Pricing Beach Congestion: An analysis of the introduction of an access fee to the protected island of Lobos (Canary Islands)

Francisco López-del-Pino[1]
University of Las Palmas de Gran Canaria, Spain;
University Institute of Tourism and Sustainable Economic Development, Spain.

José M. Grisolía
University of Las Palmas de Gran Canaria, Spain;
University Institute of Tourism and Sustainable Economic Development, Spain
Nottingham University Business School China, University of Nottingham Ningbo China, China.

Abstract

There is a growing need for instruments to control and reduce the impacts of the increasing number of tourists visiting protected natural areas. Among these economic instruments, the use of access fees can have positive effects on enhancing environmental sustainability by reducing the number of visitors. Access fees are also a source of financing the management costs of a protected area. Among the negative impacts of tourism, users of beaches perceive congestion as a factor in reducing the final value of the touristic experience. This article analyses the perception of locals of an access fee to enter the small Canary island of Lobos, a protected natural area with high quality beaches, whose quietness is endangered by an increasing number of visitors, clearly exceeding the current carrying capacity. We approached the problem using different tools: firstly, we looked at visitors' opinions on the website TripAdvisor to identify whether congestion is perceived as a problem; secondly, we carried out an opinion survey using Likert-type scale questions to capture opinions about crowding and pricing; and finally, we used a discrete choice experiment to estimate the willingness to pay (WTP) for accessing the island and reducing congestion. The results reveal a high degree of perception of congestion and the potential of an entrance fee as an effective tool in reducing that congestion and thus generating resources to cover the maintenance costs of the protected area.

Keywords: access fees, congestion, discrete choice model, Likert-type scale, natural protected areas, sustainability, willingness to pay Introduction

[1] **Corresponding author:** Francisco López-del-Pino, Department of Applied Economics Analysis, University of Las Palmas de Gran Canaria, Las Palmas 35017, Spain; University Institute of Tourism and Sustainable Economic Development, Las Palmas 35017, Spain. Email: francisco.lopez@ulpgc.es

Introduction

One of the key aspects of nature-based tourism focuses on analysing how to manage natural resources in a way that makes their touristic exploitation compatible with their conservation. In the case of natural protected areas, given their special sensitivity, an excess of visitors can cause irreversible damage both to an area's environmental value as well as its attractiveness as a touristic site.

In these cases, it may be necessary to use some kind of strategy to reduce the negative effects of an excess of visitors. Eagles et al. (2002) analyse and compare the main strategies that can be used in protected areas. In general terms, four major types of strategies can be distinguished: (i) The first type of strategy is managing the resource capabilities to handle use, such as site hardening (building infrastructures such as paths to reduce the impact of the visits on ground and vegetation), information (information about the area, its values and its norms) and interpretation (informative signals, guides, interpretation centres, etc.), which encourage visitors to appreciate the values of the site and modify their behaviour accordingly, thus diminishing their impact. (ii) The second type involves managing the impact of use, for example, reducing the negative impact by modifying the type of use or scattering or concentrating use. Zoning and regulation of permitted uses, or the form of access, are the main tools. (iii) The third group of strategies is related to the management of the supply, which implies regulating the amount of space available or the time in which it can be accessed. These measures range from zoning (determining the type of use allowed in a given area combined with the use of barriers) to access prohibition. Finally, (iv) demand-management tools can be used, affecting how visitors can access space. These tools include setting a maximum number of visitors, limiting access on a temporary or seasonal basis, pre-assignment of recreation site (e.g. waiting lists) or setting access prices (flat fares or differentiated fares by type of visitor, length of stay or period of time).

When the number of visitors is so high that it creates congestion problems, and it is not possible to adapt the capacity of the available space to demand, it is common to use some of the demand management tools mentioned above (see, e.g. Cole et al., 1987). Enforcement is a key element in the effectiveness of these measures. Simply determining a limit number of visitors has no effect if it is not accompanied by access control systems, used in conjunction with surveillance and penalties.

In general, these control and surveillance systems associated with demand management involve certain operating and management costs. Access fees to natural protected areas are widely used and have advantages over other measures mentioned. Firstly, there is an efficiency criterion, as the pricing mechanism allows the space available to be accessed only by those visitors who value the access to the protected area more highly, thus increasing the social surplus. Secondly, possible equity problems associated with price can be mitigated by a price discrimination system that would also be designed to maximize revenues from the collection of fees. Finally, the capacity to generate financial resources to cover the maintenance costs of these natural areas (see, e.g. Alpízar, 2006) is also an important advantage over other measures.

There is extensive literature regarding the use of fees in different natural areas around the world (see, just as examples, Buckley, 2003; Dharmaratne et al., 2000; Knapman and

Stoeckl, 1995; Laarman and Gregersen, 1996; Rivera-Planter and Muñoz-Piña, 2005; or Reynisdottir et al., 2008).

In general, there is consensus in the economic literature about the capacity of such pricing policy for resource generation (Thur, 2010), although access fees are not sufficiently exploited (Depondt and Green, 2006). Generally, user fees are frequently below the amounts that visitors are willing and able to pay (Laarman and Gregersen, 1996; Scarpa et al., 2000; Schultz et al., 1998; Siddiqui, 2003), and an inadequate pricing scheme may be neither efficient nor equitable (Buckley, 2003).

Social acceptance might be a problem for the implementation of any tolling system (see, e.g. Lee and Pearce, 2002; Park et al, 2010; or Grisolía et al., 2015 for the case of congestion charging schemes in the transport sector). Although the level of acceptability of the pricing system can be increased by public education campaigns (Edwards, 2009) and the use of persuasive communication (Steckenreuter and Wolf, 2013), public rejection is common. Usually this rejection is based on two main reasons: first, on equity reasons (access to nature should be a right to be granted, especially for low income visitors and for residents), and second, on a lack of confidence in politicians and how they will use the public funds raised by the toll system.

With regard to the first reason, an optimal design of the pricing scheme could reduce levels of rejection. Although there are different schemes, Becker (2009) concludes that price differentiation seems to the best option in terms of cost-effectiveness. There seems to be a general consensus about the convenience of price discrimination according to the type of consumer (Chase et al., 1998; Cruz, 2008), and it is common to conclude that tourists are more willing to pay an entrance fee to a natural area than local residents are. It is therefore particularly important to discriminate between residents and tourists (Cruz, 2008) in order to improve the acceptability of the scheme. Price discrimination among residents and tourists is important when the natural landscape to be priced is a beach (Oh et al., 2010).

The second critical issue when talking about acceptability is the lack of trust in the public agency responsible for collecting the fees (see, e.g. Winter et al., 1999) and the way in which the revenue arisen from fees is used (Goodwin et al., 1997). Acceptability can be increased by guaranteeing that the revenues of the system are reinvested in the improvement of the natural space (see, e.g. Casey et al., 2010; Mmopelwa et al., 2007 or Taylor et al., 2009; Wilson and Tisdell, 2004) in a way that these improvements are clearly perceived by users. Visitors are then willing to trade off some degree of pricing for better environmental outcomes and reduced congestion (Fleming and Manning, 2015).

Access fees have also been used to reduce environmental impacts on islands and beaches. One of the key issues in the development of small islands is to achieve an adequate equilibrium between the conservation of natural resources and their exploitation (Henderson, 2001). Congestion and overcrowding appear as critical issues when talking about sustainability in the development of small islands (McElroy, 2003) or when discussing the preferences of beach users (Oh et al., 2010)

Regarding congestion, it is generally considered as a negative attribute when selecting leisure spaces. As pointed out by Hindsley et al. (2007), empirical models that include

congestion as an attribute within the demand of use of natural areas mainly use stated preference (SP) methods (see, e.g. McConnel, 1977, for an application to beaches). SP methods such as discrete choice models allow us to analyse separately each of the attributes of the natural area (such as congestion). As Schroeder and Louviere (1999) mentioned, although ideally these models should include all the relevant attributes of the site, even if they do not include all the important features, they are useful in providing a general idea on how the public values the specific attributes and features that are in the model. Thus, the economic cost of the deterioration of the natural landscape due to overcrowding can be valued by including congestion levels as one of the attributes of the landscape in the SP experiment. These methods are preferred to others because the level of congestion can be modified independently from the rest of the attributes, avoiding any simultaneity bias between attributes (see Timmins and Murdock, 2007).

