Water Supply and Depuration

Spanish scale

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Cooperating across borders in the Mediterranean

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Co-Evolve4BG

Analysis of Threats and Enabling Factors for Sustainable Tourism at Pilot Scale

Water supply and depuration

Spanish scale

UNIVERSIDAD DE MURCIA

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OVERVIEW

The present document was produced in the framework of **Co-Evolve4BG** project "*Co-evolution of coastal human activities & Med natural systems for sustainable tourism & Blue Growth in the Mediterranean*" in relation to Threats and Enabling Factors for maritime and coastal tourism development on a national scale" Co-funded by ENI CBC Med Programme (Grant Agreement A_B.4.4_0075).

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REVIEW

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Abstract

The issue of water depuration and reuse is of great importance, especially in areas where the scarcity of conventional resources is a structural problem, as is the case in Spain. This report is developed through the review of existing data at European, national and regional scale. The document is structured as follows.

Section 1: is a brief introduction to the increased demand for water associated with the growth of tourism in the Mediterranean.

Section 2: describes the water supply and depuration situation in Spain.

Section 3: describes the methodology and characteristics of water supply and depuration parameters selected in this project.

I. Introduction

The Mediterranean is considered a tourist hotspot and a biodiversity hotspot (Tovar-Sanchez et al. 2020) characterized by great biological diversity and the presence of endemism that, due to the growing anthropic pressure (demographic, urban, tourist) that it suffers, have become one of the most vulnerable areas on the planet (EEA Technical report No 6/2014; IPCC, 2018). Some authors such as Cramer et al. (2018) warn that «the expected increase in population, particularly in the coastal areas of the eastern and southern Mediterranean countries, and the increasing urbanization, would not only lead to a greater demand for water, but also to a greater deterioration of the quality of water.

Thus, water resources and their availability, both in quality and in quantity, are of fundamental importance for the development of the different socio-economic sectors of the territory (Gabarda et al. 2015). The availability of water resources has focused international attention in recent years, as many countries and regions are faced with the challenge of coping with serious water crises, with depleted surface and ground resources and often also highly polluted. The predicted scenarios indicate changes in the availability of water, suffering pressures derived and exacerbated by the effects of climate change, especially in relation to the decrease in rainfall, increased temperatures and prolonged periods of drought (IPCC, 2018), which translates into a progressive increase in social problems.

Mediterranean societies must face the double challenge of meeting the increased demand for water from all sectors, precisely in a context of reduced availability of freshwater resources (Cramer et al. 2018). Faced with this challenge, we cannot lose sight of the fact that precisely the tourism sector has become one of the main engines of global economic growth (World Tourism Organization, 2013). The Mediterranean basin represents a territory with an important tourist vocation, especially sun and beach tourism (Gabardaet al. 2015), ranking first in the world subregions receiving visitors (World Tourism Organization, 2013).

At the global level, the use of water resources is increasing more and more, due to economic growth and changes in people's lifestyles. Water is a vital resource for different economic, social and environmental needs (Annual UN-Water Zaragoza Conference 2012/2013) and is used in most of the countries in the socio-economic sectors of the territory. In general, it is considered that its consumption is divided between agricultural, industrial and domestic, with a percentage of 70, 20 and 10%, respectively (UNESCO WWAP, 2009). The tourism sector is one of the sectors most dependent on local ecosystem services, since it must provide tourists with food, water, energy and recreational activities (Pueyo-Ros, 2018).

Tourism depends on the availability of water and this generates important tensions as tourist activities reach their peak in destinations such as the Mediterranean, where water is also an extremely scarce resource. In fact, in the Mediterranean basin the tourism sector represents an important socio-economic activity of the territory (World Tourism Organization, 2013), characterized by a strong seasonality, with pressure on natural resources concentrated spatially and temporarily on the coast and in summer (Gabarda et al. 2015).

If we focus on the relationship between tourism and water, we can see how tourism depends on the water resources and, at the same time, has a transcendental impact on its use and consumption. Undoubtedly, tourism activities also affect both the quantity and the quality of water, and both locally and globally. Tourists consume it directly (to drink, for personal use) within leisure spaces (spas, beauty areas, swimming pools) through recreational activities (skiing, golf, water sports), or simply relaxing in a garden or in an artificial tourist setting. To these more visible and tangible uses are added more invisible uses, such as the production of food, energy or fuel needed to maintain the collateral tourism infrastructure.

In addition, tourism is indirectly dependent on water, in its dimension of element / landscape, constantly visited by tourists, and allowing many leisure activities to be carried out on site. In this sense, ecosystems, landscape and territory become a livelihood platform for most tourist activities (aquatic sports, kayaking, canyoning, fishing, nature tourism).

II. Water and Tourism in the Mediterranean

Every tourist consumes between 300 and 850 liters of water per day. This rate could be reduced by 50%, a daily total of 273 million m^3 of water basically compensating for the forecasted increase in tourist numbers and associated water consumption by 2025.

