



**Universitat**  
de les Illes Balears

# *The effect of beach pollution on tourist satisfaction*

*Reachel Nabirye*

**Master's Thesis**

Master's degree in Economics of Tourism: Monitoring and Evaluation

(With a speciality in '*Monitoring techniques applied to tourism*')

at the

UNIVERSITAT DE LES ILLES BALEARS

Academic year 2017-18

*Date: 04/Sept/2018*

*UIB Master's Thesis Supervisor: Angel Bujosa Bestard*

## **ABSTRACT**

In the past few decades, plastic pollution has become a global concern and it's currently well-known to have adverse effects on ecosystems, humans and economies worldwide due to the growing consumption, urbanization and changing life styles. While the impact of tourism on pollution is quite clear, this study has examined the opposite effect: how beach and sea pollution affects tourist satisfaction. This was explored through a survey of 60 tourists in various beaches on the island at the beginning of the tourism season (May-June 2018). The results from an ordered logit model show that several variables associated to beach pollution (such as *Water transparency*, *Lack of familiarity* with the concept of plastic pollution and the *Dissatisfaction* about the presence of plastic) are determinants of the level of tourist satisfaction. These non-trivial results show the impact of the littering phenomenon and its repercussions on the tourism industry, which is part of the cause as well.

**KEYWORDS:** *Tourist satisfaction; Beach pollution; Plastic litter; Mallorca*

## **ABSTRACTO**

En las últimas décadas, la contaminación plástica se ha convertido en una preocupación mundial y actualmente es bien sabido que tiene efectos adversos en los ecosistemas, los seres humanos y las economías de todo el mundo debido al creciente consumo, la urbanización y los estilos de vida cambiantes. Si bien el impacto del turismo en la contaminación es bastante claro, este estudio ha examinado el efecto opuesto: cómo la contaminación de las playas y el mar afecta la satisfacción del turista. Esto fue explorado a través de una encuesta de 60 turistas en varias playas de la isla al comienzo de la temporada turística (mayo-junio de 2018). Los resultados de un modelo logit ordenado muestran que varias variables asociadas a la contaminación de las playas (como la transparencia del agua, la falta de familiaridad con el concepto de contaminación plástica y la insatisfacción con la presencia del plástico) son determinantes del nivel de satisfacción del turista. Estos resultados no triviales muestran el impacto del fenómeno de arrojar basura y sus repercusiones en la industria del turismo, que también forma parte de la causa.

**PALABRAS CLAVE:** *satisfacción del turista; Contaminación de la playa; Arena plástica; Mallorca*

## ACKNOWLEDGEMENTS

I would first like to thank my thesis supervisor Professor Angel Bujosa Bestard of the Applied Economics Department at Universitat de les Illes Balears (UIB) and director of the Master's Degree in Economics of Tourism: Monitoring and Evaluation (METME). The door to his office was always open whenever I ran into a trouble spot or had a question about my research and writing. He consistently allowed this paper to be my own work, but steered me in the right direction whenever he thought I needed it.

I would also like to thank the experts who were involved in the field survey for this research project: Bradley Robertson the President at Asociación Ondine and the entire scientific research team especially Alice and Marie. Without their passionate participation and input, the field survey could not have been successfully conducted.

I would also like to acknowledge Mrs. Cristina Viganó and Mr. James Steptaw as the second readers of this thesis, and I am gratefully indebted to their very valuable comments.

Finally, I must express my very profound gratitude to my beloved parents: Mrs. Edith Kaganda, Mrs. Antonella Manzoni, Mr. Giovanni Viganó and to my spouse Dr. Daniele Viganó for providing me with unfailing support and continuous encouragement throughout my year of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them. Thank you.

Author

Reachel Nabirye

## Table of Contents

ABSTRACT .....	2
1. INTRODUCTION.....	5
2. LITERATURE REVIEW.....	8
3. DATA AND METHODOLOGY.....	10
3.1 Data collection .....	10
3.2 Descriptive statistics of data.....	11
3.3 The ordered logit model .....	15
4. RESULTS.....	17
5. CONCLUSIONS.....	19
6. BIBLIOGRAPHY .....	21
ANNEX: QUESTIONNAIRE .....	23

## **1. INTRODUCTION**

During the last half century, the use of plastic materials has spread at an exponential rate in virtually every inhabited corner of the planet thanks to their versatility, durability, mechanical resistance and economical affordability. These characteristics have allowed them to replace other materials in many fields, especially related to the everyday life. Although they are quite recent inventions, plastic products like straws (introduced in 1960), plastic bottles (1970), shopping bags (1982) and tetra packs (1983) have become essential for the current life style. As a matter of fact, the global production and consumption of plastic has increased by orders of magnitudes in the last decades, rising it from 1.5 MTons in 1950 to 322 MTons in 2015<sup>1</sup>.

However, such growth of more than 200 times in 65 years has not been accompanied enough by an increasing efficiency in the waste collection and management system and by sustainable habits. Without forgetting the important contribution of plastics to development and economic growth, it is now evident that the uncontrolled production, use and disposal of this oil-based material have shown the negative impacts on the environment and society.

The lack of regulations, the personal and collective behavioral patterns and consumption habits; the inefficient use and poor management are causing and increasing the uncontrolled accumulation of plastics in the terrestrial and marine environment (e.g., Auta et al., 2017). Better management in the developed world compared to developing countries is negatively compensated by a much higher consumption in the former, such that the effects on the environment are effectively the same: a good fraction of the waste (hard to quantify but not negligible) is intentionally disposed to the environment or accidentally leaks into waters and soil. The issue is well-known at the institutional level, and it currently represents, for instance, a focus of the UN Environment Programme (UNEP 2018)<sup>2</sup> and a key point (the European Strategy for Plastics, approved in January 2018) of the recent Circular Economy Package approved by the European Commission.<sup>3</sup> The latter aims at reconvertng the current mainly throw-away consumption system to a one based on reusing, recycling and proper harmless disposal. Policies at national and local levels are changing fast, and diverse countries like Kenya (with the strictest policy worldwide on this issue), Rwanda, Morocco, France, Taiwan, Vanuatu, Uganda, Zimbabwe and Eritrea have forbidden or are going to forbid completely the use of plastic products like bags, plastic cutlery, or expanded polystyrene.<sup>4</sup> Other similar bans have been taken as well at a municipality or regional level, including the possible ban of plastic bags in Mallorca from 2020.

