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Promoting tourism businesses for "Salgado de Aveiro" rehabilitation

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ABSTRACT

Aveiro lagoon is a wetland that represents a valuable ecosystem; it has a status of Special Protection Area and Site of Community Importance, under the Nature 2000 network. Inside Aveiro lagoon there is a salt production site known as *Salgado de Aveiro*, which represents an important cultural value for the region. However, the decline of artisanal salt production has resulted in saltpans abandonment and consequently degradation, affecting negatively their natural and cultural values. Saltpans rehabilitation or maintenance is the only way to conserve those values.

In Aveiro, the project *Sal de Aveiro* was developed aiming saltpans rehabilitation through the development of new businesses related with artisanal salt production, aquaculture, or tourism. This study proposes to identify the most suitable tourism and recreation activities for saltpans of Aveiro. Thus, it proposes to develop a qualitative analysis of *Salgado de Aveiro* in terms of legal framework, tourism activities under development, saltpans physical conditions, location and accesses as well as activities developed in other salt production sites or wetlands.

As a result, the authors identified a widely ranges of tourism and recreation potential activities to be developed in the saltpans of Aveiro. The activities were divided in different categories according with their core product: artisanal salt production; biodiversity; aquaculture; health and wellbeing; water sports; other outdoor recreation activities; and accommodation. Although, the economic viability and the environmental impacts of those activities should be addressed in future researches.

Management implications

- This study might clarify potential investors about the most suitable tourism and recreation activities to develop in *Salgado de Aveiro*.
- Makes a connection between saltpans physical conditions and the needs of specific tourism activities.
- Stressed the need of saltpans owners/managers to balance natural conservation and touristic and recreation uses.
- Points out some local management problems and the need for a management plan involving different levels and sectors of authority.
- Tourism and recreation activities and even projects such as *Sal de Aveiro* might be used to attempt the rehabilitation of other saltpans sites.

1. Introduction

1.1. Saltpans: decline and rehabilitation processes

Saltpans, located inside wetlands, are particular ecosystems created and maintained by anthropic actions (Crisman, Takavakoglou, Alexandridis, Antonopoulos, & Zalidis, 2009; Rodrigues, Bio, Amat, & Vieira, 2011). Their original purpose was the artisanal salt production, which mainly in South Europe is traditionally based on solar evaporation methods (Gauci, Schembri, & Inkpen, 2017, pp. 1–16; Hueso & Petanidou, 2011). This ancient activity has transformed the wetlands landscapes in many ways: physical, environmental, ecological, cultural and economic (Hueso & Petanidou, 2011; Petanidou & Dalaka, 2009; Sainz-López, 2017). Salt production creates a very typical landscape, which is defined by Kortekaas (2004, p.199) as saltscapes: *"a type of cultural landscape formed in salt making areas, combining saline semi-natural habitats and cultural values related to salt making activity"*.

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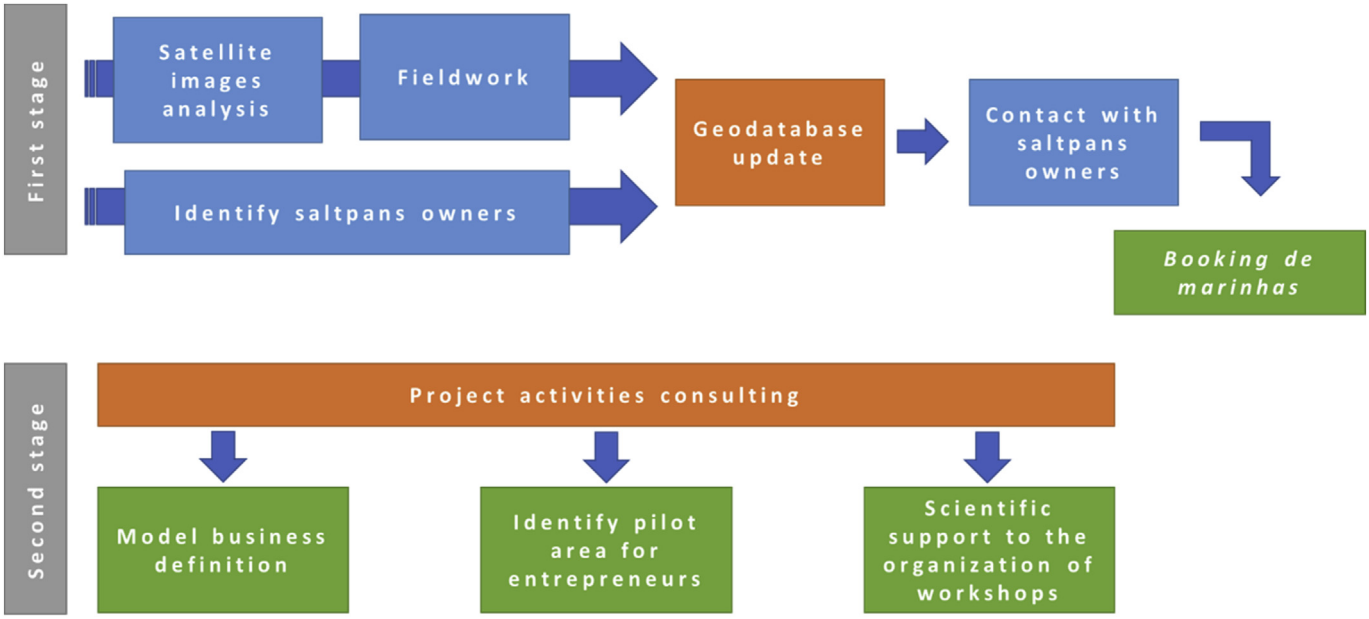

Fig. 1. Diagram of University of Aveiro role in the project *Sal de Aveiro*.

Moreover, it supports the landscape preservation and the environment protection while generates economic benefits (Crisman et al., 2009; Hueso & Petanidou, 2011; Rodrigues et al., 2011). In the past, salt was an essential element for food preservation, for the livelihood of many coastal communities and gave political power to whom controlled its production or trade (Gauci et al., 2017, pp. 1–16; Hueso & Petanidou, 2011; Ramsar & UNWTO, 2012; Sovinc, 2011). However, artisanal salt production has been in continuous decline since the 1950s (Crisman et al., 2009; Gauci et al., 2017, pp. 1–16). There are many reasons, mainly related with economic motivations, to justify artisanal salt production decline and therefore saltpan's abandonment. For instance the loss of salt value due to the introduction of refrigeration devices and the land use changes for industry, urbanization, aquaculture, or tourism purposes (Crisman et al., 2009; Gauci et al., 2017, pp. 1–16; Hueso & Petanidou, 2011; Petanidou & Dalaka, 2009; Sainz-López, 2017). This process affects negatively local salt culture as well as saltpan's biodiversity and landscape, leading to further loss of heritage (Gauci et al., 2017, pp. 1–16; Petanidou & Dalaka, 2009; Rodrigues et al., 2011).

