This facility, producing 5 000 m^3/day, is associated with a property that requires 800 m^3/day. Desalinated water is produced when there is wind, and the excess water produced is pumped to a reservoir where water is stored until necessary. Normally, the system works 250 days a year with optimum wind conditions. This facility does not use any chemicals, and the brine generated, with a concentration of less than 58 g/l, is held in a filtration well beside the sea with a low impact on the coastal environment. In this wind desalination complex, water is generated without any subsidies, using wind power at a cost of EUR 0.60/m^3, and it is sold to farmers at EUR 0.83/m^3, adding the costs of pumping and distribution. These are reasonable prices in the area and Soslaires can see in wind energy a business opportunity comparable to its water business (Serrano-Tovar et al., 2019).

In conclusion, it is necessary to emphasise a series of challenges to and observations on the efficient development of desalination, as an alternative to the resources of natural origin. It is necessary to think about operating technology that makes use of renewables, given that the intermittence of wind is a challenge that is still not resolved. It is possible to desalinate all the water the island needs with the exclusive use of wind energy. We have the research and technical potential on the island to overcome all these challenges. What is necessary is a boost from politics, modifying regulatory aspects that would prevent the technological development and dealing with the policies of subsidising the energy produced on the island from fossil fuels (see Section 4.6.2). Desalination with renewable energies generates a saving in the national energy system thanks to its low energy cost.

There are also a number of topics of concern in relation to this subject: obsolescence of desalination plants, aspects regarding the quality of desalinated water (for agriculture), management of brine, minimising the environmental impact and being able to obtain by-products (sea salt, chlorine, etc.) instead of dumping the brine in the sea.

4.4 Wastewater management

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In the Canary Islands, as in other semiarid islands, the foreseeable consequences of climate change will be predictably characterised by (1) global increase in temperatures, (2) change and displacement of precipitation patterns – increase in dry periods and extreme rainfall phenomena – (3) increase in the natural evaporation process in soils, (4) change in the regime of trade winds – desertification and greater frequency of heat – and (5) competition for water between various economic sectors and environmental uses ([10]). Furthermore, it is important to consider agronomic effects, such as (6) significant impact on soil erosion (i.e. floods, drought, etc.), (7) changes in pests and diseases (Yohanes, 2016), (8) modification of soil properties, including a reduction in the availability of nutrients (Adeyeye et al., 2018), and (9) increase in crops' water and nutrient needs. On the other hand, high temperatures can increase the water use efficiency, calculated using the ratio of dry mass per area and the amount of water consumed (Mendoza-Grimón et al., 2015). Moreover, the progressive decrease in unusually cold days and nights, together with the increase in unusually warm nights (IPCC, 2014), raises the possibility of introducing C4 species in areas where the temperature are limited for their cultivation or to advance sowing dates to grow them in times of lower water demand. These plants are more productive and efficient in the use of resources such as water (Mendoza-Grimón et al., 2015), light or nitrogen (Fatima et al., 2018).

([10]) https://climatique.itccanarias.org/es/

Although a higher concentration of CO_2 can have a positive influence on photosynthesis under optimal growing conditions (Sombroek and Gommes, 1996), under predictable climate change scenarios rural areas will have less water and nutrients available. In this context, reclaimed water (RW) resources can be used as an alternative that can contribute to partially solve the abovementioned problems. In addition, the availability of alternative resources (RW, desalinated seawater and desalinated RW) at a foreseeable price will allow farmers to design the optimal infrastructures adapted to their needs (Palacios-Diaz et al., 2008a). As an example, maralfalfa (*Pennisetum hybridum* or *Pennisetum sp.*) production could be competitive against imports, being financially viable with RW prices in a range of EUR 0.20-0.30/m^3 (Palacios-Díaz et al., 2015).

Water reuse presents environmental, economic and social benefits but also potential drawbacks. The risks presented by water reuse have to be addressed in order to ensure health and environmental safety. Several key potential benefits and risks (environmental health and economics) have been identified (AMEC et al., 2016). As they are influenced by multiple factors, reuse projects must be analysed on a case-by-case basis according to site-specific conditions. There are no guidelines, regulations or good management practices at European Union (EU) level on water quality for water reuse purposes, although ISO 16075-1:2015 ([11]) contains good practices from health, environmental and hydrological points of view regarding operation, monitoring and maintenance of water reuse projects for unrestricted and restricted irrigation of agricultural crops. Various guidelines (Pescod, 1992; EPA, 2012) also include agronomic parameters.

