pre-existing potential storage units (eg. old lagoons rehabilitated for water reuse)
	Water availability	S2.1 Irrigation period in summer synchronized with period of high wastewater production (in touristic area)
	Markets	S3.1 Occitanie is the second biggest agricultural region in France with high water demand S3.2 Urban agriculture development slowly growing
Product related (RW)	Technical aspects	S4.1 French companies are among world leader firms on water management, treatment, water management, metrology and irrigation - Most of the technologies are efficient and reliable
		S4.2 Many specialized laboratories for soil and water samples analysis able to perform a broad range of analysis (microbiologic, chemical, micro-pollutant, trace element, isotopes, etc). Moreover, the region hosts many technology hall and instrumented site for process experimentation.
	Technology transfer	S5.1 /
	Health	S6.1 Strict regulation standards and efficient disinfection technologies to reach low sanitary risk
Social & Governance	Social aspects	S7.1 Farmers who need water have a quite high trust in water reuse as long as legal standards are respected (and as long as reclaimed water price is affordable) - Territory managers (e.g. City council: WWTP owners) are quite aware and open to water reuse potential
	Regulators	S8.1 For some cultures like vineyards and trees irrigation national water quality standards can often be reached without additional reclamation facility

	Management	S9.1 French water regulation enables reclaimed water producers but also end-users (farmers) to be the official leader of a water reuse project thus leading to more possibilities in terms of project management and leadership.
	Environmental	S10.1 Sometimes less environmental impact of the water reuse chain than other alternative water supply chains for farmers (carbon footprint, increase of the quality of the environment...)

Weaknesses

General aspects	Specific aspects	Attributes
Market related	Economic aspects	W1.1 Additional disinfection system and buffer storage can be expensive (construction, operation and price of land)
		W1.2 Implementation of reclaimed water networks is expensive due to roadways, elevation or scattered plots for some crops such as vineyards
	Water availability	W2.1 Occitanie region is a dry area, it already adapted agricultural production with low water demand (vineyards and cereals)
		W2.2 Occitanie region is a dry area, it already adapted water supply (water from BRL and CACG networks) thus leading to water reuse being hardly interesting, profitable and competitive with other water resources.
	Markets	W3.1 Low potential of water reuse compared to the total agricultural water demand
Product related (RW)	Technical aspects	W4.1 Few reclamation technologies for rural areas have been promoted and demonstrated (stakeholders often limited to UV technology)
	Technology transfer	W5.1 Low knowledge of reclamation technologies used abroad in more "experienced" countries
	Health	W6.1 /
Social & Governance	Social aspects	W7.1 Farmers worried about consumers acceptance

	Regulators	W8.1 French national regulation requires high water quality standards: expensive reclamation treatment required (specially for vegetables and sprinkler irrigation).
	Management	W9.1 Farmers and irrigation associations often not "able" to manage treatment/disinfection systems --> dependency to other stakeholders
		W9.2 No organisation is officially entitled, compelled and empowered to be the ONE organisation to manage and support a water reuse project in its globality thus leading to some places where no one want to take the lead on the project and expect another organisation to support the major efforts.
Environmental	W10.1 Sometimes less environmental impact of other alternative water supply chains for farmers than the water reuse chain (carbon footprint, increase of the quality of the environment...)	

Opportunities

General aspects	Specific aspects	Attributes
Market related	Economic aspects	O1.1 Increase loss of agricultural gross margin for farmers without irrigation OR rise of conventional water cost can push forward water reuse
		O1.2 Beyond direct benefits: externalities (socio-environmental) and indirect benefits sometimes highlight the profitability of water reclamation and reuse for the territories
	Water availability	O2.1 Occitanie has a littoral coast where treated water is discharged into the sea and "lost" for any uses thus leading to a high opportunity on those areas
		O2.2 Water Reuse can be complementary to other resources such as channels networks and regional raw water networks in regions/areas that are not supplied
O2.3 Growing population in Occitanie leading to increasing volume of reclaimed water available.		