Related to this, an environmental and social issue has emerged fast in the last decade: the complex phenomenon of litter, which means the presence of abandoned waste in the environment. It can be caused

---

<sup>1</sup> Plastics Europe, Report "Plastics – The Facts 2016/17", 2017

<sup>2</sup> [https://wedocs.unep.org/bitstream/handle/20.500.11822/25496/singleUsePlastic\\_sustainability.pdf](https://wedocs.unep.org/bitstream/handle/20.500.11822/25496/singleUsePlastic_sustainability.pdf)

<sup>3</sup> [http://ec.europa.eu/environment/waste/plastic\\_waste.htm](http://ec.europa.eu/environment/waste/plastic_waste.htm)

<sup>4</sup> See this recent article: <https://www.globalcitizen.org/en/content/plastic-bans-around-the-world/>

by direct dumping, or by dragging by natural agents (e.g. wind and water currents), and it is aggravated by the progressive fragmentation of the thrown products into smaller and smaller pieces. The problem is especially serious in oceans: litter, mainly composed by plastics, can be found even in the most remote deserted islands on the planet (Lavers & Bond, 2017),<sup>5</sup> and have created the gigantic Trash Vortices in the Oceans, hundreds of kilometers wide, making this a global environmental problem, similar to climate change for causes, responsibilities and challenges. The quantification, causes and impacts have attracted the attention from researchers, institutions and NGOs.

Research shows that a good majority of marine litter comes from single-use disposable items which include packaging and sewage-related debris like ear picks (flushed in toilets, they end up in sea if, as it happens often, the filtering system of the wastewater conditioning plant does not work properly).<sup>6</sup> For instance, in a recent study focused on the analysis of beach pollution, Ryan et al. (2018) found that the abundance of meso-debris (few centimeters long) at beaches is correlated with the amount of plastic pellets also known as nurdles, which are occasionally lost during shipping or dumped into industrial wastewater. At the same time, they suggested that the amount of litter on each beach depends on different beach-specific factors such as the shape, the slope and the local currents, among others. Such prevalence of single-use plastic items is in line with what has been found by environmental associations. This is a paradox of the current production system: the combination of the trendy and growing 'throw-away' culture, and the increased plastic production, imply that a material designed to be long-lasting (centuries) is often used for short-term purposes (minutes).

The present study will focus on a local level, in the Balearic island of Mallorca. The waste management in any island is intrinsically problematic, due to logistic limitations and geographical isolation, which increases the costs and limit the availability of facilities. Regarding the quantity of litter in Mallorca, it is virtually impossible to have a reliable estimate. The Council of Environment, Agriculture and Fishery of Mallorca has been providing a coastal cleaning service through the use of several boats, which collect several tens of tons of waste per year in the coastal waters.<sup>7</sup> In this sense, there are also countless events and initiatives related to the cleaning of beaches and waters, voluntarily organized by citizens, associations, and recreational tourism industry (divers especially).<sup>8</sup> To exemplify, during the few hours of beach cleaning in

---

<sup>5</sup> <https://www.businessinsider.com/photos-of-henderson-island-plastic-trash-2017-5?IR=T>

<sup>6</sup> In Mallorca, for instance, the sewage treatment plant close to Palma de Mallorca gets stuck in presence of heavy rain, and the only solution to avoid a technical breakdown is to open the barrier to let the filtered material flow into the sea, including the ones flushed in toilets: this often causes the heavy presence of in the coastal area of Palma of sewage waste like paper washcloths. See also the EMAYA campaign "Do not feed the monster" about this: <https://www.emaya.es/ciclo-agua/consumo/no-alimentos/>

<sup>7</sup> <https://ultimahora.es/noticias/local/2018/06/25/1009297/servicio-limpieza-litoral-recoge-toneladas-residuos-costa-baleares.html>

<sup>8</sup> For example: <https://www.mallorcadiario.com/retiran-650-kilos-de-basura-del-fondo-marino-de-la-playa-de-can-pere-antoni>

the 'Dos Manos' by the Association Ondine<sup>9</sup>, it is possible to recover thousands of plastic pieces on a beach segment of 50m.

The present study aims at providing knowledge about how the problem of plastic pollution is affecting the tourism industry by means of tourist satisfaction surveys. On the other hand, the field work helped to sensitize tourists who were not familiar with the problem of plastic pollution on the beaches.

Below (section 2) we give a sketch of the most relevant among the explored literature about the relation of tourist satisfaction and pollution. Then, we proceed to describe the methodology of data collection (section 3) and to present results of surveys collected at five beaches (section 4). Finally, we discuss the main conclusions (section 5)

---

<sup>9</sup> <https://www.asociacionondine.org/en/our-projects/dos-manos/> (it is a local association that joins tens of volunteers and hundreds of citizens in different beaches of the island carry out monthly collection of scientific data on plastic pollution in Majorca. The detailed categorization of the different types of litter greatly helps in assessing the growing magnitude and causes at a local scale. This aims at assessing the importance of the problem and creating database which is the scientific base for local and national policy makers (for example, the last creation of the Marine Protected Area in Sa Dragonera waters has been decided by the Balearic Government relying on the data provided by the Association's study on the field by its professional marine biologists). The association relies on a well-built and collaborative network with the private sector, as exemplified by the starting pilot project consisting in assessing the usage of plastic products and providing existing market solutions to single-use plastic to different hotels and businesses in the Palma area).