"A tourist consumes 3 or 4 times more water per day than a permanent resident, with non-tourist water use ranging between 100 and 200 liters per person per day across Europe Necessary investments in the sewage system and wastewater treatment have taken place and have led to Europe's bathing waters being much cleaner today than they were 30 years ago. In 2013 more than 90% of bathing areas were judged as having good water quality."

Hosting, entertaining and supplying the increasing number of tourists along the limited space of the Mediterranean coast will push urban boundaries further inland, most likely destroying in the process the few remaining coastal wetlands and lagoons. Reducing water consumption and preventing encroachment into wetlands can only be achieved if the tourism industry, the government and individual tourists take concrete measures, such as installing water saving devices, reusing water, enacting water saving policies and adopting a land use plan that respects environmental considerations. Saving water does not have to incur additional costs but can be economically advantageous as hotels save on their water bills. Thus, in protecting wetlands, one of the attractions that people come to see is maintained.

Tourism in the Mediterranean has the following impacts on freshwater resources:

1. Over-exploitation of groundwater:

Groundwater overexploitation occurs when the volume of abstracted groundwater exceeds the average annual renewal of the groundwater body. Aquifer overexploitation is considerable in many Mediterranean countries: 13% in Cyprus, 24% in Malta (in 1990), 29% in Gaza (Palestine), 32% in Israel (in 1994) and 20% in Spain (25% in the Júcar basin, 4% in the Balearic Islands). Aquifer overexploitation was registered also in Egypt, Greece, Libya, Morocco, Turkey, and Tunisia.

2. Construction of new reservoirs or water transfer schemes:

The growth of tourism is often associated with the search for complementary water sources to satisfy the great demands on water for this economic sector. The combination of water needs for agriculture and tourism has led to the construction of a significant number of dams.

3. The exploitation of non-renewable groundwater resources:

This is a serious problem for the Saharan aquifers in Libya (which provide 87% of the amount of water used), but also in Egypt, Tunisia and Algeria. These resources may last at best fifty years because of the depletion of exploitable stocks. Moreover, the quality of extracted water can deteriorate by mixing with saline water even before reserves are depleted, thus reducing their 'useful' life.

4. Pollution of surface and groundwater:

Insufficient, inefficient or non-existent waste water treatment systems have a direct negative impact on the quality of water and therefore on the ecosystems associated with them. According to a study of Ramsar sites, pollution, water regulation, and urbanization and settlement impacts are among the five most frequently recorded change factors in Ramsar wetlands over the world. Of these, pollution is the most important one in Eastern and Western Europe.

5. Occupation of wetland areas:

Coastal areas often host unique ecosystems in deltas estuaries and lagoons, where birds, fish and other aquatic and terrestrial species dwell and breed. More than 50% of the 25,000 plant species in the Mediterranean are endemic to the region (UNDP, 1999). Mediterranean wetlands are also critical areas for migratory birds: it is estimated that about 2 billion migratory birds of 150 species use the Mediterranean wetlands as seasonal sites or as a stopover before crossing the sea or the Sahara Desert in their Africa-Palearctic flyway (UNDP, 1999).

6. Degradation of sensitive wetlands:

Tourism intensity contributes to the degradation of certain sensitive wetlands near tourist hotspots. Recreation and tourism are listed as the second major use of Ramsar site wetlands both in Western Europe, Eastern Europe and in Africa (WWF, 2009). This means that wetlands - especially the protected ones - are a tourist attraction and when their recreational use is not strictly regulated and monitored it can cause negative impacts on species dwelling in the area. Indeed, except for very specific and local cases (*e.g.*, the degradation of small protected wetlands on the dunes of Doñana, Spain for the decrease of groundwater levels due to water supply for the tourist Matalascañas village), wetland degradation is due to a combination of causes (*e.g.*, agriculture, tourist, industrial development). EEA (2003a) reporting a loss of habitats in transitional and coastal waters related to intense pressures due to "high human population densities", without specifying how much was lost and due to what.

The main causes of the impacts on freshwater ecosystems described in the previous section are:

7. High water consumption due to population increase:

Tourist areas suffer from significant fluctuations in the number of local dwellers that have to be supplied with freshwater and consumption peaks normally occur in the dry season, when tourist demand overlaps with high water demand by agriculture.

8. Higher consumption of water for associated facilities and leisure:

Tourists require constant access to water. A tourist staying in a hotel uses on average one third more water per day than a local inhabitant (EEA, 2003b). Moreover, extensive landscaping, water parks, swimming pools and golf courses are typical tourist facilities that require water during the dry season.

Peaks in wastewater volumes become serious with inefficient or non-existent wastewater treatment facilities. According to EEA (2003b), tourists consume up to 300 liters (up to 880 liters for luxury tourism) and generate around 180 liters of waste water per day.