		O2.4 Growing population in Occitanie leading to higher water consumption for domestic purposes. Resources used to produce potable water can be preserved by using reclaimed water instead of conventional water for irrigation.
	Markets	O3.1 Climate change and water stress induce the need of introducing new irrigated areas : high economic losses are planned without irrigation in fore coming years O3.2 Organic farming areas are growing: no additional specific restriction to the legal standards for water reuse
Product related (RW)	Technical aspects	O4.1 Efficient, performant and new (90's - 2000) range of existing WWTP: 99% of wastewater is treated before discharge. O4.2 Many big cities with big WWTP (centralized) able to deliver high volumes of reclaimed water
		Technology transfer
	Health	O6.1 Many discharge areas are sanitary sensitive (swimming and sea-food production) : driver to water reclamation and reuse to limit the discharge into the environment and to improve the general water quality of the resources discharged
	Social & Governance	Social aspects
Regulators		O8.1 Regulatory framework strict but complete and clear
Management		O9.1 /
Environmental		O10.1 Driver to water reclamation and reuse to limit the discharge into the environment : many discharge areas of treated water are environmentally sensitive to N and P pollution : O10.2 French water agencies subsidize first and foremost : savings, efficient-use and substitution projects in irrigation. Thus, encouraging water reuse for farmers that currently uptake under pressure conventional water resources (ground and surface waters)

		O10.3 Salt intrusion in coastal areas emphasised by agricultural water uptakes in groundwater: high water reuse opportunity for substitution of those uptakes
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Threats

General aspects	Specific aspects	Attributes
Market related	Economic aspects	T1.1 French water agencies do not plan to subsidize new irrigation projects but only substitution projects
	Water availability	T2.1 Direct planned water reuse could be in competition with indirect and often unplanned agricultural reuse (or even potable and environmental reuse)
	Markets	T3.1 Other existing water sources with low cost (OPEX CAPEX) compared to water reclamation and reuse (ex :raw water network)
Product related (RW)	Technical aspects	T4.1 Many environmental areas sensitive to N and P pollution : most of the biggest WWTP are designed for nutrient removal purposes thus leading to lower the fertilizers properties of reclaimed water
		T4.2 Efficient, performant and new (90's - 2000) range of existing WWTP : Water reclamation was not the objective then. Thus, considering water reclamation : (1) additional reclamation facility are always needed and (2) water reuse is not considered for WWTP construction or regional development strategy.
	Technology transfer	T5.1 /
	Health	T6.1 Emerging topic of micropollutants and microplastic with few answers available (scientific results?)
Social & Governance	Social aspects	T7.1 Very low public and consumers awareness and acceptability of water reuse
	Regulators	T8.1 The regulation does not cover many uses and does not push forward multi-purposes project.
	Management	T9.1 Multi-purposes projects remain marginal because of high complexity (multi-stakeholders)