The rehabilitation of saltpans could help to keep their structures and their natural and cultural values. However, that is a complex and expensive process because saltpans are formed by permeably muddy subtracts, often subject to water erosion and high level of vegetation growth, and the movement of soil involves higher costs due to the soil conditions and the difficult access to some sites (Neves, 2002; Rodrigues et al., 2011). Moreover, saltpans degradation evolves as erosion propagates to adjacent saltpans, which are often also abandoned (Rodrigues et al., 2011).

Taking in account those reasons, along with the fact that artisanal salt production was no longer a profitable activity, it is not expectable saltpans rehabilitation merely for artisanal salt production purposes (Petanidou & Dalaka, 2009; Rodrigues et al., 2011). Currently, saltpans owners/managers have diversified their businesses, converting the area mostly for aquaculture or tourism and recreation activities (Crisman et al., 2009; Gauci et al., 2017, pp. 1–16; Hueso & Petanidou, 2011; Petanidou & Dalaka, 2009; Rodrigues et al., 2011). On the other hand, artisanal salt producers are now focused on selling a high quality product, as a certificated salt or *fleur de sel*, or combining it with tourism and recreation activities (Hueso & Petanidou, 2011; Rodrigues et al., 2011). In fact, tourism seems to be an alternative and/or a complement to artisanal salt production as a way to protect natural and cultural values of saltpans and to generate economic profit.

The Ramsar Convention on Wetlands published in 2008 a guidance document for wetland's cultural heritage conservation where saltpans abandonment issue is addressed (Ramsar Culture Working Group, 2008). In order to achieve traditional saltpans rehabilitation or maintenance and therefore natural and cultural values preservation, the document suggests the following actions:

a) "Compile inventories, record and document traditional salinas, whether in use or abandoned
b) Evaluate the viability of operating individual traditional salinas
c) Encourage certification labelling of salt from traditional sustainable sources
d) Relate tourism/ecotourism programmes to traditional salt production
e) Support or initiate the establishment of salt museums or salt information centres
f) Assess the feasibility of restoring to use individual abandoned salinas
g) *Investigate other uses for abandoned salinas, which would maintain their natural and cultural values"* (Ramsar Culture Working Group, 2008, p. 48).

1.2. The project: Sal de Aveiro

In Aveiro, a littoral city in the centre of Portugal, it was developed a project named *Sal de Aveiro,* which follows to certain degree the Ramsar Convention guidance and it attempts the creation of new businesses enterprises in part of a saltpans complex. *Sal de Aveiro* was promoted by *Associação Comercial do Distrito de Aveiro* (Aveiro's District Commercial Association) and it was developed by a company called *KWL* and the University of Aveiro. The final product is an online platform providing the following information to potential investors:

- saltpans available for sale or rent, including their conservation status;
- potential types of businesses to develop in Aveiro saltpans; and
- financial programmes available for potential investors.

The role of University of Aveiro in the mentioned project can be divided in two stages (Fig. 1). In the first stage of *Sal de Aveiro*, a geodatabase composed by saltpans data from previous projects was

updated, while saltpans owners were identified and contacted to express their interest in participating in this project. The result is an online platform hosted in www.bookingmarinhas.com, where potential investors can find saltpans available for sale or rent. The second stage consisted in providing support as a consultant to various project activities, namely the model business definition and the identification of the pilot area for entrepreneurs as well as in the organization of workshops for saltpans owners or potential investors. Those workshops addressed issues related with saltpans of Aveiro such as potential activities to be developed, mainly aside from salt production, and the legal framework and required authorizations to start a new business.

In order to support those activities we tried to understand the potential activities to be developed in salt production sites and their specific context. The current study explores the University of Aveiro contribution for the second stage of *Sal de Aveiro* through the identification of the most suitable tourism and recreation activities to be developed in *Sal de Aveiro* implementation area.

2. Literature review

2.1. Tourism in wetlands

According with Ramsar Convention, wetlands *are "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters"* (Ramsar, 2016, p.2). They are very productive and valuable ecosystems and have a rich biodiversity, hosting thousands of animal and plant species (Kortekaas, 2004; MedWet, 2016; Ramsar & UNWTO, 2012). In addition, wetlands hold important cultural and spiritual values (Kortekaas, 2004; MedWet, 2016). Numerous functions are assigned to wetlands, which can be understood as ecosystem services: provide food, water, transportation, raw materials, coastline protection, water purification, climate regulation, flood regulation, a natural environment for the sequestration and storage of carbon dioxide from the atmosphere, as well as significant opportunities for tourism and recreation (Kortekaas, 2004; Lee & Hsieh, 2016; MedWet, 2016; Ramsar & UNWTO, 2012; Sainz-López, 2017; Sorotou & Dodouras, 2011). Although, wetland are disappearing in Europe, where some countries have lost more than an half of their wetlands areas in the last century due to human activities, including tourism, which lead to wetlands resources overuse, pollution and land use changes (Kortekaas, 2004; MedWet, 2016; Sorotou & Dodouras, 2011).

Wetlands attract visitors due to its typical fauna and flora, its unique landscape and the strong connection between people and water, which may conduct them to a sense of calm and relax (Do, Kim, Kim, & Joo, 2015; Lee, 2016; Ramsar & UNWTO, 2012). Moreover, wetlands value increases when natural and cultural are combined (Papayannis & Pritchard, 2011). Lee and Hsieh (2016, p.779) argued that wetland tourism is *"directly dependent on a relatively undisturbed natural area and contributes to the conservation and management of the wetland setting"*. Many types of tourism activities take place in and around wetlands, such as cultural tourism or nature-based tourism, including land or aquatic activities (Do et al., 2015; Ramsar & UNWTO, 2012). The Ramsar & UNWTO (2012) revealed 14 wetland tourism case studies, from different types of wetland around the world, and pointed out the main activities or equipments available for visitors in each place, showing the potential and diversity of values present in wetlands:

- Land activities: Beaches; Board walks; Cave tours; Cycling; Guided tours; Horse riding; Horse/Camel trekking; Interpretative/ Educational trails; Nature trails; Safaris; Wildlife/Bird watching
- Aquatic activities: Boat tours; Canoeing; Fishing; Kayaking; Scuba diving; Snorkelling; Wildlife/Bird watching
- Culture activities: Cultural experience; Indigenous Art tour
- Accommodation services: Camping, Floating houses, Houseboats, or Homestays.