In the Canary Islands, more than 40% of their surface area is subject to some degree of environmental protection. There are 146 protected areas, accounting for 3097.6 km2. In addition, 4680 km2 of the land surface (62.8% of the total) and 3520 km2 of sea have also been declared UNESCO Biosphere Reserves, given their great natural and cultural values. Nevertheless, despite this great level of protection, there are just a few examples of the application of access fees to natural protected areas. Simancas (2006, 2008) reviews the eight protected areas with access fees in the Canary archipelago, five of them on the island of Lanzarote.

Simancas found potential of such pricing policy as a tool for planning and managing the use of protected areas as well as source of revenue. Nevertheless, although there is consensus about the capacity of such policy for raising funds, its impacts on environmental quality are not as clear and seem to be more limited (Roca et al., 2003).

The inhabited small island of Lobos, located to the north of the island of Fuerteventura, is a recent example of an area in which an access fee is being seriously considered by the local authority. The island is suffering from an increasing number of visitors in recent years. There is no mechanism to control entrance, so there is no accurate information about the real current number of visitors entering the island. Nevertheless, there is a feeling that the quantity of people accessing the island is very often exceeding the threshold determined by the current carrying capacity, which is limited to 200 visitors per day (according to the access regulations in force). There is a general feeling among visitors (mainly local residents) about a significant level of congestion that cannot be longer ignored.

The local government of the island of Fuerteventura, which is responsible for the environmental policies affecting Lobos, decided to revise the island's carrying capacity in 2016 and increased the limit to 700 visitors per day using the standard methodology of Cifuentes (1992) (see Guatisea, 2016). It seems clear that simply increasing the legal threshold will not solve the related congestion problems already perceived by users. Congestion problems cannot be solved by just setting the number of visitors, unless such a limit is accompanied by any effective access system controlling the entrance.

More recently, the local government has been seriously considering charging visitors to Lobos with an access fee to reduce congestion and its associated environmental impacts and also to provide an income source to cover (at least partially) the costs of management

and cleaning of the island. As the measure would greatly affect local residents in Fuerteventura, who are used to having free access to Lobos, it is of great interest to the politicians to know the acceptability and possible response of this group of voters. This article analyses the response of Canary island residents to a hypothetical entry payment to the island of Lobos. We first analysed more than 500 opinions of the island's visitors on the TripAdvisor website in order to select the attributes that defined the quality of the tourist visit. Secondly, we launched an online questionnaire to more than 300 potential local visitors using the Google forms toolkit, which allows participants to complete the questionnaire using smartphones. The designed questionnaire included some questions about personal opinions regarding an access fee and a discrete choice experiment in which congestion was included as an attribute to be valued.

The island of Lobos: Description and characteristics

Lobos is a small island with a surface area of approximately 4.58 km2, located 2 km to the north of the island of Fuerteventura, just in front of the very touristic beach of Corralejo. Administratively, it is considered as a part of the municipality of La Oliva (Fuerteventura). Its reduced dimensions (with a perimeter of just 13.7 km) make it possible to walk around the whole island in a short time.

It is one of the most ancient places in the Canary Islands and one of the wildest areas in the archipelago. The islet is basically made up of lava fields and volcanic sand deposits at a low altitude, under the continuous influence of trade winds, which gives the island a semi-arid climate with a stable average temperature (ranging from 16_ centigrade in winter to 25_ in summer) and scarcity of rain. In the 15th century, the island was the habitat of a great number of Mediterranean sea lions (whose name in Spanish 'lobos marinos' gave the island its name). In more recent times, human settlements were related to the activity of the lighthouse of the island up to 1968, when the lighthouse was completely automated. Lobos was acquired by a private entrepreneur in 1963, who sold it to the public sector due to the prohibition of any class of building given the high degree of protection of the island.

In 1982, the island was considered as a part of the natural park of Corralejo dunes. Due to its natural values, the island has additional protection after being qualified as an area of ecological sensitivity, special protection area for birds, important bird area and place of community interest. Nowadays, the island is entirely protected and was declared a Natural Park in 1994. Currently, the whole of the island of Fuerteventura is declared a Biosphere Reserve and is part of the *network Natura 2000* of natural spaces. The island also has some other important landscape, ethnographic, geological and paleontological values.

The island is currently unoccupied although there are some infrastructures such as the Martiño lighthouse of neoclassical style, dated 1895, a pier, a small restaurant, a visitors' centre with toilets and a group of old fishermen's houses without sanitation infrastructure nor electricity (that are still used as holiday residences) as well as some paths. However, the main tourist attraction of Lobos is the small beach of La Caleta (also named Beach of La Concha, see Figure 1), prized for its white sand and clear water as well as its quietness.

The beach is located near the small dock (the only access point to the island). There is also an area for camping for small groups (needing previous authorization).

Regulation of the island of Lobos

Given the high degree of protection of the island of Lobos, there is extensive legislation affecting the activities that can be carried out on it. According to the Insular Management Plan of Fuerteventura, Natural Resources Management Plan (Plan Insular de Ordenación de Fuerteventura, Plan de Ordenación de los Recursos Naturales), the park receives the classification of zone A, corresponding to an area of greater natural, ecological and scenic value. However, the main instrument of regulation of Lobos island is its Master Plan of Use and Management (Plan Rector de Uso y Gestión (PRUG)). The PRUG determines a zoning of the island, as shown in Figure 1, and regulates the permitted and prohibited activities in each zone (see Table 1 for a detailed description of these activities). The Master Plan (PRUG) declares zones of exclusion to be those 'areas that contain values of great interest and fragility, so they must be preserved from any uses or presence of human beings compromising its conservation'. This higher degree of protection affects an area of 25.7 ha (see Figure 1). Basically, the only activities allowed in this zone are those related to the conservation of the area and research (requiring authorization).

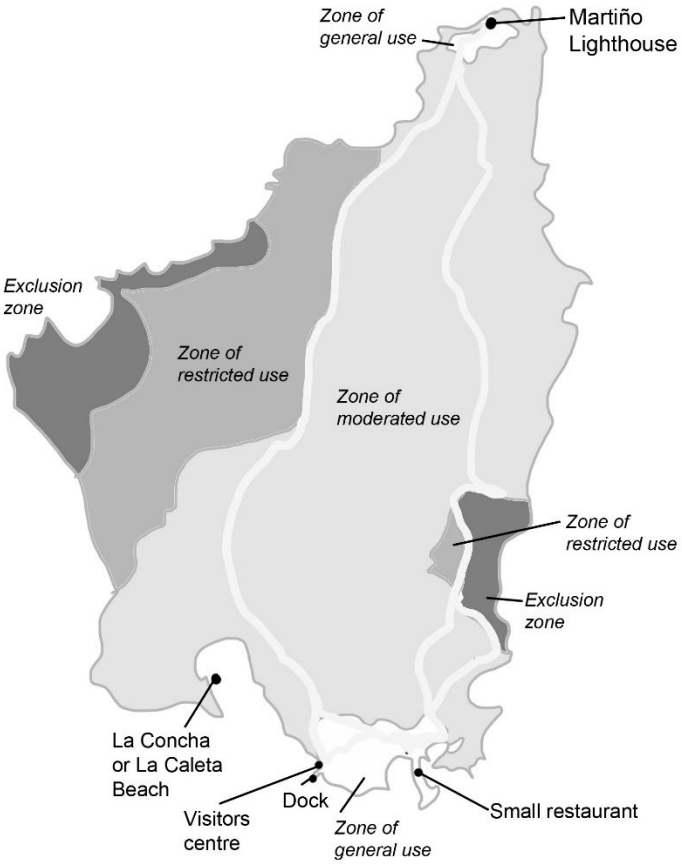

Figure 1. Zoning of the island of Lobos Natural Park.

Areas of restricted use are those that present 'fragile and representative elements of interest for conservation and that nevertheless admit by their characteristics a reduced public use. Although in some areas this use will only be possible in certain seasons'. In Lobos, the majority of areas of restricted use are found in the western sector of the island (see Figure 1), occupying about 126.6 ha. Walking along the signalized paths is allowed in small groups up to 10 people.

Zones of moderate use are those containing 'values of less fragility' and that 'can receive more intensely activities of public, educational and recreational use'. This zone includes the centre and eastern part of the island and excludes the sector of the lighthouse (in the north) and El Puertito (what means small port) in the south. Traditional fishing, cycling and walking along the paths for groups of up to 20 persons are allowed activities. The beach is also included in this area.

