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ASSESSMENT OF THE SUSTAINABILITY OF SENSITIVE ECOSYSTEMS

APPLICATION IN BALOS LAGOON

MASTER'S THESIS
BY
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ΠΟΛΥΤΕΧΝΕΙΟ ΚΡΗΤΗΣ

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ΠΕΡΙΛΗΨΗ

Τα ευαίσθητα οικοσυστήματα διαδραματίζουν έναν σημαντικό ρόλο για το μέλλον του περιβάλλοντος, της οικονομίας και της κοινωνίας, καθώς επηρεάζουν και μετριάζουν την εμφάνιση, συχνότητα και συμπεριφορά φυσικών καταστροφών, παρέχουν φυσικούς πόρους, πληθώρα θέσεων εργασίας και ευκαιρίες ψυχαγωγίας και αναψυχής. Ωστόσο, ο ταχέως αναπτυσσόμενος τουρισμός στη φύση ασκεί μη βιώσιμες πιέσεις στα εν λόγω οικοσυστήματα, θέτοντας ως προτεραιότητα την αξιολόγηση της βιωσιμότητάς τους, δηλαδή της λειτουργίας τους από περιβαλλοντική, οικονομική και κοινωνική άποψη.

Για να εξασφαλιστεί η μακροπρόθεσμη ανάπτυξη και διατήρηση ενός τέτοιου τύπου οικοσυστήματος, τα οφέλη από το φυσικό κεφάλαιο πρέπει να αποτιμώνται και να εντάσσονται στο σχέδιο διαχείρισής τους. Η παρούσα διπλωματική εργασία στοχεύει να αξιολογήσει τη βιωσιμότητα της λιμνοθάλασσας του Μπάλου, μιας περιοχής NATURA 2000, που αποτελεί τουριστικό προορισμό υψηλής επισκεψιμότητας, στην Κρήτη.

Η Ζωνική Μέθοδος Κόστους Ταξιδίου (ZTCM) σε συνδυασμό με την Μέθοδο Προθυμίας Πληρωμής (WTP), αξιοποιήθηκαν, αφενός για τη σκιαγράφηση του προφίλ επισκεπτών και αφετέρου για την κατασκευή τριών μοντέλων που συσχετίζουν την τιμή εισιτηρίου στην παραλία με το ποσοστό επισκεπτών που εισέρχονται, βάσει του κόστους μεταφοράς στην παραλία (μοντέλο TC), του κόστους μεταφοράς συνεκτιμώντας το ευκαιριακό κόστος του χρόνου (μοντέλο TTC) και της δεδηλωμένης προτίμησης (μοντέλο WTP).

Τα αποτελέσματα της έρευνας εντοπίζουν ότι ο Μπάλος είναι πόλος έλξης νεαρών επισκεπτών, υψηλού μορφωτικού επιπέδου, που ταξιδεύουν με σύντροφο για αναψυχή. Η επιλογή της μεταφοράς τους μοιράζεται ισόποσα σε θαλάσσια και επίγεια μέσα, με μεγαλύτερα ποσοστά όσων ταξιδεύουν με κρουαζιέρα προς την παραλία να προτείνουν υψηλότερη τιμή εισιτηρίου.

Από την ανάλυση ευαισθησίας των μοντέλων προκύπτει ότι από όλα, το TTC είναι το πιο σταθερό σε αλλαγές βασικών παραμέτρων, καθιστώντας το κόστος του χρόνου σημαντικό παράγοντα της ανάλυσης.

Η πλειοψηφία των επισκεπτών πρότεινε να είναι ελεύθερη η πρόσβαση στην παραλία. Συγκρίνοντας τα μοντέλα, το WTP προβλέπει μείωση $60-70\%$ της τουριστικής ροής με χρέωση εισιτηρίου $EUR\ 5$, ενώ τα μοντέλα ZTCM συμφωνούν σε μια μείωση 40% για το ποσό αυτό. Επιπλέον, το πλεόνασμα καταναλωτή εκτιμήθηκε στα $9.90, 15.42$ και 17.74 $EUR/επισκέπτη$, για τα μοντέλα WTP, TC και TTC αντίστοιχα, υποδεικνύοντας ότι οι επισκέπτες επωφελούνται πολύ περισσότερο από ό,τι τελικά πληρώνουν.

Τελικά, διαφαίνεται ότι η επιβολή υψηλότερου εισιτηρίου μπορεί να βοηθήσει στον έλεγχο της τουριστικής ροής, χωρίς τη μείωση των ετήσιων εισόδων της παραλίας. Οι πληροφορίες αυτές μπορούν να ενσωματωθούν στη διαδικασία ανάπτυξης ενός βιώσιμου σχεδίου διαχείρισης και ακόμα στον σχεδιασμό τουριστικών πακέτων που αφορούν στην Λιμνοθάλασσα του Μπάλου και την ευρύτερη περιοχή.