9. Urban development associated with tourism:

Tourism leads to urban development because it needs facilities not only to host, feed and entertain tourists, but also to transport them, care for them (*e.g.*, hospitals), treat their wastes *etc*. On the other hand, economic growth is normally associated with the growth of the local population which provides services to tourists. All these facilities occupy land and transform the landscape and the natural dynamics of wetlands located near tourist resorts.

10. Transport infrastructures associated with tourism:

The tourist industry requires efficient facilities to transport huge amounts of goods (food and all types of goods that can be sold to tourists) to tourist resorts and, of course, to bring tourists to their destination. The construction of transport infrastructures often negatively affects the environment.

11. Opportunities to reduce water consumption and its impacts on the environment:

Applying existing technology to save water in Mediterranean hotels could bring about a significant reduction in water demand and could possibly accommodate a further increase in tourism without more dams being constructed. According to the EEA (2003) water saving devices can save up to 50% of water. Assuming a doubling of the number of tourists in the Mediterranean by 2025, a savings potential of 50% would amount to a total of 273 million cubic meters of water per year. Many effective water-saving devices can be purchased at a reasonable price with some of the devices not requiring any structural modifications.

The tourism industry should be directly concerned with the impact of its activities on freshwater because:

- Decreasing overall water use can lead to cost savings. Restrict water use especially during periods of drought.
- Reducing water use can conserve and protect the local water resources upon which hotels and local communities depend. This is even more relevant if overexploitation or pollution of water is causing deterioration to the freshwater ecosystems that symbolize a tourist destination.

- Preserving the quality of local water resources can reduce the need for costly drinking water treatment processes.
- Water conservation can enhance reputation among guests and others who are concerned about reducing water consumption and protecting local resources.

III. Water depuration and reuse in Spain

The issue of water depuration and reuse is of great importance, especially in areas where the scarcity of conventional resources is a structural problem, as is the case in Spain. The potential presented by this unconventional resource, strategic in deficit situations, is unquestionable; especially if it is taken into account within the framework of planning and under the assumption of a water exploitation model that has as its priority the conservation, protection and improvement of water quality, and the sustainable and efficient use of natural resources.

The work shows how purification and reuse are linked, since the reuse of wastewater is associated with a previous regeneration, and they are two essential tools of the environmental model of water, as recommended by the community regulations. The entry of Spain into the European institutions has been a catalyst in environmental issues, as it has meant the need to adapt the country to European regulations, which are much more demanding. The effort made has been important, but we are still far from complying with all the requirements of Europe.

Regenerated purified water should be considered as an unconventional resource, whose management should be included in a comprehensive planning of water resources, which considers economic, social and environmental aspects. Reuse can increase the uses of water already used, increasing the availability of water resources. Regenerated water can replace uses that do not require high quality, freeing up volumes of better quality for other more demanding uses.

The benefits of reuse are mainly manifested in the increase in available resources, considering also that, compared to other alternative resources, regenerated water presents important advantages. They are a stable resource being conditioned by the supply. They are cheaper than those obtained through transfers or desalination since their production consumes less energy than the previous methods of increasing the supply. With current treatments, its quality is sufficient for most uses, so it makes no sense to use better quality water for irrigation or other over-cost activities.

European environmental policy has among its fundamental principles the conservation, protection and improvement of water quality, as well as the prudent and rational use of natural resources. To achieve these objectives, different strategies have been followed over time, ranging from the protection of water resources based on water uses (quality objectives), to the control of discharges through emission standards, to arrive at an environmental strategy based on the protection of water bodies considered as aquatic ecosystems, with a more environmental approach, which promotes and encourages a more sustainable use of water.

In Spain, large-scale purification began with the 1995-2005 National Sanitation and Purification Plan (PNSD), whose main objective was to comply with Directive 91/271CEE, which established discharge quality of treated wastewater based on the discharge area. The PNSD was developed to coordinate the actions of the public administrations on this matter, since it is an autonomous competence. During the implementation period, the volume of wastewater treated in 1996 went from 0.13 to 0.31 m^3/inhabitant/day in 2006. The most recent data, from 2011, puts the volume of wastewater treated at 13.5 hm^3/day.

The uses that can be given to regenerated water are many and varied. The five main ones to which the regenerated water is destined in Spain are represented in Figure 1. In the first place - and much different from the others - is agricultural, with more than70% of the total destination of the regenerated water and an annual volume of 261 hm^3/year, which is used for the irrigation of products for human consumption in fresh, pastures, agriculture, woody crops, ornamentals, nurseries and forages, among others. It is undoubtedly the use that can contribute the most to saving surface and / or underground water, and, therefore, helping to conserve the natural environment. The agricultural use is followed by the environmental in importance, to which more than 17% of the reused flows are destined, which are used for the recharge and recovery of aquifers, the irrigation of forests and green areas, forestry, the restoration and maintenance of wetlands, the infiltrations for avoid saline intrusion or the restoration of ecological flows.