## **2. LITERATURE REVIEW**

Tourist satisfaction is not a well-defined concept, but in simple terms we will refer to it as “an emotional state of a tourist after being exposed to an opportunity”, which is experience for the case of this study (Baker & Crompton, 2000). Tourist satisfaction can be well understood and measured by focusing on its influencing factors like cultural, demographic, travel behavioral characteristics of the tourist, destination attributes, and travel information among others (Shahrivar 2012).

Tourists have different expectations over destinations and, restricting ourselves to beach tourism, each tourist is assumed to visit beaches with some expectations about an experience composed by different factors (Baker & Crompton, 2000). So far, previous studies have found that the level of tourist satisfaction depends on the quality of accommodation facilities, cleanliness, water and food safety, hospitality and comfort, as well as accessibility, attractiveness and authenticity of the destination.

Regarding the context of beach tourism, a recent report written by the SAS<sup>10</sup> shows that beach cleanliness is a priority by most users when making a choice for a destination. More precisely, Prebensen (2004) considered expectations as important antecedents of satisfaction, meaning that the higher the expectation in relation to a trip, the higher the experience and satisfaction in the destination. Sangpikul (2007) suggested that tourist experience is one of the determinants of repeated trips and an indicator of tourist satisfaction. This means that the rate of satisfaction determines the probability to return or not. In a similar way, Kozak & Rimmington (2000) show that satisfaction also depends on the intrinsic attributes of the destination such as easily accessible location, good weather and unique aesthetic value. Al-Shakarchi & Al-Hashimi (2015) evaluated visitors' satisfaction by reflecting on their behavior (e.g return visits, service consumption, received complaints, etc.), acknowledging that the subjective nature of impressions makes it hard to accurately measure tourist satisfaction. The explanations of tourists' satisfaction done by Tran (2011), through reviewing the existing literature, pointed out that loyalty, purchase and consumption experiences are some of the important indicators of satisfaction and are also the key guarantees to the longtime survival and success of the tourism industry. In the same way, Hayat (2016) measured tourist satisfaction using socio-demographic variables such as: age, gender, origin, marital status; and he also found out that providing individualized services to tourists would increase satisfaction.

While the diverse factors mentioned above are determinants of tourism satisfaction, there is little literature reviewed about the impact of beach pollution. This relative lack of literature is probably due to the complex nature of satisfaction and the large quantity of factors determining it, among which litter, which is a recent phenomenon, has not been considered. Several studies have been done on the effects of tourism activities on pollution, degradation and depletion of natural resources. For instance, Saenz-de-Miera & Rosselló (2013) explored the contribution of tourists to air pollution in Mallorca using the number of tourists as indicator to express the direct and induced pressure on the environment. Greiner et al. (2001) discussed

---

10 Surfers against Sewage, 2014, Report “Marine litter”

the policy of tourism and pollution and confirmed that in situations of high pollution, tourism activities possibly reduce with the hope to give a recovery time to the environment. The study by García & Servera (2003) shows that the dwelling capacity of Mallorca has been exceeded in terms of tourists and residences and this is increasing the rate of beach degradation, therefore making the tourism industry no longer sustainable.

Regarding the impacts of plastic litter, a large amount of research has raised concerns about health, social wellbeing and loss of aesthetic value. For instance, as Dhimer (2017) explains, micro-plastics very easily enter in the sea food chain and accumulate in the gastrointestinal tracts of edible fish, therefore tiny material and the related toxins accumulated in the flesh can easily climb up the chain food up to humans. Litter also increases the possibility of exposure to a range of disease and health problems (Fewtrell & Kay, 2015).

Different studies have also focused on the analysis of the financial effects of beach pollution on tourism (Colford et al, 2007). In these works, like in the paper by Tisdell et al. (1992) on the impact of marine pollution, the emphasis is focused on the irreversible damage made by pollution on the marine-based recreational tourism infrastructures, although they neglect the impact of such pollution on the wellbeing and satisfaction of tourists.

Regarding the source of pollution, Ivar do Sul & Costa (2013) found evidence that these ecosystems are polluted not only from marine based activities (e.g. commercial fishery, recreational activities, etc.), but also from land-based human activities often associated with the hospitality sector. In fact, the impacts of tourism on pollution are quite evident and relatively well-known. For instance, in Spain, there is a growing concern spotlighted on environmental costs like depletion and over-exploitation of natural resources (Bujosa & Rosselló, 2007) because of tourist expansion. However, while the contribution of tourism activities on pollution has been explored by previous research, the inverse relation, i.e. the impact of pollution on tourism is less clear and probably more interesting for the tourism sector itself. There is, to our knowledge, a gap in the literature concerning the impact of such pollution on the experiences of tourists and therefore, on their level of satisfaction. This is the subject of this thesis.

Our study aims at providing a pilot case for the statistical survey of tourism satisfaction in relation with plastic litter, and it can be replicated in any location. At the same time, the tourists could express their level of concern and familiarity about plastic pollution which is a good aspect of knowledge source necessary for research needed to create awareness and, ultimately, develop suitable solutions to the problem.

### 3. DATA AND METHODOLOGY

#### 3.1 Data collection

Field surveys were undertaken to gather primary data from five different beaches of Mallorca by means of a questionnaire, included in the Annex, was designed to identify the level of tourists' satisfaction and their experience on the beaches visited. It was made of different sections that captured: information about the tourists' trip and accommodation (section A); beach experience (section B); knowledge and opinions about plastic pollution (section C) and socio-demographic characteristics (section D).



Figure 1. Map of the surveyed beaches of Mallorca.

On 13<sup>th</sup> May, the first surveys were carried out during the pilot test in Es Domingo beach (Cales de Mallorca), where 6 questionnaires were collected. A preliminary analysis considered them exhaustive enough, and with the same questionnaire the researcher surveyed another four beaches (see Fig. 1): 20 surveys were collected at Can Pere Antoni beach (Palma) on 15<sup>th</sup> May, 14 surveys in Palmanova beach (Calvià) on 19<sup>th</sup> May, then 10 surveys from S'Amarador beach (Santanyí, Mondragó Natural Park) on 23<sup>rd</sup> June, and lastly 10 surveys from Playa de Muro (Alcudia) on 30<sup>th</sup> June. A total of 60 valid questionnaires were collected in face-to-face interviews with the tourists in different locations (see Table 1). 8 additional questionnaires were not considered because the respondents turned out to be residents, which are not included in our tourist-oriented survey.