ABSTRACT

Sensitive ecosystems play a major role in the future of the environment, economy and society, as they affect and mitigate natural hazards, provide food, energy and medicinal resources, a plethora of employment jobs, as well as cultural and recreational services. Meanwhile, the rapidly growing nature-based tourism is applying unsustainable pressures on such ecosystems, prioritizing the assessment of their sustainability, i.e., environmental, economic and social functionality.

To ensure the long-term development and conservation of an ecosystem, benefits from the natural capital must be valued and included in a management plan. This project aims to assess the sustainability of Balos lagoon, a NATURA 2000 site and highly visited tourist attraction in Crete, Greece. The Zonal Travel Cost Method (ZTCM), along with Willingness to Pay (WTP), were utilized as economic valuation methods for non-market goods. The analysis provided useful insight into the visitors' profile, as well as three different models that relate the price of an Entrance Fee to the percentage of visitors, based on travel costs to the beach (TC model), travel costs including the opportunity cost of time (TTC model) and visitors' stated preference (WTP model).

The results of the survey indicate that Balos attracts young, highly educated visitors, travelling from Europe with their partners for leisure. Their choice of transport is evenly split between sea and land transport, with a larger percentage of those who travel by cruise to the beach suggesting a higher ticket price.

The sensitivity analysis performed shows that of all three models, TTC is the most stable to changes in key parameters, making the cost of time an important factor in the analysis.

The majority of visitors suggested that access to the beach should be free. Comparing the models, the WTP predicts a $60 - 70\%$ reduction in tourist flow with a EUR 5 ticket charge, while the ZTCM models agree on a 40% reduction for this amount. Furthermore, the consumer surplus was estimated at $EUR\ 9.90, 15.42$ and $17.74\ EUR/visitor$ by the WTP, TC and TTC model respectively, indicating that visitors benefit much more than what they actually pay.

Finally, it appears that the implementation of a higher entrance fee can help control the tourist flow without reducing annual revenues. This information can be incorporated into the development of a sustainable management plan and the design of tourism packages for Balos Lagoon.

Keywords: Ecosystem valuation, Travel Cost Method, Balos Lagoon, Sustainable development, Sustainable tourism

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NOMENCLATURE

Abbreviation	Description
PA	Protected Area
UN	United Nations
TRAN Committee	Transport and Tourism Committee
SDG	Sustainability Development Goals
N2K	NATURA 2000
SCI	Sites of Community Interest
SAC	Special Areas of Conservation
SPA	Special Protection Areas
WTP	Willingness to Pay
TC	Travel Cost
TCM	Travel Cost Method
ITCM	Individual Travel Cost Method
ZTCM	Zonal Travel Cost Method
CTCM	Crowdsourced Travel Cost Method
CB	Contingent Behaviour
CVM	Contingent Valuation Method
CE	Choice Experiment
MBV	Mitigation Behaviour Valuation
HPM	Hedonic Pricing Method
DR	Dose-response
EV	Economic Valuation
GNI	Gross National Income
NNI	Net National Income
IUCN	International Union for Conservation of Nature
GDPR	General Data Protection Regulation
OCT	Opportunity Cost of Time
tC	or Time Cost
CS	Consumer Surplus
ATVs	All-terrain Vehicles

1. INTRODUCTION

1.1. The Role of Sensitive Ecosystems

The benefits linked to protected areas are numerous and encompass a wide range of ecosystem services that are crucial for the seamless functioning of natural systems, social cohesion and integration, and a healthy economy.

Protected areas are of immense ecological importance due to their ability to preserve and promote biodiversity. Besides their key role in the formation of nutrient-rich soils and sediments, as well as critical habitats for vulnerable species, they are a coping mechanism for natural disasters, such as floods, while contributing to climate regulation. These two traits, rich biodiversity and resilience to disturbances, are strongly related, due to portfolio effects and functional redundancy (Costello Mark John, 2022; Edmunds & Lasker, 2022; Giuffrida & Salvo, 2022).

Another asset of healthy ecosystems are provisional services related to food, energy, and medical resources. Furthermore, ecosystems are found to be regulating the range and number of species that may pose a threat to human health and safety. Marine and coastal protected areas such as mangroves and wetlands, for instance, can act as natural barriers to invasive species and prevent the proliferation of harmful pathogens, like those ones that cause harmful algal blooms or infectious diseases, while providing a home to natural predators that help control populations of dangerous animals (Kennerley et al., 2022; Klohmann & Padilla-Gamiño, 2022; Mukhopadhyay et al., 2020).

Besides promoting physical fitness, access to nature and outdoor activities can offer a unique chance for relaxation and stress relief, symptoms which are reportedly intensified by urbanization. Frequent exposure to green and blue settings, either natural or artificial, has been linked to improved mental health outcomes, including reduced anxiety, attention restoration, children's cognitive development and enhanced visitors' overall well-being. Moreover, the presence of protected areas can contribute to a sense of place and community identity. Protected areas often serve as cultural and historical sites, where local communities can connect with their heritage and traditions while visitors gain opportunities for environmental education and awareness, as well as social integration (Nawrath Maximilian et al., 2021; Subiza-Pérez et al., 2020).

