

SWOT analysis of reclaimed water use for irrigation in Southern Spain



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Introduction

- Objective:

- This research is part of the **EU project SUWANU-Europe** which is a thematic network funded by the EC under the H2020 programme (contract number: 818088).
- It aims to **identify and evaluate the relevance of barriers and factors of success in implementing reclaimed water** as an alternative water source for the agricultural sector.
- To achieve this objective, a **Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis** has been conducted in five European regions, including the region of Andalusia (southern Spain).



Introduction

- Justification:

- Water scarcity is a critical economic and environmental problem in many regions of the world, as it is the case of southern European countries.
- Water scarcity is a 'long term' imbalance between supply and demand where available sources cannot satisfy the increasing economic and societal priorities.
- According to the European Commission (2012), economic cost of droughts recorded in Europe has been estimated at around € 100,000M for the period 1976-2006, and water scarcity affects 11% of the European population and 17% of the territory of the EU.



Case study

- This research is based on **previous work** done within the framework of the **EU funded project “Sustainable water treatment and nutrient reuse options” (acronym: SUWANU) in 2012**, where different aspects related to water reuse and nutrient treatment were identified and evaluated in the EU context (Michailidis et al., 2015).
- Further, the **current project SUWANU-Europe (H-2020 programme)** seeks to identify barriers and factors of success in the implementation of reclaimed water use for irrigation purposes, with **special focus on certain EU regions**, such as Andalusia (southern Spain), with significant potential benefits.



Case study

- The **region of Andalusia** has an area of 87,268 squared km. Its Mediterranean climate is characterised by dry and hot summers, warm winters and irregular rainfall. Average rainfall is 750 mm/year.
- The main water sources in Andalusia are surface water (76.6%) and groundwater (28.2%) (INE, 2016). Other alternative sources, such as reclaimed water, do not register significant figures (1.2% in 2016). The total volume of wastewater treated in Andalusian amounts to 698 hm³/year, thus representing a significant water source to reuse.



Case study

	Sea	River	Reuse	Groundwater
Spain	33.5	55.8	10.4	0.2
Andalusia	58.0	36.1	5.9	0.0
Aragón	0.0	99.2	0.8	0.0
Asturias	21.7	74.5	3.8	0.0
Balearic Islands	59.6	7.3	33.0	0.0
Canarias	77.9	2.1	19.8	0.2
Cantabria	79.5	18.8	1.7	0.0
Castilla y León	0.0	99.1	0.9	0.0
Castilla-La Mancha	0.0	96.2	3.8	0.0
Cataluña	66.3	28.7	4.9	0.1
Comunidad Valenciana	16.5	33.6	47.5	2.4
Extremadura	0.0	100.0	0.0	0.0
Galicia	30.5	60.7	8.8	0.0
Madrid	0.0	97.7	2.3	0.0
Murcia	11.5	16.7	71.8	0.0
Navarra	0.0	100.0	0.0	0.0
País Vasco	67.7	31.4	0.9	0.0
La Rioja	0.0	100.0	0.0	0.0
Ceuta y Melilla	100.0	0.0	0.0	0.0

Mainly gardening,
2.6% irrigation

Table 1 Percentage of wastewater according to the point of discharge

(Source INE, 2016. Authors' elaboration)



Method

- Our study analyses perceptions regarding the ***strengths, weaknesses, opportunities and threats*** related to the use of reclaimed water for irrigation, as expressed by the **assessment of experts and stakeholders** involved in the water and agricultural sectors, as well as from other societal groups (e.g. consumers associations, public institutions).
- Our SWOT analysis addresses a wide range of factors, including **market-related, product-related, social and governance aspects**. It also highlights the **main challenges** to focus on future research **to facilitate the acceptance of reclaimed water** as an alternative water source for irrigation purposes in Andalusia.



Method

- Existing aspects from SUWANU (2012) (Michailidis et al. (2015) were analysed by ten Spanish experts, who reconsidered their suitability and identified new factors/aspects to take into account. This group of experts comprised distinguished scholars, policy-makers and business practitioners in the water sector.
- Based on the **comments received from the 10 independent experts** and those of the members of the project consortium, the list of aspects to be evaluated in each group was selected.
- The third step was the **development of a questionnaire** to evaluate the relevance of identified aspects. The questionnaire uses a Likert scale from 1 (not relevant) to 5 (very relevant) to assess the relevance of the SWOT factors/aspects identified.
- Fourth step consisted in sending the questionnaire to a group of national experts and stakeholders with an active role in water reuse.



Result (Strengths)

No	Strengths Item	Explanation	Score
F7	Increasing supply reliability	Water availability guaranteed even in drought periods	4.7
F3	Legislation	National and European regulations are available to ensure the sanitary and environmental quality of reclaimed water for agricultural irrigation	4.6
F2	Quality perception	The quality and safety of food crops irrigated with reclaimed water has been scientifically documented by numerous international projects	4.5
F9	Mixed resources	Reclaimed water use mixed with other water resources (surface water, groundwater, etc.)	4.5
F1	Previous cases	Numerous success stories are available on local water reuse projects for agricultural irrigation	4.4
F5	Climate change adaptation	Reclaimed water offers a more environmentally friendly water source alternative, capable of mitigating climate change effects, than other conventional or sophisticated water sources such as desalination	4.3
F4	Environmental Practice	Irrigating with reclaimed water is considered as an environmental practice	4.2
F8	Alternative resource in the coast	Water reclamation in coastal areas provides a net water contribution to water basins, by preventing the irrecoverable loss of freshwater discharged to the sea	4.2
F10	Groundwater support	Reclaimed water can be used as an alternative source (no mix at the source)	4.2
F11	Reclaimed water project support	Existence of projects that promote a better perception of using reclaimed water with the support of the health systems authorities	4.2
F6	Water nutrients	Reclaimed water provides a natural supply of nutrients (nitrogen and phosphorus), in a very similar way to fertirrigation .	3.9
	Total average score		4.3