We believe that the surveyed locations are fairly representative of the variety of beaches of the island, being geographically spread and including massively exploited beaches (Playa de Muro, Palmanova), city beach (Can Pere Antoni), National Park beach (S'Amarador) and a more family-oriented beach (Es Domingos). The choice of the location was aiming at covering different targets of tourists. The period of the collection (May and June 2018) coincided with the beginning of the tourist season, far from the peak of July and August, so that beaches were only moderately occupied, and the mildly warm weather was also favouring the field activity. The period of the surveys implies that the production of plastic and the littering

phenomenon were still moderately visible compared to the summer months, and this can of course affect the perception of the problem and the questions related to the pollution and cleanliness.

<i>Beach</i>	<i>Number</i>	<i>Percentage</i>
<i>Es Domingo</i>	6	10%
<i>Can Pere Antoni</i>	20	33.3%
<i>Palmanova</i>	14	23.3%
<i>S'Amarador</i>	10	16.6%
<i>Platja de Muro</i>	10	16.6%

Table 1. Valid collected surveys in the five beaches.

The choice of specific targets on each beach was on a random basis, aiming at a quite uniform representation in terms of gender, age, nationality and number of people in the group. The researcher personally led the interviews alone, in the English language. This biases the sample since it excludes the non-English speakers from the survey target, possibly introducing an indirect bias in other socio-demographic characteristic like nationality and education. However, we note that most of the group tourists were (native or not) English-speakers.

The surveys were usually carried out for about half an hour each, including the presentation, explanation and exchange of opinion. The questionnaires were printed and left to be responded in presence of the researcher, who could clarify doubts and reduce non-responses. Likely, the willingness to respond can introduce a slight bias in favour of people interested to the topic. However, note that an estimate of approximately 70% of people who were asked to participate, accepted being interviewed: such high percentage of acceptance indicates that the approach taken by the interviewer showed them to be trying to be as much inclusive as possible, to maximize the number of filled questionnaire.

Since most tourists were in groups, the interviewer mostly led the survey to only one of them, and in any case never exceeding two out of a group of three or four people, or three out of larger groups (5 or more). This meant avoiding an over-representation of individuals coming from the same family or group.

Two of the survey sessions (Can Pere Antoni and Es Domingo) above were performed within the events of the Dos Manos project mentioned in the introduction. This could introduce a bias in matter of familiarity with the topic for the information provided the same day, but we underline that the interviews were still led to random tourists that were not participating in the activity.

After having reviewed the possible biases in our sample, we proceed below with the description of collected data.

### **3.2 Descriptive statistics of data**

Table 2 summarizes the socio-demographic data collected (section A and D of the questionnaire). For variables (like gender and country), we show the frequency in terms of percentage and for variables (Nights and Age), we show the mean and the standard deviation.

<b>Variables</b>	<b>Percentage/Mean</b>	<b>Std. dev.</b>
<u>Gender</u>		
Male	28.3%	
Female	71.7%	
<u>Country</u>		
UK	20%	
Spain	18.3%	
Portugal	8.3%	
Germany	8.3%	
Poland	8.3%	
Others	36.7%	
<u>Education</u>		
Secondary school	23.3%	
Vocational/Technical diploma	18.3%	
University degree	58.3%	
<u>Occupation</u>		
Employee	73.3%	
Entrepreneur	10.0%	
Freelancer	3.3%	
Un-employed	3.3%	
Looking after family	1.6%	
Student	8.3%	
<u>Family status</u>		
Single	28.3%	
Married	65.0%	
Divorced/Widower	6.6%	
<u>Age</u>	37	13.1
Young (16-29)	23.3%	
Thirties (30-39)	48.3%	
Middle-age (40-49)	10%	
Elders (50-79)	18.3%	
<u>Accommodation</u>		
Hotel	53.3%	
Short-term rental	10%	
Long-term/Hosted/Property	36.6%	
<u>Number of nights</u>	7.0	3.4
<u>Trip</u>		
First time in Mallorca	36.6%	
Already been in Mallorca	63.3%	

Table 2. Descriptive statistics of the most relevant socio-demographic variables

A large fraction of respondents were women (71.7%). The sample consists of 15 different countries of origin, the most frequent of which are the UK and Spain, and with a quite homogeneous representation also of Portugal, Germany, Poland, Italy, Norway, Argentina, Russia, Finland, Ireland, Denmark, Belgium, Sweden and Uruguay. Note that the vast majority are Europeans. The average profile is a married, employed woman in her thirties, but a variety of occupations and civil status has been collected. The age of respondents covered from 16 to 77 years, with a mean of 37 years. When we grouped the age distributions in four ranges (below 30, from 30 to 39, from 40 to 49, above 49), the highest frequency is the range 30-39 years (*Thirties* hereafter).

Only approximately one third of the respondents were coming to Mallorca for the first time. Most of the interviewed tourists were accommodated in hotels or in long-term accommodation (hosted by family or friends, long-term rentals or own properties), and they were often close enough to come to the beach by foot. The average length of stay was 7 nights, the minimum being 1 night and the maximum 15 nights.

In Table 3, we indicate the remaining collected data about beach experience, plastic litter and satisfaction (sections B and C of the questionnaire).

The party size indicates the number of people in the group, including the interviewed, and we considered separately the number of people below and above 18 years old. In 19 cases out of 60, there were people below 18 years old in the group. On average, the groups consisted of about 5 people, with a large dispersion. Sunbathing, reading/relaxing and bathing are by far the most common activities, while water and sand sports are practiced by slightly less than half of respondents (yes/no questions were asked for the information in the table below).

