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Management priorities from tourists' perspectives and beach quality assessment as tools to support sustainable coastal tourism

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ABSTRACT

Recently coastal tourism has increased dashingly; however, it has negatively affected environmental, social and cultural sustainability. Algarve is the most visited tourist attraction in Portugal with a large number of beautiful beaches. Due to negative tourism impacts and climate change, coastal tourism management tools need to be assessed and implemented. Most beach areas have the dual mandate of conserving natural resources and providing opportunities for recreation and tourism. This paper aims to develop a methodology for sustainable beach management. An urban, rural, resort and remote beach type were chosen as case studies. The proposed methodology for assessing beach quality and effective beach management consisted of three parts: initially, SWOT analysis was performed, where overcrowding, coastal urbanization, ecosystem degradation and coastal erosion due to sea level rising emerged as main future threats. Beach quality evaluation was assessed using the Bath Area Registration and Evaluation (BARE) method. Face-to-face interviews were conducted to get the beach visitor's opinions. An Importance–performance (I–P) analysis has been applied to identify the service quality gap and the most appropriate actions to improve beach management. For most of the beach attributes, satisfaction exceeded importance, and hence no management attention was needed. Exceptions were the condition of litter facilities, public toilets, showers and associated footpaths, the use of renewable energy, and the presence of litter in sand and vegetation health. For these, satisfaction was lower than importance, suggesting management attention is needed. The combined methodology allowed to identify beach management priorities resulting in enhanced visitors' experiences and protecting the natural environment.

1. Introduction

In September 2015, world leaders agreed upon 17 sustainable development goals (SDGs) to guide countries' development until 2030. Since then, we have seen a rapid shift towards a more inclusive and green development approach worldwide. Currently, the tourism industry has become one of the fastest-growing economic sectors. It accounts for more than 9% of the global GDP (UNWTO, 2018). It has become an essential pillar for local economies in many destinations (UNEP, 2009). However, many destinations face challenges in preserving the environment's quality, affecting visitor satisfaction and ultimately resulting in smaller revenues from tourism-related activities.

Today, 63% of Europe's holidaymakers prefer coastal tourism (European Commission, 2000). The number of coastal tourists increases worldwide, reaching 1.56 billion in 2000 (Sánchez-Quiles and Tovar-Sánchez, 2015). In coastal ecosystems, beaches are a valuable resource, dominated by biodiversity. Large, clean, and gleaming beaches scaled by clean ocean water are the main tourists' priority (Lucrezi et al., 2016).

Despite the positive effects, tourism has contributed to environmental degradation, adverse social and cultural impacts, and habitat fragmentation (MacNeill and Wozniak, 2018). Growing tourism has been linked to ecosystem degradation. The coastline's progressive development has changed many beaches' visual image and the natural coastal ecosystem dynamics (Dempsey and Roberston, 2012). The most common problems of modern beaches are coastal erosion, water and sand pollution, and coastal dunes (Newton and Semeoshenkova, 2015). Those undesirable side effects have increased concerns about the conservation of natural resources, human well-being, and coastal communities' long-term economic viability.

With the tourism pressure on the coast, urbanization contributes to rapid environmental deterioration either. Predictions made by Povh (2000) say that three-quarters of the world's population will be living within 60 km of the shorelines by 2020. There will be increased tension

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between the demand for coastal leisure and tourism facilities, coastal environments, and unpredictable climate change threats. Among climate change threats, rising sea level is a significant threat for coastal regions, particularly where tourism plays a vital role (Enríquez et al., 2017). It might result in a significant reduction or disappearance of sand beach areas (Ferreira et al., 2008) and increase infrastructure vulnerability to extreme marine events (Jones and Phillips, 2006). Constrained regional resilience is inevitable due to the reduced beach carrying capacity, particularly for Mediterranean regions that rely on coastal tourism (Snoussi et al., 2008; Kantogianni et al., 2014; Samora-Arvela et al., 2018).

Meanwhile, tourism is a significant contributor to climate change due to unsustainable economic activities (Rico et al., 2019). As a result, the concept of sustainable tourism development has emerged as globally desirable in politics, aiming to lead future tourism sustainably. At the European level was adopted recommendations on Integrated Coastal Zone Management (ICZM) (2002/413/EC). It is essential to assess beach quality and identify priorities regarding beach users to adopt ICZM. Appropriate ICZM implementation is crucial in Portugal, whose coast is riveted by the Atlantic Ocean and highly diverse in cliffs, beaches, coastal lagoons, and barrier islands. Sandy beaches make up to 44% (522 km) of the Portuguese coast, therefore since the 1970s, Algarve has been seen as a sea and sun tourism destination. The Algarve region is a destination for more than 30% of Portugal's international tourists (INE, 2018), mostly due to the unique coastal diversity in various types of beaches.

The region is influenced by the Mediterranean climate (Köppen climate classification: Csa) and is characterized by a long dry season with more than 300 sunny days per year and an annual average temperature of around 17 °C (Panagopoulos and Antunes, 2008). The economy of Algarve is mainly driven by tourism (Antunes, 2000). However, sun and sea tourism seasonality remain an issue in the region, highly unbalancing beach management. Mass tourism in the region has also influenced rapid real-estate growth, significantly impacting natural coastline features, where beaches are the main component. Therefore, it is central to ensuring Algarve's sustainability as a tourism destination (Barreira and Cesário, 2018).

The chosen study case beaches for this research are located in Albufeira, a small municipality with 140 km^2 and 40 thousand residents. The municipality has more than 25 beaches, from small coves to the kilometer-long beach strand. From a small fisherman's village, Albufeira has turned into one of Europe's significant beach destinations, receiving about 3 million tourists every year. It is the most popular tourist destination in Algarve (INE, 2018).

The present paper aims to develop a methodology for sustainable integrated beach management in the face of climate change and high coastal tourism pressure in south Portugal. The BARE system was employed at four different beaches in the Algarve region to assess beach quality. The user preferences survey was applied to identify priorities, which will lead to a more efficient allocation of resources and optimization of coastal zone management. This work might be used as a tool for coastal ecosystem services enhancement and sustainable beach management.

2. Material and methods

2.1. SWOT analysis

SWOT analysis is a framework for analyzing and positioning an organization's resources and the environment in four dimensions: Strengths, Weaknesses, Opportunities and Threats (Ullah et al., 2014). Strength and Weaknesses are internal dimensions, which are controllable and supporting organizations to achieve the target. While Opportunities and Threats are uncontrollable external dimensions that enable and disable the organizations to achieve the target (Karppi et al., 2001). Identifying factors in these four dimensions allow the recognition of competence for decision-making and planning strategies (Berte and Panagopoulos, 2014).

