



SUWANU
EUROPE

SWOT and PEST analyses for implementation of reuse practices in Alentejo, Portugal

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Socio-economic characterization of the region

Alentejo is a region of Southern Portugal that corresponds to one third of the territory of Portugal mainland with an area of 31,551.2 km² (33% of the Continent) and 760,098 inhabitants (7.4% of Portugal).

It is characterised for having a low population density, but with high agricultural potential. The lack of water in this region has been one of the main constraints to its development, impeding the modernization of agriculture and sustainability in the public supply, although this situation has been improved and modified in the Alqueva region.

In terms of GDP the region was ranked fourth compared to other regions of Portugal, with a value in 2013 at 11,275 million € (which included some municipalities of Ribatejo region) corresponding to 6.6% of national GDP.

The climate in Alentejo region is identified as Csa according to the climatic classification of Köppen-Geiger, being characterized by mild temperatures with hot and dry summers; in the rest of the year a more humid climate predominates. The west coast of Alentejo is characterise for having a temperate climate with dry and mild summer. In a small region of the Lower Alentejo, in the district of Beja, there is Arid Climate - Type B, Subtype BS (steppe climate), BSk variety (medium latitude cold steppe climate).

The Alentejo is one of the regions with the highest insolation in Europe, being able to reach 3,200 h of sun per year and values of global solar radiation of 1,700 kWh/m²/year.

The Alentejo region is characterized by large precipitation deficit and high intensity of irrigated agriculture. This is an area with high potential for promoting the production and the reuse of reclaimed water in agriculture. The lack of water is thus an opportunity to investigate and support more alternatives that, taking advantage of the available water resources, are sustainable from the economic, social and environmental point of view.

SWOT Analysis

SuWaNu Europe SWOT departs from the SWOT developed in SuWaNu (2012). The proposal for this project is adapting the different aspects identified in 2012 and reclassify them following the three categories explained above: market-related, product-related and social & governance.

In the Portuguese region of Alentejo, the internal aspects (strengths and weaknesses) and external (opportunities and threats) were identified within the cluster.

In the following pages, you could see the different aspects classified as internal (strengths and weaknesses) and external (opportunities and threats).

The evaluation of the relevance of each aspect was achieved with the use of a questionnaire. First of all, the different aspects were translated into Portuguese. Portuguese partners discussed the most relevant aspects to ask for and with them, a questionnaire was developed using google forms.

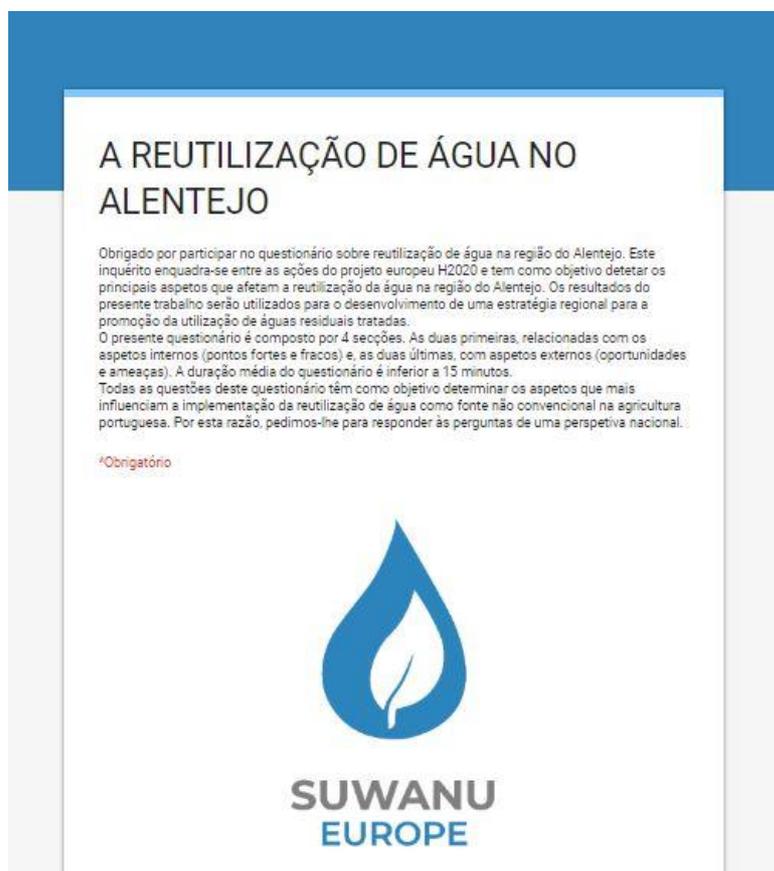


Figure 1 - Questionnaire form

The questionnaire of the Portuguese cluster is available in the following link: <https://forms.gle/kD2xR9U4C37q8ZtG9>. The questionnaire was sent to twelve experts in the thematic of the project and six answers were obtained.