<b>Variables</b>	<b>Percentage/Mean</b>	<b>Std.dev</b>
<u>Beach experience</u>		
Bathing	86.7%	
Sunbathing	98.3%	
Reading or relaxing	91.7%	
Practice beach sport	46.7%	
Practice water sport	45.0%	
<u>Party size of the respondent's group</u>		
People below 18 years	2.4	0.8
People above 18 years	2.4	1.4
<u>Transport accommodation-beach</u>		
By foot	65%	
Public transportation	11.6%	
Rented vehicle	26.6%	
<u>Importance of Factors on beach experience.</u>		
Presence of lifeguard	46.7%	
Presence of showers	63.3%	
Presence of bars & restaurants	60.0%	
Accessibility	78.3%	
Parking	38.3%	
Shoreline quality	83.3%	
Surrounding	73.3%	
Congestion	56.7%	
Composition (rock/sand)	71.7%	
Arboreal cover	50.0%	
Water transparency	70.0%	
Beach cleanliness	80.0%	
Calmness	70.0%	
<u>Importance of plastic-related Factors</u>		
Litter in beach water	75.0%	
Presence of plastic packaging	70.0%	
Litter in the sand	80.0%	
Number of trash bins	71.7%	
<u>Level of Global Satisfaction</u>		
Very low	4.1	0.7
Low	0%	
Medium	16.6%	
High	56.6%	
Very high	26.6%	
<u>Level of Beach satisfaction</u>		
Very low	4.1	0.8
Low	0%	
Medium	5%	
High	15%	
Very high	45%	
Very high	35%	
<u>Level of Lack of Concern</u>		
Very concerned	2.1	1.1
Somewhat concerned	40%	
Not concerned	26.6%	
Not at all concerned	20%	
Uncertain	13.3%	
Uncertain	0%	
<u>Level of Lack of familiarity</u>		
Strongly familiar	1.9	1.0
Somewhat familiar	40%	
Not familiar	38.3%	
Not at all familiar	13.3%	
Uncertain	6.6%	
Uncertain	5%	
<u>Level of Dissatisfaction due to plastic</u>		
Very low	2.7	1.2
Low	18.3%	
Low	21.6%	

Medium	35%	
High	15%	
Very high	8.3%	
Missing response	1.6%	

Table 3: Descriptive statistics of variables related to beach experiences and plastic litter

Following previous studies (e.g. Clemes et al, 2008; Shanka, 2012; Hayat, 2016) a 5-point Likert scale was used to measure the satisfaction of tourists, ranked from (1), meaning very low level, to (5), meaning very high level. As seen in Table 3, although satisfaction was separately measured in reference to global experience and beach experience, only beach satisfaction was used in this study to investigate whether beach pollution affects tourist satisfaction. On the other hand, we also surveyed the level of dissatisfaction due to the presence of litter in beach sand and waters, with the same Likert scale. Finally, we quantify the level of concern and familiarity about the litter phenomenon. With this case higher points mean less satisfaction. Note that regarding lack of concern and lack of familiarity, the answer 5 'uncertain' is outside the Likert scale which then goes from 1 to 4. The variable *Lack of concern* was measuring the tourists' level of concern about the quality of beach environment. Whereas *Lack of familiarity* was examining the tourists' level of familiarity with the concept of plastic pollution in marine areas which includes the beaches in this case, this is because we have a theory that lack of familiarity would influence the level of satisfaction. These are categorical variables with different levels of scaling.

The interviewed were asked about a series of 13 factors which affect the beach experience that is: the presence of lifeguard, showers, bar/restaurant, accessibility, parking, quality of shoreline, surroundings, congestion, composition, arboreal cover, water transparency, beach cleanliness and calmness. According to the data collected (see Table 3), the most frequent important factors were: shoreline quality (indicated by 83% of responses), beach cleanliness (80%) and accessibility (78%), while parking and lifeguard presence are important for less than half of the respondents.

Similarly, a second set of four factors were investigated regarding their influence on the dissatisfaction about pollution at the beach: presence of plastic packages, presence of litter in the sand and the number of trash bins. All the four variables were important, with presence of litter in the sand and beach water being the most important (with 75% and 80% of respondents indicating them) compared to the other two. This data alone shows how important a litter-free environment is in enhancing the level of beach satisfaction for tourists.

The respondents were asked *yes/no* questions about how the above factors affect their satisfaction and by the use of ordered Logit model (see after), we were able to identify the determinants of their satisfaction by focusing on the statistical significance of the variables and if their effect on satisfaction is positive or negative (coefficient sign). The model showed a causal relationship between the independent variables and the dependent variable (beach satisfaction).

Looking at these variables, we noted that first, both the global and beach satisfaction were very high, underlining the good tourist offer in Mallorca. The mean level of beach satisfaction is, in fact, 4.1. On the

other side, we note the quite high average level of concern and familiarity of beach litter (or low, lack of them, as shown in the table), meaning that there is a certain awareness about the topic.

### 3.3 The ordered logit model

The order logit model is a convenient approach to handle the estimation of models with a dependent variable of a discrete and ordered nature (Bujosa & Rosselló, 2007). As the tourist level of satisfaction follows a 5-level Likert scale, the ordered logit model will allow the identification of its determinants. More specifically, for an ordinal response variable like *Beach satisfaction* in our study, the ordered logit model allows us to estimate the effects of a set of independent variables ( $X_i$ ) on the underlying dependent variable ( $y^*$ ), by introducing a cumulative distribution function  $F$ :

$$\Pr(Y = 1/X_1, X_2, \dots, X_n) = F(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n) \quad (i)$$

Let  $Z$  be the linear function of the independent variables ( $X_i$ ),

$$Z = X_1 \beta_1 + X_2 \beta_2 + \dots + X_n \beta_n + \varepsilon \quad (ii)$$

Where  $\beta_i$  are the vectors of the parameters to be estimated and the  $\varepsilon$  is a random error due to the precision limitations of the model. Their values provide the magnitude of importance on the underlying dependent variable. Basing on the linear function in equation (ii) it is possible to observe the categories of the responses therefore, in the case we are using an ordered variable that can be grouped in different ranges. Let the observable category be  $E$

$$E = \begin{cases} 1 & \text{if } y^* \leq \mu_1 \\ 2 & \text{if } \mu_1 < y^* \leq \mu_2 \\ 3 & \text{if } \mu_2 < y^* \leq \mu_3 \\ 4 & \text{if } \mu_3 < y^* \leq \mu_4 \\ 5 & \text{if } \mu_4 < y^* \end{cases} \quad (iii)$$

Here  $y^*$  is the underlying response function and are parameters to be estimated whose function is to establish the correspondence between the probability function and linear function. At the end of the analysis, the cumulative distribution of the random error  $\varepsilon$  is determined by calculating the probability of observing each value of the observable category  $E$ .