Environmental analysis is a critical part of the strategic management planning process (Karbassi et al., 2008). Therefore SWOT analysis has been praised for its simplicity and practicality in environmental management studies (Nicolaou and Evangelinos, 2010). Originally SWOT was applied in business management (Humphrey, 2004), identifying external opportunities and threats that may affect its future. Similarly to a business strategy, public coastal authorities can use this approach relevant to sustainable beach management strategies.

In this research, the focus was given on the current status of beaches, the effects of climate change and the demand for tourism, anticipating prospects, and assessing Algarve's beaches as a significant economic development mechanism. Attention was drawn to identifying problem areas and measures to improve four beaches' quality and function: Praia dos Pescadores, Praia de Santa Eulalia, Praia dos Olhos d'Agua, Praia da Falesia (Fig. 1).

2.2. Bath Area Registration and Evaluation (BARE)

The BARE method was designed by Williams and Micallef (2009) to identify management needs and could be applied to any beach environment. It has a registry of five main parameters: safety, water quality, beach infrastructure, litter, and coastal scenic, with a ranking based on four grades A, B, C, D, satisfying the assessment as very good (A), good (B), fair (C) and poor (D). The overall classification of beaches was rated at 1–5 stars based on the evaluation of the main parameters. The 5-star award is given if at least 4 parameters were rated A and one B, 4-star award is given if security, facilities, scenery and water quality is evaluated no less than B and litter no less than C, 3-star award is given if all 5 parameters evaluated no less than C, 2-star award is given if security, facilities, scenery and water quality is evaluated no less than C and litter no less than D and 1- star award is given if all 5 parameters were evaluated with D.

Case study beaches were chosen according to the classification made by Williams and Micallef (2009) and are described as follows:

Praia dos Pescadores is a typical urban beach certified by the Blue Flag. Easy accessible from the old town walking, by car, by public transport, using an escalator or a lift. The beach is surrounded by dwellings, apartments, shops, cafes, restaurants, markets and banks. There are plenty of lifeguards, showers, sunbeds, umbrellas and water sports equipment during the high season.

Praia de Santa Eulália is a resort-type beach, certified by the Blue Flag. Easily accessible by public or private transport and on foot. There is good access for disabled people and a spacious parking area either. The resort is dominated by a 5-star hotel, exotic natural landscape with golden sand, rocks and tombstones. During the high season, the beach is equipped with showers and toilets for a fee.

Praia dos Olhos de Agua is a typical rural beach, certified by the Blue Flag on the coast of Olhos d'Agua village and surrounded by the rocky shore with vast sandy swathes within walking distance from the village. The beach is accessible only by private transport. However, parking is available far-off the beach. There are only a few dwelling houses around with a few small cafes.

Praia da Falesia is remote and one of Algarve's longest beaches, certified by the Blue Flag and is unique due to the distinctive orange-red cliffs and wildlife. The beach is accessible only on foot; there are no dwelling houses or hotels around.

2.3. Beach user perception

Data of beach user perception was collected using a questionnaire survey, consisted of three parts. The socio-demographic profile with nine questions, the visitor behavior and expenditures part, and an importance-performance (I–P) assessment part. Beach visitor surveys and I–P analysis has been applied in the tourism research field (Lai and

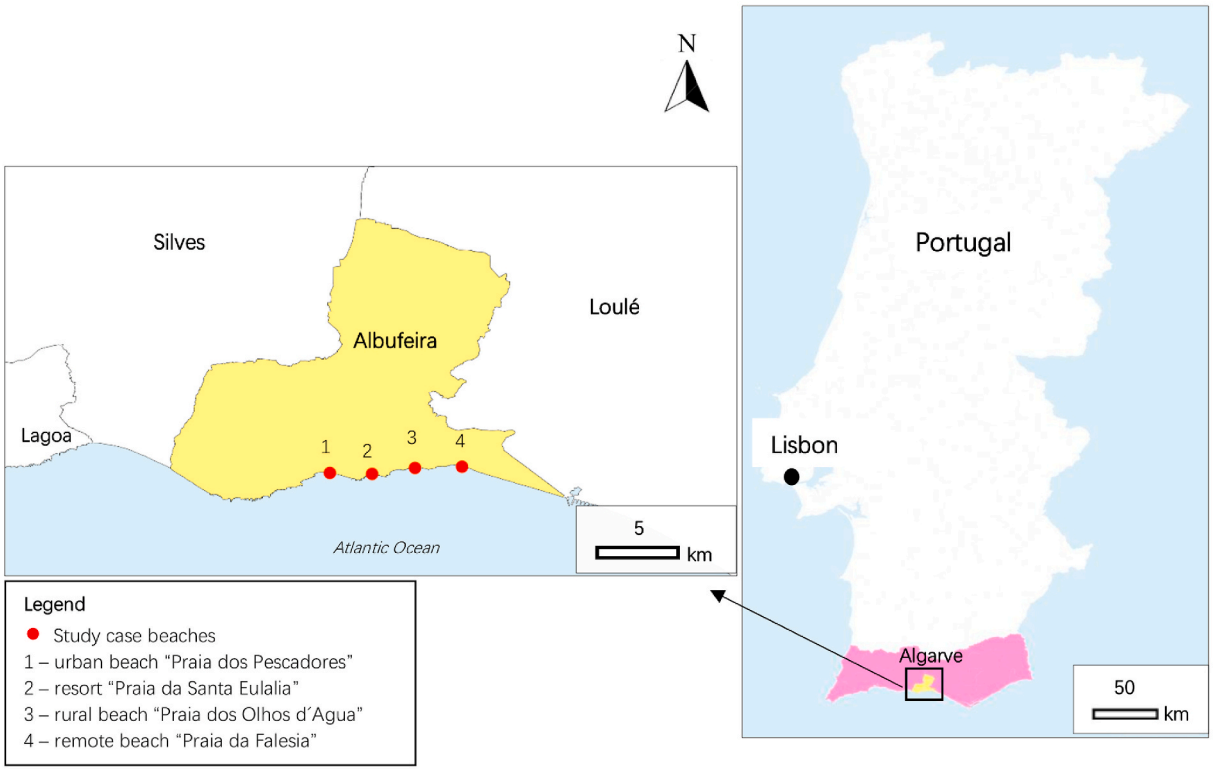

Fig. 1. Location maps of study case beaches in the municipality of Albufeira, Portugal.

