Photovoltaic Solar-Powered Modular Desalination System for brackish water and its inyection to environmental and productive cycles.
SolarCircDesal

1. Ecellence

1.1 Objectives

- Build a large-scale demonstrative prototype with modular membrane (reverse osmosis) desalinization plant for brackish aquifers, powered by solar energy. Aim: a) reach at least 65% efficiency of the water desalination process with near 100% use of water obtained -environmental and production uses-; b)never less production of 1,5Hm^3/year; c)obtain at least 70 to 85% energy requirements by photovoltaic solar power for desalinitation process.
- Use the “big to small” approach to reduce the size and make a transportable mini-desalinization solar prototype based on the same technology to provide desalinated water to isolated areas and small pumping wells. Aim: Variable coefficient scaling from 1:10 to 1:25.
- Study desalinization methodologies, offering an essay facilities site for brine concentration.
- Fit the viability of technology approaches to achieve a water price in accordance with the normal prices in the area, covering the water requirements of the Vega Baja, Alicante, Spain, never under 1,5Hm^3/year.
- Assess the “environmental service” carried by the filtration of sea water to the aquifer, studying the possible restructuring of the native wetland zone.
- *Reduce the Environmental Impact of the non regulated Agriculture water extraction in “La Vega Baixa” (Alicante, Spain)* involving the agricultural sector in responsible management of this resource.
- Foster regulation related to the use of desalinized water where it is technically and environmentally viable, following global viability studies and financial arrangements with focus on end-users acceptance and collective models.

1.2 Relation to the work programme

This project framed in the topic “*CIRC-02-2016-2017: Water in the context of the circular economy”*, fits requirements of the cross-cutting Call -*Industry 2020 in the circular economy* of the *WP 2016-2017*

As in many places in Europe, (South of Italy, Mediterranean French, Croatia, Albania, Greece…) in the “Vega Baixa” (Alicante, Spain) are located brackish aquifer which can´t be used as a source of freshwater for human activities.. Those historical actvities have been developed on adjacent less historical brackish aquifer overland. Moreover, the annual precipitation mean in this region is lower than 200mm. The challenge presented to these areas is to maintain basic human activities, it sustainable growth avoiding the exiguous freshwater resource's overexploitation, and approach a local wetland rehabilitation. Moreover, the sustainability of agricultural activities is drastically lowered by pumping water from 80km, in the river Vinalopó using large -not completely achieved infrastructures-, using fossil energies. Those aspects decrease widely the cost effectiveness of the agricultural sector. In tourist season this situation leads to production and social conflicts. The overexploitation of other local sources of water carry to a negative environmental impact.

With the aim to boost innovative activities of SME, academic institutions (universities) and socio-economic sectors, the Regional Government responsible of water affairs (*Dirección General de Aguas*) is working to foster new technological and organizational developments with the purpose of improving the water management systems and its contribution to the circular economy driving to a resource efficient society. This project in born from the experience and lessons learned along the years by all the members of the development team, from a special regard of a Regional Government of a very hydric depressed area. They all participate in a holistic view of each step of the ***water value chain.*** *(Optimizing Water reuse in UE - final report, DG ENV-, Guidelines on Integrating Water Reuse into Water Planning and Management in the context of the WFD, 10th June 2016).* This project will also offer the use of regenerated water's quantitative viability costs as a self-added value in the value chains of consumption and production patterns. In accordance with the Road Map for a *Circular Economy Strategy and the Action Plan for a Circular Economy in Europe*, the project will strength the competitiveness of the Agricultural Sector SME's by protecting them against the resource scarcity (concretely water) and will create new value chains with the introduction of new available and renewable water resources. It will also enable the use of abandoned fields which will have the chance to produce again with a reasonable water price.

Moreover, after its implication of the **7th EAP priorities (4,5,6,7,9)** the Regional government encourages and *help* partners (through the local responsible of RIS3), concretely SMEs involved, to transfer and replicate knowledge and technology acquired in the Project. Moreover, when this technology reaches TRL 7 it will be able to use the desalinated water for other kind of applications such as industrial uses or even human consumption.

The innovative strategy includes the involvement of farmers communities changing the role of the regional government, which is starting to act as a support for the co-creation of knowledge, not only in the technical area but also in the organizational aspects such as the organization for the distribution of water and irrigation periods. Linked to this strategy, the project is enabling the Regional Government to use the Public Procurement and GPP as a policy tool to support social and technical innovation to foster the *green growing* and raise awareness to the society about environmental issues.