We take as dependent variable the *Beach satisfaction*, which, as said above, was measured using the 5-level Likert scale. The levels 1-2 with few observations were grouped in a single level and, therefore, the dependent variable ranged from 1 (low satisfaction) to 4 (high satisfaction). Note that level 1 and 2 of the Likert scale were grouped together because none of the respondents expressed a satisfaction level very low (level 1).



Figure 2: Bar chart showing the distribution of beach satisfaction

Respondents' information about trip and accommodation characteristics, beach experiences and demographics was considered as potential explanatory variables in the estimation of the model. Despite the large number of variables included in the dataset, only statistically significant variables are presented here and variables *Nights*, *Lack of familiarity*, *Water transparency*, *Thirties*, *Dissatisfaction on plastic* and *Trip* were found significant.

Binary variables, such as *Trip* and the factors affecting beach experience (see Table 3), have been included in the model as dummy variables, taking value 1 when the respondent has taken his/her first trip to Mallorca or when the evaluated factor affects his/her beach experience. Similarly, categorical variables like *Age* and *Gender* have been transformed into a set of dummy variables.

#### 4. RESULTS

The econometric software Nlogit/Limdep was used to estimate the ordered logit model described above considering the ordered and discrete nature of the dependent variable.

Although different specifications have been tested, this section presents the results of the specification achieving the best goodness-of-fit, and using only the most statistically significant variables, that show a sound significance in all combinations of set of variables. Such variables are: *Nights*, *Lack of Familiarity*, *Water transparency*, *Thirties*, *Dissatisfaction on Plastic and Trip*. A constant term has also been included in the specification to improve the goodness-of-fit of the model (see Bujosa & Rosselló, 2007)

<b>Variable</b>	<b>Coefficient</b>	<b>t-value</b>	<b>p-value</b>
Constant	3.63216**	2.44	0.0149
Nights	0.20026**	2.24	0.0250
Lack of Familiarity	0.73237**	2.18	0.0296
Water transparency	1.74912***	2.72	0.0065
Thirties	-1.83511***	-3.05	0.0023
Dissatisfaction on plastic	-0.81364***	-3.02	0.0026
Trip	-1.20477**	-2.01	0.0445
$\mu_1$	2.04265***	4.81	< 0.0001
$\mu_2$	5.08678***	9.18	< 0.0001
Dependent variable	Beach Satisf	Significance	0.00001
Log likelihood	-52.5	Pseudo R	0.246
Restricted log likelihood	-69.7	AIC	123.1
Chi-square (5 d.f)	34.2	K	9
Number of observations	60		
Note: ***, ** and * indicate that coefficients are statistically significant at the 1%, 5% and 10% level, respectively.			

Table 4. Ordered logit best-fit model results

Table 4 shows the parameters of the best-fit ordered logit model where all the variables included are statistically significant. Overall, the goodness-of-fit of the model is high with a Pseudo R of 0.246 in the line of previous applications found in the literature. The low p-values of the independent variables facilitate the conclusion that the variables included in the model are statistically significant and it means that this is reasonable evidence that the explanatory variables have a significant effect on tourist satisfaction in the case of this study. Table 4 also presents the threshold parameters ( $\mu$ ) establishing the correspondence between the probability function of the respondent choosing one of the satisfaction levels and the observed satisfaction level. The two estimated parameters (the third one is normalized to one) are statistically significant showing that the estimated model works in the expected way.

The explanatory variables in our study facilitated in identifying the determinants of satisfaction, so the factors that cause a higher and lower level of satisfaction among tourists. The positive sign of the variable '*Nights*' shows that tourists taking a longer trip in Mallorca will tend to have a higher level of beach satisfaction and the negative sign of the variable '*Trip*' means that individuals staying by the first time in Mallorca (*Trip*=1) will show a lower level of beach satisfaction.

The negative sign of the variable '*Dissatisfaction on plastic*' signifies that tourists who are dissatisfied with the plastic litter at the beach tend to have a lower level of satisfaction. The positive sign of variable *Water transparency* shows that tourists who find the beach water transparent happen to be highly satisfied. This is a reasonable result if we consider that in May and June, when the survey was done, waters are in their best conditions, since they are not suffering from overcrowding, and the tourists are the first ones of the season to enjoy them. It would be interesting to see if an analogous survey in August would give the same correlation, given that waters tend to be much more opaque and dirty.

The negative sign of variable *Lack of familiarity* shows that tourists who had high level of familiarity (meaning low values of lack of familiarity) about the on-going global plastic problem happen to have a lower level of satisfaction. This proves that the knowledge of the issue has an important influence of tourist satisfaction.

The negative variable *Thirties* shows that interviewed tourists in their 30s tend to show a lower level of satisfaction. This result is not obvious and would need further study.

## 5. CONCLUSIONS

This study dealt with the effect of beach pollution on tourists' satisfaction in beaches of Mallorca. This work was carried out in the field by the researcher, in five beaches geographically apart in Mallorca (Es Domingo, Can Pere Antoni, Palmanova, S'Amarador and Platja de Muro) in a period (May-June) far from the peak season when the beach waters were still in good conditions, and by reviewing some of the very extended literature about litter and tourism. We have provided the first (to our knowledge) survey in Mallorca, which quantifies the effects of litter on tourist satisfaction.