Finally, the *zone of general use* comprises the area with lower environmental fragility in the island. This area contains the infrastructure and public services necessary for the management of the Park, including the lighthouse, the port, the small restaurant, the fishermen's houses area and the visitors' centre. Main tourist recreational activities are allowed in this area. Table 1 includes a more detailed description of the forbidden and permitted activities (with or without authorization).

Table 1. Regulation of activities prohibited, authorized and allowed in the island of Lobos

	Forbidden activities	Activities permitted only with authorisation	Permitted activities
Exclusion zone	Any activities not for scientific or conservation purposes, or that involve a transformation or modification of the environment or the degradation of their ecosystems; camping (except for research reasons, requiring authorisation); free or guided access, except for conservation and management reasons; fishing from land and for shellfish.	Those linked to scientific research as long as they are compatible and do not contradict the programs and guidelines of the management administration, and always under its supervision.	Activities with the aim of ensuring a proper conservation of the area, included in the planned management guidelines or actions.
Area of Restricted use	Walking off the trails, except for conservation and management reasons; Cycling, camping (except for research reasons); free movement of unguided people on the route to the top of the Caldera (except for management reasons) during nesting periods or other periods not considered appropriate for conservation reasons; fishing and shelling; Any other action not linked directly to the conservation of natural resources.	Actions with the aim of conservation of natural and cultural resources, as well as maintenance works for public infrastructures, conditioning and restoration of cultural heritage; camping justified for research or conservation reasons; top of the Caldera can only be accessed in the company of guides or the staff of the Park.	Hiking and self-interpretation of nature, except for those routes established as guided, in groups of up to 10 people, not for places occasionally closed for conservation reasons.
Area of Moderate use	Walking out of the trails and cycling along the trails, except for the access road to the	All those actions with the purpose of conservation of natural, cultural and public use resources; improvement	Fishing and shelling with traditional techniques from the ground (cane and crab); educational and recreational

	lighthouse that runs through the central sector of the island	and signalling of public use trails; the conditioning of the path of the Lagunitas in order to offer an alternative that diverts the current traffic, avoiding affecting the dynamics of the natural processes; camping justified by research reasons; the installation of equipment and light infrastructure like lookouts, informative signals, rest areas, etc.	activities compatible with the conservation of nature that do not use facilities or equipment; trekking and the interpretation of nature (within the trails and in groups up to 20 people); cycling along the central road that gives access to the lighthouse; maintenance works to the existing infrastructure.
General use area	All those that go against the PRUG and do not represent actions related to the management and conservation of the Park as well as those that do not benefit the organization of the public use of it, any new building that does not represent benefit or public interest in the zone of the Puertito	Tourist-recreational activities that do not contradict the indications of the Plan, and those with the objective of making compatible the pre-existing activities with the works of attention and maintenance of the lighthouse.	Camping in the area of La Carpintería; temporary accommodation of researchers or personnel involved in nature conservation; any activity that intends to offer new services to the Park and that constitutes an action compatible with this zone and does not contravene the provisions of the Plan; maintenance works to infrastructure of public use and conditioning of elements of cultural interest; the accommodation and extended stay of staff related to the public use services, surveillance or management of the Natural Park and the installation of public facilities (camping area, visitor centre, reception area of the pier ...) that do not contradict the Plan or the corresponding guidelines of use.

Source: 'Plan Rector de Uso y Gestión' (PRUG). Official Gazzette of the Canaries (Boletín Oficial de Canarias, BOC 2000). Carrying capacity and congestion in Lobos

Currently, there is a complete lack of control of the number of people that enter the island of Lobos. There is only control over the visit of groups camping in the permitted areas, since this activity needs previous authorization and is subject to restrictions (maximum of three nights and a maximum of 75–80 people at any one time). Since access to the island is not controlled in any way, there is no reliable data on the actual number of visitors. Although data could be obtained from visitors transported by regular transport lines, there are no data from other companies or about access by private vessels.

The only approximate data are collected in the current Master Plan of Use and Management (PRUG), which roughly estimates a figure of 26,000 visitors in 2006. This figure would mean an average of 71 visitors per day. However, since the visits are not distributed homogeneously throughout the year, it is clear that (especially in summer) the real number of visitors surely exceeds this figure.

The current carrying capacity of the island, established by the PRUG in force, is considered to be between 150 and 200 people per day. Among the usual visitors, it is generally perceived that the number of visitors has been gradually increasing in recent years, and there is a sense of overcrowding, especially in the summer months. This number of visitors reaches figures that far exceed the carrying capacity of the ecosystems in the islet, which could cause the deterioration of the aforementioned natural values. A recent study by a consultancy company (Guatisea, 2016) includes a count of visitors to the island on one day in August 2015, giving a figure of 547 people (21% of whom were visiting the island for the first time). This means that the current number of visitors represents between 2.7 and 3.6 times the carrying capacity.

For this reason, the local government of the island (Cabildo of Fuerteventura), through the Insular Board of Natural Spaces of Fuerteventura, is preparing a revision of the PRUG in order to adapt this to the new legislation and to revise the carrying capacity accordingly. The proposed amendment (see the report by Guatisea, 2016) includes a new carrying capacity estimated according to the methodology of Cifuentes (1992) that considers physical, environmental and biological variables as well as management capacity. The proposed new carrying capacity is finally set at 704 visitors per day, which represents between three and four times the current limit.

It is not known, however, whether the current number of daily visitors exceeds 704. Based on the above-mentioned counting data of 547 people on a summer day, and taking data from garbage collected on the island (see Guatisea, 2016), it was possible to calculate an average number of kilogram of garbage per visitor that specific day. Then assuming that this average remains constant throughout the year, it is possible to estimate the number of visitors if the amount of annual garbage collected is available. Guatisea data show a generation of garbage per day from 50 to 55 bags (60 l capacity) in summer, which (considering 547 visitors) implies between 5.48 and 6.03 l per person (an average of 5.75 l per visitor per day). With this average figure, and taking data from garbage generated in winter (from 20 to 25 bags), we inferred that the number of visitors per day in winter would be in the range 208–260, that is, an average of 234 visitors per day in winter. Considering only two periods (summer and winter, each lasting 6 months), the total number of visitors in 2015 would therefore be approximated as 140,580 visitors per year, which means an average of 385 visits per day.

Indeed, although this is a very crude approximation, these estimated visitors (385) clearly exceed the current load capacity (200). Given the pace of growth in the number of visitors, it seems only a matter of time before this figure will also exceed the new carrying capacity of 704. Maintaining a constant yearly growth rate in the number of visitors, the figure of 700 visitors will be exceeded in 7 years. We should remind ourselves that this is an average number, thus this figure would surely be exceeded in summer periods (where daily occupation currently can reach values of about 1500 persons, see Ruiz and Sanchez, 2016). Although it is logical to assume that the rate of growth may slow down as the social costs associated with overcrowding become evident (beach congestion, deterioration of water quality, garbage, impacts on wildlife, etc.), it seems sensible to devise instruments for demand control before these limits are reached.

It appears that the current policies, such as zoning, regulation of activities, maximum size for group camping, information and, even, limiting the number of simultaneous visitors according to the carrying capacity, are not succeeding in controlling an excessive entrance to this natural area. In this context, an access fee seems to be the next step that the government should carefully take under consideration to overcome congestion on the island of Lobos. Determining the most adequate level for this pricing access in order to increase the acceptability among residents is the objective of this work.

TripAdvisor opinions

The first step in our work consisted of the analysis of visitors' opinions on the *TripAdvisor* website. We analysed all traveller contributions from 2010 (the first year when opinions about the island were recorded) to 2016. After discarding the comments that offered no justification for the evaluation, finally a total of 588 comments were analysed.

TripAdvisor classifies people's opinions by dividing them into five categories (lousy, very bad, normal, very good and excellent). Table 2 shows a summary of these evaluations during the period considered, grouping the categories into three levels: negative opinions (which includes the ratings 'lousy' and 'very bad'), neutral opinions (i.e. the evaluation 'normal') and positive opinions (which combines the evaluations 'very good' and 'excellent'). As can be observed, the number of evaluations has increased in recent years in a very significant way. In general, the vast majority of the opinions about Lobos (more than 85% in 2016) are positive, whereas the negative opinions make up less than 5%, which indicates that the overall perception of the island is that of a quality destination.