An important aspect of the involvement of the regional government, as expected in the future work program, that is actually being developed, is the firm and compliance of an *Innovation Deal* to boost normative that would promote the use of desalinated water obtained with near zero CO^2 emissions wherever this technology should be economically and environmentally viable (as in this case of study in "La Vega Baixa", Alicante, Spain). Moreover, new approaches are being developed to take into account the environmental services (some evaluation correspondence of eco-systemic environmental services are made yet) of the water infiltrations through the aquifer, that reduces the water salinity making the desalinization process cheaper. To be totally acceptable for the society and for new regulations about innovation *facts*, there is expected to include in this technology, the requirements of the Horizon 2020's *Responsible Research Innovation* (RRI) and develop it in line with the results of the conference *"Science, Innovation and Society: achieving Responsible Research and Innovation" held in Rome on 19-21 November 2014*, before and after the implementation of the proposed technology.

Many same characteristic locations in Europe exists. In neighbors countries The same problems lead to in some case to partial responses. This proposal would provide, by a its global approach and comparision to others similar responses, a notable European added value. From the experience acquired in this region, this transversal approach will try to quantify a change in the social paradigm of the water supply sector and offer new more integrated business models (ecological improved value, brine by-products introduction into market, etc)

In line with the EIP Water thematic priorities, this project is contributing to protect *Mediterranean human communities against the drought*, a very frequent phenomenon in this very semi-arid area, by enabling the use of new sources of water which until now were impossible to be used. Another related challenges, floods (with a period of recurrence lower than 10 years in the location of the project) and its effects, will be palliated by the presence of more crop fields which could slow down these catastrophic events. The floods brought contamination of little well, will be treated by the transportable desalinization plant that offer desalinization or treatment procedures for these contaminated waters.

Summarizing, this project contributes with a new approach to the water and its circular economy, integrating the concept of the circular economy with the natural cycle of the water, showing up that water is a ***key resource*** whose circularity in a short, middle and long term not only depends on human acts. It depends also on the ***environmental services*** naturally offered by environment in the region. A workpackage of this project refers to the quantification of saline intrusion (sea-brackish aquifers) as a benefit and abatement costs of treatment for society-use adding those parameters not as a weakening in global viability analysis but as an added value.

The role of the regional government is to encourage SME and other agents to develop the necessary changes to allow human activities to work together with the nature enabling technologies that could help to a sustainable growing. The use of natural pre-filtered human desalinated water (by the use of solar energy) is a proper system to accomplish the European environmental requirements without compromising the human welfare and economic growing.

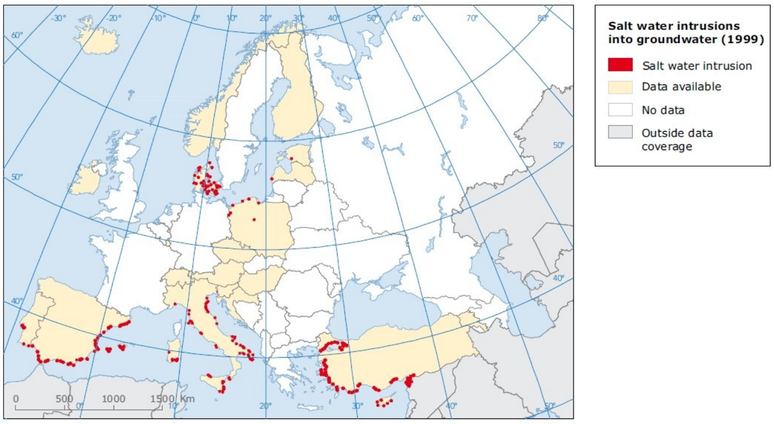
It is well known that some desalination water projects of former or current calls exists (technology, health, quality, agriculture, industry, pilots concerned, about 150 current and formers). With clarifying purpose, some H2020 calls are followed with great interest to propose possible synergies development (*Greening the economy, Sustainable food security, Rural renaissance, and of course,* the coordination and support action*: Policy support for Industry2020 in the circular economy* and its projects). From the point of view of non-overlapping bottom-up expected applicability *criteria*, the use of the respective innovation centres and networks of the partnership are fundamental.