The estimated model has provided reliable evidence that there is a statistically significant effect of beach pollution on tourist satisfaction. This is proved by the influence of the identified determinants of beach satisfaction like water transparency and how they are influence by pollution. Some factors like dissatisfaction on plastic facilitated in the highlighting the importance of the aesthetic value in the tourism experience.

Our study consists of 60 observations with a huge number (45) of variables, that aim at describing in a precise way the profile of the respondents. We have analysed the best-fit model, in which the causal relationship was reflected by the high significance of 6 variables (*Nights, Lack of familiarity, Water transparency, Thirties, Dissatisfaction on plastic and Trip*). The tourists taking longer trips in Mallorca, with a high level of *Familiarity* about the plastic problem have a higher level of *Satisfaction* when they find the beach water clean and clear. Whereas the tourists in their *Thirties* are dissatisfied by the presence of plastic litter at the beach and staying for the first time in Mallorca tend to experience a lower *Satisfaction*.

Of course, the limitation realized is that; this study would benefit much more by providing bigger picture of the underlying effects and their significance. However, it was quite difficult to prove because the size of the study sample was not large enough to provide more precise estimates from which concrete conclusions could be drawn. Also, the period of the survey was at beginning of the tourist season when most of the beaches were still clean and this affected the perception about the problem. In the same way, the survey only questioned the English speakers and the non-English speakers were not able to express their opinion about the problem.

Overall, this work and their findings could become the first step to design and execute a larger and more complete study to provide data supporting the development, enforcement and implementation of policies aimed at protecting and improving the state of marine areas. Given the large number of explored variables of this study, we recommend that a large sample can be used for the future study with at least several hundred participants, using the same survey. This is because a very large number can strengthen or weaken the significance of our findings, and new ones could appear. In the same way, extending this study to high seasons (July and August), could lead to observations of different patterns, since the average target of tourists likely changes over the months, and the waste production and litter phenomenon both become more evident.

This work also shows the importance of involving tourists in studies aimed at improvements to the tourism industry services, keeping awareness about natural resources. Therefore, the researcher recommends further research studies to be done not only in an academic perspective but also social, health, economic and public perspective.

Finally, we remark that plastic pollution is just one of the effects of overcrowding, and it can have negative feedback on the same tourism industry. Besides having an efficient waste management service, including rubbish collection, separation and disposal, a change in the consumption is needed, especially in an island, where resources are limited and the geographic isolation should push towards more self-sustainable practices in all fields.

## 6. BIBLIOGRAPHY

- Auta, H. S., Emenike, C. U., & Fauziah, S. H. (2017). Distribution and importance of microplastics in the marine environment: a review of the sources, fate, effects, and potential solutions. *Environment international*, 102, 165-176..
- Baker, D. A. & Crompton, J. L. (2000). Quality, satisfaction and behavioral intentions. *Annals of tourism research*, 27(3), 785-804.
- Bestard, A. B. & Nadal, J. R. (2007). Modelling environmental attitudes toward tourism. *Tourism Management*, 28(3), 688-695.
- Colford Jr, J. M., Wade, T. J., Schiff, K. C., Wright, C. C., Griffith, J. F., Sandhu, S. K., ... & Weisberg, S. B. (2007). Water quality indicators and the risk of illness at beaches with nonpoint sources of fecal contamination. *Epidemiology*, 27-35.
- Clemes, M. D., Gan, C., Kao, T. H., & Choong, M. (2008). An empirical analysis of customer satisfaction in international air travel. *Innovative Marketing*, 4(2), 50-62.
- Davis, D., & Tisdell, C. (1995). Recreational scuba-diving and carrying capacity in marine protected areas. *Ocean & Coastal Management*, 26(1), 19-40.
- Dhimmer, V. R. (2017). Microplastics in gastrointestinal tracts of *Trachurus trachurus* and *Scomber colias* from the Portuguese Coastal waters (*Doctoral dissertation*).
- do Sul, J. A. I. & Costa, M. F. (2014). The present and future of microplastic pollution in the marine environment. *Environmental pollution*, 185, 352-364.
- Garcia, C. & Servera, J. (2003). Impacts of tourism development on water demand and beach degradation on the island of Mallorca (Spain). *Geografiska Annaler: Series A, Physical Geography*, 85(3-4), 287-300.
- Giannoni, S. & Maupertuis, M. A. (2007). Environmental quality and optimal investment in tourism infrastructures: a small island perspective. *Tourism Economics*, 13(4), 499-513.
- Greiner, A., Feichtinger, G., Haunschmied, J. L., Kort, P. M., & Hartl, R. F. (2001). Optimal periodic development of a pollution generating tourism industry. *European Journal of Operational Research*, 134(3), 582-591.
- HAYAT, M. M. U. (2016). Measuring Domestic Tourist Satisfaction at Cox's Bazar Sea Beach, Bangladesh (Doctoral dissertation, School of business, Siam University, Bangkok, Thailand).Jamhawi, M. M., Al-Shakarchi, N., & Al-Hashimi, (2015), I. *Assessment of tourists' satisfaction in the downtown of Amman*. pp. [127-136]

Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., ... & Law, K. L. (2015). Plastic waste inputs from land into the ocean. *Science*, 347(6223), 768-771.

Fewtrell, L., & Kay, D. (2015). Recreational water and infection: a review of recent findings. *Current environmental health reports*, 2(1), 85-94. Kozak, M., & Rimmington, M. (2000). Tourist satisfaction with Mallorca, Spain, as an off-season holiday destination. *Journal of travel research*, 38(3), 260-269.

Lavers, J. L., & Bond, A. L. (2017). Exceptional and rapid accumulation of anthropogenic debris on one of the world's most remote and pristine islands. *Proceedings of the National Academy of Sciences*, 114(23), 6052-6055.