Finally, protected areas can provide numerous cultural and recreational benefits, including enjoyment and appreciation of their aesthetic value and, of course, tourism. Nature-based tourism is associated with employment in multiple sectors and industries (Trovato et al., 2021).

1.2. Tourism in Protected Areas

Tourism is a constantly growing industry and the numbers speak for themselves; 9.8% of the total Global Domestic Product (GDP) and 7% of global trade are related to this sector, as well as 11% of the global workforce (Pan et al., 2018). Currently, 20% of jobs created over the past decade were due to tourism (Sorin & Sivarajah, 2021). By 2030, tourism is expected to take over 57% of the global economy (Pan et al., 2018).

Europe claims 5 out of the top 10 tourism destinations in the world (Rodríguez et al., 2020). Between 2017 and 2019, there was 5.52% increase in arrivals, only to be held back by a sudden drop of 83% in the first 3 months of 2021, in comparison to 2020, due to COVID-19 restrictions (Arzoumanidis et al., 2021). Still, Europe accepts $500\ million$ arrivals annually, which corresponds to $EUR\ 610\ billion$ each year. Also, $12\ million$ occupations are directly linked to European tourism, as well as $2\ million$ enterprises (Zorpas et al., 2021).

Regardless of this constant growth, we have to bear in mind that other factors, such as carrying capacity, resilience and natural resources are not going to scale proportionally, but are bound to further deplete instead (Martínez-Cabrera & López-Del-Pino, 2021; Rodríguez et al., 2020).

Protected areas (PAs) all around the world are estimated to attract around $8\ million$ visitors per year. In Europe, up to $10{,}000$ destinations contribute to economic security, with an ever-growing interest in the natural environment (Buongiorno & Intini, 2021; Kim et al., 2020).

Over the years, the purpose of tourism in protected areas has shifted from an anthropocentric approach towards a biocentric one. The “PA for visitors” evolved to the “PA with visitors” model, both retaining adverse environmental effects, leading to the “PA and visitors” ideal, which brings forward a symbiotic relationship between any given area and visitors, wherein both profit (Weaver & Lawton, 2017).

Several tourism types have been proposed, in the context of sustainability, including (Table 1.1):

Table 1.1 Types of sustainable tourism (Source: https://www.earth-changers.com/)

Tourism Type	Traits	Origin
Sustainable tourism	Considers social, economic and environmental needs of given community and visitors	World Tourism Organization
	Aims to improvement	
Ecotourism	Stresses the importance of knowledge and education for everyone involved in a given area (stakeholders and visitors)	The International Ecotourism Society, 2015
Volunteer tourism	Working holiday for social and environmental causes	*Not explicitly determined*
	Covers basic expenses	
Responsible tourism	Promotes activities that improve the economy and conserve the cultural heritage of a protected area	Cape Town Declaration, 2002, Goodwin
Geotourism	Involves environment, agriculture, culture, local cuisine etc.	National Geographic
	Aims to improve the geographical character of protected area	

All of the aforementioned tourism types have their pros and cons, but they still converse in encouraging a participatory approach, rather than a consumeristic one (Pásková et al., 2021). Of course, there are many other types, such as culture (heritage) tourism, community tourism, wildlife tourism etc. (Pan et al., 2018).

1.3. Pressures applied on Ecosystems due to Unsustainable Tourism

The expansion of tourism applies environmental, economic and social pressures in some parts of the world. The tourism industry is responsible for 8% of global CO_2 emissions, 72% of which are associated with transportation, 21% with accommodation and 4% with tourist activities (Sørensen & Bærenholdt, 2020).

There are also other types of pollutants, such as microplastics in the marine environment and cigarette butts that display seasonality affiliated with tourist activities. As for waste generation, according to the European Environmental Agency (EEA) tourists produce 6.8% of Europe's waste (Rodríguez et al., 2020). Around $1\ kg$ of solid waste per capita daily is double the amount produced by a local resident. In America, this number rises up to $2\ kg$ (Pan et al., 2018).

Loss of biodiversity is another existing issue. A plethora of natural destinations is overexploited, leading to disturbance of the wildlife they harbor. Beach resorts in Dubai are an example of damaged habitats. The maintenance of cultural heritage is also at stake, due to the construction of infrastructure that is ever-expanding (Pan et al., 2018).

Apart from these environmental issues, gender inequality (covered by the 5th goal of UN's 2030 agenda) is a social phenomenon reportedly related to economic costs in addition to environmental damage. Women usually occupy front-of-the-house hospitality jobs, thus confronting the worst aspects of the industry; oppression, sexual harassment, exploitation, pay gap etc. (Boluk et al., 2019).