Especially in protected areas, which are the case of some saltpans sites, it is important to ensure the scope and the level of impact of tourism and to avoid mass tourism in order to protect the environment and tourism assets (Faganel & Trnavčevič, 2012; Ramsar & UNWTO, 2012; Rodrigues et al., 2011). Promoting sustainable development strategies is fundamental for wetlands conservation (Pelegrín, 2014). Sustainability practices are *"key for tourism businesses since they help to protect the features that appeal to tourists – attractive and interesting landscapes, wildlife, culture and local traditions"* (Ramsar & UNWTO, 2012, p.20).

Nevertheless, a proper and desirable sustainable tourism development requires government cooperation and effective organization in different levels of management (Khoshkam, Marzuki, & Arzjani, 2014). Besides, training residents increases their environmental knowledge and their awareness about the potential benefits of wetlands wise use, stimulating an environmentally friendly behaviour, thereby increasing the number of visitors (Chunchang & Nan, 2012; Khoshkam & Marzuki, 2011; Ramsar & UNWTO, 2012). According to social exchange theory, host residents who perceive more benefits than costs from tourism may support the development of sustainable tourism (Lee & Hsieh, 2016). In addition, some studies prove local communities wiliness to contribute for wetland conservation and restoration with cash or voluntary work (Baral, Basnyat, Khanal, & Gauli, 2016) or through an entrance fee (Lamsal, Atreya, Pant, & Kumar, 2016). Yet, a protected area does not necessarily need to charge an entrance fee to be economically successful, instead it is fundamental to reinvest sufficient funds into wetland management in order to protect it (Ramsar & UNWTO, 2012).

2.2. Tourism in saltpans

Saltpans functions changed from production sites of tangible products to a contemporary use associated with recreational and aesthetic attributes to produce intangible touristic experiences (Wu, Wall, & Yu, 2016). Saltpans became an attractive resource for tourism, which have gradually caught the attention of saltpans owners/managers, based on distinct types of activates, for example, culture, nature, education, science, health and wellbeing, and gastronomy (Crisman et al., 2009; Gauci et al., 2017, pp. 1–16; Kortekaas, 2004; Petanidou & Dalaka, 2009; Rodrigues et al., 2011). Hueso and Petanidou (2011, p.222) justify the rise of salt tourism in Mediterranean region with *"the rehabilitation of our cultural and industrial heritage, the fragmentation of vacation periods into shorter trips, the diversification and specialization of tourism products and destinations and the proliferation of museums on craftsmanship."*.

Artisanal salt production sites encompass a unique landscape and an important function as substitution habitat for many wetland species of fauna and flora. In fact, the natural value is its key attraction as a touristic destination (Hueso & Petanidou, 2011; Kortekaas, 2004). Their usually highly controlled accesses provide maximum protection to resident and migratory birds for feeding and breeding and their rare halophytic flora communities make it poor in terms of biodiversity but increase its value (Crisman et al., 2009; Kortekaas, 2004; Papayannis & Pritchard, 2011; Petanidou & Dalaka, 2009; Rodrigues et al., 2011; Sainz-López, 2017).

On the other hand, salt production sites have begun to attract a new type of visitor with an interest in cultural heritage (Hueso & Petanidou, 2011). Those places hold cultural values, mostly related to artisanal salt production, represented by tangible assets, such as buildings or artefacts/tools, and intangible assets, such as the traditional knowledge, customs and practices, history, social life related to salt workers, and the salt itself as a cultural element (Crisman et al., 2009; Gauci et al., 2017, pp. 1–16; Kortekaas, 2004; Papayannis & Pritchard, 2011; Sainz-López, 2017). The buildings and the outdoor facilities once used in salt production can be used now for alternative purposes, as educational

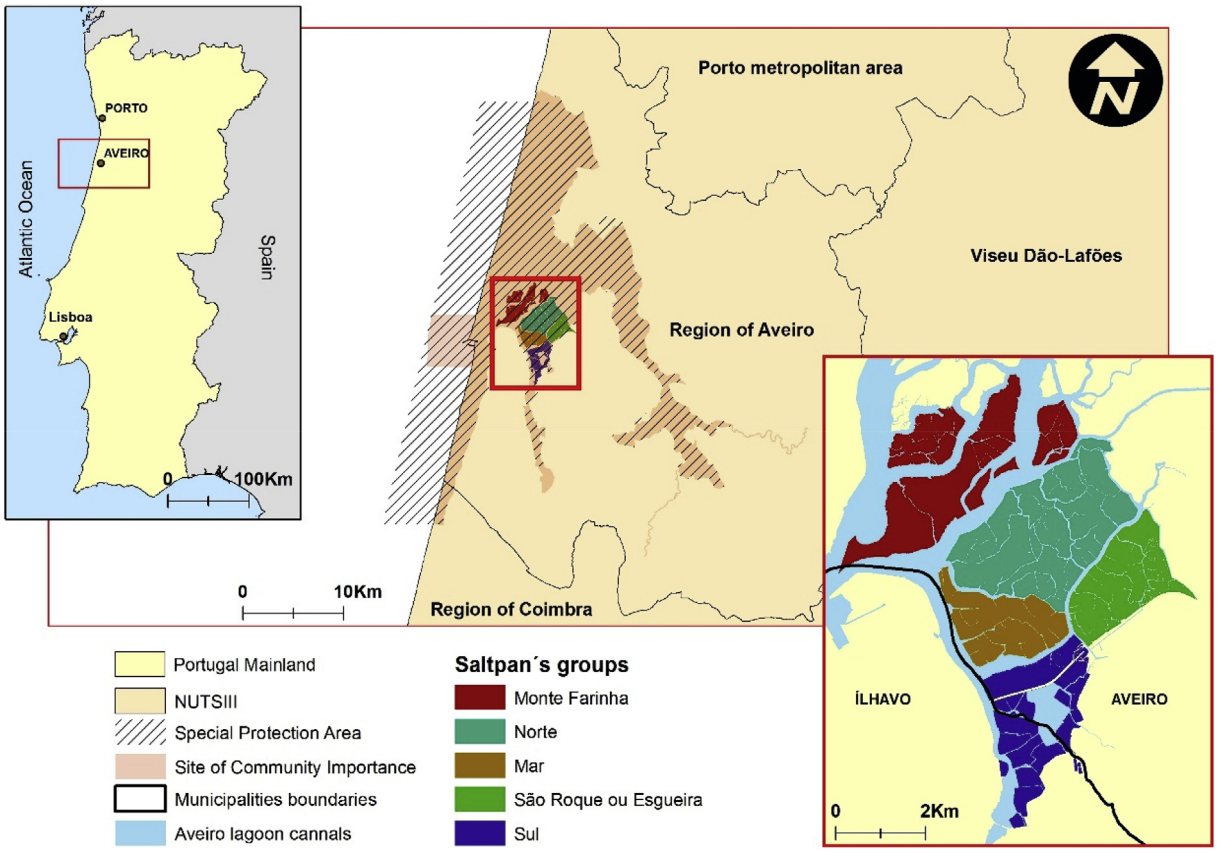

Fig. 2. *Salgado de Aveiro* - Location and Classification.