	<p>Environmental</p>	<p>T10.1 Water streams in Occitanie have often intermittent flows and rely very much on treated wastewater discharges thus leading to environmental issues when considering water reuse</p> <p>T10.2 Many environmental areas sensitive to N and P pollution: most of the biggest WWTP are designed for nutrient removal purposes thus leading to lower the fertilizers properties of reclaimed water</p>
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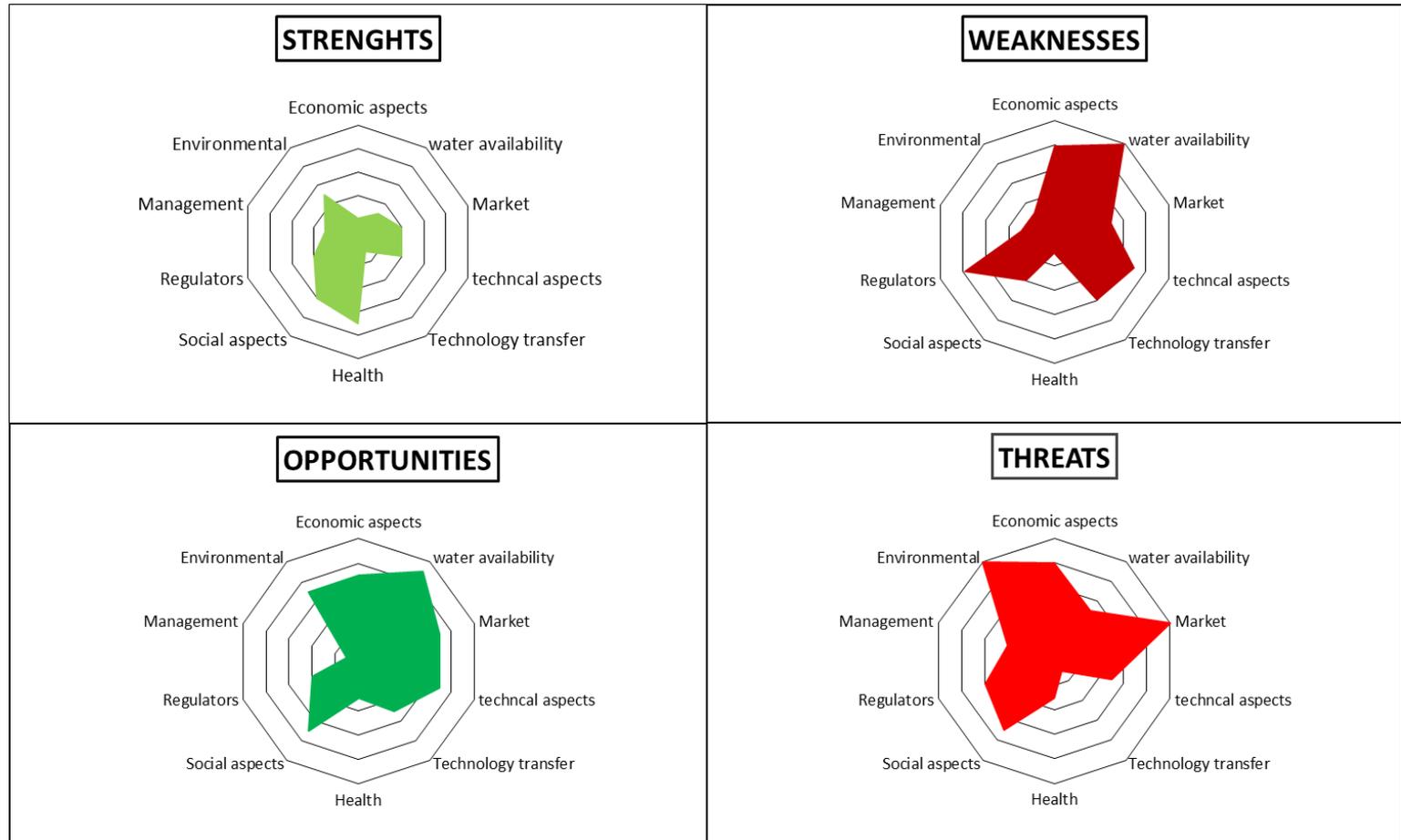


Figure 1 : spider diagram of the SWOT analysis

Spider diagrams (Figure 1) illustrate the relative intensity of each specific aspects and the categories.

As it was expected, weaknesses and threats (sum of intensity reaches respectively 55 and 59) are more relevant than strengths and opportunities (sum of intensity reaches respectively 39 and 57).

Strengths are particularly **low compare to other categories** except for health criteria.

Weaknesses, opportunities and **threats** seems to have a similar relevance.

PEST Analysis combined with SWOT

The following tables classify the parameters identify throughout the SWOT according to PEST factors (Political, Economic, Social and Technological aspects)