Overtourism seems to be an up-and-coming problem for sustainable tourism. Defined as "the situation in which the impact of tourism […] exceeds physical, ecological, social, economic, psychological and or political capacity thresholds" by the European Parliament's TRAN Committee in 2018, it is reportedly linked to the expansion of international tourism, due to:

• low-priced transportation tickets and travelling opportunities,

• abundance of bed and breakfast accommodation, as well as several other tourists' facilities,

• political phenomena, such as war or terrorist attacks, that disfavor certain destinations, and

• the expansion of the Internet, through which information is easily obtained and experiences are shared on various platforms (Bertocchi et al., 2020).

This situation stirs negative feelings towards visitors, as their presence is associated with rising prices or deterioration of residents' well-being. At this point, antitourism activity may take place, or even tourismphobia, in the form of discrimination or organized campaigns against tourists (Mihalic, 2020). Thailand, the Philippines, Barcelona, Venice and part of Scotland are dealing with this phenomenon via the implementation of entry fees or tourism downgrading policies (Butler, 2020).

After the failure of the Millennium Development Goals, UN's 2030 Agenda is a promising strategy (Figure 1.1). Conveying 17 sustainable development goals, which include 169 targets, some of which have to do with the future of the tourism industry (Boluk et al., 2019).

Figure 1.1 UN's Sustainability Development Goals (Source: https://www.un.org/)

Specifically,

• inclusive and sustainable economic growth: 8, 9, 10 and 17

• social inclusiveness, employment and poverty reduction:1, 3, 4, 5, 8 and 10

• resources regulation, environmental protection and climate change: 6,7, 8, 11,

12, 13, 14 and 15

• cultural heritage and diversity: 8, 11 and 12

• peace and security: 16

This study seeks to investigate the impact of implementing an entrance fee on tourist flows within an N2K protected area that serves as a tourist destination. This site is purposefully selected as a sensitive ecosystem where the increasing number of visitors has compromised its sustainability. Therefore, the examination of tourist flows and the influence of entrance fees on these flows are crucial in understanding how to manage sustainable tourism in the region. This study will contribute to the existing body of literature, presented in the following section, by providing empirical evidence on the effectiveness of entrance fees in regulating tourist flows and mitigating the negative impact of tourism on the natural environment.

2. STATE-OF-THE-ART

A critical review of the scientific literature in the Travel Cost Method is presented in this chapter (state-of-the-art), detailing the theory behind the method (2.1, 1.1), and mentioning selected case studies, referring to the type of methodology followed, the analysis and estimated costs where possible. Its scope is to gain a better understanding of the methodology, trace gaps and limitations, provoke new approaches and inspire innovative ideas for future research.

The first step for constructing this review involved exploring scientific publications on the subject through several academic databases/research engines:

- ScienceDirect,
- Web of Science,
- Scopus and
- ResearchGate.

Focusing on the most recent work, results were limited to a date range between 2018 and 2022. The searching terms (keywords) inserted were:

- "Travel Cost Method + Natura",
- "Travel Cost Method + Beach",
- "Travel Cost Method + Protected Area",
- "Travel Cost Model Beach",
- "Travel Cost Analysis Natura 2000" and
- "Travel Cost Method Greece".

The second step involved going through the obtained material and shortlisting it based on its relevance to coastal ecosystems, especially beaches and protected areas. The works mentioned include case studies from around the world, not only the Mediterranean region or the EU. Consequently, the monetary values stated below have all been converted into euros, based on the change rate of the year each research was conducted.

2.1. Non-Market Economic Valuation Methods

Non-market Economic Valuation (EV) serves as a tool that can be used to estimate the monetary value of the benefits that humans obtain from natural resources through goods and services that are not traded in the market. Given that the conservation of the ecosystem services that these natural resources offer has a positive economic value higher than the cost of misusing them, the information estimated regarding its ecological, cultural, aesthetic and economic benefits can underpin conservation actions. The economic value of ecosystem services is necessary information affecting government decision-making for developing protection plans, which are usually limited to an admission fee, based on Pigou's tax theory or Coase's contract theory. (Houngbeme et al., 2021; Zambrano-Monserrate et al., 2018).

Valuing the environment to improve or maintain its quality has been subject to controversy, due to misunderstanding the valuing approach. The concept of "value" encompasses a broad set of ideas, with two main categories: "held values" and "assigned values". Held values are a person's beliefs on what is good or preferable, while assigned values are given to an object relative to other objects. Nonmarket valuation estimates assigned values, which are affected by held value (Segerson Kathleen, 2017).