Finally, as funding complements or follow up resources to the main project, the applying for several other funds from the EC are planned: a)*Interreg Sudoe*, to make a comparison and effectiveness with others regions between different desalination solutions of WWT, b)*Urban Innovative Actions*, for closing the gap of the water *movements* and the re-introduction infrastructures, including monitoring systems for environmental quality of desalinated water, c)*Interreg Europe*, to work in policy learning tasks for the improvement of the related regulations to this approach (contribution to *Regulation on minimum quality requirements for reused water in agricultural irrigation and aquifer recharge*, *EU-level instrument of Water reuse, etc..,* or supporting with real data the implementation of some not yet answered questions (*Optimizing Water reuse in UE - final report*, *DG ENV-*, *Guidelines on Integrating Water Reuse into Water Planning and Management in the context of the WFD*, *10th June 2016*), d) Particularly, due to the involvement of Regional Governmemt, an *Integrated Project type of LIFE program* will embrace some more specific environmental problems. As other public funds which could be of interest for the continuation of the project, are the Commitment of Regional Government Budgets heading planned for water management issues and R&D that include about 40M € lines in four years.

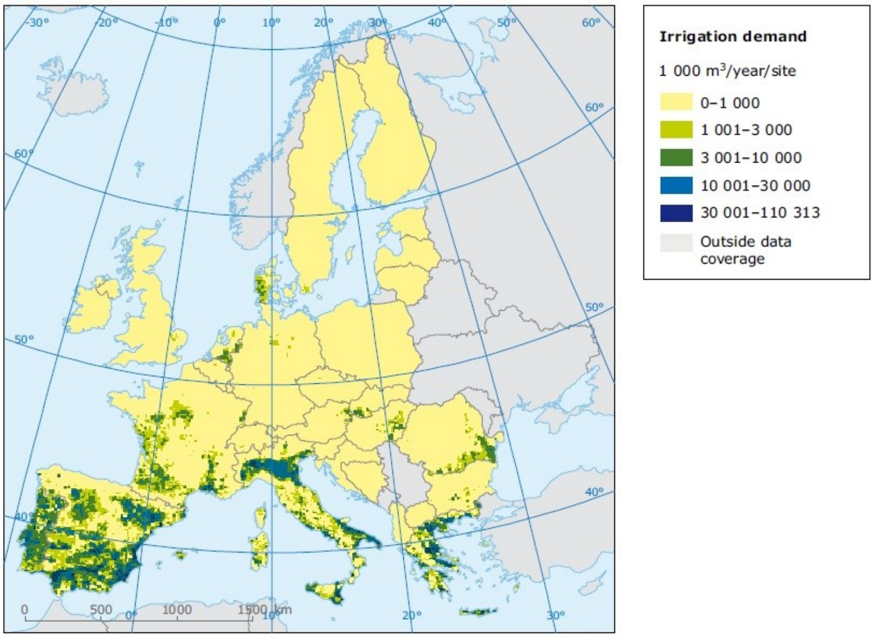
1.3 Concept and Methodology

1.3.1 Concept

As acknowledged by the Blueprint (EC, 2012), studies conducted as part of it, as well as more recent works (e.g. Forzieri et al., 2014), have shown that climate change will substantially increase the severity) and length of droughts in Europe by the end of the century. According to Global Water Intelligence (GWI, 2010a), the global market for water re-use is on the verge of major expansion and, going forward is expected to outpace desalination. However, these projections are focused on ***seawater salinity ranges*** and reach of seawater uptake treatment net-gross 9-12€/m3, brackish desalination reach in near seawater salinities ranges, 7€/m3 and down to 3€/m3 ***for human consumption***. This projects frames perfectly the current water costs (up to 4,6€/m3) in this region . Moreover, in Europe high requirements for irrigation are often encompassed brackish aquifers or saline intrusion aquifers.



Source: EEA, 2007.



Source: Wriedt *et al.*, 2008.

It exists in Spain spectacular desalination installations (Ie: Llobregat desalination plant, Barcelona, 230 Million €, *without infrastructure costs*), but current energy costs (grid or gas energy providers) are endangering their viability. This project, by the use of photovoltaic integrated power source, stabilized the future energy increasing costs. Furthermore, due to the localisation, this project will use near achived infrastructures.