Hitchocock, 2016; Wu and Jimura, 2019) to understand the relationship between the dynamics of satisfaction and the importance of specific groups of visitors with regards to local political, economic, environmental and social dimensions (Wade and Eagles, 2003).

The I–P table had 24 variables of beach environment, equipment, and services measured in the Likert scale from −2 to 2 to determine the relative importance of various beach attributes and the visitors' satisfaction. The results of I–P attributes are presented in four quadrants (Sever, 2015): the first quadrant, 'keep up the good work' represents major strengths and potential competitive advantages of a service; quadrant 'possible overkill' contains attributes of low importance to customers, which are performing strongly, indicating possible waste of limited resources that are inefficiently used and could be reallocated elsewhere; the quadrant 'low priority' is considered to be relatively unimportant to customers and managers should not be overly concerned with these attributes; quadrant' concentrate here' are considered to be underperforming and represent significant weaknesses and threats. These attributes have the highest priority in terms of investments.

The survey was applied by a direct approach, completed by face-to-face interviews with beach users that lasted between 15 and 20 min. A random sampling approach was selected since this method is simple and does not require exceptional high-level knowledge from respondents (Karipidou-Kanari et al., 2015). The recommended number of respondents interviewed was 50 per site (Williams and Semeoshenkova, 2011; Tampakis et al., 2018). Foreign beach users over 18 years-old were interviewed. Responses were not included in the sample unless the respondent answers all the questions. The sampling period was between January 5th and April 30th, 2018. The IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY, was used for all statistical data analysis after transmitting collected data to the Microsoft Excel sheet for data integration.

A two-dimensional matrix for importance-performance was developed establishing arbitrary gridlines, which reflects standards of service quality and organizational goals. Afterward, the four-point Likert scale was reclassified to a scale of one to four (with no negative values) in order to be able to calculate the standard deviation coefficient. Knowing that data distribution was normal, a parametric test was used to analyze the importance and performance attributes. A paired sample *t*-test was applied to get mean values with standard deviation and determining the mean difference between performance and importance. Hence the null hypothesis assumes that the difference is zero. Therefore there is no gap between visitor's satisfaction and importance. Meanwhile, an alternative hypothesis assumes that the difference is not equal to zero. The more significant is the difference, the more attention it calls for management strategies.

3. Results

3.1. SWOT analysis

Initial SWOT analysis is suitable for defining sustainable beach management strategies. It is easily adapted with other research techniques, applicable at different levels: local (Ioppolo et al., 2012), regional, or national (Panigrahi and Mohanty, 2012). The secondary source data for analysis was obtained from the Portuguese Local Agenda and environmental agency, local managers, newspapers, books, and scientific publications. The analysis was performed listing factors per strengths, weaknesses, opportunities, and threats categories. Each of the factors was prioritized based on the significance of the regional sun and sea tourism and beach management. The analysis of internal and external factors was based on seeking a fit between the two perspectives. The results are presented through the SWOT model (Table 1), reflecting four key areas: socio-demographic, economic, environmental and political. The results can help define beach management interventions or strategies at the governmental level associated with sustainability and climate change concerning beach user needs.

3.1.1. Strengths

The main strength of the current beach management is a diversity of coastal landscapes and Albufeira's local municipality's good economic

Table 1
SWOT analysis of exploratory beaches in Algarve region.

Strengths	Weaknesses
Aesthetics (superb scenery) Diversity of landscape Geographical position Environmental management system Collaboration with non-governmental organizations and conventions for conservation	Light and noise pollution Dry climate with low natural water reserves Uncontrolled coastal urbanization Lack of enforcement of the ecotourism regulations Non-active beach management during the low season Lack of green spaces with a high risk of heatwaves No safety facilities during the low season Low development of trails Lack of strategy for the land-use planning
Opportunities	**Threats**
Potential of solar energy Ecotourism promotion Control of beach access International, regional research cooperation Implementation of land use planning legislation Environmental education and public awareness of current coastal problems Sustainable beach management integration into Local Agenda 21	Increasing water consumption and pollution due to increased tourism Deterioration of dunes due to the high flow of tourists Affected ecosystems and well-being Increasing transport and accommodation services Coastal erosion that will be intensified by sea-level rise Short term interests of tourism business prevailing the long term sustainability Overcrowding Increasing coastal urbanization Reduced beach carrying capacity due to sea-level rise

status due to the high incomes from tourism. Four main types of coasts can be distinguished along the Portuguese continental coastline: low sandy beaches, cliffs, littoral wetlands, and artificialized coasts (Neto et al., 2013). In collaboration with several organizations, Albufeira's municipality manages beach-cleaning and dune restoration. Moreover, a significant strength is a role in current and future environmental management actions.

3.1.2. Weaknesses

One of the most significant weaknesses is that the beaches are highly vulnerable to climate change and sea-level rise (Ferreira et al., 2008; Nunes et al., 2009). A considerable contribution to dunes degradation adds beach overcrowding, which is already occurring in most beaches in Algarve. Some beaches have also been greatly affected by coastline urbanization and lack of public green space (Martins et al., 2012; Alves et al., 2017). During and heatwaves, residents and tourists' shifting towards coastal waters to avoid heatwaves again contribute to overcrowding.

Coastal urbanization contributes to light and noise pollution that disrupt ecosystems, which are the critical factor for successful tourism development (Mondal, 2017). It is essential to develop boardwalks and trails to limit tourists' free movement on the dunes' fragile vegetation regarding preserve the ecosystem. Due to climate change, drought is more intense, resulting in low natural water reserves. With a transition to a high-quality tourism paradigm, specifically golf resort development, ecosystem services deteriorated, resulting in increased water consumption and pollution (Thiel, 2010).

3.1.3. Opportunities

A critical opportunity is the use of solar energy in local tourism businesses. It is essential in sustainable development; however, solar energy's potential is not fully exploited in the region, considering 300 sunny days per year. Therefore, a regional renewable coastal energy policy implementation is urgent. Some financial incentives have been explored and introduced.

Urbanization planning and legislation associated with coastal erosion protection are considered for the regional resilience to natural disasters. Moreover, control of beach access restrictions or entrance fees can be applied to regulate beach overcrowding. After citizens consulting, the Local Agenda 21 strategy was approved and showed a high potential to lead in sustainable coastal management and develop environmental education and public awareness programs.

3.1.4. Threats

Among the most threatening beach management issues, coastal erosion remains the most influential (Defeo et al., 2009). Faro is an example in Algarve with one of the most vulnerable areas due to fisherman settlements and touristic residences. This area has been impacted by severe storms in the past, with consequences over infrastructures (Martinez et al., 2015). Also, Vaz et al. (2012) have forecasted urban sprawl along the Algarve coast.