Table 2. Number of opinions according to evaluation of the destination.

Year	2010	2011	2012	2013	2014	2015	2016	Total
Number of opinions								
Negative	0	1	0	4	7	6	9	27
Neutral	0	0	3	4	10	14	24	55
Positive	1	9	25	44	80	127	220	506
Total	1	10	28	52	97	147	253	588
Percentage on the total of opinions in high season								
Negative		0	0	11	14	4	6	
Neutral		0	0	7	10	14	12	
Positive		100	100	82	76	83	82	
Total	0	100	100	100	100	100	100	
Percentage on the total of opinions in low season								
Negative	0	14	0	4	0	4	1	
Neutral	0	0	18	8	11	4	7	
Positive	100	86	82	88	89	91	93	
Total	100	100	100	100	100	100	100	

Note: *Negative*: Those opinions ranking destination as 'dreadful' or 'very bad'; *Neutral*: Those opinions ranking destination as 'normal'; *Positive*: Those opinions ranking destination as 'very good' or 'excellent'.

Detailed analysis of the figures shows, however, that there is an increase in negative evaluations, especially during the months of higher saturation. The table lists the percentage of evaluations, differentiating those that were given in high season (during the months of June to September) to those that refer to low season. Comparing the results from both seasons, it is observed that in low season, the negative and neutral opinions comprise 8% of the evaluations, while in high season, these comments account for 18%. Table 3 performs a content analysis of the visitor comments in order to determine the reasons for this lower evaluation in the high season months. The table resumes the number of comments addressing particular issues, differentiating between high and low season (H or L). Comments were classified as having a positive, negative or neutral character. We initially observed a majority of positive comments (1012 comments, 72% of the total comments) over negative comments (347 comments, 25% of the total comments; note that the number of comments is much higher than that of the ratings because each *TripAdvisor* user can submit many comments on the destination but only one evaluation of it).

Table 3. Comments about Lobos on the TripAdvisor website (2010–2016)

Year	2010	2011		2012		2013		2014		2015		2016		2010-2016	Percentage on the total of (...)			
Season (H: high; L: low)	L	H	L	H	L	H	L	H	L	H	L	H	L	Total	...negative comments	...positive comments	...all comments	...people commenting
Number of people commenting	1	3	7	11	17	28	24	50	47	80	67	132	121	588				
Negative comments														347	100%		25%	
Overcrowding	1	0	0	0	0	4	1	4	4	4	3	24	9	54	16%		4%	9%
Too many boats	0	0	0	0	0	0	0	0	0	1	1	3	0	5	1%		<1%	1%
Crowded restaurant	0	1	0	1	1	5	0	8	5	14	6	32	24	97	28%		7%	16%
Dirty	0	0	0	0	0	1	0	1	1	0	2	2	1	8	2%		1%	1%
Danger of continuous entry and exit of boats	0	0	0	0	0	0	0	0	0	0	1	1	0	2	1%		<1%	<1%
No shade	0	0	0	1	3	4	3	11	7	14	11	21	15	90	26%		6%	15%
Transport to the island poor	0	0	0	0	0	0	0	1	0	1	0	4	0	6	2%		<1%	1%
Poor accessibility	0	0	0	1	1	0	0	0	3	1	1	2	3	12	3%		1%	2%
Lack of infrastructure	0	0	2	2	1	0	2	6	6	4	10	8	11	52	15%		4%	9%
Lack of toilets	0	0	0	0	1	0	1	0	3	2	6	5	1	19	5%		1%	3%
Visual impact from houses	0	0	0	0	0	0	0	0	0	0	0	1	1	2	1%		<1%	<1%
Neutral comments																		
It is nothing special	0	0	1	1	3	6	2	7	1	7	2	15	6	51			3%	1%
Positive comments														1012		100%	72%	
Beautiful beach	0	1	4	5	7	9	4	17	11	43	29	45	38	213		21%	15%	36%
Nice views/landscape	0	3	3	6	8	12	16	23	26	47	49	58	68	319		32%	23%	54%
Peaceful	0	1	2	7	4	3	8	11	13	14	24	34	42	163		16%	12%	28%
Clean water	1	2	2	8	4	10	7	19	17	30	17	45	35	197		19%	14%	34%
Charming	0	0	0	0	3	1	0	0	5	8	4	15	12	48		5%	3%	8%
Unspoilt nature	0	0	0	0	0	4	3	4	6	4	11	19	21	72		7%	5%	12%

Note: H: high season (4 months from June to September); L: low season (rest of the year).

As for the positive evaluations, they highlight the beauty of the views/landscapes (32% of the total positive comments), the beauty of the beaches (21%), the water quality (19%) and the tranquillity (16%). In relation to the negative valuations, it is observed that these have increased over time and are concentrated in the high season periods. The most repeated negative comments relate to the lack of shade (26%) and saturation in the restaurant (28%). However, on certain occasions, the comments on these two aspects did not have clear negative connotations but rather took the form of advice or warnings to other users. Conversely, the level of saturation, always had a marked negative character,

was pointed out by 9% of people (accounting for 16% of the total negative comments). These percentages would increase to 20% if we were to include other signs of congestion such as excess vessels (2%), the danger of continuous entry and exit of boats (1%) and the growing perception of dirtiness (2%). To these, we could also add the lack of space in the restaurant, which, on many occasions, was associated with comments about the saturation level of the island. The lack of infrastructure shows some percentages similar to congestion (9% of people and 15% of negative comments); the toilets being the main concern (5%of all negative comments).

In general, it can be noted that opinions about the island are very positive, with the landscapes and the quality of the beaches (especially the clarity of the water) being the attributes mentioned most often. With regard to the clearly negative comments, besides the lack of shade, there were an increasing number of comments about congestion and its effects (saturation in the restaurant, dirtiness, etc.), and the lack of infrastructure (mainly toilets), especially in the high season months.

Methodology

Discrete Choice Models and State Preferences

Since we are analysing a hypothetical market it is convenient to employ stated preference (SP) methods for data collection (see, for instance Louviere et al 2000). SP are very common in environmental economics (Boxal et al. 1996) as it is used for the economic valuation of non-market goods. In SP, individuals are asked to elicit their preferred option within a set of hypothetical alternatives. These alternatives usually represent different policy interventions compared with the current situation, or so-called status quo.

Information is modelled employing discrete choice modelling (DCM). This type of model analyses situations where any individual q faces a set of J well-defined alternatives (see, for example, Train, 2011). Each alternative j is attached to certain utility U_{jq} and it is assumed that individuals will choose the alternative with the highest utility. Utility, at the same time is decomposed into attributes (Lancaster, 1966). These attributes X_{jq} are characteristics that describe the good that we are analysing. These attributes and their levels are combined in bundles that will create alternatives. The utility is measured as the weighted sum of these attributes. Weights are called betas and represent the ultimate object of estimation.

$$U_j = \beta_{0j} + \beta_{1j}\chi_{1j} + \cdots + \beta_{kj}\chi_{kj} + \varepsilon_{qj} \quad (1)$$

In equation (1) we have a part that can be measured (deterministic) and an error component ε. This error represents the observed inconsistency of individuals when they choose and the lack of information of the modeller. Depending on the type of distribution of this error there will be different models. Assuming that ε is a random variable independent and identically distributed and extreme value type I, the model will be a multinomial logit (MNL) (see, for instance Ortúzar & Willungsem, 2011). For a MNL, the probability of choosing alternative j is given by this expression (McFaddem 1974):

$$P_{qj} = \frac{e^{V_{qj}}}{\sum_j e^{V_{qj}}} \quad (2)$$

From here, the model is estimated by maximum likelihood. That is: estimated parameters beta are those who maximize the likelihood function. A likelihood function is the product of probability of each observed choice.

Mixed logit (ML), also called Random Parameter Logit (RPL), is a more advanced model that assumes that betas are random parameters. A ML provides the parameters (mean and variance) that describe its underlying distribution $f(\beta|\theta)$. In this case, the probability of choosing alternative j for individual q has a non-closed form expression (Ortúzar and Willumsen, 2011):

$$P_{iq} = \int L_{iq}(\beta) f(\beta|\theta) d\theta \quad (3)$$

Where L represents a simple Logit. This probability is estimated maximizing the log-likelihood with simulation.