The ***core realization*** is an actual state of art desalination plant modular for urban and productive sectors, empowered by optimized ***photovoltaic solar energy. The*** component's part of this project has to be integrated in a unique, scalable, robust and transferable system that will be used as referent of desalination medium plant system. The adaptive needs incrementation will be reached by the capacity of modules adding performance of this proposal. The mobile mini-desalination plant will be developed as a miniaturization of this system offering a new adaptable character to this integrated technology. An evaluation and DSS software will be added to enabling the energy and modules flow requirement integration.

This station shall be conceived with the real feasible purpose of desalination ***and reinjection*** in agricultural, urban or industrial productive system in compliance with the actual more restrictive national and EU legislation **(*Quality is understood as set in -Water Framework Directive (2000/60/CE); Directive 98/83/CE modified by Directive 2015/1787; Directive 75/440/CE; and further regulations***

such as the initiative "Minimum quality requirements for reused water in the EU" (new EU legislation); ***Royal Decree 1620/2007 from the Spanish government)***.

Throughout the course of this project, an exhaustive financial viability study will be achieved. When new facilities are planned, it is necessary to predict the operation and maintenance costs of water desalination plants. Not only total costs are important, but also the relationship between costs and the ***quality*** of water. It is fundamental that pricing for desalinated water also takes the cost recovery principle into account. Otherwise, desalinated water will never be competitive. The inclusion of externality charges in desalinated water is very difficult because these externalities are often unperceived by society. Therefore, it will be essential to develop public awareness campaigns about the true cost and benefits of both sources of water, and the quantified costs of "***do nothing***". In spite of, financial instruments and mapping feasible business models, financial and non-financial values to desalinated water will be integrated as another essential ***core realization*** through all the project.

For the of using adapted membranes technologies, and following International and National research is concerned, about 150 successefull projects have been achieved as regard of "solar" desalination processes, since 1994. However, only 40 are integrating high efficiency photovoltaic power supply. (Photovoltaic Demonstration Projects 1, 2). Moreover, only 16 have tipically mentioned or are related to industrial brine streams. Concentrates from water desalination plants with dense membrane processes can be treated with a number of markets available and emerging treatment trains. The composition of reverse osmosis concentrates is complex and challenges the technologies such as forward osmosis or electrodialysis. Almost all of both thematic themes have been followed for present and further specific integration scheme proposal. ACTIWATE or SOWAEUMED are some good examples. A specific aim is the integration of an optional system for brine concentration. International water association (London siege), EUWMA (from whom FENACORE, is the Spanish representative), WssTP, Zero Emission Platform, SmartGRID, European Desalination Society, PhotoVoltaics ETP's are perfects targets for transferability, replication and communication ways.

1.3.2 Methodology

Traditional supply-side approaches to water management are associated with various negative impacts upon the aquatic environment. In particular, reservoirs, inter-basin transfers and desalination each cause specific problems by modifying water quantity, water quality, or both.

In line with the new approach that this project provides, the difference of water salinity between the seawater (TDS of 30.000-50.000) and the brackish aquifers (TDS of 500 to 30.000) will be used to reduce the energy consumption in desalination. In this case the salts concentration in brackish water is 2500ppm (TDS).

Desalination technologies have been under development for many years. Some of the first reported experimentations for desalination date from 1627 (Sir Francis Bacon with sand filtration) and 1791 (Thomas Jefferson with distillation). In the modern era, one of the first major industrial programmes around desalination was launched in the US. Thus, the more than 300 years old learning curve has leads to the current technologies:

Membrane technologies	Thermal technologies	Other technologies
Reverse osmosis (RO) Forward osmosis (FO) Electrodialysis (ED) Electrodialysis reversal (EDR)	Solar distillation Multistage flash (MSF) Multi-effect distillations (MED, sometimes called multi-effect evaporation or MEE) Thermal vapour compression (TVC) Mechanical vapour compression (MVC) Adsorption vapour compression	Membrane distillation (MD) Electrodeionisation (EDI) Capacitive deionisation (CDI) Freeze separation (FS) Rapid spray evaporation Vacuum distillation Gas hydrates Ion exchange

To develop the methodology for this project, most of the current real affordable technologies have been examined. However, due to the characteristics of this proposal (lower energy consumption), Reverse Osmosis has been chosen as the most adequate in comparison with other interesting technics. In this project, the modular RO facilities are permitted with a potential increment up to site limits. The pre-treatment and prefiltration required to avoid fouling problems, is determined by the Silt Density Index and the efficiency of the desalination process (around 60%) is estimated by the mass balance as follows,