Coastal erosion and ecosystem degradation might be intensified by climate change. Algarve region frequently suffers from floods, demonstrating consequences from intensive urbanization and inappropriate urban planning. Finally, Portugal was confronted with a choice between tourism and oil and natural gas exploration. Drilling could undermine the country's natural charms and increase the risk of pollution.

According to the worst-case scenario, climate change will intensify and the population and tourism will continue growing. It is recommended to use the region's strengths and opportunities to minimize weaknesses and mitigate threats and compensate for environmental impacts by providing appropriate measures for the sustainable coastal management of Albufeira municipality's case study beaches to help environmental managers' decision-making.

3.2. Bath Area Registration and Evaluation (BARE)

Praia dos Pescadores. The litter parameter obtained a B rating due to several broken glass items, cigarette packs, and plastic bags. The security parameter obtained the highest rating, having a safe bathing environment, lifeguards, buoys, security equipment, an emergency room, alert markers and alerts. Also, water quality was rated at the highest A rating and the beach was in the Blue Flag program. The beach's scenic quality was evaluated as mainly natural with few outstanding landscape features (D = 0.36), indicating C rating. The rate was affected by urbanization and the tourism industry on the beach, degraded dunes and noise. There are several restaurants, cafes, and 4-star hotels on the beach. Meanwhile, the beach facilities obtained C rating due to a lack of sports facilities, toilets, showers, and litter bins.

Praia de Santa Eulalia. The litter parameter obtained the highest A rating, as few paper food packages and plastic bags were observed. No harmful oil waste, feces and accumulated waste has been recorded. The water quality obtained the highest rating, as the resort was included in the Blue Flag program. The safety parameter obtained A rating, having a safe bathing environment, lifeguards, buoys, security equipment, an emergency room, warning signs and alert. A clean public toilet and shower were equipped on the beach. Meanwhile, facilities obtained B rating due to a lack of cigarette liner cache in litter bins. The beach was at an attractive natural site with some outstanding landscape features (D = 0.37). However, the rate was affected by the parking area close to the beach, utilities, and noise from the restaurant. Thus, the beach obtained C rating.

Praia dos Olhos deAgua. Litter parameter was evaluated C rating due to observation of feces, plastic bags, paper containers and four storage sites of accumulated sludge. Water quality met the highest A rating because the beach is included in the Blue Flag program. The beach was rated C even that it was located at an attractive natural site with outstanding landscape features (D = 0.45). However, the rate was affected by the tourism industry's presence, dune degradation, noise

from restaurants, and utilities on the beach. During the survey period, the beach was not crowded with tourists. The beach occupancy rate was assumed to be <40% of the beach carrying capacity. According to the BARE system, on remote/rural beaches, the provision of facilities, including safety-related, is not expected (Williams and Micallef, 2009).

Praia da Falesia. Litter parameter obtained B rating, due to observation of 2 glass wastes and four food packaging. There was also seaweed debris scattered along the coast. Water quality meets the highest A rating because the beach is included in the Blue Flag program. The beach was defined as an attractive natural site with a high landscape value (D = 0.68), indicating B rating. The rate was affected by the dry valley and the cliff. During the survey period, there were not many people on the beach, and the beach load level was <40%; therefore, the provision of safety-related facilities was not expected.

Based on BARE results (Table 2) Praia dos Pescadores, Praia da Santa Eulalia, and Praia dos Olhos deAgua received a 3-star rating due to observed litter, inadequate facilities, and quality of the scenery. Praia da Falesia was awarded a 4-star rating since it is a remote and clean beach with a high landscape value. The results of BARE evaluation allowed beach managers to assess the beach quality and make decisions for improvement and protection. Meanwhile, sustainable beach management highly depends on how beach users perceive it.

3.3. Beach user profile and perceptions

The demographic attributes of the beach visitors who participated in the research are given in Table 3. The Shapiro-Wilk normality test shows a significant deviation from normality on variables age (W = 0.944, p = 0.000) and average spending on the beach (W = 0.758, p = 0.000). However, based on normality values for the total sample size (n = 200), skewness, and kurtosis's values provide strong evidence that the data was normally distributed. The average age of beach visitors was 48 years (min – 18, max – 86) and the most represented age group of the participants was over 51 years (52.5%, sp = 0.0353). Male respondents (50.5%) slightly outnumbered females (49.5%).

Majority of respondents had secondary education (40.5%), hold a university degree (39.5%), while the rest hold a college degree (20%). Fifty-eight percent of the participants declared an income of more than 1000 euro per month. The largest group of participants used hotels for their accommodation (41.5%, sp = 0.0348), 35% choose to rent an apartment, 19% stayed at their own house, 5.5% stayed in the camping car, and only 2% arrived at the beach for one day.

In response to a question about beach visitor's monthly incomes and how much they spend at the beach daily, it was found that the majority has higher than the average national income. However, the majority spend nothing during a day at the beach. This indicator is essential in estimating the overall satisfaction with beach quality, facilities, and services. It often depends on tourist financial status. On average, a beach visitor spent 6.5 euros per visit. The majority (50%) of the respondents do not spend money during their visit to the beach; 27.5% spend from 5 to 10 euros, 18% spent from 11 to 20 euros, and 4.5% spend more than 21 euros. According to interviewed beach users, food and beverages are mostly provided at the hotel, where most tourists stay.

Table 3
Socio-demographic profile of beach visitors (sp: standard error of proportion; n = 200).

Items		p (%)	sp
Gender	Female	49.5	0.0353
	Male	**50.5**	**0.0353**
Age	≤20	2.5	0.0110
	21–30	17	0.0265
	31–40	14.5	0.0248
	41–50	13.5	0.0241
	>51	**52.5**	**0.0353**
Origin	International	**85**	**0.0252**
	Portuguese	15	0.0252
Education	University	39.5	0.0345
	College	20	0.0282
	Secondary	**40.5**	**0.0347**
Monthly incomes	>1000€	**58**	**0.0348**
	<1000 Eur	42	0.0348
Spending on the beach	Nothing	**50**	**0.0353**
	5–10 Eur	27.5	0.0315
	11–20 Eur	18	0.0271
	>21 Eur	4.5	0.0146
Accommodation	Hotel	**41.5**	**0.0348**
	Rent apartment	34	0.0334
	Own house	17	0.0265
	Camping car	5.5	0.0161
	Day trip	2	0.0098