Table 3 : PEST - STRENGTHS

STRENGTHS	
Political aspects	<ul style="list-style-type: none"> ▪ Strict regulation standards and efficient disinfection technologies to reach low sanitary risk ▪ Sometimes less environmental impact of the water reuse chain than other alternative water supply chains for farmers (carbon footprint, increase of the quality of the environment...)
Economic aspects	<ul style="list-style-type: none"> ▪ For some cultures like vineyards and trees irrigation national water quality standards can often be reached without additional reclamation facility ▪ Irrigation period in summer synchronized with period of high wastewater production (in touristic area) ▪ Occitanie is the 2nd biggest agricultural region in France with high water demand ▪ Urban agriculture development slowly growing.
Social aspects	<ul style="list-style-type: none"> ▪ Farmers who need water have a quite high trust in water reuse as long as legal standards are respected (and as long as reclaimed water price is affordable) - Territory managers (e.g. City council : WWTP owners) are quite aware and open to water reuse potential ▪ French water regulation enables reclaimed water producers but also end-users (farmers) to be the official leader of a water reuse project thus leading to more possibilities in terms of project management and leadership.
Technological aspects	<ul style="list-style-type: none"> ▪ Pre-existing implemented disinfection technologies on some WWTP (for environmental and sanitary issues like potable water production, swimming areas and sea-food production) and pre-existing potential storage units (e.g. old lagoons rehabilitated for water reuse) ▪ French companies are among world leader firms on water management, treatment, water management, metrology and irrigation - Most of the technologies are efficient and reliable ▪ Many specialized laboratories for soil and water samples analysis able to perform a broad range of analysis (microbiologic, chemical, micro-pollutant, trace element, isotopes, etc). Moreover, the region hosts many technology hall and instrumented site for process experimentation.

Table 4 : PEST - WEAKNESSES

WEAKNESSES	
Political aspects	<ul style="list-style-type: none"> ▪ Occitanie region is a dry area, it already adapted agricultural production with low water demand (vineyards and cereals) ▪ No organisation is officially entitled, compelled and empowered to be the ONE organisation to manage and support a water reuse project in its globality thus leading to some places where no one want to take the lead on the project and expect another organisation to support the major efforts. ▪ Sometimes less environmental impact of other alternative water supply chains for farmers than the water reuse chain (carbon footprint, increase of the quality of the environment)
Economic aspects	<ul style="list-style-type: none"> ▪ Additional disinfection system and buffer storage can be expensive (construction, operation and price of land) ▪ Implementation of reclaimed water networks is expensive due to roadways, elevation or scattered plots for some crops such as vineyards ▪ Occitanie region is a dry area, it already adapted water supply (water from BRL and CACG networks) thus leading to water reuse being hardly interesting, profitable and competitive with other water resources. ▪ Low potential of water reuse compared to the total agricultural water demand ▪ French national regulation requires high water quality standards: expensive reclamation treatment required (specially for vegetables and sprinkler irrigation).
Social aspects	Farmers worried about consumers acceptance
Technological aspects	<ul style="list-style-type: none"> ▪ Few reclamation technologies for rural areas have been promoted and demonstrated (stakeholders often limited to UV technology) ▪ Low knowledge of reclamation technologies used abroad in more "experienced" countries ▪ Farmers and irrigation associations often not "able" to manage treatment/disinfection systems --> dependency to other stakeholders

Table 5 : PEST - OPPORTUNITIES

OPPORTUNITIES	
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<p>Political aspects</p>	<ul style="list-style-type: none"> ▪ Water Reuse can be complementary to other resources such as channels networks and regional raw water networks in regions/areas that are not supplied ▪ Growing population in Occitanie leading to higher water consumption for domestic purposes. Resources used to produce potable water can be preserved by using reclaimed water instead of conventional water for irrigation. ▪ Structured network of local professional stakeholders involved in the thematic ▪ Salt intrusion in coastal areas emphasised by agricultural water uptakes in groundwater: high water reuse opportunity for substitution of those uptakes ▪ Water circular economy is a key topic for politicians: some "pushes" the thematic forward on their territory ▪ Regulatory framework strict but complete and clear ▪ French water agencies subsidize first and foremost: savings, efficient-use and substitution projects in irrigation. Thus, encouraging water reuse for farmers that currently uptake under pressure conventional water resources (ground and surface waters)
<p>Economic aspects</p>	<ul style="list-style-type: none"> ▪ Increase loss of agricultural gross margin for farmers without irrigation OR rise of conventional water cost can push forward water reuse ▪ Occitanie has a littoral coast where treated water is discharged into the sea and "lost" for any uses thus leading to a high opportunity on those areas ▪ Growing population in Occitanie leading to increasing volume of reclaimed water available. ▪ Many discharge areas are sanitary sensitive (swimming and sea-food production) : driver to water reclamation and reuse to limit the discharge into the environment and to improve the general water quality of the resources discharged ▪ Climate change and water stress induce the need of introducing new irrigated areas: high economic losses are planned without irrigation in fore coming years ▪ Organic farming areas are growing: no additional specific restriction to the legal standards for water reuse
<p>Social aspects</p>	<ul style="list-style-type: none"> ▪ Beyond direct benefits: externalities (socio-environmental) and indirect benefits sometimes highlight the profitability of water reclamation and reuse for the territories ▪ General public support water saving program such as rainwater reuse or water recycling (survey IPSOS 2018)