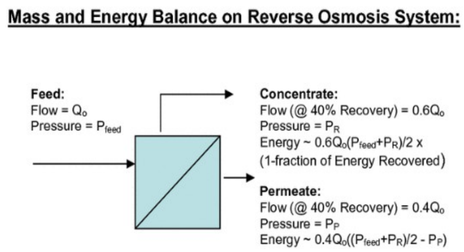
$$SDI = \frac{(1-t_i/t_f)\,100}{T}$$

Where:

t_i = initial time (secs.) required to collect 500 ml sample

t_f = time (secs.) required to collect 500 ml sample after fifteen minutes or less elapsed flow

T = total test time in minutes (usually 15, but maybe less in high SDI waters)



As usual, pretreatment are require (prefiltration for solids and organic matter removal, pH adequation, fouling inhibition treatment). The water will be filtered through a RO system powered by photovoltaic solar energy. The first power estimations for the global process are about 4-6 Kwh/m^3 (including pretreatement, brine's, pumping, concerned processes, transportation, point and membrane rearm requirements).

Specifications	MSF	MED	RO
Energy requirement (kWh/m^3)	Electrical: 3.5–5.0 SA[4]: Thermal 69–83 CG[5]: Thermal: 44–47	Electrical: 1.5–2.5 SA: Thermal: 41–6 1 CG: Thermal: 28	Seawater (SW): 4–8 Brackish water (BW):2–3
Cost of water ($/m^3)	0.9–1.5 (the cost reduces with co-generation and unit capacity)	Around 1 (the cost reduces with cogeneration use of thermal VC (TVC)) 0.827 for Jubail II plant	SW: 0.99 BW: 0.2–0.7
Environmental impact	Discharge is 10–15°C hotter than ambient, TDS increase of 15–20%	Brine discharge and temperature rise are similar to MSF	Brine discharge at ambient temperature, TDS increase of 50–80%

Comparison of energy requirements, cost and environmental impact of most popular treatment technics

As observed in the table, the most important environmental issue of the RO is the discharge of the brine flow to the environment. As a new business model, this project presents a workpackage focused on the introduction in the market (powered by local yet existent salt commertial activity) of these brine flows in order to revalorize this by-product that can be used after a purification process to easily produce different types of slats.

The miniaturization of the desalination plant, performed to get a mini-desalination plant will be developed doing a scaling and adjusting the different parameters. This activity is addressed to make a comparison between centralized desalination services and the small scale decentralized water services as well as offer, in a flood risk zone, an emergency transportable system.

A revision of the current state of desalination in the world under the socio-economics water desalination impact's point of view, should be considered as a prevision of the future of desalination impacts into the economy and as an economic viability study baseline for this project.

Regarding the production of desalinated water during the last 50 years, it had been recognized a steady growth of desalination plants worldwide, surpassing today 30 million m^3 of desalination capacity per day. It appears that first, the desalated water cost had been decreasing over time as a result of technology improvement and economy of scales (*Zhou & Tol 2004, Chaudhry 2003, Miller 2003, Ebensperger & Isley 2005, World Bank 2004, Fritzmann et al. 2006*), second, that energy consumption of larger plants is lower (Miller 2003) and, of course, that desalination of brackish water is cheaper than desalination of seawater both in terms of investment and energy costs (Chaudhry 2003, Miller 2003, World Bank 2004, Fritzmann et al. 2006).

Several methods to estimate the cost of a desalination plant are known (*see World Bank 2004 and Fritzmann et al. 2006, Miller 2003*). Due to the large amounts of water, which is expected to have to be desalinated to fill the water gap by 2030, costs for large desalination plants have been chosen. It is assumed that desalination plants with a daily capacity of 100 000 m3/day will be constructed, resulting in an average value of desalination costs under of 0.35 €/m3 with last ***two decade*** average energy prices. ***It is clearly demonstrated that those costs are not currently related to the costs of actual energy prices.*** In the same way, literature about transportation costs is poor. Zhou and Tol (2006) only provide references to average transportation costs (based on Kally, 1993). As an average, the costs to transport 1 m^3 of water is estimated at 0.037 € per 100 ***m*** of vertical transport and 0.043 € per 100 ***km*** of horizontal transport. These data offer a clear ***non current adecation to the reality***.