There are two main categories of nonmarket EV methods: stated and revealed preference. Some of them are summarized in Table 2.1 (Börger et al., 2021; Leh et al., 2018; Rolfe et al., 2021; Tribe, 2020):

Table 2.1 Most common Non-Market Economic Valuation Methods (Source: Börger et al., 2021; Leh et al., 2018; Rolfe et al., 2021; Tribe, 2020)

Type	Method	Explanation
Stated preference	Willingness to pay (WTP)	WTP can be obtained via surveying a site's users. The total valuation is estimated by multiplying the average WTP by the total number of users. It is found that respondents tend to over-report their WTF under hypothetical questions.
	Contingent Valuation (CV)	In CV, users are presented with one or more hypothetical scenarios in which they are asked to express their WTP, for a specific improvement in environmental quality or conservation of a natural resource. The responses are then used to estimate the overall economic value of the environmental good or service. Suitable for sites with aesthetic features.
	Choice Experiment (CE)	In CE, users choose between different alternatives presented to them, each with a different combination of attributes regarding the environmental quality or conservation policies.
Revealed preference	Mitigation behaviour (MBV)	MBV is based on estimating costs related to avoiding or reducing exposure to environmental risks (e.g., a potential flood).
	Hedonic pricing (HPM)	HPM involves gathering data on price variations, pinpointing their origin and estimating the impact of the environment on them.
	Travel Cost Method (TCM)	TCM is based on the assumption that the travel expenditures to a site are related to visitor's valuation of it. Suitable for tourist destinations.
	Dose-response (DR)	DR data are often utilized to estimate the impact of environmental quality (e.g., air pollution) on human health.
	Replacement cost technique	Mostly used in damage assessment, this method estimates the costs of replacing lost or damaged services or goods.

2.2. The Travel Cost Method

The TCM, the oldest nonmarket EV method, was first proposed by Hotelling in 1947, where "zonal" data were defined around the examined site. These zones would usually but not necessarily be concentric circles of varying distance. For each area, the visitation frequency would be measured and based on different average travel costs per trip calculated for each zone, a demand function would be constructed, providing information on the total consumer surplus. This method was refined by Clawson and Knetch in 1966 and became more elaborate by King and Mazzotta, Boardman et al., and Parsons in 2000 and 2011 and 2017, respectively. Meanwhile, during the 1970s, a different approach emerged that included "individual-based" data (Brown and Navas, 1973, Gum and Martin, 1975) (Parsons R. George, 2017).

The main differences between the ZTCM and ITCM are compared in Table 2.2 (Mukhopadhyay et al., 2020; Soares, 2021).

Table 2.2 Individual and Zonal Travel Cost Method comparison (Source: Mukhopadhyay et al., 2020; Soares, 2021)

ITCM	ZTCM
Specifies individual's traits	Uses average data for each zone
Produces more accurate demand function	Avoids outliers
Requires significant sample	Deals with lack of data
Assumes that individual's characteristics affect travelling decisions	Considers certain socioeconomic variables statistically insignificant
Robust estimations require variation in visitation rate	Robust estimations require adequate number of zones

2.2.1. Limitations of the Travel Cost Method

The TCM demand curve is based on two main factors: the users' willingness to pay, given that they have spent both money and time to visit a site, and the frequency of their trips (usually annual), which is affected by their motivation and experience. The standard information needed is:

- the number of trips to the area,
- demographics,
- travel cost,
- time spent travelling,

and for a more elaborate model, the following:

- time spent at the destination,
- other sites visited during the same trip,
- visiting purpose
- overall satisfaction (usually referring to environmental quality).

However, there are some elements that are hard to consider in this methodology, giving away its limitations. These include (Leh et al., 2018):

- Travel duration: the time spent travelling to a destination can be seen as part of the trip's expenditures by time-constrained individuals, whereas others may benefit from a scenery journey.
- Multi-Purpose and multi-destination trip: when visiting the examined site is part of a trip that involves several other destinations, there are difficulties in calculating the travel cost of interest. When the overall travel cost is allocated to different destinations, the partial cost drastically decreases.
- Substitute destinations: the presence of other destinations, even of the same type as the one ultimately visited, actually adds value to the latter. So, given two different travellers covering the same distance, the one with access to substitutes could value the preferred destination more.
- Other expenditures: besides transportation costs, there are several other, such as parking fees, vehicle maintenance expenses, as well as food and accommodation costs.

2.2.2. The Opportunity Cost of Time

According to some studies, the travel duration to a certain destination influences the value assigned to it, generating the "opportunity cost of time", tC, which is usually considered proportional to income (varying from 0 to 100% of it) (Pascoe, 2019; Soares, 2021).

In some cases, the opportunity cost of time is not included in the travel cost model, due to a lack of information on income, the assumption that visitors are off-work anyway or that travelling time is part of the experience (Börger et al., 2021; Deely et al., 2022). However, most studies propose that the opportunity cost of time is equal to one-third of the hourly earnings multiplied by the time spent on roundtrip travel (Tienhaara et al., 2021; Trovato et al., 2021). The hourly earnings could be an average for different countries or zones (Juutinen et al., 2022) or the stated individuals' income (Giuffrida & Salvo, 2022). In order to obtain the net hourly income, Lankia et al., 2019, divided the household monthly gross income by the number of adults, subtracted the corresponding tax rate and then divided it by the standard $158 - hour$ working time.