With the answers the Portuguese partners were able to identify and classify the most important aspects, that are the most relevant in the definition of a regional strategy within the region of Alentejo.

The next tables show the major results identified by the Portuguese stakeholders, first in the SWOT analyses and after in the PEST (Political, Economic, Social and Technological) analyses.

The chapter of the discussion and conclusions synthesises the most relevant aspects obtained from the questionnaire and represented in graphics to better perceive the results.

STRENGTH

General Aspects	Specific Aspects	Alentejo region
Market-related	Water availability	S11. Guarantee of water supply availability in times of drought and in areas of water scarcity
		S12. Reduction of pressure on surface and groundwater resources.
		S13. Possibility of replacing surface or underground water with treated waste water, releasing the first for other uses
Product related	Technical aspects	S14. Focus on the acquisition of new knowledge (workshops, training)
		S15. Nutrients contribution from treated wastewater to crops
	Technological transfer	S16. European initiatives already finished or under way (acquisition of experience in the sector)
Social & governance	Social aspects	S17. The perception that the use of treated wastewater is safe for food production and quality
		S18. Existence of information programs of project promoters, with the aim of improving public perception on the use of treated wastewater, with the support of public health authorities
	Regulators	S19. Existence of national or European regulations establishing clear requirements on the quality of treated wastewater
	Management	S20. Consideration of treated wastewater as an alternative resource for water in coastal areas
		S21. Use of treated wastewater in an integrated way with other water sources (surface, underground or desalinated)
	Environmental	S22. Decrease of pollution load in water bodies
		S23. Consideration as good environmental practice the use of treated wastewater
		S24. Consideration of treated wastewater as a resource that contributes against climate change

WEAKNESSES

General Aspects	Specific Aspects	Alentejo region
Market-related	Economic aspects	W11. High costs of production, distribution and operation
		W12. Weak financial sustainability (difficulty in determining the cost of reused water, high prices, transport and storage costs, etc.)
		W13. High investments in storage and treatment infrastructures
		W14. Energy consumption required to treat water
		W15. Pumping and transport of treated wastewater (WWTP) to its destination
	Water availability	W16. Lack of guarantee of flows and volumes (about 7% of agricultural needs)
		W17. Distance between WW supply reclaimed facilities and farms
	Markets	W18. Reduced number and small size of infrastructures
		W19. Existence of a negative attitude from the food distributors not to market products irrigated with treated wastewater
Product related	Technical aspects	W20. Lack of dissemination of scientific and technological knowledge and of health and environmental impacts
		W21. Agronomic aspects (incompatibility with some crops)
		W22. Unawareness and misinformation in the use of these resources
Social & governance	Social aspects	W23. Natural rejection of agricultural products
		W24. Food chain contamination
		W25. Exposure of farmers to health risks
	Regulators	W26. Resistance in the licensing of water reuse projects (sanitary and environmental risks)
	Management	W27. Need of seasonal storage of treated wastewater for seasonal use in agriculture
	Environmental	W28. Soils and groundwater contamination

OPPORTUNITIES

General Aspects	Specific Aspects	Alentejo region
Market-related	Economic aspects	O11. Increasing the cost of other conventional water sources (e.g. groundwater)
		O12. The distribution of costs in the treatment of treated wastewater between irrigators and WWTP operators
	Water availability	O13. Strengthening available water resources through an alternative water source
		O14. Restriction of water use resources for irrigation in times of scarcity
		O15. The possibility of carrying out an exchange of conventional irrigation concessions in exchange for treated wastewater
	Markets	O16. Address wastewater reuse as an environmental service for agriculture
		O17. Increasing strategies for the promotion of unconventional water sources
		O18. Promoting the use of wastewater treated by the European Union
	Product related	Technical aspects
O20. Implementation of new and improved treatment technologies		
O21. Use of treated wastewater for organic farming		
Technological transfer		O22. Enable the expansion of some projects heavily dependent on water availability
		O23. Access to information and studies on treated wastewater in crops (ego RichWater)
Social & governance	Social aspects	O24. Acceptance of farmers in the use of reclaimed WW for irrigation
		O25. Social concern about water scarcity and search for alternatives
		O26. Existence of touristic areas close to field crops
		O27. proximity of field crops to population centres
	Regulators	O28. Possible positive influence of the national and European strategies "Zero Waste" and "Circular Economy"
		O29. Existence of standards for the use of treated wastewater in agriculture