activities, cultural events, workshops, and others (Kortekaas, 2004). Several active or inactive salt production sites have museums, interpretation centres, or eco-museums (Petanidou & Dalaka, 2009). Tourism related with salt heritage includes tours, as guided tours or school visits, participatory experiences either watching artisanal salt production or effectively being active part of the process, and the purchase of salt and salt-related products such as soap, bath salts, or gourmet salts (Hueso & Petanidou, 2011; Kortekaas, 2004; Wu, Xie, & Tsai, 2015). Kortekaas (2004, p.205) consider that *"active tourism should be promoted, in which visitors can participate in salt production, enjoy a spa, taste traditional salt recipes, or learn about the cultural and natural heritage in a proactive way"*. Additionally, Wu et al. (2015) stated that interactive programs would help tourists to better understand salt heritage and consequently to enjoy their experience. In Europe, salt harvesting occurs at the same time of the peak of tourist season, between June and September, providing the opportunity for visitors to engage in an active participation of salt harvesting (Gauci et al., 2017, pp. 1–16).

Furthermore, visitors may enjoy health and wellbeing experiences, such as health treatments, based on the healthy properties of salty water and mud, or spending a relaxing day enjoying a scenic landscape (Hueso & Petanidou, 2011; Kortekaas, 2004). Alternatively, some visitors are also interested in the culinary side of salt, such as the recipes where salt is used as a basic ingredient and combined with local specialties (Hueso & Petanidou, 2011; Kortekaas, 2004).

Nevertheless, salt tourism requires the involvement of communities and current or former salt workers to succeed once the knowledge, culture and tradition related to the activity is spread mainly by word-of-mouth, otherwise there is a risk to lost that knowledge (Hueso & Petanidou, 2011; Wu et al., 2015, 2016). Tourism activities should fulfil economic, social, and aesthetic needs and maintain cultural and natural heritage for the enjoyment of future visitors (Faganel & Trnavčevič, 2012; Kortekaas, 2004). They can raise the awareness of local residents, tourists and tourism industry about local culture and the necessity to protect this habitat (Faganel & Trnavčevič, 2012; Ramsar & UNWTO, 2012; Rodrigues et al., 2011; Wu et al., 2015). Such awareness raising is generally related to activities developed by guided tours, visitor centres, and educational programs (Hueso & Petanidou, 2011).

In Europe, there are saltpans sites where tourism activities were essential to recover and maintain them. The most discussed in literature are Guerande, in France, and Secovlje, in Slovenia. In Guerande, saltpans were bound to disappear but the local population have made an effort to reconstruct their abandoned facilities, made them productive again, and trained young salters to keep their work. There, tourists may visit local museums devoted to the history of Guerande salt or their natural values, and they can purchase salt and salt-related products (Kortekaas, 2004). In the case of Secovlje, saltpans are located inside Salinas of Secovlje National Park (SSNP), which is managed by a private entity. Saltpans were restored and an open-air museum was opened. The SSNP main touristic products are health and wellbeing activities, namely a thalassotherapy centre, as well as its nature value and its artisanal salt production (Faganel & Trnavčevič, 2012; Kortekaas, 2004; Neves, 2002).

3. Material and methods

3.1. Study area

Aveiro lagoon, also known *as Ria de Aveiro*, is a coastal lagoon in the centre of Portugal and it has an approximate length of 45–47 km (NNE-SSW) and a maximum width of about 10–15 km (Rodrigues et al., 2011). Considered one of the most productive coastal wetland in Portugal, it is an area for reproduction and feeding of several bird species, as well as a habitat for a variety of fish species (Albuquerque, Martins, & Costa, 2009). Thus, *Ria de Aveiro* has a status of Special Protection

Area (SPA) and Site of Community Importance (SCI), respectively under Wild Birds and Habitat Directives – included in the Nature 2000 network. Indeed, its natural and cultural heritage attracts visitors to the Region of Aveiro (Albuquerque et al., 2009). Wherein, cultural values rely mostly on artisanal salt production remaining heritage.

In *Ria de* Aveiro, the saltpans complex is known as *Salgado de Aveiro* (Fig. 2), which is part of Aveiro and Ílhavo municipalities and is divided in 5 groups, namely *Monte Farinha*, *Norte*, *Mar*, *São Roque* or *Esgueira* and *Sul*.

There, artisanal salt production decline in the last decades have led to the saltpans abandonment or conversion to aquaculture. From 265 saltpans dedicated to artisanal salt production in 1956, only 9 saltpans were producing salt in 2017 (Peixinho, 2017). However, recently new businesses have emerged in *Salgado de Aveiro*, with a wide range of activities combining artisanal salt production, aquaculture or tourism and recreation activities.

The project *Sal de Aveiro,* and thereby our study area does not include all *Salgado de Aveiro*, instead comprises only two groups: *São Roque* or *Esgueira* and *Mar*, both located inside Aveiro municipality.

São Roque or *Esgueira* was selected due to its land access and privileged location, close to Aveiro city centre and the former salt warehouses. Moreover, this group of saltpans is visibly in better physical conditions than other groups (Fig. 3).

Mar group is also located near the city centre but the access is made only by boat. Those saltpans show an advance stage of degradation, provoked by water erosion (Fig. 4). Thus, local authorities have planned the reconstruction of a portion of its exterior wall to protect it (Sociedade Pólis Litoral Ria de Aveiro, 2010).

3.2. Data collection and analysis

The current study aims to identify the most suitable tourism and recreation activities that could be developed in *Sal de Aveiro* implementation area. To achieve that goal, it was made a qualitative analysis of spatial planning instruments and tourism in the Region of Aveiro. Besides, it was taken in account the previous literature review and the specific conditions of the saltpans of Aveiro (Fig. 5).

Thus, we analysed Region of Aveiro (NUTS III) touristic supply, according with the Portuguese national tourism registry, considering only companies recognized as Nature tourism activities by the Portuguese Institute for Nature Conservation and Forests (ICNF). This recognition is required to carry out activities in a protected area such as *Ria de Aveiro*, but also to distinguish companies located outside of these areas for the implementation of good environmental practices (Ministério da Economia e da Inovação, 2009). Those activities will be presented according with Portuguese national tourism registry defined categories. In addition, during the first stage of *Sal de Aveiro* was possible to identify touristic activities currently developed in Aveiro saltpans. Furthermore, all the activities must respect the legal framework and management guidelines comprehending the study area. Therefore, it was taken in account the municipal master plan and the sectorial plan of Nature 2000 network regarding *Ria de Aveiro* status of SPA and SIC, among other studies developed by public authorities. Nevertheless, it is also considered saltpans characteristics, namely their facilities such as haystacks (typical constructions of *Salgado de Aveiro*), physical conditions, dimensions, location, and land and water accesses. Those data were also collected within the scope of the project *Sal de Aveiro* and they are broadly shown in section 3.1 Study Area.