2.3. The NATURA 2000 network

Apart from several initiatives, such as the “EU Biodiversity Strategy for 2030” and “European Green Deal” amongst them, the EU has established laws for the conservation of biodiversity and nature, regarding wildlife and regulating activities such as hunting and fishing. The Directives 2009/147/EC “Birds” and Directive 92/43/EEC “Habitat”, first promoted in 1979 and 1992, respectively, protect over a thousand animals and plants and over 200 habitat types, comprising the NATURA 2000 network (N2K). This network encompasses the “Sites of Community Interest” (SCI), later named “Special Areas of Conservation” (SAC), following the “Habitats” Directive and also the “Special Protection Areas” (SPA), that focuses on protecting wild birds (https://natura2000.eea.europa.eu/, last visited: 17/02/2023).

Although Europe’s protected areas cover 26% of its land, there are currently over $27{,}300$ designated NATURA 2000 sites, covering approximately 18% of EU’s land and about 4% of the marine area (Figure 2.1). Based on visitor’s willingness to pay, the value of recreation in these areas can potentially reach $EUR\ 9\ billion$ annually, a number far exceeded by the annual expenditures associated with tourism, which rise beyond $EUR\ 80\ billion$ per year. Due to the perpetual declining in ecological richness and variety of Europe, the N2K network is constantly expanding (Buongiorno & Intini, 2021; Rocchi et al., 2020; Spiliopoulou et al., 2021).

As it has already been mentioned, protected areas are linked to working positions. Around $12\ million$ full-time jobs in agriculture, forestry, fishing, recreation and other industries are generated by the presence of an N2K site. Meanwhile, managing and maintaining these ecosystems demands over $EUR\ 5\ billion$ per year. Realizing the economic benefits of this network would require stakeholders’ support and secure financing for conservation initiatives and additional investments (Trovato et al., 2021).

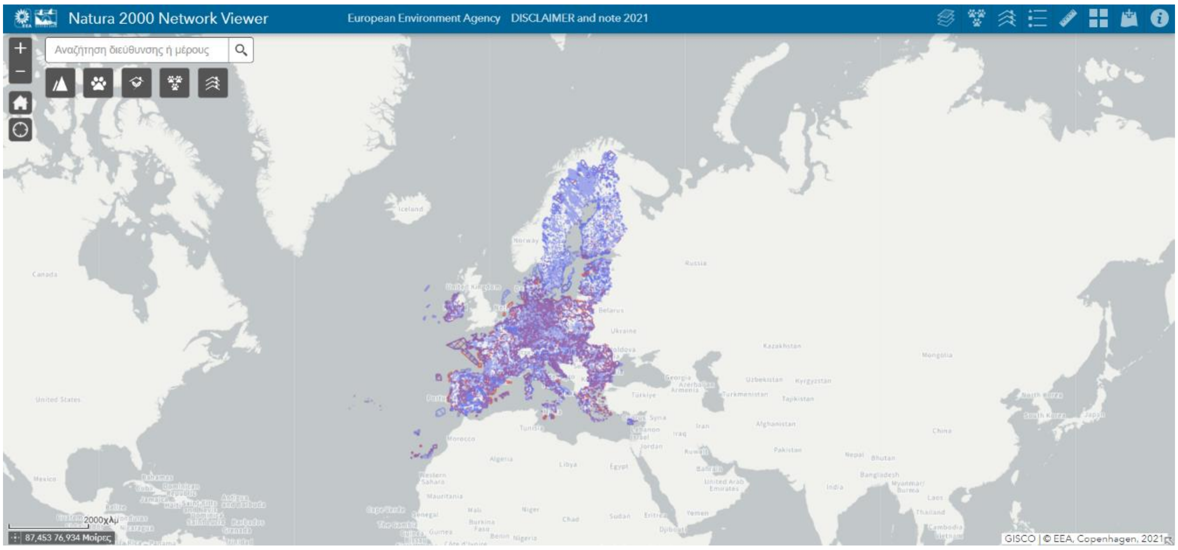

Figure 2.1 The NATURA 2000 Network (Source: https://natura2000.eea.europa.eu/)

2.4. Global Experience

In Indonesia, Gunungkidul Regency encompasses a coastal area of 46 beaches, where the number of visitors has rapidly increased over the second half of the past decade. However, this surge in tourism and fishing activities has led to significant management issues, notably waste overload. In 2018, a study conducted by Diponegoro University examined the economic value of the entire coastal area using the TCM across six beaches. The results showed a value of $EUR\ 190\ thousand$ per year, emphasizing the importance of sustainable management of the coastal zone. The study also identified the push and pull factors that motivated visitors to the area, providing effective management actions. (Riesti & Indah, 2018).