3.4. Importance – performance (I–P) matrixes

3.4.1. Praia dos Pescadores (urban beach)

The results from the importance-performance (I–P) assessment from Praia dos Pescadores are presented in Fig. 2. The results of the parameters belonging to the quadrant 'keep up the good work' were: clean seawater had importance and satisfaction 1.98 and 1.66 respectively, cafes (1.58; 1.58), sand dune restoration (1.18; 1.52), restaurants (1.16; 1.24), vegetation health (1.26; 1.08), trails and boardwalks (1.22; 0.98), clean sand (1.98, 1.66), garbage facilities (1.92; 0.8), opportunity to observe wildlife (1.34, 0.72), multimodal mobility (0.78; 0.76), biodiversity (0.44; 0.74), medical facilities (0.82; 0.16) and information panel (0.56, 1.02). The parameters scored lower in the quadrant' concentrate here' were public toilets (1.78; −0.84), showers (0.82; −1.26), and renewable energy (0.9; −0.86). Beach users mostly emphasized the lack of showers and an insufficient number of toilets. Overcrowding (−0.56; 0.52), special-needs accessibility (−0.32; 1.16), and children recreation (−1.28; 0.16) parameters resulted in the quadrant 'possible overkill,' which emerged as insignificant aspects in terms of importance and beach users were satisfied with the current situation. Regarding overcrowding, beach visitors were satisfied with the situation during the low season.

3.4.2. Praia de Santa Eulalia (resort beach)

The results are presented in Fig. 3. Satisfaction of the beach users was high and the following parameters were significant belonging to the quadrant 'keep up the good work': garbage facilities (2; 1.42), clean seawater (1.98; 1.7), vegetation health (1.9; 1.74), clean sand (1.98; 1.7), opportunity to observe wildlife (1.98; 1.86), cafes (1.26; 1.82), restaurants (1; 1.82), trails and boardwalks (1.54; 0.9), biodiversity (1.36; 0.98), parking (0.66; 1.4), overcrowding (0.14; 1.1), information panel (0.12; 1) and multimodal mobility (0.1; 0.58). Renewable energy

Table 2
Star ratings awarded to case study beaches.

Site/Parameter	Water quality	Litter	Scenery	Security	Facilities	Grade
Praia dos Pescadores	A	B	C	A	C	***
Praia de Santa Eulalia	A	A	C	A	B	***
Praia dos Olhos d'Agua	A	C	C	Not applicable	Not applicable	***
Praia da Falesia	A	B	B	Not applicable	Not applicable	****

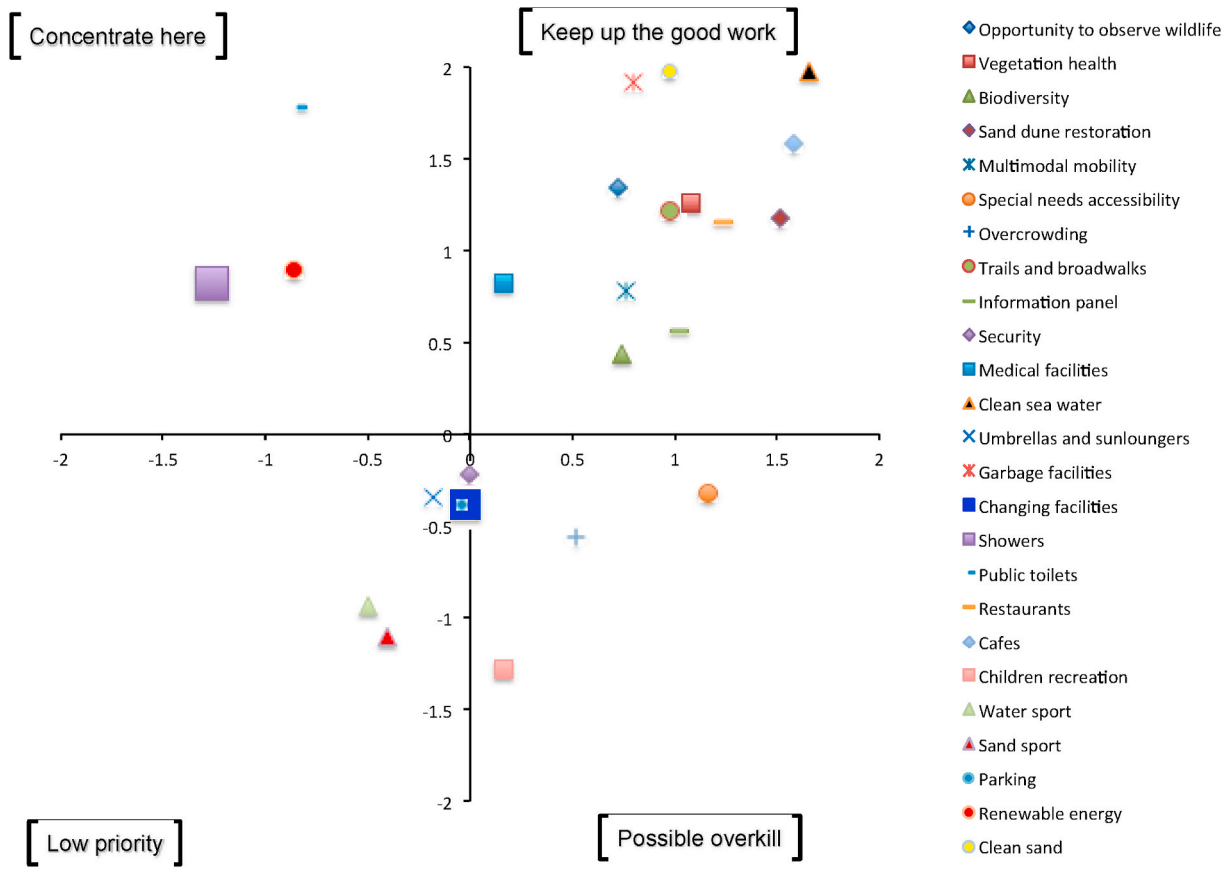

Fig. 2. Importance – performance matrix of Praia dos Pescadores visitors (urban beach).

