

# Visitation ‘Barometer’ as a tool for environmental management and awareness: the Berlengas Nature Reserve case-study

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## Introduction

Protected areas are fundamental to nature conservation, providing also opportunities for tourism and recreational activities (Spenceley *et al.*, 2015). The visitation of these areas offers many benefits but, without control, high numbers of users may have serious environmental impacts and may also reduce the quality of the recreational experience (Lockwood *et al.*, 2006). Therefore, it is essential to establish and regulate the human carrying capacity of protected areas, defined as the amount of visitors they can support without threatening or modifying its original characteristics (Manning, 2007). This concept however, has been highly discussed within the scientific community, being criticized for its subjectivity when applied to the recreational activities, with the attempt to use a universal formula able to comprehend the complexity of factors involved in the carrying capacity calculation (Silva, 2002). However, with caution, it can be a very useful tool for the management of protected areas, as long as it is combined with other methods.

Effective management of protected areas requires the use of social data for decision-making. Moreover, new solutions encompassing educational and awareness strategies are essential to insure a better communication, decision-making and policy development (Zorilla-Pujana and Rossi, 2016).

Environmental education and stakeholders’ involvement are critical to the long-term success of protected areas. Indeed, communication is an important instrument of management, and awareness strategies a key contribute to its efficiency (Sureda *et al.*, 2004).

The use of signage is a cost effective tool to communicate complex environmental and management information, contributing to increase stakeholders’ knowledge and awareness. Specifically, in-situ informative/interpretative signage may help promote positive attitudes, and increase beneficial environmental behaviors, and voluntary compliance (Martin *et al.*, 2015).

The Berlengas Nature Reserve in Portugal (39°24’N, 9°30’W) encompass Berlengas archipelago and is part of Natura Network 2000. It has a Special Protection Area (SPA) for Wild Birds (Directive 79/409/EEC), covering the same boundaries as the reserve, and is part of UNESCO Biosphere Reserve.

However, the reserve has been facing multiple human pressures and degradation, namely in association with the visitation of the Berlenga island. The Berlengas’ carrying capacity was roughly set as 350 people per day in 1990 - a number that is frequently exceeded, especially in august.

In fact, as estimated by the management body, the island was visited by nearly 25.000 people in 1998, 30.000 in 2000 and 40.000 in 2003 and in 2004. Recently there was a clear assumption that the number of visitors has increased dramatically. Therefore, the characterization and monitoring of Berlenga's visitors was included in a LIFE Project that seeks to establish and recover some of the natural values of Berlengas Nature Reserve (LIFE 13 NAT/PT/000458 – [www.berlengas.eu/](http://www.berlengas.eu/)).

This study aimed to: i) determine the number of visitors in Berlenga island - a baseline for carrying capacity adjustment, and ii) develop a Visitation 'Barometer' – a tool presented as a quality scale associated to the recreational pressure of the protected area, with the aim to provide information for management decisions and visual support to environmental awareness.

## Methods

Visitor surveys and counts were conducted in the Berlenga Island in 2015 and 2016, during four weeks per year. Surveys were conducted between 12pm and 6pm, included 35 questions, open-ended, close-ended and using Likert scale, and had a filling duration of 15 to 20min.

Counts were made by observers in a fixed place, namely in the port where the vast majority of people disembark, beginning at 9am with the arrival of the first boat and finishing at 8pm with the departure of the last one. Records included boats' names, hour of arrival and number of people arrived, and were used to estimate the total number of visitors per year.

The Visitation 'Barometer' was built from key questions of the survey regarding the visitor's perception about the number of people in the island and the quality of experience compared to expectations. These were closed-ended questions with three options (positive, negative and neutral). Additionally, it was used a rating question with the classification by the visitors about some aspects of the island: accessibility, signage, trails, vigilance, natural beauty, tourism, cleanliness, environmental quality, bathrooms, beaches, prices and people's behavior. The average results were converted into a 180 degree scale for the close-ended questions, and to a radar chart for the rating question. The Visitation 'Barometer' presents, for each question, the results of 2015 and 2016 for comparison, derived from 707 and 358 surveys, respectively.

Correlations between key questions and other questions of the survey were quantified using the Spearman's coefficient. For each variable, differences between groups were assessed using the non-parametric Mann-Whitney and Kruskal-Wallis tests. Finally, reduced Linear Regression models were built to describe the associations between variables.

## Results

The number of visitors ranged between 65.620 in 2015 and 79.875 in 2016. Berlengas' carrying capacity was often surpassed, with records of more than 1000 people landing per day.

The Visitation 'Barometer' (Figure 1) showed that visitors perceived an excess of people in the island in 2016, whereas in 2015 they indicated the number of people in the island was 'fine like this'. However, the experience still exceeded the expectations, and there was a slight increase of satisfaction from 2015 to 2016. The worst rated aspects of the island were vigilance, restrooms facilities and prices in both years.