Located in the Kenting National Park of Taiwan, Nanwan Bay is a popular recreational area of high biodiversity that has recently turned into a busy attraction for water activities. This may be the repercussions of the abrupt economic growth of the country, which has enhanced the standard of living. Since 2001, the two days off per week policy let more and more people enjoy recreational activities, thus creating the need to produce a management plan. Dond et al., exploited a truncated Poison model, a truncated binomial distribution model and an on-site Poison model based on TCM that estimated a consumer surplus of $EUR\ 234$ per person per visit, or a yearly gross of $EUR\ 221\ million$ (Dong et al., 2018).

Villamil Beach National Recreation Area, located in the Guayas province of Ecuador, is a highly visited tourist destination all year long. Managed by the Ministry of Environment, this protected area provides various recreational services at the shoreline. To effectively manage the coastal area, it is crucial to comprehend the characteristics of both locals and tourists. As such, economic valuation, which reveals diverse uses of natural resources like beaches, has been employed to estimate the economic value of the area. Specifically, the Individual Travel Cost Method (ITCM) revealed that the estimated value for the whole sample (residents and tourists) is $EUR\ 14.95$ per person per visit. A semi-elasticity analysis in this study showed that tourists are less sensitive to slight changes in travel expenses (Zambrano-Monserrate et al., 2018).

Malecón 2000 located in the city of Guayaquil, Ecuador, stands out as one of the most significant parks in the country. It is a tourist destination, boasting a wide range of attractions, including historical monuments, retail shops, lagoons, and gardens. However, for the park to continue thriving in a sustainable manner, it is crucial to develop effective policies that ensure its maintenance. To achieve this objective, it is necessary to understand the profile of the visitors who frequent the park. In 2020, researchers applied the ITCM, which yielded a value of approximately $EUR\ 14$ per visit, indicating that new strategies could be put in place to improve the park's financial performance. It is projected that if these strategies are effectively implemented, the park's earnings could rise up to $EUR\ 334\ million$. (Menendez-Carbo et al., 2020).

Using a travel cost modelling approach with online-survey data as input, Sean Poscoe estimated the economic value of beach usage by residents of New South Wales, Australia. This study improves upon previous research by modelling the activities that visitors usually undertake when they visit the beach and by considering the occurrence of multiple activities. It is observed that the various activities have different consumer surplus values, with surfing, fishing, and swimming giving higher values than more passive activities like enjoying the environment. Moreover, Sydney residents and non-Sydney residents have different values, $EUR\ 22$ and $EUR\ 11$ per trip, respectively. It is also suggested that a trip to the beach provides an initial consumer surplus of approximately $EUR\ 9$ per trip for Sydney residents, with additional benefits coming from engaging in different activities. For instance, adding a walk along to the beach after surfing can increase the value of the visit by $EUR\ 15$ (Pascoe, 2019).

South-western Victoria, Australia, is a well-travelled destination that encompasses the Greater Geelong area as well as the Great Ocean Road, along with several coastal villages. The ITCM, in conjugation with a Choice Experiment was applied to five seaside towns, the former for the estimation of the recreation values generated by the coastal caravan and camping parks and the latter to measure visitors' WTP to cope with climate change impacts on beach access. For this particular study, 388 campers and 382 local residents were interviewed, revealing a value of $EUR\ 40$ per person per night or $EUR\ 1.6\ thousand$ per camper annually. What is more, 66% of the campers were willing to pay around $EUR\ 100$ annually, so that beach size and park sites are not reduced (Rolfe et al., 2021).

The economy of Benin, a developing country of extreme poverty, heavily relies on agriculture, a sector vulnerable to climate change. The government has shifted its focus to seaside tourism to boost economic growth, as it remains under-exploited. However, this needs to be done sustainably, taking into account the coastal degradation that has occurred over the past decade. A number of programmes have been launched to serve these purposes, such as the costly "Fishing Route Tourism Development Project" and the second "Phase of the East Coast Cotonou Protection Project". In order to inform public policies on preserving and enhancing the coast, costs and benefits of beach tourism and recreation in Benin have been examined by a 2021 study. It focused on Fidjrossè beach, one of the country's most attractive ones, using ITCM and negative binomial regression as a count model. The determinants of demand for recreation were highlighted, including the negative relationship between travel costs and positive relationships with time spent on the site and level of education. The estimated visitor surplus was estimated at $EUR\ 0.76$ for overall expenses per visitor, which is relatively low, so further investigation is required to address methodological limitations (Houngbeme et al., 2021).

Gahar Lake is situated in a valley surrounded by the Oshtrankooh Mountains, which are part of a wider protected area in Lorestan Province, Iran. The lake has gained popularity as an attraction for nature-based tourism, drawing visitors from various parts of the country and beyond. To assess the economic value of this resort, Kheyri et al. employed the ZTCM model, which involved surveying 380 randomly sampled visitors during the visiting seasons. The survey included sections on both economic and social aspects of the visitors' experience. The analysis of the data revealed a value of $EUR\ 74$ per person or an impressive $EUR\ 1.7\ million$ annually. This study also found that the poor facilities available at the resort played a significant role in mainly attracting younger visitors. The results of this study stress the need to develop a comprehensive tourism plan for Gahar Lake, which should take into account the economic value of the resort as well as the users' profiles (Kheyri et al., 2020).