Questionnaire

We implemented the questionnaire using the Google forms toolkit for online questionnaires. As most of responses should be collected via smartphones we had to avoid complicated designs. This method imposed limitations on the number of attributes and levels, as we will see shortly.

The questionnaire was administrated using social networks, mail contacts and the instant messaging platform *Whatsapp*. We applied a snowball sampling method (Biernacki and Waldorf, 1981). Eventually we collected 303 valid responses, of which 37.6% were residents of the island of Fuerteventura. 65% of the sample had visited Lobos at least once.

The questionnaire was divided into four parts: firstly, we sought opinions about the island in general and asked about a hypothetical entry fee. These questions were arranged as Likert scales statements from 'totally agree' to 'totally disagree' using five levels. The second part contains questions about the number of times the respondent was planning to visit Lobos, average spending in each visit, general opinions about an entry fee and their willingness to pay it. The third part included the choice scenarios of the stated preference experiment and the final part contained socioeconomic questions.

Attributes and levels were arranged after analysing over 500 visitors' opinions about Lobos on the *Tripadvisor* website. Although most of the opinions showed positive attributes of the island such as tranquillity and cleanliness, a significant number of users complained about the crowded beaches in summer and the lack of toilets.

Given the limitations of a mobile-phone questionnaire, we selected only three attributes: number of toilets, congestion, and entry fee. Visually these attributes were depicted in this way: Toilets were represented on a map of the island, with icons of "WC" located in the area of El Puertito (where the visitors' centre and restaurant are located), near the main beach of Island (La Caleta beach, also named La Concha beach, see figure 1). Regarding congestion, as most of the visitors spend the whole day on this beach, we decided to concentrate on the perceived congestion in this area of the island. According to the available data, the beach of La Caleta has dimensions of about 140 meters long by 20 meters wide, which implies an area of 2,800 m^2. With the average estimated visitor

level (385 users/day), there would be about 14 users per 100 m^2, which was considered to be the Status Quo level of congestion in our experiment. Figure 2 shows an example of a choice card. For each scenario, the image shown represents a sand portion of dimensions 14x7.5 metres (approximately 100 m^2) and around 50 m^2 of water surface. The attribute congestion was represented with certain number of users shown as dots in the image (see figure 2).

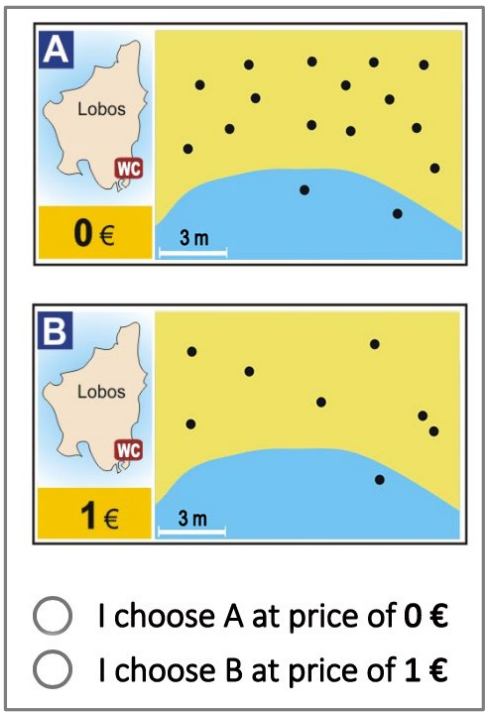

Figure 2. Example of screen with choice card.

Table 4 shows the attributes and levels. We set 13 scenarios with two alternatives (A and B). Status Quo was described as a free entrance with just one toilet and a medium congestion level in the beach. Price levels were defined as price per person and visit, payable upon entry to the island (including access by private boat). In the design of the scenarios, in the absence of additional information, it is common to choose an orthogonal design (Street and Burgess, 2007); however, since there are only three attributes we applied a full factorial design (eliminating those in which there was no choice because the free scenario was better than the alternative -with tax- on all attributes). Finally, after eliminating individuals who stated that they had not paid attention to all the attributes of the exercise, the model was estimated with 292 responses.

Table 4. Attributes and levels (SQ marked with *)

Attributes	Levels	How is it shown in the card?
Toilets	Low*	Map of the island with 1 WC icon
	High	Map of the island with 3 WC icons
Congestion	Low (half SQ)	Beach image with 8 dots
	Medium*: SQ	Beach image with 16 dots
	High: (double than SQ)	Beach image with 32 dots
Fares	0*, 1, 3, 7 and 10	

Note: SQ: status quo; WC: toilet.

Results

Likert scale

The first part of the questionnaire included some questions to analyse the visitors' perception of the main attributes of the quality of the island. Within the sample, there was a large proportion of individuals (65%) that had visited Lobos in the past. Those who had not visited the island before argued that they had not had chance to do so. In general, respondents ranked high in their awareness of the environmental attributes of the island. For instance, 94% knew the island of Lobos is within a natural protected area. According to the sample, the island is visited mainly by groups and the preferred transport mode to access is a regular line boat (83.6%). 30% of respondents stated that they had stayed overnight in Lobos. Approximately 55% of the people in the sample estimated spending from 10 to 20 € during their stay on the island.

In general, opinions about Lobos were very positive among persons who declared that they had visited Lobos before. They highlighted the tranquillity of the island as the most important attribute for 76% of the sample, followed by the quality of landscape (71.6%) and the quality of the beaches (47.7%). Clearly, visitors consider Lobos as a nice and quiet place to enjoy a beach day, and are much less attracted by other natural values such as birds or vegetation. These findings are consistent with the opinions shown on the *Tripadvisor* website. Results from the Likert scale questionnaire to residents that already had visited Lobos (n=197) are shown in table 5. A first group of questions show that, in general, people are aware of the natural values of the island, although one third of the visitors do not know the regulations about permitted or forbidden activities on it. A second group of questions in the table were related to the perception of congestion. It seems that here is a generalized perception of the excessive congestion: 55.8% agree with the statement "*the beach is too crowded in summer*" (whereas only 17.3% disagree). Congestion is also perceived as difficulty to be attended in the restaurant (by 57.9% of the sample) although its consequences in terms of dirt on the island are only perceived by 21.8% of people.

Most people believe that some intervention is needed to control the effects of overcrowding, for example, limiting the number of boats anchored in the bay of Lobos (44.7% in favour, whereas 25.4% disagree) or controlling the entrance of visitors (42.6% agree or totally agree). There is a significant perception that overcrowding will destroy the charm of the island unless some measure is taken (49.7% agree or totally agree with this, a figure that is almost double the percentage of people disagreeing).

Regarding the infrastructures of the island, some of the complaints of the visitors deal with the lack of shade, wastebaskets and lifeguards. Nevertheless, the main demand of users regards the lack of toilets: 64% of the sample agree or totally agree with the statement "*there is a lack of public toilets on the island*".

Table 5. Visitors' perception of Lobos.

Statements	Percentage of responses. Likert Scale (previous visitors sample: n=197)				
	Totally disagree	Disagree	Neutral	Agree	Totally agree
Degree of knowledge about Lobos					
I know the regulations about permitted activities	18,3	14,7	26,9	14,2	25,9
I know about the natural values of Lobos	7,6	8,1	26,4	27,4	30,5
Perception of congestion and its effects					
The beach is too crowded in summer	5,6	11,7	26,9	28,9	26,9
It is difficult to be attended in the restaurant in summer	5,1	10,2	26,9	26,9	31,0
There is too much garbage	17,3	33,0	27,9	13,7	8,1
The number of ships should be limited	11,7	13,7	29,9	14,2	30,5
Entrance of visitors should be controlled	16,2	19,3	21,8	20,8	21,8
If some action is not taken, overcrowding will destroy the charm of the island	14,7	11,2	24,4	20,3	29,4
Infrastructures and services					
There is a lack of public toilets	6,6	11,2	18,3	25,9	38,1
I would like more areas with shade	12,2	14,2	17,3	24,9	31,5
there are not enough garbage bins	9,1	12,7	25,4	29,9	22,8
The dock is not safe enough	21,8	21,8	25,9	19,3	11,2
A lifeguard is needed	14,7	16,8	19,8	19,8	28,9
I would like a touristic guide	28,4	21,3	18,3	16,8	15,2
The quality of the restaurant is good enough	5,6	17,3	45,2	15,2	16,8
Paths are properly signalled	7,1	8,1	24,4	31,5	28,9
There are enough leisure activities	11,7	17,8	33,5	17,8	19,3
There should be another shop and another restaurant	25,4	13,2	19,8	15,2	26,4
The houses on the island have a negative visual impact on landscape	42,1	20,3	20,8	7,1	9,6

The next part of the questionnaire focused on finding out opinions regarding the collection of a hypothetical entry fee to the island. The results of table 6 show an initial rejection to payment in a significantly important part of the sample (43.9%) compared with those who support it (40.9%). A large majority of the sample (62.7%) rejects the idea of a fee for residents, but support the idea that tourists should pay more than residents (59.4% agree or totally agree). The lack of equity (meaning harming visitors of lower income) was claimed by 43.9% of the sample as an argument to oppose the pricing, although the biggest objection had to do with the lack of confidence in politicians and their management of the money collected, reported by 54,8% of people interviewed.