To substitute RW from conventional water resources in agriculture, water treatment technologies must provide water to end users with enough quality (safe for human health and the environment but also agronomically adequate in the long term) and at affordable prices (economically feasible but avoiding socioeconomic and legal and/or institutional constraints). In this context, in Gran Canaria, as an example of the Canaries in general, treated water reuse has been stable for the last 20 years at about 0.08 hm^3/day ([12]), only 20 % of its treated water. The rest of the water is poured into the sea, which represents a resource waste. While agricultural water represents 53 % of in the total consumption in the Canary Islands, it is only 32 % in Gran Canaria. In 2014, RW was only 7 % of the water consumed by agriculture, while desalinated water was 45 % ([13]). Palacios-Diaz et al. (2008a) observe that optimal water desalination plants use about 2.5 kW/m^3 of electricity. It can be estimated that 0.5 kW/m^3 is used to raise water by 100 m. Therefore, as altitude increases, higher energy consumption is necessary to provide desalinated water to rural communities. In our mountainous island, RW from small villages could be reused *in situ* for irrigation, instead of transporting the effluent to high-tech treatment plants. Therefore, the use of RW is an alternative way to provide water for agricultural irrigation, decreasing energy consumption. Regarding economic considerations, the cost of desalinated water production (EUR 0.59/m^3) has to be increased by the pumping costs, so it is obvious that mountain villages have difficulties in being supplied with desalinated water. Comparing the costs of RW (EUR 0.20/m^3) shows that there is an advantage of *in situ* reuse. RW is a more sustainable option for agricultural production but some institutional decisions are needed to improve RW capacity to increase its consumption (Palacios-Diaz et al., 2008b).

The problems described related to reuse are far from the optimistic forecasts of the 1990s: the pollutant load, price and salinity are high and the reuse network is only available in Gran Canaria, Tenerife, Lanzarote and Fuerteventura (Delgado et al., 2008, 2012). Other problems can be mentioned: management difficulties, lack of training and information, inadequate legislation and problems in marketing irrigated products.

The initiative of a regulation on minimum quality requirements for reused water in agricultural irrigation and aquifer recharge will encourage efficient resource use and reduce pressures on the water environment, provide clarity, coherence and predictability to market operators, and complement the existing EU water policy (Alcalde-Sanz and Gawlik, 2017). The main barriers to promoting alternative water resources have been identified by the Partnership on Research and Innovation in the Mediterranean Area ([14]): (1) safety risks (environment, human health) have been linked to the use of improperly treated wastewater, (2) treatment costs are particularly linked to the energy needed and (3) public acceptance of RW varies depending on its potential use.

In relation to health hazards, guidelines from the World Health Organization and the Food and Agriculture Organization of the United Nations (Winpenny et al., 2013) recommend defining realistic health-based targets and assessing and managing risks along the continuum from wastewater generation to consumption of what its produced by cultivating with wastewater, to achieve these targets. This allows a regulatory system in line

([11]) www.iso.org/standard/62756.html
([12]) http://www.gobiernodecanarias.org/istac/jaxi-istac/tabla.do?uripx=urn:uuid:ca78f0d4-dc73-4fcd-8109-4b7ee61eae47
([13]) http://www.aguasgrancanaria.com/pdfs/PlanHidro/PHart47_MemInfo.pdf
([14]) http://ec.europa.eu/research/environment/index.cfm?pg=prima

with the socioeconomic realities of the country or locality. The document analyses different options for using recycled water for irrigation.

According to Winpenny et al. (2013), subsurface drip irrigation (SDI) demands less treatment than any alternative, improving health security by preventing contact between water and stems and leaves and, thus, minimising sanitary risk. SDI has other advantages: it enables water-conserving production practices and mechanised cultivation of high-yield crops ([15]), and uses the soil for advanced treatment of the water (Mendoza-Grimón et al., 2019). Furthermore, considering that farming the land is compatible with SDI reusing RW, this irrigation system can be proposed as the best one for reusing naturally treated livestock effluent (Palacios-Díaz et al., 2009).

As mentioned above, one of the main barriers to the reuse of RW is consumers' lack of information about its water quality. Consequently, it is necessary to generate knowledge to answer all those doubts. It is necessary to ensure the safe use of RW, thereby encouraging water reuse at EU level and enhancing public confidence (European Commission, 2018). One good way to generate this knowledge is using experimental plots. In these plots, many specific agronomic parameters necessary to provide guidelines about the best water management practices can be monitored, as the water management modifies the spatial distribution of substances (Palacios-Díaz et al., 2009) that are well adapted to crops, agroecological zones and farming practices, and thus, avoids RW dumping and land contamination.

Nowadays soil studies are focused on the soil's physical and chemical properties (organic matter content, pH, electrical conductivity, macro and microelements), but the soil biota, which plays an important role in the fertility of the soil, is usually forgotten. The consequence of the lack of measures is that farm managers do not take soil fertility into account in their decisions, since it is impossible to assess what is not measured (Buckwell, 2014). RW can contain considerable amounts of inorganic substances, such as heavy metals and salts that may have negative effects on agroecosystems (Frenk et al., 2014). Besides, RW can contain small quantities of emerging compounds. Soil biodiversity is an important indicator of soil tolerance and resilience (Guo et al., 2018). These organisms contribute to the sustainable functioning of all ecosystems by acting as the primary drivers of nutrient cycling, the regulation of the dynamics of soil organic matter, the sequestration of soil carbon and the emission of greenhouse gases, modifying the physical structure of the soil and the water regime, and improving the quantity and efficiency of nutrients ([16]).

In addition to the soil, both the root system and the rhizosphere represent a barrier between emerging compounds and the plants, detecting diverse factors of bioconcentration (with respect to the concentration detected in the soil) in various plants, measuring values from 0.02 to 21.72 (Eggen and Lillo, 2012). They also contribute to the biodegradation of toxic compounds (Huang et al., 2007).

([15]) http://www.fao.org/tempref/docrep/fao/010/i0112e/i0112e07.pdf

([16]) http://www.fao.org/tempref/docrep/fao/010/i0112e/i0112e07.pdf