Other costs, related to the pre-treatment and the concentrate discharge, can also be considered. Even if often mentioned in the literature, very few articles give clear cost calculations. Miller (2003) estimates pre-treatment costs to account for up to 30% of O&M costs while Younos (2004) estimates the costs of brine disposal between 5 to 33% of total costs.

As an approximation to the effect of desalination on water prices is considered that the total cost of 1 m^3 of desalted water (pdesa) is then the future "baseline" water price (p2030) plus the additional cost linked to the desalination (Δdesa), including desalination process and transport.

$$\mathbf{pdesa = p2030 + \Delta desa}$$

Whereby: pdesa = Price of desalted water; p2030 = Future water price without additional desalination (but including the level of desalination today); Δdesa = Additional costs to desalinate water, including transport costs.

The following formula could then be used to determine the future water price (p2030+desa) for each river basin:

$$\mathbf{p2030{+}desa = [pdesa * WD2030 + p2030\ (WA2030 - WD2030)] / WA2030}$$

Whereby: p2030+desa = New water, taking into account that part of the water consumed stems from additional desalination; WD2030 = Water deficit 2030; WA2030 = Water abstraction / consumption 2030

To consider current water prices is necessary to take into account that prices are highly variable between river basins. The highest value, 4.27 €/m3 (Zealand river basin in Denmark) is approximately tenfold higher than the lowest value, 0.49 €/m3 (West and East Aegean river basins in Bulgaria). The average water price in Europe is 1.74 €/m3.

Using these basic considerations, during the project, economics previsions of the effect of desalinization in water prices will be performed, as well as global viability estimations will be performed, including social, health and overall environmental parameters (environmental services and risks).

	Work Package Preview		Transversal Work Packages	
Coordination & Management	Industrial Level Technology Integration	WP2	Socio-economic Impact Studies	Viability & Cost Reduction Studies
	Construction of integrated system	WP3		
	Miniaturization	WP4		
	Participative Network Platform	WP5		
	Environmental Impact Studies	WP6		
	Brine Revalorization & Market Inclusion	WP7		
WP1	Knoledge and Data Exploitation (DMP)	WP8	WP9	WP10

1.4 Ambition

The success of this project will provide the technology and social-regulatory schemes to make available new sources of hydric resources by the desalinization of ***these water that currently cannot be used*** (15 known brackish aquifers). This process will be solar empowered so it will reduce the amount of fossil energy currently spent on desalinization processes. Based on this project, a Regional plan of *photovoltaic solar desalination* will be raise the current negative viability of most of the 41 desalination plants in the Valencian Community. From a Regional point of view, with the perspective of *Regulation on* *minimum quality requirements for reused water in agricultural irrigation and aquifer recharge* Roadmap (Inception Impact Assessement), this project has the **ambitious purpose** to develop ***a state of art adding possibility integrated technology for the EU by offering measurable, reliable and replicables technical data, as well as integrated socio-economic, global viability and replicability models to water desalination in the context of circular economy.*** The further ambition of this project is ***to explore ways to obtain other streams of brackish water, with higher TDS (3000-10000) (sewage collection systems) introduce it in the water cycle as regenerated waters.***

2. Impact: Expected Impacts

This project is expected to have a significant impact in the area of the water economy and the re-use of this resource in the context of the circular economy.

Impact 1: -*"significant reduction of the current water and energy consumption"*

This new approach of using brackish aquifers water with a previous natural filtration, in spite of using sea water, is providing a new way of water resources exploitation and water supply with less (or zero) dependence on non-renewable energies. Project aims: a) desalination of 1,5 Hm^3/year, b) 50% energy requirements (grid and generators), solar supplied.

Impact 2*: -"interconnectivity between the water system and other economic and social sectors and "increased public involvement in water management"*

The positive impact on the interconnectivity between water and others social sectors is actually expected by the presence of actors from different sectors (government, universities, farmers communities, SMEs…) in the partnership of the project. A network platform will allow members from productive sectors to express their ***needs*** to adequate quality water requirements.