	Environmental	O30. More awareness to climatic changes
		O31. Strengthening of available water resources through an alternative source of water

TREAHTS

General Aspects	Specific Aspects	Alentejo region
Market-related	Economic aspects	T11. Non-competitive price compared to current water tariffs for irrigation
		T12. Lack of financial support
		T13. Cost of water treatment for agricultural use
		T14. Low profitability of many agricultural products for the use of treated wastewater
	Water availability	T15. Possibility of greater demand than supply of treated wastewater
Markets	T16. Use of treated wastewater as an excuse in commercial disputes	
	T17. Lack of acceptance of products irrigated with treated wastewater by distributors	
Product related	Technical aspects	T18. Food safety (requirement for regular analysis and monitoring, etc.)
		T19. Impact on soil productivity and crop yields and lack of knowledge
	Technological transfer	T20. Lack of transport and storage infrastructures
Social & governance	Social aspects	T21. Reluctance in public acceptance and lack of consumer confidence
	Regulators	T22. Insufficiency and contradiction of the legislative and normative system
		T23. Lack of willingness to undertake the necessary water treatment reforms
		T24. Possible prioritization of cities or industries as an object of use of treated wastewater
	Management	T25. Need to define a responsible entity / management model, and targets for water reuse
		T26. Lack of specific planning
Environmental	T27. Contamination of surface and groundwater	

PEST Analysis combined with SWOT

PEST/SWOT	STRENGTH	WEAKNESSES	OPPORTUNITIES	THREATS
Political aspect (P)	<ul style="list-style-type: none"> Existence of national or European regulations establishing clear requirements on the quality of treated wastewater 	<ul style="list-style-type: none"> Resistance in the licensing of water reuse projects (sanitary and environmental risks) 	<ul style="list-style-type: none"> Possible positive influence of the national and European strategies "Zero Waste" and "Circular Economy" Existence of standards for the use of treated wastewater in agriculture 	<ul style="list-style-type: none"> Insufficiency and contradiction of the legislative and normative system Lack of willingness to undertake the necessary water treatment reforms Possible prioritization of cities or industries as an object of use of treated wastewater
Economic aspect (E)		<ul style="list-style-type: none"> High costs of production, distribution and operation Weak financial sustainability (difficulty in determining the cost of reused water, high prices, transport and storage costs, etc.) High investments in storage and 	<ul style="list-style-type: none"> Increasing the cost of other conventional water sources (e.g. groundwater) The distribution of costs in the treatment of treated wastewater between irrigators and WWTP operators Address wastewater reuse as an environmental service for agriculture 	<ul style="list-style-type: none"> Non-competitive price compared to current water tariffs for irrigation Lack of financial support Cost of water treatment for agricultural use Low profitability of many agricultural

		<p>treatment infrastructures</p> <ul style="list-style-type: none"> • Energy consumption required to treat water • Pumping and transport of treated wastewater (WWTP) to its destination • Reduced number and small size of infrastructures • Existence of a negative attitude from the food distributors not to market products irrigated with treated wastewater 	<ul style="list-style-type: none"> • Increasing strategies for the promotion of unconventional water sources • Promoting the use of wastewater treated by the European Union 	<p>products for the use of treated wastewater</p> <ul style="list-style-type: none"> • Use of treated wastewater as an excuse in commercial disputes • Lack of acceptance of products irrigated with treated wastewater by distributors
<p>Social aspect (S)</p>	<ul style="list-style-type: none"> • The perception that the use of treated wastewater is safe for food production and quality • Existence of information programs of project promoters, with the aim of improving public perception on the use of treated wastewater, with 	<ul style="list-style-type: none"> • Natural rejection of agricultural products • Food chain contamination • Exposure of farmers to health risks 	<ul style="list-style-type: none"> • Acceptance of farmers in the use of reclaimed WW for irrigation • Social concern about water scarcity and search for alternatives • Existence of touristic areas close to field crops • Proximity of field crops to population centres 	<ul style="list-style-type: none"> • Reluctance in public acceptance and lack of consumer confidence