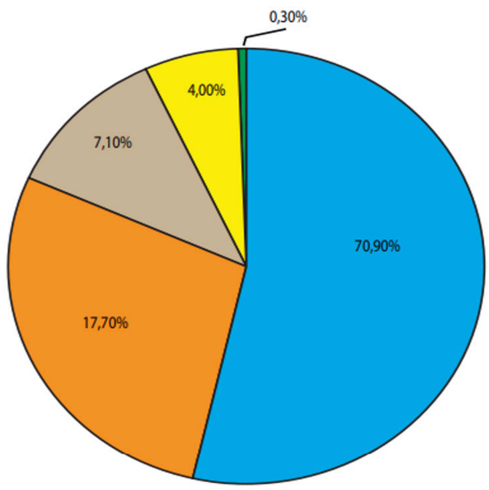

Figure 1. Distribution by uses of reclaimed water in Spain (Modified from Melgarejo et al., 2017)

The recreational use, with 7% of the flows, constitutes the next most important use, the volumes being used mainly in this case for the irrigation of golf courses, although also ponds or ornamental circulating flows. Urban use (residential, private gardens, discharges of sanitary devices) and services (irrigation of green areas, street cleaning, fire-fighting systems, industrial car washing) use 4%; while only a meager quantity, 0.3% of the total, is for industrial use (process and cleaning water, refrigeration, condensers). It is essential that regional administrations promote and even enforce when it is advisable to use purified wastewater when its use allows it, especially in spaces that are affected by permanent deficits.

Proper water management requires a balance between its economic values and its environmental, social and cultural values. The MSFD (Marine Strategy Framework Directive) establishes a new water use model that can be called the environmental or sustainable growth model, in opposition to the traditional models of supply development and in line with some aspects of the demand management models. In sustainable growth models, the use of more efficient technologies must be promoted and stimulated, both from an environmental and economic point of view. Under this new conception, the quality of water is a restriction for the development of economic activity and the prices of the resource must be set in such a way that, in addition to encompassing the opportunity cost, they reflect the scarcity and the damages produced in the environment.

Currently, Spain does not comply with community legislation on urban water treatment. The level of coverage is close to 90% of the total in relation to the pollutant load, but it is especially far from meeting the objectives set by the MSFD for purification in municipalities with more than 10,000 inhabitants, since only 32% of these Spanish municipalities have the tertiary purification systems required by the Community legislation. There are two aspects towards which management should be directed in the future: 1) the application of new technologies that imply less energy costs, that are more friendly with the environment, that generate less waste, and ultimately, that are more sustainable; and 2) a change in the financing model, with a greater role for sanitation fees and a thorough review of water rates, which guarantees compliance with the cost recovery principle. In this new model, the potential for water reuse is an incontrovertible fact, especially in countries with scarcity problems such as Spain, but its consolidation as a non-conventional strategic resource is a challenge that forces all actors with responsibility in the matter to act in a coordinated manner and with absolute rigor in planning future actions.

However, it must be taken into account that the increase in the volumes cleaned will not mean an automatic increase in reuse, since there are various factors that can stop its expansion. It is worth highlighting, in this sense, the lack of regularity in the quality of the treated effluent in some WWTPs; the need to use purified effluents to guarantee ecological flows, especially in times of low water or times of drought; the difficulty of converting potential demands into real, especially in the case of reuse in agricultural irrigation, due to the resistance of farmers to substitute traditional resources for reclaimed water; and, finally, the absence of a planning culture in decision-making regarding reuse actions, which implies the adoption of initiatives without the necessary feasibility studies.

IV. Supply of drinking water and sanitation in Spain

The supply of drinking water for its use by the population is one of the main challenges facing Humanity. In Spain the demand for water supply for human use is estimated at a range between 160 and 180 liters per person per day, experiencing an increase in activity in this sector not only due to urban growth but also due to the demands on quality and wastewater treatment and the consequent National Sanitation and Treatment Plan, which has resulted in the entry into service of numerous EDAR (EstaciónDepuradora de Aguas Residuales-Wastewater Treatment Stations) throughout the national geography, estimating that currently 95% of the Spanish population is connected to some treatment system.

In total, for the country as a whole, an estimated urban supply water flow of 3,730 hm^3 per year and a volume of treated wastewater of 4,450 hm^3, justifying the difference in that, although not all the water supplied ends in a drainage channel to the WWTP, the treatment plant also receives rainwater and other possible effluents. The energy consumed in order to achieve these treatments is estimated, for the collection, supply and distribution of urban water, at about 447 GWh/year; and as that of purification, it is about 2,225 GWh/year.

The reduction in energy consumption will be driven by the reduction of water losses in the supply networks, not only by the improvement of the existing networks but also by the implementation of remote-control systems for the systematic detection of hidden leaks; for the reuse of purified water in municipal consumption (irrigation of gardens and street cleaning) and for the optimization of pumping systems adapted to the variation of pressure and the demands of the water supply.