4. Results and discussion

4.1. Tourism in the region of Aveiro

4.1.1. Ria de Aveiro

According with the Portuguese national tourism registry, in 2018, there were 129 companies operating in the region of Aveiro. Among them, 20 companies were recognized as Nature tourism activities by ICNF. Due to the natural value of *Ria de Aveiro*, *wildlife* or *bird watching* activities are part of the touristic supply of several touristic companies. Besides, there are guided tours to museums, monuments and other points of interest and thematic routes to discover local heritage. On the other hand, some companies offer several outdoor land activities such as: All-terrain rides (moto, moto4, 4 × 4, or kart cross); Orientation activities, i.e. geocaching; Outdoor activities to enhance team building;

Fig. 3. Aerial view of *São Roque* or *Esgueira*.

Fig. 4. Aerial view of Mar.

Cannyoning, Coasteering and similar activities; Traditional outdoor games; Climbing, Abseiling or Slide; Hiking; Cycling; Equestrian activities; or Paintball and other similar activities. Aquatic activities are also an important part of touristic supply in *Ria de Aveiro*, namely: Canoeing and Rafting; Surf, Body board, Windsurf, Kitesurf, Skimming, or Stand-up paddle boarding; Sailing, Rowing and others similar nautical activities; Scuba diving or snorkelling; Hidrospeed; or Fishing. Nevertheless, services as Boats rental with or without crew, Boat trip, and fluvial or maritime taxi are also available.

4.1.2. Salgado de Aveiro

In *Salgado de Aveiro*, there is now a trend to recover saltpans to develop new businesses related with tourism as a core or complementary activity. It is possible to find a widely range of products/services combining tourism with aquaculture, artisanal salt production, health and wellbeing, nature, and sports or other recreation activities.

A combination of tourism and artisanal salt production makes a proper scenery for visitors who want to learn about salt culture, specifically the history of artisanal salt production in Aveiro. This can happen in Santiago da Fonte or Troncalhada, respectively owned by University of Aveiro and the City Council of Aveiro. Besides, there are private initiatives on this field, namely *Cale do Oiro*, *Noeirinha* and *Ilha dos Puxadoiros*. Also, saltpans visitation has an environmental approach focus on its specific fauna and flora, with emphasis in birdwatching. Tour guides or free tours are offered, as well as pedestrian pathways with interpretation signs. In *Passagem* saltpan, visitors are also able to taste products from *Ria de Aveiro* in a saltpan that combines tourism and aquaculture by producing and selling bivalves (Oysters and Clams) and fishes (Sea bass, Gilt-head bream, Ell). In addition, they organize cultural events, i.e. live music, to attract visitors. The health and wellbeing experience in *Salgado de Aveiro* is offered by *Cale do Oiro* that converted a saltpan in a salty water pool where tourists can enjoy mud baths and massages services. Recently, *Balacozinha* saltpan was recovered and converted into an artificial beach and another one is starting its activity as a place where people can practice Stand up paddle. Furthermore, saltpans usually have products available for purchase, such as salt, *fleur de sel*, Salicornia, salt-based products (i.e. soap, exfoliating and bath salts or chocolates), handcrafts, ceramics, or other merchandising. Note that in some cases a boat trip is required to access saltpans. Additionally, the public authorities built a boardwalk around *São Roque*

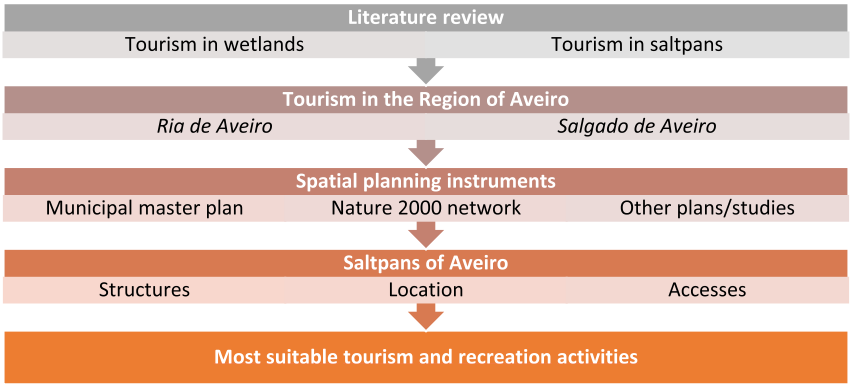

Fig. 5. Workflow applied to identify the most suitable tourism and recreational activities for Aveiro saltpans.

or *Esgueira* group allowing the visitation of this area by bike or foot.

4.2. Spatial planning instruments

4.2.1. Aveiro municipal master plan

Sal de Aveiro project is restricted to two groups of *Salgado de Aveiro*, both located inside Aveiro municipality, so it is fundamental to consider Aveiro municipal master plan. First, the plan states the need to make a spatial plan to manage *Salgado de Aveiro,* aiming a compatible economic use for artisanal salt production or aquaculture and nature conservation (City Council of Aveiro, 2008). Yet, there is no reference to tourism activities and the plan was never done. Second, the plan considers our study area as part of Portuguese National Ecologic Reserve (REN), integrating areas that need special protection due to their ecological value and sensibility or their exposition and susceptibility to natural hazards (Ministério do Ambiente do Ordenamento do Território e do Desenvolvimento Regional, 2008). REN defines a set of restrictions to land cover or use and the compatible actions to develop according with each type of area. REN rules are reflected in Aveiro municipal master plan and there are some rules regarding saltpans rehabilitation:

- saltpans walls have to be reconstructed or repaired only using traditional materials;
- saltpans barriers consist in wooden poles with maximum height of 1,80 m and connected by flat wire;
- constructions must be authorized only on a precarious, temporary, or provisional basis, using perishable materials, according with *Salgado de Aveiro* traditional buildings, with only one floor and a maximum area of 100 m^2.

Moreover, there are some guidelines for domestic sewage and effluents from aquaculture farms treatments, electric cables installations, or roads construction in *Salgado de Aveiro* (City Council of Aveiro, 2008).

4.2.2. Sectorial plan: Nature 2000 network

As part of *Ria de Aveiro* SPA and SCI area, the saltpans must follow the management guidelines of the sectorial plan of Nature 2000 network. The management guidelines for *Ria de Aveiro* SCI refers the objective of habitats conservation and stress the importance of a balance between natural values and land use and to ensure a correct spatial planning regarding urban, agriculture and touristic occupation (ICNF, 2014). Besides, it mentions that habitats reduction in the region is caused, among other factors, by the salt production abandonment and saltpan conversion to aquaculture. The plan identifies the most important habitat in *Ria de Aveiro, namely* the *Estuaries* (code 1130), *Atlantic salt meadows* (code 1330), and *Mediterranean and thermo-Atlantic halophilous scrubs* (code 1420). Moreover, it refers the importance of Aveiro lagoon by connecting the sea and the fresh water of watercourses, which has a crucial role in the life cycle of species such as *Petromyzon marinus; Alosa alosa; Alosa fallax;* and *Lampetra planeri*.