Prebensen, N. K. (2004). Tourist satisfaction with a destination: Antecedents and consequences. In XIII *Simposio Internacional de Turismo y Ocio* (Vol. 13, pp. 1-45).

Ryan, P. G., Moore, C. J., van Franeker, J. A., & Moloney, C. L. (2009). Monitoring the abundance of plastic debris in the marine environment. *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, 364(1526), 1999-2012.

Redclift, M. (2001). Environmental security and the recombinant human: sustainability in the twenty-first century. *Environmental Values*, 10(3), 289-299.

Rustagi, N., Pradhan, S. K., & Singh, R. (2011). Public health impact of plastics: An overview. *Indian journal of occupational and environmental medicine*, 15(3), 100.

Saenz-de-Miera, O., & Rossello, J. (2013). Tropospheric ozone, air pollution and tourism: a case study of Mallorca. *Journal of Sustainable Tourism*, 21(8), 1232-1243.

Sangpikul, A., & Batra, A. (2007). Ecotourism: a perspective from Thai youths. *Journal of Hospitality, Leisure, Sport and Tourism Education*, 6(1), 81-85.

Shahrivar, R. B. (2012). Factors that influence tourist satisfaction. *Journal of Travel and Tourism Research (Online)*, 12(1), 61.

Shanka, M. S. (2012). Bank service quality, customer satisfaction and loyalty in Ethiopian banking sector. *Journal of Business Administration and Management Sciences Research*, 1(1), 001-009.

**ANNEX: QUESTIONNAIRE**

**Universitat**  
de les Illes Balears

**THE EFFECT OF BEACH POLLUTION ON TOURIST SATISFACTION**

Dear Sir / Madam,

thank you for visiting Mallorca. We are pleased that you have agreed to collaborate with us in this study research and we are requesting for your opinion about the level of cleanliness and plastic pollution at the beaches and the other underlying aspects of satisfaction in reference to your experiences.

The survey will help us to examine the effect of beach pollution on your satisfaction. The interview will take about 10-15 minutes.

**SECTION A: INFORMATION ABOUT THE TRIP AND ACCOMODATION**

- 1) Is this your first trip to Mallorca? [Yes / No] \_\_\_\_\_
- 2) If no, including this trip, how many times have you visited the island during the last 5 years? \_\_\_\_\_
- 3) Where have you stayed?
  1. Hotel
  2. Short-term tourist apartment
  3. Rural or agro-tourism establishment
  4. Long-term rented/owned house or apartment, or hosted by family/friends
- 4) This time, how many nights do you expect to spend on the island? \_\_\_\_\_
- 5) Considering your initial expectations about your trip, would you say your satisfaction level is:
  1. Very low
  2. Low
  3. Medium
  4. High
  5. Very high
- 6) Are you planning to come back in the future? [Yes / No / I do not know] \_\_\_\_\_

**SECTION B: BEACH VISIT EXPERIENCES**

- 1) In which of the following activities have you participated? [Multiple answer]

	<u>Activity</u>	YES	NO
1	Bathing		
2	Sunbathing		
3	Reading or relaxing		
4	Practice beach sport (walking, running, playing volleyball, etc)		
5	Practice water sport (surfing, windsurfing, swimming, etc)		

- 2) Yourself included, how many people have you gone to the beach with?
  1. \_\_\_\_\_ younger than 18 years old
  2. \_\_\_\_\_ older than 18 years old
- 3) Did you get to the beach by foot? [Yes / No] \_\_\_\_\_
- 4) Did you use public transport to get to the beach? [Yes / No] \_\_\_\_\_
- 5) Did you rent any vehicle to get to the beach? [Yes / No] \_\_\_\_\_
- 6) In a scale from 1 to 5, with 1 - "very low" and 5 - "very high", which degree of satisfaction did you obtain from the visit to this beach? \_\_\_\_\_
- 7) Did the following factors affect your degree of satisfaction? [Yes / No]

	Beach Factor	YES	NO		Beach factor	YES	NO
1	Lifeguard presence			7	Surroundings		
2	Showers			8	Congestion		
3	Bars/Restaurants			9	Composition (sand, rocks...)		
4	Accessibility			10	Arboreal cover (shadow)		
5	Parking			11	Water transparency		
6	Shoreline quality			12	Beach cleanliness		
				13	Calmness		

- 8) What level of concern do you feel for the quality of the beach surrounding that you intend to visit in reference to cleanliness?
1. Very concerned
  2. Somewhat concerned
  3. Not concerned
  4. Not at all concerned
  5. Uncertain

**SECTION C: PLASTIC POLLUTION ASPECT**

- 1) How familiar are you with the concept of plastic pollution in marine areas?
1. Strongly familiar
  2. Somewhat familiar
  3. Not familiar
  4. Not at all familiar
  5. Uncertain
- 2) Do you agree that the following factors have an impact on your satisfaction at the beach you visit?

Plastic litter factors	YES	NO
Floating litter in the waters		
Presence of plastic packages in the beach		
Presence of litter in the beach sand		
Number of trash bins at the beach		

- 3) Using a scale of 1 to 5, with 1- "very low" and 5 - "very high", what is your rate your dissatisfaction basing on the litter viewed at the beach?

**SECTION D: SOCIO-DEMOGRAPHIC CHARACTERISTICS**

- 1) What is your gender? \_\_\_\_\_
- 2) What is your Nationality? \_\_\_\_\_
- 3) Which year were you born? \_\_\_\_\_
- 4) Which is the highest education level you have achieved?
  1. Rather not say
  2. Primary education
  3. Secondary education (high school)
  4. Vocational school / college
  5. University education
- 5) Which is your main occupation?
  1. Full-time or part-time employee
  2. Freelancer
  3. Entrepreneur
  4. Unemployed (Non-working)
  5. Looking after the kids/other family
  6. Retired
  7. Student

- 4) What is your family status?
1. Single
  2. Married
  3. Widow
  4. Divorced
  5. Widower
  6. Separated

THANK YOU SO MUCH!

\*\*\*\*\*END\*\*\*\*\*