And in relation to the EDAR, the water treatment and purification facilities are experiencing an improvement in their efficiency due to technological innovation and due to the pooling of flows towards larger communal facilities. Thus, small treatment plants, which tend to lack aeration control systems and where their design is based on mechanical robustness, imply a certain oversizing of electromechanical equipment so that the unit consumption in such treatment plants is relatively high, of the order of 50 kWh/ha. In large wastewater treatment plants, the design, sizing and control are optimized to achieve energy consumption close to 20 - 30 kWh/ha.

Basic principles governing supply and sanitation services:

- Water is an essential basic good and a Human Right, recognized by the UN.
- It is a rare and heterogeneously distributed resource - Water is public property and its use is subject to the general interest.
- The urban water supply has the highest order of preference with respect to other uses.
- The urban water service is a municipal responsibility. The choice of the form of management of urban water services is a municipal responsibility and competence in accordance with criteria of sustainability and efficiency.

The main urban water use in Spain is for domestic use (68%) and industrial and commercial consumption (14%) and the remaining 17% is assigned to other uses, such as municipal or institutional (AEAS-AGA, 2020). The percentage of water reused with respect to the water supplied and treated is only 7.1%. The most water-consuming sector is gardening (Fig. 2).

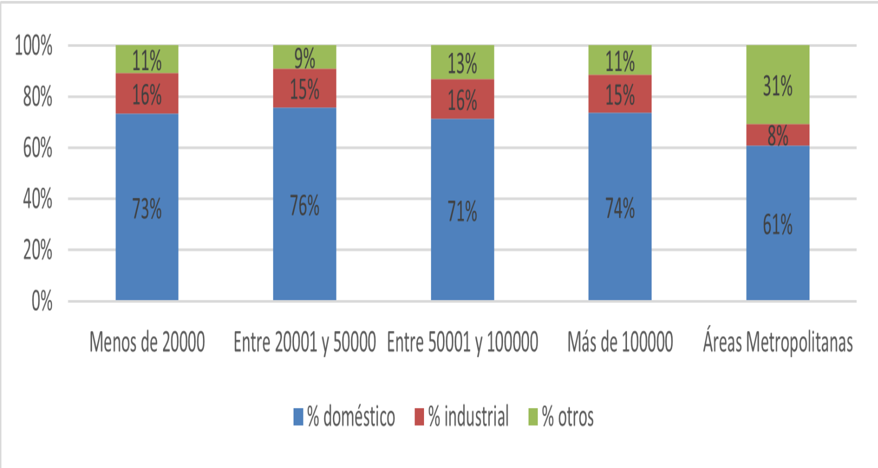

Figure 2. Uses of reclaimed water reused in Spain
(Modified from CEDEX (2008) and AEAS-AGA (2020))

Concern for climate change in the sector is reflected in the application of different techniques implemented by the urban water services to minimize, as far as possible, their carbon footprint. Likewise, the circular economy strategy promoted by the EU has a direct application in supply and sanitation operators. Regarding energy aspects, 69% of sanitation facilities have devices for the use of renewable energy, and 71% cogeneration. In addition, urban water services generate a total of 611.66 GWh/year.

Approximately, the volume of supplied urban water in Spain was 4,057 hm^3, the equivalent of 237 liters/inhabitant/day. The domestic appliance consumption was 128 liters/inhabitant/day. Most of this water comes from surface sources (74%) and the highest percentage of uses is usually domestic (around 70%), while industrial uses are usually around 18%, but with an ANR of 23% (Fig. 3).

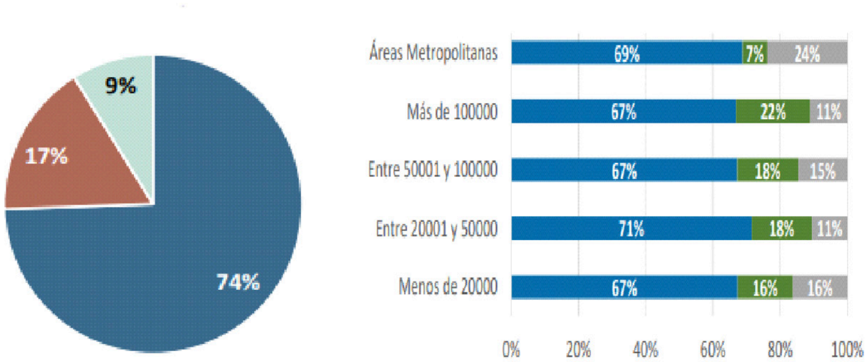

Figure 3. Origin of raw water acquired per year (A) and Water used by type of municipality (B)(Modified from AEAS-AGA (2020))

Water consumption per inhabitant/day has been decreasing in recent years, from 169 liters/inhabitant/day in 2000 to 128 liters/inhabitant/day in 2018. Likewise, the ANR (Agua No Registrada - Unregistered Water) has also decreased gradually, from 32 to 23% between 2000 and 2018.