In the case of *Ria de Aveiro* SPA the management focus is aquatic and migratory bird's conservation, and maintaining and restoring the wetland and its mosaic of habitats (ICNB, 1999). The plan mentioned the need for saltpans maintenance or rehabilitation in order to protect the following bird species: *Calidris alpina, Charadrius alexandrinus, Charadrius hiaticula, Himantopus himantopus, Recurvirostra avosetta, Sterna albifrons*. Additionally, it refers other bird species under protection in Aveiro lagoon, namely, *Ixobrychus minutus; Ardea purpúrea; Platalea leucorodia; Melanitta nigra; Milvus migrans; Circus aeruginosus*; and *Pandion haliaetus*. The management guidelines point out the need of a balance between anthropic activities and nature conservation, suggesting the limitation of urban-touristic expansion and infrastructure construction, the valorisation of uses and activities that lead to saltpans maintenance and rehabilitation, and the management of leisure and recreation activities.

4.2.3. Other plans/studies

In the past decades, *Salgado de Aveiro* degradation has been a real issue in the Region of Aveiro. The City Council of Aveiro promoted in 1989 a study for the elaboration of *Salgado de Aveiro* spatial planning (Borrego, 1989). The process of artisanal salt production decline was already happening and leading to saltpans abandonment and degradation. Simultaneously, aquaculture was already seen as an alternative to artisanal salt production. The study states the need to zone *Ria de Aveiro* area according with the most suitable areas for salt production or aquaculture activities. Besides, it suggests an integrative strategy of *Salgado de Aveiro* in *Ria de Aveiro* and considers tourism activities as an opportunity to valorise the region. At the time, the fast and unorganized growth of tourism and the possibility of exceed the carrying capacity and therefore endangers ecological values of *Ria de Aveiro* were considered the main threats. The indicated solutions were a study regarding tourism impacts, evolution and trends, an inventory of touristic resources and a touristic spatial plan developed together with the regional entity for tourism. On the other hand, the City Council of Aveiro released in 2007 a study about *Salgado de Aveiro* revitalization and valorisation focusing on artisanal salt production development. In this case, tourism was mentioned as a complementary activity to artisanal salt production and, in order to promote the touristic value of salt, four actions were suggested:

- promote saltpans visitation through adequate signalization around the city;
- promote saltpans of Aveiro among touristic agents and consequently promoting saltpans visitation and salt purchase by visitors;
- create an webpage for salt of Aveiro to promote salt history and leisure activities related with saltpans;
- organize an annual fair dedicated to salt, aiming to promote salt image and brand and to connect saltpans with touristic products of Aveiro (Branco & Santos, 2007).

4.3. Most suitable tourism activities for groups of São Roque and Mar

Indeed, saltpans hold a rich cultural and natural heritage and potential to develop a wide range of tourism and recreation activities, as a core business or a complementary activity. The following activities are divided in categories, but in practice, they might complement each other (Fig. 6). The selection was based on activities that seem to be feasible considering saltpans legal framework and morphology, but it was not taken in account the economic viability of those activities.

4.3.1. Artisanal salt production

Artisanal salt production represents an important component of the history of Aveiro, but similar to what happens in other salt production sites, it is no longer a profitable activity by itself (Petanidou & Dalaka, 2009; Rodrigues et al., 2011). Tourism activities can be a complement, attracting visitors and generating new sources of income. Visits may focus on the cultural value of salt regarding their tangible assets such as buildings and equipments used in salt harvesting or intangible assets based on salt history, singular methods of production and its strong influence in local community life (Crisman et al., 2009; Kortekaas, 2004; Papayannis & Pritchard, 2011; Sainz-López, 2017). There, visitors may participate in guided or self-guided tours that can be supported by interpretation signs. Saltpans are occasionally converted in open-air museums and its haystacks used as interpretative centres (Petanidou & Dalaka, 2009). In order to engage visitors and to valorise their experience it is reasonable to consider the introduction of interactive programs using new information and communication technologies or practical experiences in salt harvesting (Gauci et al., 2017, pp. 1–16; Kortekaas, 2004; Wu et al., 2015). Note that in Aveiro, salt harvesting and touristic peak season occur at the same time, between June and September.

In general, saltpans in *São Roque* or *Esgueira* have better physical

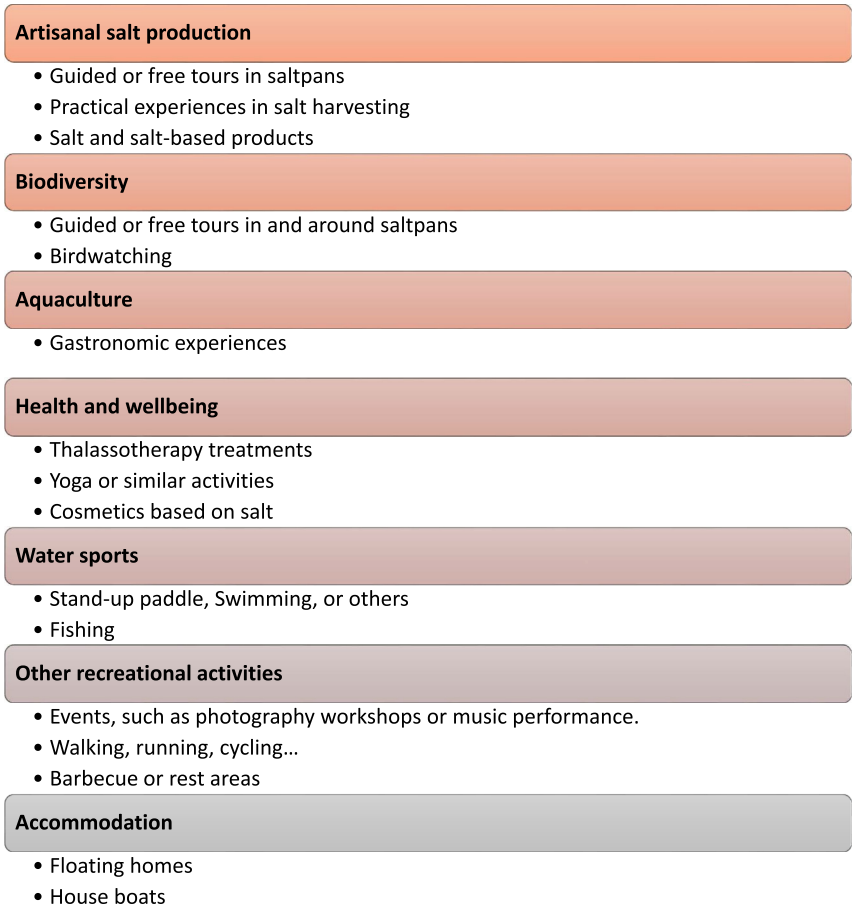

Fig. 6. Most suitable tourism and recreational activities.

conditions in terms of walls and haystacks. Considering the complexity and the costs of saltpans rehabilitation those should be more suitable for salt production (Neves, 2002; Rodrigues et al., 2011). In addition, they have a privileged location, near Aveiro city centre and former salt warehouses, and land access. Otherwise, a boat trip is needed to reach the saltpan, increasing salt production costs. For visitors, it can be an advantage or a disadvantage depending on visitor's willingness to participate in a boat trip and the related costs for companies and visitors.