	<p>the support of public health authorities</p>			
<p>Technological aspect (T)</p>	<ul style="list-style-type: none"> • European initiatives already finished or under way (acquisition of experience in the sector) • Focus on the acquisition of new knowledge (workshops, training) • Nutrients contribution from treated wastewater to crops 	<ul style="list-style-type: none"> • Lack of dissemination of scientific and technological knowledge and of health and environmental impacts • Agronomic aspects (incompatibility with some crops) • Unawareness and misinformation in the use of these resources 	<ul style="list-style-type: none"> • Nutrients recovery present in treated wastewater • Implementation of new and improved treatment technologies • Use of treated wastewater for organic farming • Enable the expansion of some projects heavily dependent on water availability • Access to information and studies on treated wastewater in crops (e.g. RichWater) 	<ul style="list-style-type: none"> • Food safety (requirement for regular analysis and monitoring, etc.) • Impact on soil productivity and crop yields and lack of knowledge • Lack of transport and storage infrastructures

Discussion and conclusion

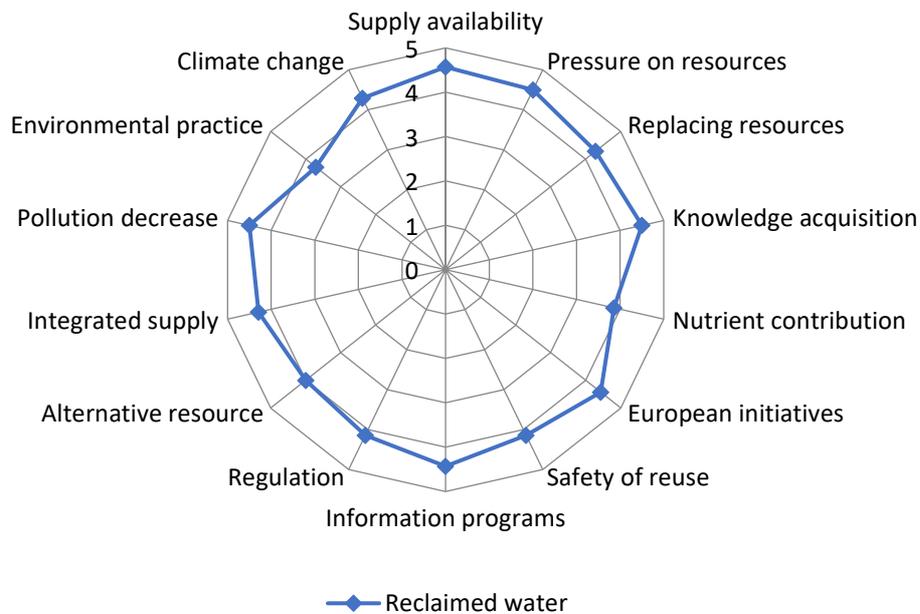
The questionnaire sent to key actors in reclaimed water evaluated the relevance of the different aspects from 1 (not relevant) to 5 (very relevant). The following discussions include the most relevant aspects of every category of SWOT analysis. Analysing the averages of the answers, the most relevant aspects are considered strengths and opportunities, while the less relevant are the debilities and threats.

The key actors that answered the questionnaire can be classified as researchers (4), members of NGOs (1), members of water firms (2).

The SWOT analyses starts with the strengths, and all the items analysed received an average score over 4, with the exception of “Nutrient contribution” which refers to the nutrient contribution from treated wastewater to crops, and “Environmental practice”, which refers to the consideration of the reuse of reclaimed water as a good environmental practice.

The most relevant aspects are the guarantee of water supply availability in times of drought and in areas of water scarcity, the reduction of pressure on surface and groundwater resources, the need to focus on the acquisition of new knowledge, the European initiatives already finished or under way (acquisition of experience in the sector), the existence of information programs of project promoters, with the aim of improving public perception on the use of treated wastewater, with the support of public health authorities and the decrease of pollution load in water bodies.