Table 6. Public opinions about an access price to Lobos

Statements regarding "pricing access to Lobos"	Percentage of responses. Likert Scale (whole sample: n=303)				
	Totally disagree	Disagree	Neutral	Agree	Totally agree
I think that this is a good measure	28,4	15,5	15,2	17,8	23,1
This will be in favour of people with higher income	21,8	10,9	23,4	15,2	28,7
I think that residents should not pay anything	14,2	10,9	12,2	13,2	49,5
Tourists should pay more than residents	16,2	6,9	17,5	20,5	38,9
I think that this will be effective in reducing the number of visitors	16,8	12,5	27,1	19,8	23,8
I don´t trust politicians and their use of money	17,5	10,6	17,2	14,2	40,6
If imposed, I will visit the island less often	26,4	13,5	20,8	15,5	23,8
If I had to pay an entrance fee, I would spend less money in Lobos	24,4	10,6	21,5	19,1	24,4
I would never pay an entrance fee	40,6	19,8	21,5	3,0	15,2
Ï would not mind paying a reasonable price	13,9	11,2	19,1	15,2	40,6

Although the data are not included in the table, it is important to note that the opinions against the entrance fee become more radical in those users who visit this island more frequently. Acceptance of payment increases substantially in the subsample of people who have not visited Lobos before (where 54.7% believe it is a good measure, and 68.9% are willing to pay a "reasonable" price). In contrast, a 50.8 per cent of users who visit the island frequently declared that they would never pay. In contrast, the results of the whole sample show that, in the event that an entry price was imposed, the majority of people would finally accept it (18.2% declared not to be willing to pay, and a 55.8% agree or strongly agree to pay a reasonable price). Nevertheless, this might imply spending less money during their stay on the island (an opinion shared by the 43.6% of the sample).

The questionnaire also included a question about the preferred usage of the revenues. This issue becomes very relevant to increase the acceptance of the pricing scheme. The results shown in table 7 clearly indicate that the money raised should be reinvested in the island itself. In order of preference, 88.4% support the idea of employing revenues in "*cleaning and waste management*", "*improving existing infrastructure"* (67.9%),"*increase surveillance and control of non-permitted activities*" (49.3%) and "*environmental research on the island*" (48.7%). Only 3% chose to allocate the money to "*other purposes not related to Lobos*".

In summary, the results of the survey of opinion about Lobos show that users appreciate the tranquillity and the landscape as the most outstanding elements of the island. However, there is also the perception that there are deficiencies in some of the facilities on the island, especially in terms of a shortage of toilets and that there are too many visitors (especially in the summer months). The consequences of this high number of visits begin to be evident in terms of waiting time in the restaurant and overcrowding on the beach. The generally accepted opinion is that action should be taken with some measure of control before this overcrowding spoils the charm of the island.

Among the measures proposed, most support the control of both the entry of people and the anchorage of boats. The policy of collecting an entry fee, however, is initially rejected

(especially by the most frequent visitors), based on reasons of fairness and, above all, the lack of confidence in the politicians' management of the money. However, there is a general willingness to accept an entry price if set at a reasonable level, and this acceptance is greater as the collected revenue is reinvested in the maintenance of the island itself.

Table 7 Preferred use of revenue from entrance fees.
Percentage of people choosing each option (multiple answers allowed)

Preferred destination of money collected	Non visitors n=106	Previous visitors n=197	Frequent visitors n=59	Entire sample n=303
Financing costs of cleaning and waste management	85,8	89,8	88,1	88,4
Improving and maintaining existing public infrastructure	65,1	69,5	66,1	68,0
Increasing surveillance and control of forbidden activities	54,7	46,2	37,3	49,2
Financing research on the environment of the island	52,8	46,2	30,5	48,5
Creating areas with shade	22,6	45,2	45,8	37,3
Creating a lifeguard point	23,6	37,6	39,0	32,7
Controlling entrance onto the island	31,1	29,9	28,8	30,4
Creating guided routes	26,4	25,4	11,9	25,7
Improving signage	17,9	20,8	18,6	19,8
Improving the restaurant and houses	16,0	14,2	13,6	14,9
Financing other public services not related to Lobos	0,9	4,1	5,1	3,0

Modelling

The efforts in this section are focused on the valuation of the most relevant quality attributes of the island as discussed in previous sections. Firstly, we estimated an MNL displayed in Table 8. The model was estimated using Biogeme (Bierlaire, 2003). As can be seen, all parameters show correct signs and 99% significance. The negative value of the SQ represents the disutility of the current situation, which justifies the need for an intervention. In addition, this parameter is the second most important after congestion (represented as density of people on the beach). Price is negative and shows a high significance. 'Toilets' express the contribution to the utility function of an additional toilet compared to the SQ. Thus, from the model, we infer that individuals are dissatisfied with the current situation and that the perception of congestion is highly negative.

In order to obtain willingness to pay, we estimated a nonlinear utility function (Train and Weeks, 2005). This way of estimating willingness to pay is the result of the estimation problems derived from taking ratios in the case of the ML (see, e.g. the explanation in Armstrong et al., 2001). The results obtained are shown in Table 9. Some random parameters are presented with their mean and deviation. In all cases, they follow a normal distribution. Note, on the other hand, that the model is robust, since all the estimated parameters are significant at 99% and have the expected sign.

Table 8. MNL model

Name	Value	t-test
Status Quo	-0.409	-4.05
Toilets	0.328	3.48
Congestion	-0.885	-14.16
Price	-0.295	-22.92
Log-likelihood	-2264.172	
Constant Log-Likelihood	-2605.611	
Rho-squared	0.160	
Adjusted Rho-squared	0.158	
Individuals	292	
Pseudo individuals	3796	
k	4	

In order to obtain willingness to pay, we estimated a nonlinear utility function (Train and Weeks, 2005). This way of estimating willingness to pay is the result of the estimation problems derived from taking ratios in the case of the ML (see, e.g. the explanation in Armstrong et al., 2001). The results obtained are shown in Table 9. Some random parameters are presented with their mean and deviation. In all cases, they follow a normal distribution. Note, on the other hand, that the model is robust, since all the estimated parameters are significant at 99% and have the expected sign.

Table 9. Willingness to pay

Attribute		coefficient	t-ratio
WTP for the alternative		2.42	10.43
Alternative for residents		-1.59	-4.29
Price	μ	-0.715	-15.69
	sd	0.233	6.26
WTP toilets	μ	0.517	2.60
	sd	2.61	12.33
WTP congestion	μ	-0.291	-9.32
	sd	0.434	16.33
Log-Likelihood	-1670.853		
Constant Log-Likelihood	-2546.252		
Rho-squared	0.365		
Adjusted Rho-squared	0.362		
Individuals	292		
Pseudo individuals	3796		
k	8		

We begin with the willingness to pay for the intervention (access fee) of €2.42. This indicates that regardless of congestion, individuals see other advantages in a paid entrance. Here, we could consider, for example, environmental aspects that are somehow

implicit in the project. We estimated a coefficient that represents the interaction with residents. As expected, this parameter was negative, with a value of -1.59, which means that the willingness to pay by residents should be reduced by that amount, after which it remains positive (0.83).

Price is negative but it shows a considerable deviation, which allows us to calculate the positive range. This is below 10%, which is considered acceptable (see for example, Sillano and Ortúzar, 2005). The willingness to pay for toilets is, on average, €0.517.