Impact 3*:"increased citizen satisfaction with water services"*

As a very ancient tradition in the Valencian region, the management of water resources has even been a public affair, existing public committees which has the responsibility of look after the correct practices in irrigation water management (Tribunal de las Aguas/ Water Court). The project will explore these social figures as an interesting and replicable way for public involvement in water management. This system will be able to be adapted to the socio-economic context requirements, and obtain a public transparent feedback for price's fitting of the desalinated water. The increase of better quality water, is of course a direct impact of this project.

Impact 4*:"replication of new business models in other areas and replication of models for synergies between appropriate funding instruments at regional, national or European level"*

After the demonstration of feasibility and viability of this project boosted by the access and success of this proposal, in addition to funding instruments mentioned in the *relations to work programme*, ERDF, ECF, ESIF, and in some case ACP and some EIB funds are contemplated. After a transparent strategic independent feasibility and viability study, the Regional Government will acquire the capability to transfer and replicate the model through specific budget headings. Based on the extension of viability model developed for the reintegration of this resource as added value in circular economy, other projects, products or services will be able to use the same approach, using it as a competitiveness advantage by the inclusion of not usually contemplated

Impact 5:*"creation of new markets in the short and medium term"*

The system will study the viability of extracting brine subproducts increasing the potential for a new business . As well, this system that will act as an experimental tool to implement innovations in water desalination such as new developments in membranes, will noticeably increase the potential of high added value business in water treatment process at European level.

Impact 6:*""providing evidence-based knowledge that facilitate a broader transition to a circular economy in the EU"*

As regard of The *REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT,*

THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, on the implementation of the Circular Economy Action Plan (*Brussels, 26.1.2017 COM(2017) 33 final*) the development of this project considers some critical keys as *launching of the innovation deal*s *BREF's integration* or *Research and Innovation, industry 2020*. Due to the reinforcement of these purposes by a regional Government, it's expected that the extracted knowledge could help to concretise regional regulations related to circular economy and more concretely by the reinjection water. As principal actor and responsible of the project, offering a large scale and extended approach with real data, from an integrated point of view, this experience fully supported by the Valencian Regional Government will humbly give a little help to develop better policies in Europe.

Impact 7:*"implementing the Sustainable Development Goals (SDGs), in particular SDG 12 'Ensure sustainable consumption and production patterns' and SDG 6 'Ensure availability and sustainable management of water and sanitation for all', as well as the conclusions of the COP21 Paris Agreement"*

As regard of the contributions to the SDG's, this project will contribute to the implementation of the 6.1, 6.3, 6.4, 6.5, 6,6 (*Ensure availability and sustainable management of water* and sanitation for all), 12.1, 12.2, 12.7 (*Ensure sustainable consumption* and production pattern). Even more this project will contribute to the implementation of some aspects of respectively the 7^{th}, 13^{th}, 15^{th} goals. As the COP21 is concerned, sourced in a Regional Government, this project by its solar empowering, will contribute to reducing greenhouse effects emissions and low carbon economy development.

In a further stages of the project, by the reduction of the price of the construction, engineering an implementation costs, this technology will be accessible to some emerging economies.

ABSTRACT

SolarCircDesal project presents a new approach in the area of the water desalination. Several places in Europe need more water inputs each day to maintain the competitiveness in productive sectors and face the growing process of urbanization. This project exposes the solution of brackish water from coastal aquifer's use, where water is often naturally saline, as a good solution for reducing energy requirements to desalinate water making it available for productive applications and even for human consumption (futher processes required). The possibility to exploit sea brackish aquifers as a renewable source of water due to some sea water intrusion exchange factors, may reduce the pressure over freshwater bodies. As ensure access to water, a key factor for human wellbeing, the preservation of important high value costal or wetland ecosystems is also a key factor for the environment. ***This proposal involves the construction of a photovoltaic powered desalination plant and its miniaturization as well as the calculation of economic parameters***, considering as an innovative concept, the valorisation of the services provided by the nature by seawater's filtering (salts content reduction). Water distribution is one of the most important worldwide concerns. It is expected to lead several policy problems in the coming years, especially in arid and semi-arid areas. This project looks at traditional water management social figures such as the Valencian "Water Court" (a 800 years old institution which is commissioned to solve the conflicts of Valencian Region's water users) to assess a social applicability model to manadge conflicts in other regional contexts. Moreover, as a new business impulse, this project includes the miniaturization of the system making it more adaptable to different locations (and maximizing the replication potential of the system) as well as the "placing into market" of concentrated and refined brine flows as a byproduct of the desalination process.