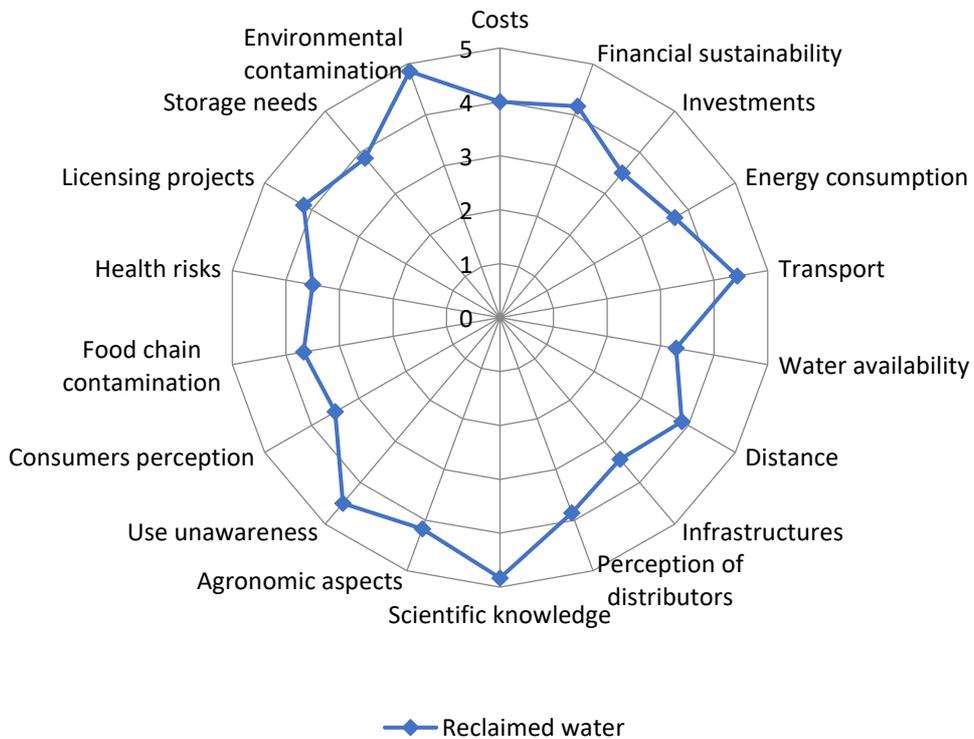
Figure 2 – Strengths relevance



The second group of aspects analysed is the weaknesses. Experts identified as less relevant the aspects related to the need of high investments in storage and treatment infrastructures, the lack of guarantee of flows and volumes, the reduced number and small size of infrastructures, the natural rejection of agricultural products and the exposure of farmers to health risks.

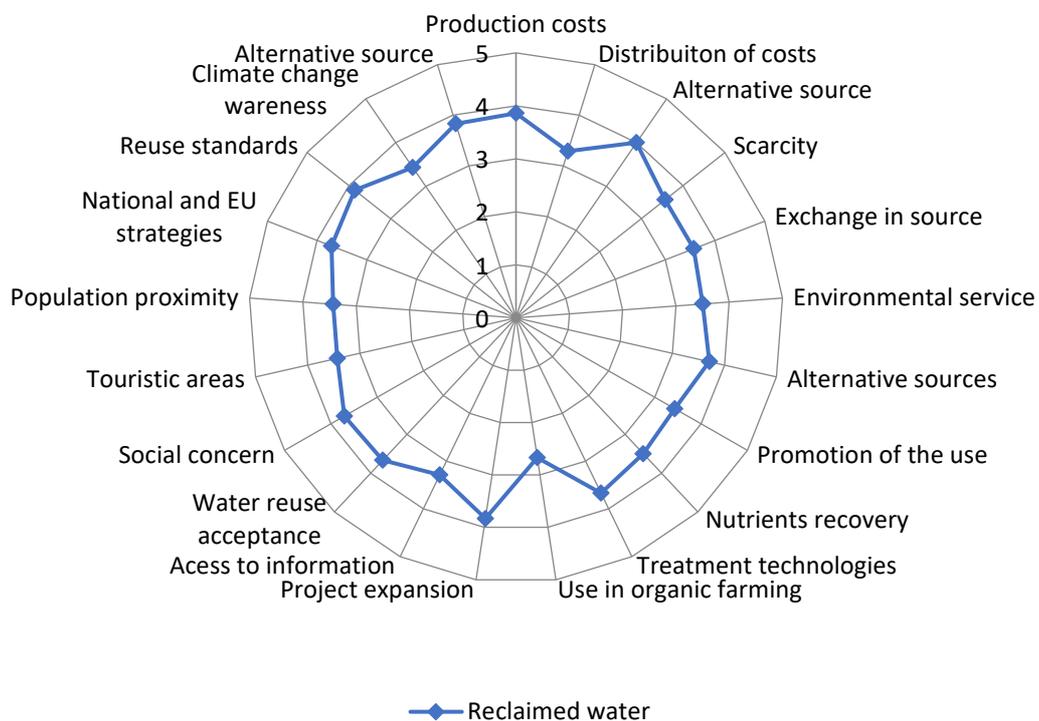
The most relevant aspects with the highest scores are the need for pumping and transport of treated wastewater to its destination, the lack of dissemination of scientific and technological knowledge and of health and environmental impacts, and the unawareness and misinformation in the use of these resources.