In overall, preliminary results showed that the 'first time visitors' have a higher tolerance to the number of people in the island than the remainder visitors (2015:  $U=53043.0$ ;  $W=146139.0$ ;  $p=0.005$ ; 2016:  $U=12693.5$ ;  $W=30459.5$ ;  $p<0.0005$ ). This was associated with the visitors opinion that the excess of people was the main problem of the island and that

implementing a reduction of the number of people will improve recreational experience ( $R^2=0.33$ ).

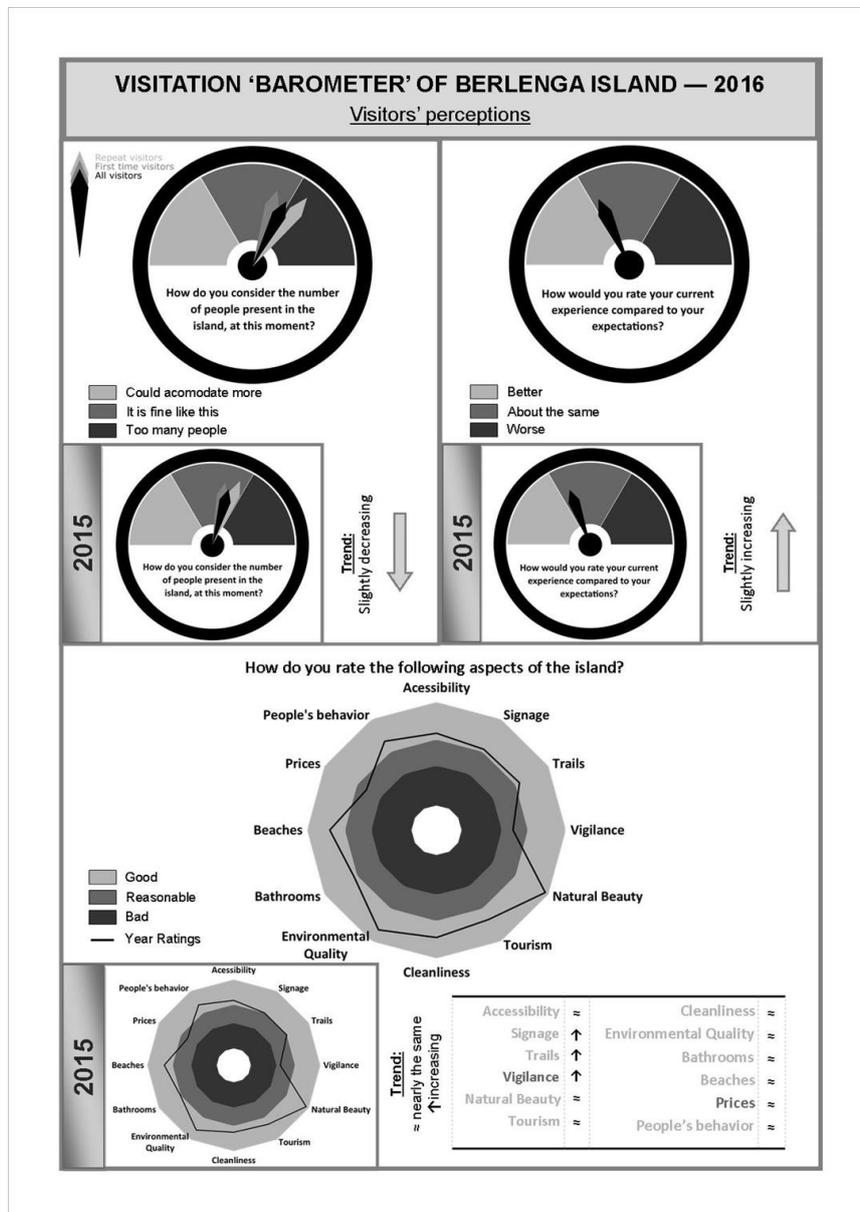


Figure1: Visitation 'Barometer' of Berlenga Island for 2015 and 2016.

## Conclusions

The increasing number of visitors in protected areas raises the need for suitable management measures.

The Visitor 'Barometer' appeared to be an appealing tool to inform visitors of the main conditions of the Berlenga island and aspects to improve, as well as to alert the management entity to the main issues to be addressed and its evolution over time. Also by uncovering relationships between key and other questions included in surveys, it may be possible to further reduce the time spend in surveys.

Therefore, the Visitation ‘Barometer’ may contribute with prompt information to management decisions, being also useful to manage visitor expectations and the quality of experience. This tool, if used as part of the in-situ signage, can be effective in nature conservation to inform visitors and other stakeholders, and to increase environmental awareness.

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