Table 2 Strength aspects



Result (Weaknesses)

No	Weaknesses Item	Explanation	Score
D19	Food chain lack of interest	Wholesalers and vendors of agricultural food crops have very limited knowledge about the implications and public health safety of using reclaimed water for irrigation	4,2
D12	Cost	Reclaimed water is too expensive for a significant part of the agricultural sector	4,0
D16	Deficient WWTP	The quality of the wastewater treated effluents (inflows to the water reclamation facility) does not comply with applicable regulatory limits	4,0
D14	Reclaimed water distribution from WWTP	The distance between the water reclamation facility (normally in an urban setting) and the irrigation areas requires pumping of reclaimed water	3,9
D17	Reclaimed water storage	Reclaimed water needs to be collected for seasonal irrigation	3,6
D13	Energy consumption deficient	Control of the energy costs involved in water reclamation is very difficult	3,5
D15	Scarcity of reclaimed water	Reclaimed water is limited in numerous agricultural areas/zones	3,2
D20	Agricultural sector size small	Agricultural irrigation with reclaimed water is a small activity sector, unable to feel motivated for participating in large innovation projects	2,4
D18	Few crops	Irrigation Districts are small, made up of a limited number of users	2,2
	Total average score		3.8

Table 3 Weaknesses aspects



Result (Opportunities)

No	Opportunities Item	Explanation	Score
O36	Legislation	The RD 1620/2007 offers assurance to farmers and consumers on the potential public health impacts associated to the consumption of food crops irrigated with reclaimed water	4,6
O31	Water scarcity concern	There is growing social concern about the effects of future water droughts and scarcity episodes, associated to the weather irregularity resulting from climate change	4,5
O25	Limits to surface water	Limitations in surface water supplies for agricultural irrigation (4,500 m ³ /ha-year) can be compensated by using reclaimed water flows	4,2
O26	Droughts periods	Increased urban water abstractions during drought periods may limit the availability of water for irrigation	4,2
O34	Reclaimed water standards	The new European regulation offers clear rules for irrigating with reclaimed water, on a European context, bringing security to growers and consumers	4,2
O38	Groundwater salt level increase	Reclaimed water offers a favourable option to counteract increased salinity of groundwater	4,2
O23	Zero waste strategy	The growing interest in the "Zero Waste" option within the circular and green economy is stimulating the consideration of alternative water sources into the political debate	4
O30	Information availability	Successful studies are available on the positive effects of reclaimed water on cultivation of food crops	4
	Total average score		3.9

Table 4 Opportunity items



Result (Threats)

No	Threats Item	Explanation	Score
A43	Food chain lack of acceptance	Wholesalers of food crops reject agricultural products irrigated with reclaimed water	4,2
A44	Lack of public support	Irrigation with reclaimed water lacks public acceptance in Andalusia	4
A45	Excessive bureaucracy	Excessive bureaucracy needed for irrigating with reclaimed water	4
A41	Low profits crops	The low value of agricultural products in certain areas prevents the use of reclaimed water	3,9
A48	Political lack of goodwill	Lack of political goodwill to make reforms to promote reclaimed water	3,9
A40	Reclaimed water cost	Reclaimed water use in irrigation has an high cost for a significant part of the Spanish agricultural sector (low value crops)	3,9
A46	Commercial issues affecting reclaimed water use	The use of reclaimed water can be an excuse for unfair trading of agricultural food crops	3,7
A47	Cities priority	Urban and industrial uses will become priorities for allocating available supplies of reclaimed water	3,4
A42	Excessive reclaimed water demand	Water flows required for irrigation exceed reclaimed water flows	3,2
	Total average score		3.8

Table 5 Threats items



Concluding remarks

- This analysis leads to **structuring and prioritizing of the most relevant aspects** identified in the characterization of the Andalusian water reuse sector.
- The **lack of interest by the food distribution system** is seen as a **weakness**, as well as a **threat** (i.e. the non-acceptance of reused water in food production).
- The low level achieved in the use of reclaimed water in Andalusia, as deduced from the SWOT analysis carried out in this study, can be explained by certain aspects. Among them, the following aspects need to be highlighted: **lack of clear quality standards to guarantee acceptance among food-chain agents and general public, deficient performance of WWTPs, higher costs for irrigators (including production, transportation and storage) and the bureaucratic process to obtain use entitlements.**



Concluding remarks

- The **SWOT analysis** constitute the **prior step** to define specific objectives and priority actions for Andalusia.
- The participation of the different actors in the **consulting process** has been essential to guarantee the co-creation of strategies and consequently, to increase further acceptance of reclaimed water as an alternative source.
- The knowledge gained in the SWOT analysis will culminate in the preparation of a **Regional Strategic Plan** to promote reclaimed water for irrigation purposes in Andalusia.



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THANK YOU



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