The total annual amount billed to all consumers for urban water in Spain amounts to 7,654 million euros, of which approximately 51% corresponds to water supply, 41% to sanitation (28% purification and 13% sewerage) and 8% to other concepts, such as the conservation of meters or connections (Fig. 4).

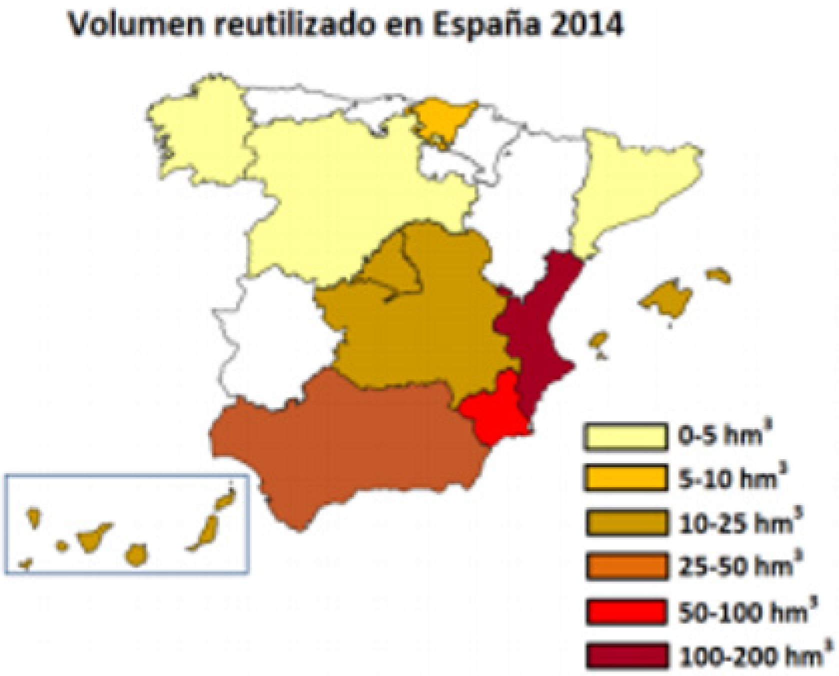

Figure 4. Volume of water reused in Spain (Modified from AEAS-AGA (2020))

Spain has some 1,640 Drinking Water Treatment Stations (ETAP) supplying an annual total of 4,057 hm^3 to urban tanks and distribution networks. In addition, we have 29,305 water storage tanks.

During the COVID-19 crisis, general urban water consumption has decreased significantly, with peaks of up to -8% per month. Consumption in tourist populations has decreased to -22% in the harshest and most restrictive months of the crisis.

V. Water supply and depuration parameters

V.1. GIS database

Geographic Information System (GIS) is applied to computer systems aimed at managing spatial data that visually allow us to analyze, manage and interpret geographic data. The methodology of this study has consisted of searching and processing shapefile layers and their subsequent analysis GIS. Shapefile layers have been downloaded from official national statistical platforms (Ministry of Ecological Transition and Demographic Challenge, MITECO) and from European platforms such as the European Marine Observation and Data Network (EMODnet).

The Spatial Reference System has the ETRS89 datum with UTM projection in the 30 North zone, with EPSG code: 25830. In addition, they are based on official statistical platforms or rigorous studies, which guarantee the soundness of the information expressed. The GIS results were expressed by NUTS administrative boundaries from the EU (EUROSTAThttps://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-gq-20-092).

The NUTS classification subdivides the economic territory of the EU Member States into territorial units (regions; Fig. 5). The classification is made up of three hierarchical levels: each Member State and the UK are divided into NUTS 1 regions, which in turn are subdivided into NUTS 2 regions and then further divided into NUTS 3 regions. Each of these regions is allocated a specific code and name. Since several different regions within Europe have the same name, a distinction has been made by adding to each of these the abbreviation for the country concerned.