In addition, saltpans owners/manager can increase their income by selling salt, salt-based products, handcrafts, ceramics, or other merchandising to visitors. Those products might be valorised by a product quality certification, the recognition of product specificities such as Protected Designation of Origin or by selling *fleur de sel*, which is a special and very valuable type of salt (Hueso & Petanidou, 2011; Rodrigues et al., 2011).

Other suggested activities are the use of saltpans to develop initiatives aiming to train new salt workers, keeping artisanal production knowledge alive, or to promote educational programs for school visits combining salt culture and fauna and flora descriptions (Faganel & Trnavčevič, 2012; Hueso & Petanidou, 2011; Kortekaas, 2004; Wu et al., 2015, 2016). Thus, it may raise awareness on the local community and visitors for the need to protect artisanal salt production, saltpans and its natural and cultural values (Faganel & Trnavčevič, 2012; Ramsar & UNWTO, 2012; Rodrigues et al., 2011; Wu et al., 2015). Furthermore, salt production sites rehabilitation and maintenance is essential for saltpans fulfil their role as substitution habitat and preserve biodiversity (Hueso & Petanidou, 2011; Kortekaas, 2004).

4.3.2. Biodiversity

Wetlands are important sites for several bird species, which nest, rest and feed there, and it has unique halophile flora species (Crisman et al., 2009; Do et al., 2015; Kortekaas, 2004; Lee, 2016; Papayannis & Pritchard, 2011; Petanidou & Dalaka, 2009; Ramsar & UNWTO, 2012; Rodrigues et al., 2011; Sainz-López, 2017). *Ria de Aveiro* is the most important wetland in the north of Portugal and it is composed mainly by the habitats Estuaries (code 1130), Atlantic salt meadows (code 1330), and Mediterranean and *thermo-Atlantic halophilous scrubs* (code 1420) (ICNF, 2014). However, salt production abandonment and saltpan conversion to aquaculture is one of the factors that are provoking habitats reduction (ICNF, 2014). Saltpans are substitution habitats so it is important to keep their walls, which act as shelter for birds and enable the growth of vegetation. Saltpans are fundamental to protect several bird species, such as Calidris alpina, Charadrius alexandrinus, Charadrius hiaticula, Himantopus himantopus, Recurvirostra avosetta, Sterna albifrons (ICNB, 1999).

By visiting *Salgado de Aveiro,* people can learn about the fauna and flora of *Ria de Aveiro* while enjoy its typical landscape. Visitors may participate in guided or self-guided tours, that can be supported by interpretation signs or haystacks adapted to birdwatching. Activities as birdwatching are already one of the main attractions of *Ria de Aveiro* and it can be done inland or in boat trips along *Ria de Aveiro* canals. Besides, birdwatching and similar activities require only passive interaction with wildlife, thus can be implemented together with other activities as long as they do not disturb the wildlife. However, it is important to control tourism impacts as well as to balance between nature conservation and anthropic activities in order to protect the natural heritage (Faganel & Trnavčevič, 2012; ICNB, 1999; ICNF, 2014; Ramsar & UNWTO, 2012; Rodrigues et al., 2011). To evaluate the potential of a saltpan for birdwatching it is important to consider its surroundings. It is reasonable to consider saltpans in the core areas of *Salgado de Aveiro*,

which are more distant from the city centre, as the most suitable areas. Although, they might require a boat trip, which may have a negative effect on birds population. Several studies suggest that bird population densities declined with their proximity to infrastructure (Benítez-López, Alkemade, & Verweij, 2010). Some saltpans are very close to the city centre and close to a highway road. Usually, roads have negative or no effects on birds, only some small birds and vultures benefit from roads infrastructures (Fahring & Rytwinski, 2009). According with Fahring and Rytwinski (2009), the proximity of roads might be an advantage for species who feed on dead animals, in this case because of road mortality, and for species who main predators show negative effects and therefore avoid roads.

4.3.3. Aquaculture

In the last decades, aquaculture has been an alternative to artisanal salt production in Aveiro (Borrego, 1989; Rodrigues et al., 2011). Nevertheless, saltpans of Aveiro are inside a protected area, consequently aquaculture is allowed only in extensive or semi-intensive systems. The most common products are bivalves, i.e. Oyster or Clams, fishes, i.e. Golden Bream or Turbot, or plants, i.e. Salicornia or Algae, in monoculture or integrated multi-trophic systems. Tourism appears as a complementary activity to aquaculture, which may generate a new source of income. Currently, a saltpan in *Salgado de Aveiro* develops a product based on aquaculture and tourism activities. There, people can visit the saltpan and taste their oyster production; besides, occasionally they organize cultural events, i.e. live music, to attract visitors.

On the other hand, the aquaculture products can be used to cook typical dishes from Region of Aveiro and it might attract visitors and the local community. Furthermore, a saltpan may sell some of their products directly to *Salgado de Aveiro* visitors if it is located near Aveiro city centre and has an easy access or in case of the saltpan or surrounding saltpans attract visitors. For aquaculture purposes is not essential to recover damaged saltpans walls, depending on the location, type of production and aquaculture system in use. However, it will be necessary if the goal is to provide all the conditions for saltpans visitation.

4.3.4. Health and wellbeing

The potential of saltpans for health and wellbeing activities rely on salty water or clays therapeutic properties and its unique nature environment. Saltpans have conditions to offer health services related with thalassotherapy treatments, salty water pools, and mud baths (Faganel & Trnavčevič, 2012; Hueso & Petanidou, 2011; Kortekaas, 2004; Neves, 2002). Besides, wellbeing activities may include massage services to visitors, enjoying a natural environment and a water plan, which transmit a sense of calm and relax, or practice yoga or other similar activities (Do et al., 2015; Lee, 2016; Ramsar & UNWTO, 2012). Another source of income already implemented in Salgado de Aveiro, as well as in others salt production sites, is the selling of cosmetic products as soap, exfoliate, or bath salts. Once more, saltpans of *São Roque* or *Esgueira* due to its location and conservation status are more suitable for these activities.