	<ul style="list-style-type: none"> ▪ Driver to water reclamation and reuse to limit the discharge into the environment: many discharge areas of treated water are environmentally sensitive to N and P pollution
Technological aspects	<ul style="list-style-type: none"> ▪ Efficient, performant and new (90's - 2000) range of existing WWTP: 99% of wastewater is treated before discharge. ▪ Many big cities with big WWTP (centralized) able to deliver high volumes of reclaimed water ▪ Many local demonstration and pilot sites - Feedbacks shared ▪ Specialized research institutes working on water reuse in Occitanie

Table 6 : PEST - THREATS

THREATS	
Political aspects	<ul style="list-style-type: none"> ▪ French water agencies do not plan to subsidize new irrigation projects but only substitution projects ▪ The regulation does not cover many uses and does not push forward multi-purposes project. ▪ Multi-purposes projects remain marginal because of high complexity (multi-stakeholders)
Economic aspects	<ul style="list-style-type: none"> ▪ Direct planned water reuse could be in competition with indirect and often unplanned agricultural reuse (or even potable and environmental reuse) ▪ Other existing water sources with low cost (OPEX CAPEX) compared to water reclamation and reuse (ex: raw water network)
Social aspects	<ul style="list-style-type: none"> ▪ Emerging topic of micropollutants and microplastic with few answers available (scientific results?) ▪ Very low public and consumers awareness and acceptability of water reuse ▪ Water streams in Occitanie have often intermittent flows and rely very much on treated wastewater discharges thus leading to environmental issues when considering water reuse
Technological aspects	<ul style="list-style-type: none"> ▪ Many environmental areas sensitive to N and P pollution: most of the biggest WWTP are designed for nutrient removal purposes thus leading to lower the fertilizers properties of reclaimed water ▪ Efficient, performant and new (90's - 2000) range of existing WWTP: Water reclamation was not the objective then. Thus, considering water reclamation: (1) additional reclamation facility are always needed and (2) water reuse is not considered for WWTP construction or regional development strategy.

	<ul style="list-style-type: none">▪ Many environmental areas sensitive to N and P pollution: most of the biggest WWTP are designed for nutrient removal purposes thus leading to lower the fertilizers properties of reclaimed water.
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Discussion and conclusion

This analysis highlights that agricultural water reuse faces many brakes in order to be fully implemented at regional scale.

It has been highlighted that the **main weaknesses** are linked to the **economic aspects** such as expensive implementation, strict **regulations** and **restriction concerning water availability** (crops with rather low water demands and existing raw water networks).

Threats are mainly **environmental** (WWTP water discharges account for stream flow), linked to **market** (competition with other water resources such as raw water systems) and linked to **social aspects** (very low public and consumer knowledge)

However, some **strengths** and **opportunities remain relevant** and could act as lever to promote water reuse in Occitanie.

The main **strengths** are linked to **health** and **social acceptance**. The regulation is very strict but limit sanitary hazard. Moreover, farmers trust the regulation and are willing to implement water reuse.

Finally, many **opportunities** have been identified but four of them are particularly relevant. The most important is linked to **water availability**, the regional population is growing while facing critical water scarcity from year to year. Water reuse is then a good opportunity to decrease pressure on conventional resources and to add value to the growing volume of RW available. Furthermore, water reuse could have high economic benefit for both securing yield and gives environmental benefit. Finally, public opinion is handling climate and ecologic issues such circular economy, this led some politics to push forward water reuse.

Currently, water reuse of reclaimed water in Occitanie remain sparsely implemented. Most of the achievements are pilots or research based. Despite many existing brakes, the SWOT analysis has also spotlighted many opportunities to overcome them.