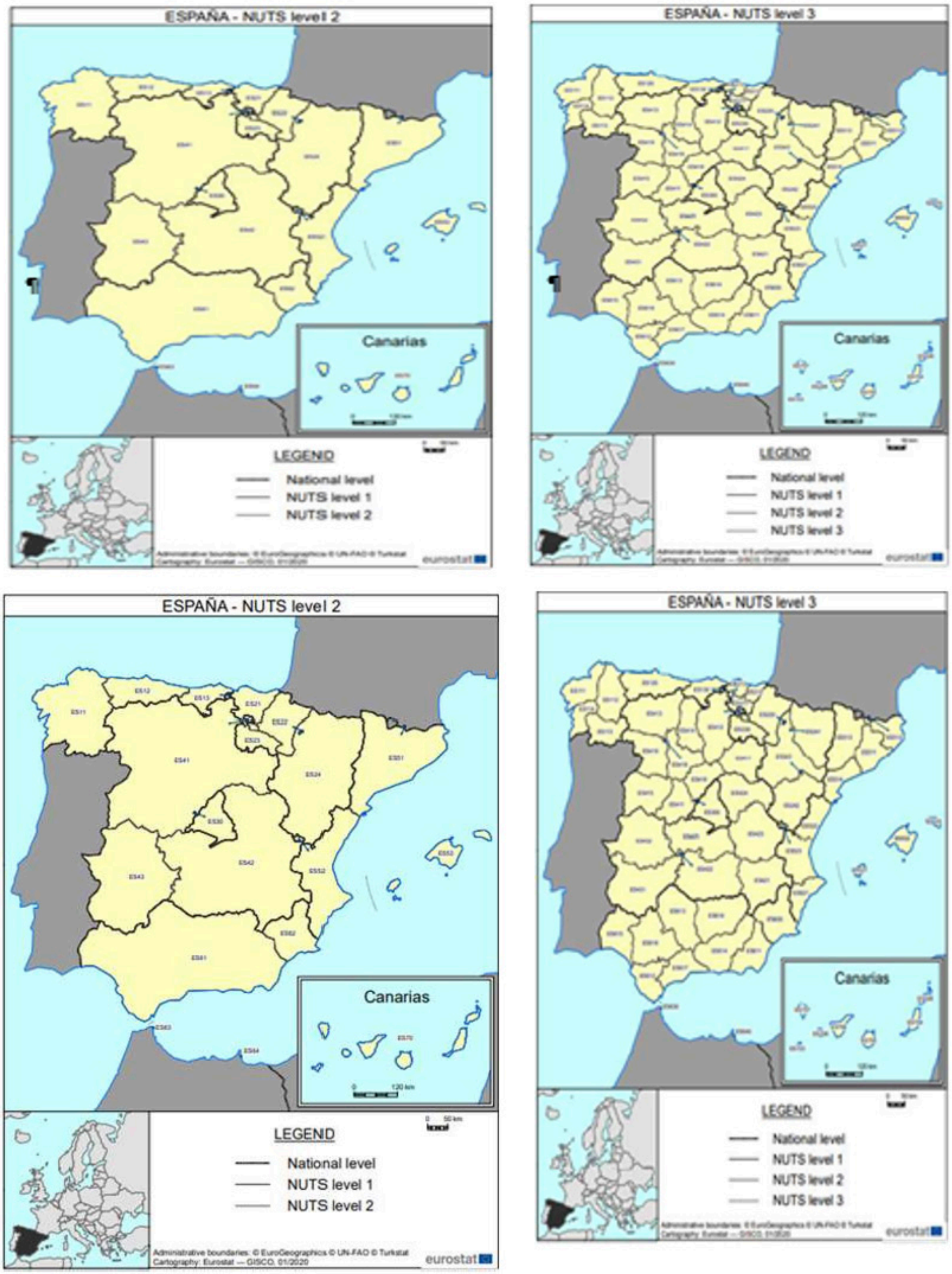

Figure 5. Spain (España): NUTS level 2 and 3 (EUROSTAT (2021))

V.2. Data Records

The developed Spanish Mediterranean coastal database described in this report is available through the fig-share repository of results. We have included a csv file with all the information at Nuts 3 level into the repository. The database will be updated and expanded as soon as new and improved data become available. The database presented here has been created using several public available datasets, which are thoroughly documented and described in reports or scientific articles (Table 1). Thus, these datasets have undergone rigorous quality controls and/or validation. In addition, for those parameters where consistent information for the studied area wasnot available, new datasets were generated.

V.3. Water supply and depuration parameters

A panel of external experts and the working group at the Mediterranean level of the Co-Evolve4BG project has selected the following parameters of Water supply and depuration parameters, which will be analyzed at the National and Mediterranean scales. In the supplementary material is located the excel table with the values of the parameters selected at the level of Spain.