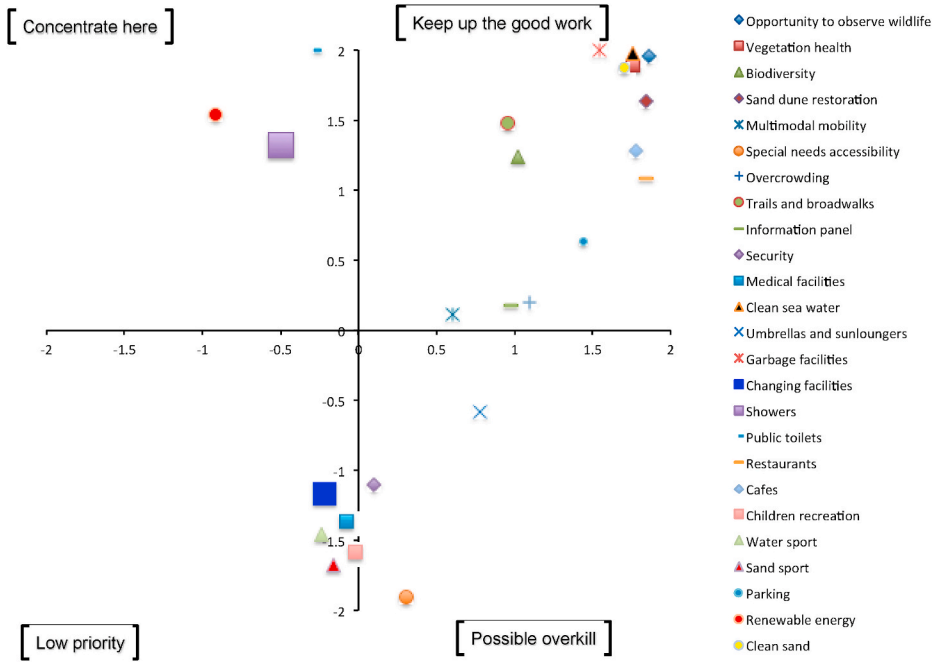

Fig. 3. Importance – performance matrix of Praia de Santa Eulalia visitors (resort beach).

(1.6; −0.98), showers (1.3; −0.56), and public toilets (2; −0.34) parameters were related to the quadrant' concentrate here'. Respondents were mostly dissatisfied with public toilets and showers, which were not available at the beach during the low season. The 'possible overkill' addressed to sun loungers and umbrellas (−0.68; 0.82), security (−1.12; 0.08) and special needs accessibility (−1.9; 0.32). These parameters were not important for beach users. In the 'lower priority' quadrant, the following parameters were obtained: changing facilities (−1.3; −0.14),

medical facilities (−1.36; −0.12), water sport (−1.54; −0.24) and sand sport (−1.66; −0.16).

3.4.3. Praia dos Olhos de Agua (rural beach)

The results (Fig. 4) showed that most of the parameters were in the quadrant 'keep up the good work': opportunity to observe wildlife (1.94; 1.82), vegetation health (1.98; 1.68), clean sand (2; 1.66), clean sea water (1.98; 1.54), garbage facilities (1.96; 0.82), trails and boardwalks (1.44; 1.06), restaurants (1.22; 1.14), cafes (1.16; 1.06), biodiversity (0.52; 0.82), informational panel (0.16; 0.92), sand dune restoration (0.26; 1; 52) and multimodal mobility (0.4; 1.32). In the quadrant 'concentrate here' resulted renewable energy (0.84; −1.22), showers (0.8; −0.94), public toilets (1.84; −0.16) and parking (0.48; −0.48), confirming the results of questionnaire, where 42% of beach visitors were identified arrived by car. 'Possible overkill' quadrant was related to overcrowding (−0.18; 0.72), children recreation (−1.44; 0.54), protection (−1.06; 0.08) and special needs accessibility (−1,56; 0,18). The following parameters were included in the 'low priority' quadrant: changing facilities (−0.06; −0.38), sun loungers and umbrellas (−1.04; −0.22), medical facilities (−1.26; −0.06), water sport (−1.4; −0.72) and sand sport (−1.74; −0.42).

3.4.4. Praia de Falesia (remote beach)

The results (Fig. 5) showed that most of the parameters were in the quadrant 'keep up the good work': vegetation health (2; 1.94), clean sand (1.98; 1.8), clean sea water (2; 1.82), opportunity to observe wildlife (1.6; 1.42), trails and boardwalks (1.4; 1.32), sand dune restoration (0.94; 1.4), multimodal mobility (1.34; 1.12), biodiversity (1.48; 0.82), garbage facilities (1.96; 0.52) and information panel (0.24; 1). The quadrant 'concentrate here' was related to parking (0.7; −0.2) and public toilets (1.42; −1.92), confirming the results of questionnaire, where 52% of beach visitors were identified arrived by car. Beach visitors were not satisfied with the small parking space. The quadrant 'lower priority' was related to showers (−0.2; −1.54), cafes (−0.56; −1.12), changing facilities (−0.9; −1.18), special needs accessibility (−1.26; −0.64), medical facilities (−1.38; −1.22), sun loungers and umbrellas (−1.56; −0.58), children recreation (−1.56; −0.38), security (−1.68; −1.24), restaurants (−1.64; −1.12), water sport (−1.98; −1.28), sand sport (−2; −1.2) and overcrowding (−1.98; −0.16).

3.5. An overview of the preferences and satisfaction of beach users

The overall importance-performance results are presented in Table 4. Overall results identified that more attention should be given to the following parameters with a statistically significant difference between performance and importance values: opportunity to observe wildlife, vegetation health, trails and boardwalks, garbage facilities, clean seawater, showers, public toilets, renewable energy, clean sand. Also, the results indicated that it was not needed management changes for the parameters with values close to zero: biodiversity, changing facilities, coffee shops, parking. Parameters, which resulted in a statistically significant difference, but positive values, meaning that performance is higher than importance should be maintained as before: sand dune restoration, multimodal mobility, special-needs accessibility, overcrowding, information panel, security, medical facilities, umbrellas and sun loungers, restaurants, children recreation, water, and sand sport. The most significant gap between performance and importance parameters values was found in values of importance-performance about public toilets and showers, representing an urgent need for improvements. In general, parameters related to litter, scenery, and beach facilities emerged as one of the most significant.