Figure 3 – Weaknesses relevance



In the third group of aspects, the opportunities, the experts only score one item above 4 which referred to the strengthening available water resources through an alternative water source. And with the lowest scores in terms of relevance are the distribution of costs in the treatment of treated wastewater between irrigators and WWTP operators, the promotion of the use of wastewater treated by the European Union, the access to information and studies on treated wastewater in crops, the existence of touristic areas close to field crops, the proximity of field crops to population centres and in the environmental aspect the awareness to climatic changes.

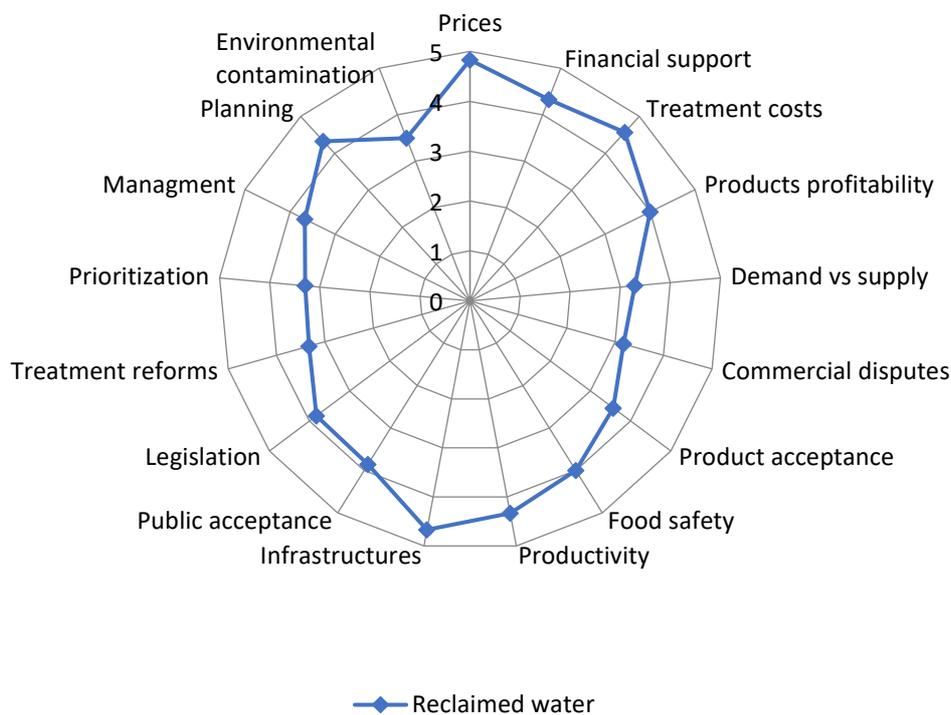
Figure 4 - Opportunities relevance



Finally, the category of threats aspects. In this category the experts considered the less relevant aspects the possibility of greater demand than supply of treated wastewater, the use of treated wastewater as an excuse in commercial disputes, the lack of willingness to undertake the necessary water treatment reforms and the possible prioritization of cities or industries as an object of use of treated wastewater.

Whereas the most relevant aspects with the highest score where the non-competitive price compared to current water tariffs for irrigation, the cost of water treatment for agricultural use and the lack of transport and storage infrastructures.

Figure 5 – Threats relevance



Following the PEST analysis methodology, economic aspects received a higher relevance, namely when it comes to costs aspects, either production, distribution and operation costs, or high investments in storage and treatment infrastructures. This was transversal to all experts.

In the political aspects, the major aspects were related to the lack of legislation and the resistance to licencing projects for water reuse.

Regarding the social aspects, the ones that stood out were the concern about water scarcity and the use of alternatives, but it is also relevant the still existing reluctance in the consumer acceptance and confidence in food irrigated with reclaimed water.

This results in the need for the regional strategy for reclaimed water reuse to pay attention to this reality and demonstrate the potential economic advantages, the social impact both in product related and environmental aspects.