Table 1. Water supply and depuration parameters

Parameters	Variable	Description	Source
Station of Waste Water Treatment Name	Name	Indicate the name of waste water treatment	EDAR: https://www.iagua.es/data/infraestructuras/ edar https://www.esamur.com/mapa-de-edar http://sig.gencat.cat/visors/VISOR_ACA.html#param=param&color=vermell&background=topo_ICC&BBOX=144808.774834,4485000, 649191.225166,4752000 &layers=AIGUA_DEPURADORES http://www.epsar.gva.es/instalaciones/ buscador-edar.aspx
Location of the Station of Wastewater Treatment	Lon., Lat. (in Degree)	Indicate the location of the wastewater treatment	EDAR: https://www.iagua.es/data/infraestructuras/ edar https://www.esamur.com/mapa-de-edar http://sig.gencat.cat/visors/VISOR_ACA.html#param=param&color=vermell& background=topo_ICC&BBOX=144808.774834, 4485000, 649191.225166,4752000&layers=AIGUA_DEPURADORES http://www.epsar.gva.es/instalaciones/ buscador-edar.aspx
Volume of treated waste water by the station	10^6 m^3/ year	Indicate the volume capacity of wastewater treated by the station (station capacity)	EDAR: https://www.iagua.es/data/infraestructuras/edar https://www.esamur.com/mapa-de-edar http://sig.gencat.cat/visors/VISOR_ACA.html#param=param&color=vermell&background=topo_ICC&BBOX=144808.774834,4485000,649191.225166,4752000&layers=AIGUA_DEPURADORES http://www.epsar.gva.es/instalaciones/ buscador-edar.aspx
Volume of fresh drinkable water (including losses in the network)	10^6 m^3/ year	Give an estimation of volume of fresh water used by the coastal population in the district/region	INE: https://www.ine.es/jaxi/Datos.htm?path=/ t26/p067/p03/serie/l0/&file=02003.px
Volume of fresh water used for agriculture	10^6 m^3/ year	Indicate the volume of fresh water used for agriculture	INE: https://www.ine.es/jaxi/Datos.htm?path=/t26/p067/p03/serie/l0/&file=02003.px
Action to reduce water consumption in touristic establishments	Possible values: Yes/No	Indicate if the district or region has a strategy to reduce water consumption in touristic establishments	Own data

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V.5. Water supply and depuration parameters

A panel of external experts and the working group at the Mediterranean level of the Co-Evolve4BG project has selected the following parameters of Water supply and depuration parameters, which will be analyzed at the National and Mediterranean scales(Table 1). In the supplementary material is located the excel table with the values of the parameters selected at the level of Spain.

Table 1. Water supply and depuration parameters

Parameters	Variable	Description	Source
Station of Wastewater Treatment Name	Name	Indicate the name of wastewater treatment	EDAR: https://www.iagua.es/data/infraestructuras/edar https://www.esamur.com/mapa-de-edar http://sig.gencat.cat/visors/VISOR_ACA.html#param=param&color=vermell&background=topo_ICC&BBOX=144808.774834,4485000,649191.225166,4752000&layers=AIGUA_DEPURADORES http://www.epsar.gva.es/instalaciones/buscador-edar.aspx
Location of the Station of Wastewater Treatment	Lon., Lat. (Degree)	Indicate the location of the wastewater treatment	EDAR: https://www.iagua.es/data/infraestructuras/edar https://www.esamur.com/mapa-de-edar http://sig.gencat.cat/visors/VISOR_ACA.html#param=param&color=vermell&background=topo_ICC&BBOX=144808.774834,4485000,649191.225166,4752000&layers=AIGUA_DEPURADORES http://www.epsar.gva.es/instalaciones/buscador-edar.aspx
Volume of treated wastewater by the station	10^6 m^3/year	Indicate the volume capacity of wastewater treated by the station (station capacity)	EDAR: https://www.iagua.es/data/infraestructuras/edar https://www.esamur.com/mapa-de-edar http://sig.gencat.cat/visors/VISOR_ACA.html#param=param&color=vermell&background=topo_ICC&BBOX=144808.774834,4485000,649191.225166,4752000&layers=AIGUA_DEPURADORES http://www.epsar.gva.es/instalaciones/buscador-edar.aspx

Volume of fresh drinkable water (including losses in the network)	10^6 m^3/year	Give an estimation of volume of fresh water used by the coastal population in the district/region	INE: https://www.ine.es/jaxi/Datos.htm?path=/ t26/ p067/p03/serie/l0/&file=02003.px
Volume of fresh water used for agriculture	10^6 m^3/year	Indicate the volume of fresh water used for agriculture	INE: https://www.ine.es/jaxi/Datos.htm?path=/ t26/ p067/p03/serie/l0/&file=02003.px
Action to reduce water consumption in touristicestablishments	Possible values: Yes/No	Indicate if the district or region has a strategy to reduce water consumption in touristic establishments	Own data

VI. Conclusions

The main conclusions of this work are:

- The main uses of regenerated waters in Spain are agricultural (70%) and environmental (*e.g.*, Restoration and maintenance of wetlands).
- Currently, Spain does not comply with community legislation on urban water treatment. The level of coverage is close to 90% of the total in relation to the pollutant load, but it is especially far from meeting the objectives set by the MSFD for purification in municipalities with more than 10,000 inhabitants, since only 32% of these Spanish municipalities have the tertiary purification systems required by the Community legislation.
- Water consumption per inhabitant/day has been decreasing in recent years, from 169 liters/inhabitant/day in 2000 to 128 liters/inhabitant/day in 2018.
- The main urban water use in Spain is for domestic use (68%) and industrial and commercial consumption (14%).
- During the COVID-19 crisis, general urban water consumption has decreased significantly, with peaks of up to -8% per month. The consumption of tourist populations fell to -22% in the hardest and most restrictive months of the crisis.

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