Results presented in this study are influenced by the season. It is expected that during the off-peak season, the majority of beach visitors in Algarve are more senior. The summer beach visitors are younger than the cooler weather off-peak tourists. They stay longer at the beach and with diverse preferences. Senior tourists prefer lower prices for touristic service and most likely are retired with plenty of time. The results showed that overcrowding was one of the least disturbing beach attributes due to a low number of beachgoers during the off-peak season. It shows a significant difference from previous studies concluding that crowding was the primary concern in the summertime (Maguire et al., 2015), significantly contributing to coastal degradation phenomena. According to Jin et al. (2016), it is essential to control perceived crowding to achieve the tourists' satisfaction and sustainable tourism industry. Meanwhile, overcrowding was identified from beach visitor perceptions and a managerial perspective as a significant threat (Sanz-Blas et al., 2019). For instance, in Spain, beach occupation, including seasonal services, could not exceed half its surface at high tide. There are no similar regulations in Portugal, and a sense of

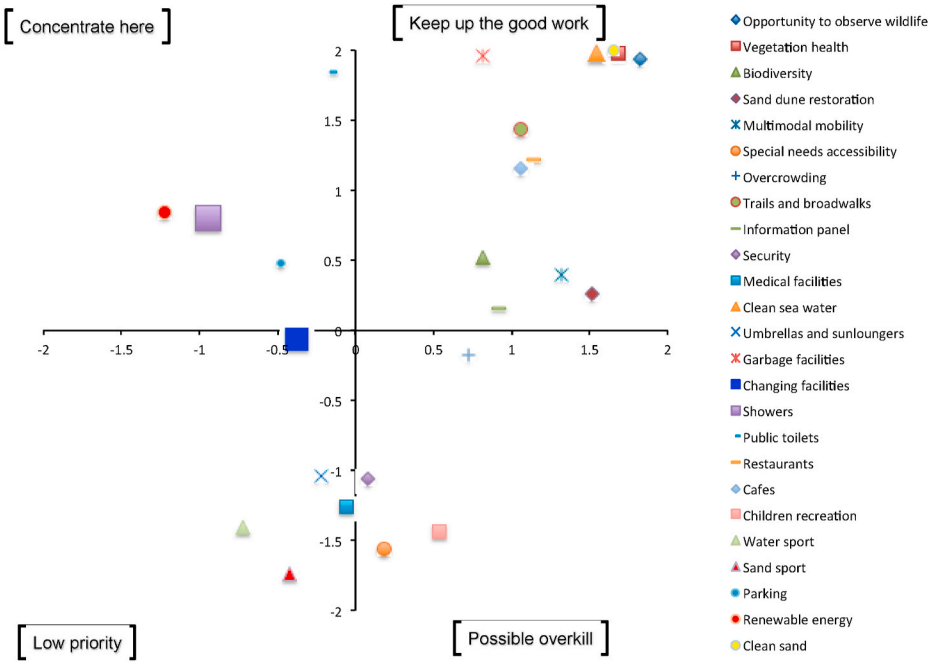

Fig. 4. Importance – performance matrix of Praia dos Olhos de Agua visitors (rural beach).

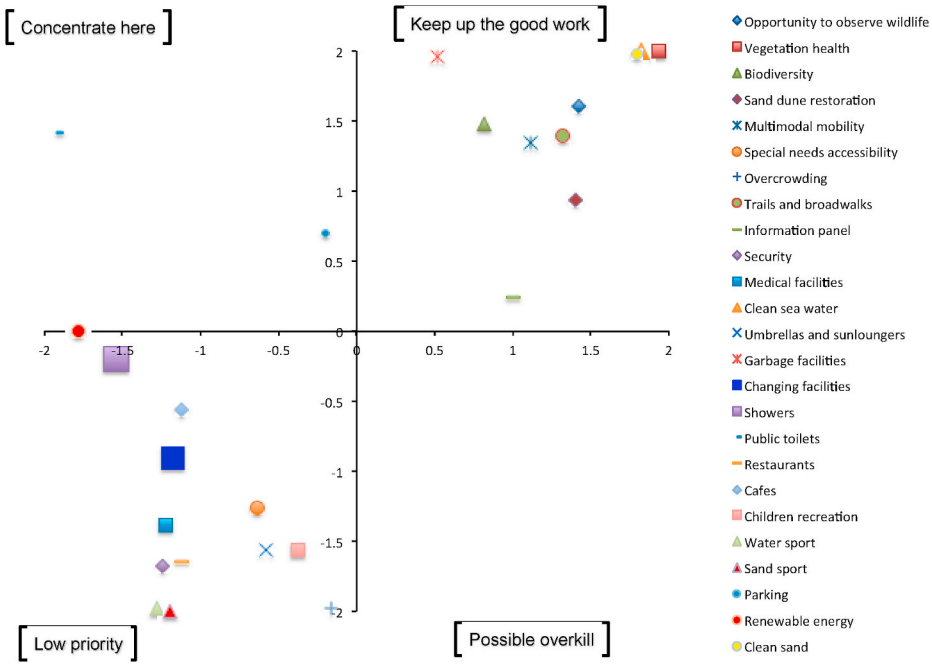

Fig. 5. Importance – performance matrix of Praia da Falesia visitors (remote beach).

overcrowding becomes the most disturbing during the peak season.

Seasonal beach visitors highly differ in age; meanwhile, the majority of Algarve beachgoers were more senior in comparison to the results of Stokes et al. (2020). Nevertheless, off-peak season beach visitors were tourists mostly from abroad (85%). The majority of beach visitors had a secondary degree, similar to the Italian peak-season beach visitor level of education (Marin et al., 2009). However, University educated tourists were more critical to beach service quality and attributes. Therefore, it is crucial to address seasonal beach visitor profiles to develop different communication strategies toward beach management plans and satisfy beach users (Phillips and House, 2009).

According to Dodds and Holmes (2019), age, education, and geographical location were the main determinants influencing the visitor's overall satisfaction. According to (Palmer, 2007) , knowledge of nature and ecological issues comes from the childhood experience of nature and widespread education, confirming the present study results. Interestingly, regardless of the season, beach cleanliness and facilities remain the most critical factors for visitors not only in Portugal but also in Italy (Marin et al., 2009), Taiwan (Chen and Teng, 2016) and Wales (Vaz et al., 2009). However, being the most important, it is also the most complicated management aspect for any beach typology due to different coastal area ownership levels.

Beach management aims to satisfy users, but it should also address education and raising awareness of environmental values and global climate change issues. In this research, identified factors related to beach area landscape transformation are the most alarming and confirms previous findings in China (Yu et al., 2016) and Pakistan (Ullah et al., 2014), focusing on the significant importance of land use planning with a long-term development perspective in order to avoid an economic downturn. Besides, this study's results support previous beach management findings for small islands in China (Zheng et al., 2020) and contribute to recognizing a high correlation between natural landscapes and beach management.

Researchers have applied several beach management strategies (Lamberti and Zanuttigh, 2005; Barugh and Williams, 2014; Penn et al., 2015). Assessment of the recreation carrying capacity is the most well-known (Newton et al., 2011; Delrieux et al., 2016). Beach quality index assessment (Semeoshenkova et al., 2017), beach description matrix, and assessment of beach user attitude and opinion (Saayman et al., 2016) were also used. In general, all these techniques use a purely single approach, whether it is beach user surveys or subjective expert evaluations. However, Cabezas-Rabadán et al. (2019) support that beach users' interests are not homogeneous, and tourism management is grounded on assumptions that might compromise the environment in the long term. Thus, there is a need for a more holistic approach. According to this study's findings, most of Algarve's beach management belongs to private entrepreneurs, partially responsible for beach cleaning and tourism services provision. Consequently, management decisions usually are not sustainably targeted because they focus on the short term.