The most interesting attribute for our analysis is congestion. Bear in mind that this has been presented as individuals on the beach at various levels (8, 16 and 32). The average payment for reducing congestion in one individual is €0.291. Given that the SQ was fixed in 16 individuals on the card, an improvement to half supposes €2.32. In total, for non-residents, we would have a willingness to pay, including all aspects of the project, of €5.75 (assuming an increase in two toilets and halving congestion).

Estimation of revenues

It would be very useful to estimate the pricing share, that is, the proportion of individuals that would actually pay the fare. Assuming that the sample is representative, it is possible to apply the sample enumeration method. As explained in Ortu´zar and Willumsen (2011: 338)

$$P_{jq} = \frac{1}{Q}\sum_q f_j(X_q) \quad (4)$$

where Pjq represents the market share of alternative j, which has been obtained averaging the probability of choosing this alternative for the entire sample.

As the fees increase, the portion of individuals interested in accessing to the island diminishes. Table 10 displays a sensitivity analysis with different fee scenarios. The departing point is the initial situation represented by 0 fees and the estimated visitors – using the garbage method – of 140,000 per year. This figure can be split into low and high season as 234 and 547 visitors per day, assuming that each season lasts for 6 months. As the fees are introduced, the number of visitors drops and income increases. Revenues are maximized with a fee of around €21 which brings a return of €1,526,000.

Currently, maintenance and cleaning of the island are the responsibility of a private company (TRAGSA), which operates under a concessional contract subsidized by the local government, amounting a total yearly cost of €243,496. The application of a pricing system would have some additional costs associated (ticketing system, entrance control, inspection and supervision, etc.); also new toilets would increase these maintenance costs. Taking into account all these extra payments, we estimated that the total yearly costs of maintenance could range from €300,000 to €500,000.

Yet, local authorities might be interested in dissuading some tourists and recovering the above-mentioned maintenance expenses. These reasons, and the fact that the majority of visitors are residents with a lower WTP, suggest a policy recommendation of a flat fare ranging from €3 to €5.

Table 10: Simulated fare scenarios and demand

Price (€)	Revenues (€)			Visitors		
	high season	low season	total revenues per year	high season	low season	total visitors per year
1.00	77,147	33,002	110,149	77,147	33,002	110,149
3.00	221,782	94,875	316,657	73,927	31,625	105,552
5.00	352,592	150,834	503,426	70,518	30,167	100,685
7.00	472,086	201,952	674,038	67,441	28,850	96,291
10.00	640,176	273,858	914,034	64,017	27,386	91,403
15.00	904,356	386,871	1,291,227	60,290	25,791	86,081
20.00	1,084,011	463,724	1,547,735	54,200	23,186	77,386
21.19	1,094,313	468,132	1,562,445	22,090	22,090	44,180
21.30	1,094,339	468,143	1,562,483	51,372	21,979	73,350
25.00	992,498	424,577	1,417,075	39,700	16,983	56,683

Despite the scarcity of statistical information about the current number of visitors, this approximation allows us to conclude that there is a great potential for revenue generation from introducing a pricing policy to the island of Lobos. But, even in this very limited and simple case of a flat fare, results show an estimation of revenue that could cover all the maintenance costs of the island. Of course, a much more precise pricing scheme could be designed where more complete information about the demand performance available.

Conclusions

In the last few years, the protected natural space of the island of Lobos (Canary Islands) has been receiving an increasing number of visitors, exceeding the current carrying capacity. Among residents, there is a clear perception of overcrowding, which could have significant negative impacts, both in terms of environmental impacts and loss of quietness. Perceived congestion appears as a signal of these problems that justify some degree of public control of the entrance.

Besides the introduction of measures to effectively control the number of visitors accessing the island, the local government is considering introducing an entrance fee as an instrument to reduce access demand and also to generate revenue to cover some of the maintenance costs of the protected area. In this article, we present an analysis of the public reaction towards the implementation of an access fee to enter in the island.

We first analysed more than 500 opinions of visitors of Lobos collected in the *TripAdvisor* website, which showed that the island was highly valued for its quietness and its beaches, but that there is a perception of overcrowding, especially in summer and a lack of public toilets. Then, using the Google forms toolkit, we launched an online questionnaire, mainly distributed via smartphones, that received 303 individual responses.

Aligned with the empirical evidence in the literature, results of our study show that the possible implementation of an access fee initially generates significant level of rejection among residents, although there is a consensus that tourists should pay more than residents. The main reason for this rejection is lack of trust in how politicians will manage

the revenue generated. Despite this initial rejection, opinions show that visitors might eventually accept a reasonable payment, mainly if the money raised from the toll system were fully reinvested in the environmental improvement of the island in a way that this improvement is clearly perceived by users. Responses confirmed that congestion and toilets were two of the most important features affecting the perceived quality of the island. These two issues (congestion and number of toilets) were identified as two of the main attributes to be included in a choice experiment.

We estimated an MNL and a WTP space model considering all random parameters following a normal distribution. It is necessary to highlight the limitations of the model, given the simplicity of the experiment and the lack of data; nevertheless, even with these shortcomings, the estimated model enabled us to find out the potential benefits of a pricing scheme in the island. Results showed a significant willingness to pay an entrance fee to the island of Lobos, with a baseline value of €2.4 for non-residents and approximately €0.8 for residents. These values might be larger when people perceive direct benefits from the payment in terms of improving infrastructure of the island and reducing congestion. In this sense, the model suggests a WTP of €0.5 for every additional toilet. Finally, the introduction of perceived congestion (presented in the experiment as different levels of concentration of users on the main beach of the island) permitted to estimate the disutility associated with overcrowding and a clear willingness to pay of around €5 if congestion is halved from its present value. A simulation of the number of visitors under the existence of a paid entrance suggests a fee in the range of €3–5, which seems enough to curb an excessive demand and provide enough support for maintenance costs.

Authors' note: An initial version of this article was presented at 6th Conference of the International Association for Tourism Economics (2017).

Acknowledgements: The authors would like to thank Ilmo. Mr President of the Cabildo Insular of Fuerteventura Marcial Morales and the Deputy for Fuerteventura of the Parliament of the Canary Islands Ms Nereida Calero. The authors would also like to thank the collaboration of the students of the course 2015/16 of the subject 'Evaluation of Projects and Tourism Policies' of the degree in tourism, University of Las Palmas de Gran Canaria for helping in distributing the questionnaire.

Declaration of conflicting interests: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. Funding The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

Alpízar, F. (2006) The pricing of protected areas in nature-based tourism: A local perspective. *Ecological Economics* 56(2): 294-307.

Armstrong, P., Garrido, R. & Ortúzar, J. de D. (2001) Confidence intervals to bound the value of time. *Transportation Research Part E* 37: 143–161.

Becker, N. (2009) A comparative analysis of the pricing systems of nature reserves. *Tourism Economics* 15(1): 193-213.

Bierlaire, M. (2003) *BIOGEME: A free package for the estimation of discrete choice models.* Proceedings of the 3rd Swiss Transportation Research Conference. Ascona, Switzerland.

Biernacki, P. & Waldorf, D. (1981). Snowball sampling: Problems and techniques of chain referral sampling. *Sociological methods & research*, 10(2): 141-163.

Boxall, P. C., Adamowicz, W. L., Swait, J., Williams, M., & Louviere, J. (1996). A *comparison of stated preference methods for environmental valuation. Ecological economics,* 18(3): 243-253.

Buckley, R. (2003) Pay to play in parks: An Australian policy perspective on visitor fees in public protected areas. *Journal of Sustainable Tourism* 11(1): 56-73.

Buckley, R. (2003) Pay to play in parks: An Australian policy perspective on visitor fees in public protected areas. *Journal of Sustainable Tourism*, 11(1): 56-73.

Casey, J. F., Brown, C. & Schuhmann, P. (2010) Are tourists willing to pay additional fees to protect corals in Mexico?. *Journal of Sustainable Tourism*, *18*(4): 557-573.

Chase, L. C., Lee, D. R., Schulze, W. D. & Anderson, D. J. (1998) Ecotourism demand and differential pricing of national park access in Costa Rica. *Land Economics* 74(4): 466-482.

Cifuentes, M. (1992) Determinación de capacidad de carga turística en áreas protegidas. *Centro Agronómico Tropical de Investigación y Enseñanza (CATIE). Serie Técnica*. Informe Técnico No. 194. Turrialba, Costa Rica.