4.3.5. Water sports

Many types of aquatic activities take place in and around wetlands such as canoeing, fishing, kayaking, scuba diving, or snorkelling (Ramsar & UNWTO, 2012). However, some water sports need specific condition to be carried out. For instance, saltpans do not have waves, water current, or enough area, which are essential for Surf, Body board, Windsurf, Kitesurf, Sailing, Canoeing, or Rafting activities. On the other hand, saltpans appear as a safer environment for beginners, children, or people with disabilities to practice other water sports, for example Stand-up paddle boarding, Rowing, Scuba diving, Snorkelling, Swimming, or Hydro flight. Some of them are already implemented in wetlands, including in *Ria de Aveiro*, as well as in *Salgado de Aveiro*. Fishing could be also an alternative, mostly for saltpans developing an extensive aquaculture system.

Saltpans may benefit from being closer to Aveiro city centre than coast, river, or lagoon sites where those sports take place currently. Nevertheless, in order to have a water plan to develop those activities is crucial to recover saltpans physical conditions.

4.3.6. Other recreational activities

Salgado de Aveiro could be understood as an outdoor green area, where orientation activities, outdoor activities to enhance team building or traditional outdoor games would suit with saltpans structure. Its nature environment and scenic landscape creates also a perfect scenario for social meeting and events and for physical activities such as walking, running, cycling or for instance horse riding (Kortekaas, 2004; Ramsar & UNWTO, 2012). In those cases, saltpans walls should be in good conditions and have enough width and length. Furthermore, there are some facilities that already exist in *Salgado de Aveiro* that could be used to benefit some saltpans, namely an artificial beach, nature trails, boardwalks and barbecue or rest areas.

4.3.7. Accommodation

As a protected area, the focus of saltpans management rely on its habitats conservation therefore the legal framework limits the constructions of new buildings or to change the occupation purpose of those already there (City Council of Aveiro, 2008). Nowadays, haystacks from *Salgado de Aveiro* once used to keep artisanal salt production tools are private households, but it is not possible to register them for example as short-term rental businesses. Moreover, there are limitations related with electric installations and domestic sewage treatments in saltpans (City Council of Aveiro, 2008). Those reasons also may exclude new businesses of camping or glamping. On the other hand, saltpans meet the necessary conditions to keep floating homes or houseboats. Saltpans would need to have infrastructures to support floating homes or to dock houseboats but both might be a good solution to take advantage of saltpans that required high investments to rebuild. Although, it is important to consider that except on the main canals the navigability depends on the height of the tide.

5. Conclusions

Ria de Aveiro hosts a rich biodiversity and its importance for birds and habitats conservation is attested by the status of SPA and SIC, under Nature 2000 network. The transformation of a certain area of this wetland for artisanal salt production makes saltpans a substitution habitat for several fauna and flora species. However, artisanal salt production decline led to saltpans abandonment and therefore their structures degradation, which endangers their natural values. This process also affects negatively artisanal salt production remaining cultural heritage as well as the local economy. In order to rehabilitate or maintain saltpans structures and to preserve all those values, it is essential to make an economic investment and the implementation of new businesses should fund it. Indeed, currently there is a trend to recover saltpans of Aveiro and new services and products have emerged, mainly based on tourism and recreation activities, as core business or complementary activities, and related with aquaculture, artisanal salt production, health and wellbeing, or nature. On the other hand, *Salgado de Aveiro* is located inside a wetland and it is an outdoor and green/blue area close to Aveiro city centre, which may enable the development of other inland or aquatic outdoor activities.

However, new projects must follow the legal constrains and management guidelines *regarding Ria de Aveiro* as a protected area or *Salgado de Aveiro* as part of REN. So far, those rules seem to be “inadequate” taking in account some projects already implemented and the recent touristic boom in *Salgado de Aveiro*. A management plan for Salgado de Aveiro would clarify this situation and that necessity is already mentioned in a study about saltpans of Aveiro in 1989 as well as in the current municipal master plan. Moreover, ICNF should establish

a management plan for *Salgado de Aveiro*, working together with City Council of Aveiro, Port of Aveiro that is the local maritime authority, the regional tourism entity (Turismo do Centro de Portugal – TCP), and the Portuguese Agency for Environment (APA). Otherwise, when those tourism activities are no longer profitable or interesting, saltpans might be abandoned again. Meanwhile, touristic and recreation activities can raise awareness for the development of the management plan as well as for biodiversity conservation and local identity enhancement. On other hand, the local community involvement is essential because they have the knowledge about artisanal salt production methods, they should have the opportunity to benefit from a resource that was their livelihood in the past, and the negative social impacts of tourism activities should be minimized.

Regarding the most suitable activities for *Salgado de Aveiro*, the activities were divided in 7 categories according with their main products:

- Artisanal salt production: activities related with the salt production heritage.
- Biodiversity: activities related with the natural value of *Ria de Aveiro*, specially birdwatching activities.
- Aquaculture: mixing aquaculture production and gastronomic experiences;
- Health and wellbeing: SPA services and enjoy from saltpans nature environment;
- Water sports: introduction of specific water sports near Aveiro city centre;
- Other recreation activities: physical or recreation outdoor activities and other events;
- Accommodation: eventually limited to houseboats or floating homes.

Some activities were excluded due to saltpans morphology, for instance Surf or Sailing, and legal restrictions, for instance All-terrain rides or Accommodation facilities.

In general, the saltpans from *São Roque* or *Esgueira* were considered the most suitable for a larger number of activities. That happens for three main reasons: better physical conditions, namely walls and buildings, which may represent a smaller investment to recover the saltpan, their land accesses, and their privileged location, closer to Aveiro city centre. In the group of *Mar*, saltpans have bigger dimensions and may benefit from a sheltered position, but the limited water access and worst structural conditions may overcome these benefits. So far, tourism activities currently in development in *Salgado de Aveiro* support this idea.

This research tried to support potential investors by enlighten them about the most suitable tourism and recreation activities to be developed in Aveiro saltpans. Nevertheless, potential investor should take in account that i) all suggested activities require an analysis of its economic viability, ii) the activities can complement each other, iii) more activities could be developed there and iv) the projects may need to be adapted according with the opinion of authorities.

Future researches could focus the economic viability of those activities but also the problem of seasonality. The high season of tourism in Aveiro and the artisanal salt production season happen more or less during summer. That provokes a seasonality problem that requires further research looking at activities or strategies to minimize it. So far, aquaculture it is the only activity developed all the year in saltpans of Aveiro. On the other hand, tourism activities in saltpans of Aveiro should be study in order to have a better understanding of their environmental impacts and the ecological footprint. Thus, it would improve the efficiency of saltpans management and nature conservation.

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