Contrary to Portugal, in Spain (Ariza, 2010) and Croatia (Perišić et al., 2010), beaches are managed from coastal municipalities, allowing the government to carry out a comprehensive dialogue. Meanwhile, beach management in Algarve becomes a complex system with insufficient information exchange between parties. Moreover, Algarve has no specific beach management policy since it is under the Portuguese Shoreline Spatial Plan (POOCs), which has had several positive effects. The most significant was the organization of land uses and containment of impacts, including improving beach infrastructures, well-organized parking lots, and beach access. However, the main weakness of POOCs is that it mainly aims to social and economic pillars, and, to a lesser extent, to environmental sustainability.

In Spain, the most critical coastal tourism and beach management issues were the adequacy of services, sand and water quality, and beach cleaning (Ariza et al., 2014). The results were obtained purely through interviews with beach managers and are similar to this study's findings. However, the present research applied a new integrated beach quality assessment method, considering both beach users' opinions and beach site evaluation to set management actions. Following Micallef and Williams (2002) recommendations to apply multi-dimensional beach site analysis for determining the scale and scope of beach problems, the proposed method aims for a more holistic approach to sustainable beach management.

The present study has considered beach management solutions with an emphasis on sustainability. McLachlan et al. (2013) described a list of ten strategies for implementing sustainable beach management. Solar energy and biophilic design might help to create a more sustainable beach environment. Future research should focus on restoring human impacts on fragile ecosystems, enhance ecosystem services, and ensure

Table 4
Results of importance-performance matrixes of four beaches in Albufeira, Portugal.

Parameter	Paired sample *t*-test					
	Importance		Performance		Difference (P–I)	*p*-value
	Value	SD	Value	SD		
Opportunity to observe wildlife	3.79	0.66	3.58	0.81	−0.21	0.000***
Vegetation health	3.83	0.60	3.68	0.65	−0.15	0.000***
Biodiversity	3.17	0.95	3.08	0.93	−0.09	0.173 (NS)
Sand dune restoration	3.24	1.17	3.63	0.59	0.39	0.000***
Multimodal mobility	2.99	1.15	3.15	0.80	0.16	0.071**
Special needs accessibility	1.58	1.09	2.61	1.12	1.03	0.000***
Overcrowding	2.02	1.36	2.78	0.95	0.76	0.000***
Trails and boardwalks	3.56	0.89	3.29	0.92	−0.27	0.004***
Information panel	2.69	1.20	3.11	0.73	0.42	0.000***
Security	1.76	1.16	2.24	1.19	0.48	0.000***
Medical facilities	1.91	1.31	2.22	1.19	0.31	0.010***
Clean sea water	3.98	0.12	3.74	0.56	−0.24	0.000***
Sun loungers and umbrellas	1.83	1.23	2.42	1.15	0.59	0.000***
Garbage facilities	3.96	0.20	3.19	0.98	−0.77	0.000***
Changing facilities	2.03	1.29	2.13	1.05	0.10	0.259 (NS)
Showers	3.00	1.30	1.71	1.02	−1.29	0.000***
Public toilets	3.82	0.67	1.91	1.26	−1.91	0.000***
Restaurants	2.84	1.35	3.03	1.16	0.19	0.007***
Coffeeshops	3.13	1.22	3.09	1.17	−0.04	0.910 (NS)
Children recreation	1.40	0.98	2.44	1.16	1.04	0.000***
Water sports	1.39	0.91	1.92	1.11	0.53	0.000***
Sand sports	1.28	0.82	2.02	1.21	0.74	0.000***
Parking	2.79	1.44	2.61	1.16	−0.18	0.232 (NS)
Renewable energy	3.09	1.21	1.60	0.88	−1.49	0.000***
Clean sand	3.97	0.22	3.61	0.71	−0.36	0.000***

Note: Items classified in 4-point Likert scale from 1 – *not important* to 4 – *very important* and 1 – *low performance* to 4 – *high performance*. SD: Standard Deviation; I: Importance; P: Performance; NS: not significant ($p > 0.10$); Significant levels: ***$p < 0.01$; **$p < 0.05$; *$p < 0.10$.

equitable access to nature (Cook, 2016). Dunes conservation should be a priority in beaches that are not facing urbanization (Ariza et al., 2010; Arens et al., 2013). Therefore, it is needed to develop recreational trails and boardwalks over the coastline that enhance tourist demand to enjoy the beaches' unique landscape without putting the ecosystem at risk.

4. Conclusions and recommendations

This study applied a combined methodology of SWOT, BARE, and surveys to find the balance between beach "consumer" needs and to protect the area's natural and cultural assets. The aim was to find a more holistic beach management strategy in the face of climate change and high tourism pressure in Portugal's most popular holiday destination. It is essential to consider beach visitor opinions towards attributes that will drive higher satisfaction and generate income for the whole regional economy. The proposed method provides a more sustainable view of a beach site focusing on subjective political, social, economic, and environmental dimensions with an objective assessment of beach visitor perceptions. This approach is a valuable reference to the importance of integrated beach assessment methods as tools to support sustainable coastal tourism and facilitate effective management strategies. It could be applied to any type of beach and at any season. Understanding the factors that influence beach visitor satisfaction and factors that threaten the natural beach environment from economic and environmental perspectives help destinations manage long-term sustainability.

This research's findings underline that the most threatening factors affecting beach management were coastal erosion, urbanization, overcrowding, and ecosystem degradation. The highest beach quality evaluation was awarded to the remote Praia da Falesia beach due to the absence of litter and high-quality scenery. Regarding the beach services, users highlighted the lack of cleanliness on the beach and the provision of public toilets and showers. There was an agreement between beach users about the importance of vegetation health, renewable energy, and boardwalks. For strategic and sustainable beach management, we strongly recommend: to provide more public toilets and showers; dune rebuilding; beach nourishment; strict control of lights from services at night; usage of solar energy for services and facilities; entrance fee, limiting accessibility; increase tax for infrastructure and facility usage; provision of more litter bins and recycling bins; encourage tourists to collect waste for recycling; regular sand cleaning during the low season; plant more shrubs and trees for dune stability and protection from erosion; improve communication with local business owners; provide educational activities about coastal ecosystems, its services, and conservation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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