Cole, D. N., Petersen, M. E. & Lucas, R. C. (1987) Managing wilderness recreation use: common problems and potential solutions. Gen. Tech. Rep. INT-GTR-230. USDA Forest Service, Intermountain Research Station, Ogden, UT, USA.

Cruz, J. L. L. (2008) Estimación de la tarifa de acceso al parque regional Johnny cay (San Andrés isla). *Ensayos de Economía* 18(32): 99-134.

Depondt, F. & Green, E. (2006) Diving user fees and the financial sustainability of marine protected areas: Opportunities and impediments. *Ocean & Coastal Management* 49(3): 188-202.

Dharmaratne, G. S., Sang, F. Y. & Walling, L. J. (2000) Tourism potentials for financing protected areas. *Annals of Tourism Research*, *27*(3): 590-610.

Eagles, P. F. J., McCool, S.F. & Haynes, C.D. (2002) Sustainable Tourism in protected areas. Guidelines for Planning and Management, in Phillips, A. (Ed) *Best Practice protected area guidelines Series* No. 8. World Commission on Protected Areas (WCPA). IUCN. Gland, Switzerland and Cambridge.

Edwards, P. E. (2009) Sustainable financing for ocean and coastal management in Jamaica: The potential for revenues from tourist user fees. *Marine Policy* 33(2): 376-385.

Fleming, C. M. & Manning, M. (2015) Rationing access to protected natural areas: an Australian case study. *Tourism Economics*, *21*(5): 995-1014.

Goodwin H. J., Kent I. J., Parker, K. T. & Walpole, M. J. (1997) *Tourism, conservation and sustainable development, vol. 1: comparative report (Komodo National Park (Indonesia), Keoladeo National Park (India) and the South-East Lowveld (Zimbabwe)*. Final report to the Department for International Development, UK.

Grisolía, J. M., López-del-Pino, F. & Ortúzar, J. de D. (2015) Increasing the acceptability of a congestion charging scheme. *Transport Policy*, *39*: 37-47.

Guatisea (2016) *Capacidad de Carga. Revisión parcial del Plan Rector de Uso y Gestión del islote de Lobos* (F-1) Fuerteventura.

Henderson, J. C. (2001) Developing and managing small islands as tourist attractions. *Tourism and Hospitality Research*, *3*(2): 120-131.

Hindsley, P., Landry, C. E., Bin, Okmyung. & Vogelsong, H. (2007) Site congestion in *recreation choice models: A generated regressors approach to beach site selection*. Working paper. East Carolina University.

Knapman, B. & Stoeckl, N. (1995). Recreation user fees: an Australian empirical investigation. *Tourism Economics*, *1*(1), 5-15.

Laarman, J. G. & Gregersen, H. M. (1996) Pricing policy in nature-based tourism. *Tourism management*, 17(4), 247-254.

Lancaster, K. J. (1966) A new approach to consumer theory. *Journal of Political Economy* 74: 132–157.

Lee, D. & Pearce, P. L. (2002) Community attitudes to the acceptability of user fees in natural settings. *Tourism and Hospitality Research*, 4(2): 158-173.

Louviere, J. Hensher, D. & Swait, J. (2000) Sta*ted Choice Methods: Analysis and Application*. Cambridge University Press, Cambridge, UK.

McConnell, K. E. (1977) Congestion and willingness to pay: A study of beach use. *Land economics* 53(2): 185-195.

McElroy, J. L. (2003) Tourism development in small islands across the world. Geografiska Annaler: Series B, *Human Geography*, 85(4): 231-242.

McFadden, D. L. (1974) Conditional logit analysis of qualitative choice behavior. In P. Zrembka (ed.), *Frontiers in Econometrics*. Academic Press. New York: 105-142.

Mmopelwa, G., Kgathi, D. L. & Molefhe, L. (2007). Tourists' perceptions and their willingness to pay for park fees: A case study of self-drive tourists and clients for mobile tour operators in Moremi Game Reserve, Botswana. *Tourism Manage*ment, 28(4): 1044-1056.

Oh, C. O., Draper, J. & Dixon, A. W. (2010) Comparing resident and tourist preferences for public beach access and related amenities. Ocean & Coastal Management 53(5): 245-251.

Ortúzar, J. de D. & Willumsen, L. G. (1994) *Modelling transport*. New Jersey: Wiley.

Park, J., Ellis, G. D., Kim, S. S. & Prideaux, B. (2010) An investigation of perceptions of social equity and price acceptability judgments for campers in the US national forest. *Tourism Management* 31(2): 202-212.

Reynisdottir, M., Song, H. & Agrusa, J. (2008) Willingness to pay entrance fees to natural attractions: An Icelandic case study. *Tourism Management*, 29(6): 1076-1083.

Rivera-Planter, M. & Muñoz-Piña, C. (2005) Fees for reefs: economic instruments to protect Mexico's marine natural areas. *Current issues in tourism*, 8(2-3): 195-213.

Ruiz, P. & Sánchez, A. (2016) Parque Natural Islote de Lobos. Uso público y gestión. Capacidad de carga. Paper presented at *14 Conferencia Atlántica de Medio Ambiente (CAMA 2016).* 15-16 december 12016. Cabildo de Fuerteventura

Roca, J., Puig, I., Hercowitz, M. & Hernández, O. (2003) *Fiscalidad y medio ambiente en la isla de Lanzarote*. Proyecto Life de la Unión Europea ENV/E/0000400. Obra Social de La Caja de Canarias.

Scarpa, R., Chilton, S.M., Hutchinson, W.G. & Buongiorno, J.,(2000) Valuing the recreational benefits from the creation of nature reserves in Irish forests. *Ecological Economics* 33: 237-250.

Schroeder, H. W. & Louviere, J. (1999) Stated choice models for predicting the impact of user fees at public recreation sites. *Journal of Leisure Research*, 31(3): 300-324.

Schultz, S., Pinazzo, J. & Cifuentes, M. (1998) Opportunities and limitations of contingent valuation surveys to determine national park entrance fees: evidence from Costa Rica. *Environment and Development Economics* 3: 131-149.

Siddiqui, R. (2003) Economic Valuation of the Environment and the Travel Cost Approach: The Case of Ayubia National Park [with Comments]. *The Pakistan Development Review*, 42(4): 537-551.

Sillano, M. & Ortúzar, J. de D. (2005) Willingness-to-pay estimation with mixed logit models: some new evidence. *Environment and Planning A* 37(3): 525-550.

Simancas, M.R. (2006) Los modelos de uso turístico de las áreas protegidas de Canarias: una propuesta metodológica. *Investigaciones geográficas* 39: 25-46.

Simancas, M.R. (2008) El sistema de cobro de una tasa pública por la prestación de servicios turísticos en las áreas protegidas de Canarias. *Cuadernos de turismo* 21: 201-237.

Steckenreuter, A. & Wolf, I. D. (2013) How to use persuasive communication to encourage visitors to pay park user fees. *Tourism Management*, 3: 58-70.

Street, D. J. & Burgess, L. (2007) T*he construction of optimal stated choice experiments: theory and methods* (Vol. 647). John Wiley & Sons.

Taylor, J. E., Hardner, J. & Stewart, M. (2009) Ecotourism and economic growth in the Galapagos: an island economy-wide analysis. *Environment and Development Economic*s, 14(02): 139-162.

Thur, S. M. (2010) User fees as sustainable financing mechanisms for marine protected areas: An application to the Bonaire National Marine Park. *Marine policy* 34(1): 63-69.

Timmins, C. & Murdock, J. (2007) A revealed preference approach to the measurement of congestion in travel cost models. *Journal of Environmental Economics and management* 53(2): 230-249.

Train, K. E. (2011) *Discrete Choice Methods with Simulation*. Cambridge University Press: Cambridge.

Train, K. E. &Weeks, M. (2005) Discrete choice models in preference space and willingness to pay space, in Scarpa, R. and Alberini, A. *Applications of Simulation Methods in Environmental and Resource Economics,* Springer, Dordrecht, The Netherlands: 1-16.

Wilson, C. & Tisdell, C. (2004) Attitudes to entry fees to National Parks: Results and policy implications from a Queensland case study. *Economic Analysis and Policy* 34(1): 79-102.

Winter, P. L., Palucki, L. J. & Burkhardt, R. L. (1999) Anticipated responses to a fee program: The key is trust. *Journal of Leisure Research,* 31(3): 207.