In the ongoing efforts to estimate the recreational value of India's coastal and marine ecosystems, the TCM has been one of the first successfully implemented. This macro-approach has been adopted in response to the recent and continuous land-use changes in the coastal zones, which have raised concerns about the sustainability of these ecosystems. The results of the ZTCM analysis indicate that the recreational value of the coastal areas of nine Indian states collectively contributes 0.9% to the country's GDP. Notably, the study also evaluated the consumers' surplus, which was found to be EUR $16\, billion$ and $EUR\ 31\, billion$ for locals and foreign visitors, respectively. These findings illustrate the immense economic significance of India's coastal and marine ecosystems, and the urgent need to develop sustainable policies that ensure their preservation and continued availability for recreational use. (Mukhopadhyay et al., 2020).

Another study conducted in North Portugal aimed to estimate the benefits and costs associated with two beaches at the Azibo Reservoir Protected Landscape, which was created and made available to the public through government public investment. These two beaches are home to a vast number of species, hence gaining the Blue Flag eco-label. The ZTCM was used, involving 224 questionnaires. The results show that in 2016, the Azibo beaches had about $20{,}000$ more visits during the high season, compared to the previous year. The visitors' travel costs were estimated at $EUR\ 10\, million$, while their net benefits were around $EUR\ 3.6\, million$. These figures indicate a surplus attributed to the site, even after accounting for the management expenses of $EUR\ 162.5\ thousand$ per year. Although certain socio-economic traits of the respondents were not included, the fact that the results were in line with other studies, suggest that the ZTCM was a suitable choice compared to ITCM (Soares, 2021).

Greece's Prespa National Park is a protected area that provides significant ecosystem services. In a recent study, Dionysios Latinopoulos developed a hybrid TCM model, in which the dependent variable was the number of trips per person (as in the zonal TCM), while including users' socio-economic characteristics (as in ITCM). Subsequently, to gather the necessary data, two surveys were conducted on hotelkeepers in the surrounding areas, utilizing both constructed and semi-constructed approaches. The consumer surplus per trip was estimated at $EUR\ 59$, resulting in an annual value of ecotourism worth approximately $EUR\ 206{,}000$ (Latinopoulos, 2019).

Researchers conducted a study at Oosterschelde, an estuary located in the Netherlands near the Belgian border, to explore whether Dutch and Belgian divers who visit this site would be willing to contribute towards its upkeep. The results of the study indicate that recreational diving alone provides a significant consumer surplus of $EUR\ 108$ and $EUR\ 197$ for Dutch and Belgian divers, respectively. This equates to an annual value of approximately $EUR\ 22\, million$. It was also found that Belgian interviewees demonstrated a greater willingness to pay than their Dutch counterparts. These findings provide valuable insights into the profiles of users of this site, which could be useful in developing effective management strategies, especially given the limited budgets available for maintenance. (Rousseau & Tejerizo Fuertes, 2020).

The TCM has also helped explore the impact on the recreational use of a seaside walking path, on Galway Bay located on the west coast of Ireland, due to natural disasters, specifically storms and erosion, as well as the cost of sustainable measures regarding green and grey infrastructure. A negative binomial model, along with input data based on an on-site survey, showed that the recreation value of the area is high, especially for locals. A further cost-benefit analysis was performed indicated that both grey and green infrastructure could generate benefits over the span of two decades, with the latter far being more efficient. The method was assessed as robust after a sensitivity analysis (Hynes et al., 2022).

Due to COVID-19 pandemic affecting the marine tourism industry and, subsequently, coastal economies, it is now a priority for island nations to inspire and bring back overseas visitors. A study carried out in Ireland examined 610 Ireland visitors' participation in the marine and coastal tourism market and the length of stay of tourists in multiple coastal areas. The TCM is used to estimate the consumer surplus, as an extra value a person gains over their costs per trip in a coastal area, at $EUR\ 295$ per day or $EUR\ 1{,}031$ per year (Deely et al., 2022).

It should be clear by now that the TCM is usually applied in combination with another evaluation method. A study applied the TCM and the Contingent Valuation Method in order to estimate the non-market value of recreation in two coastal lagoons: the Coorong (Australia) and the Ria de Aveiro (Portugal). This research is part of an international and interdisciplinary study using the same survey questionnaire (with few adaptations). Results showed that visitor profiles from both sites were similar. The consumer surplus estimated via the TCM for Coorong and Ria de Aveiro were $EUR\ 132$ and $EUR\ 160$ per person, per day, respectively, whereas the equivalent values with Contingent Valuation were $EUR\ 103$ and $EUR\ 110$, respectively, with the CVM (Clara et al., 2018).

The Dead Sea is an exceptional attraction for both nature enthusiasts and tourists alike. Unfortunately, it has lately displayed a gradual water level decrease, which is leading to constant dehydration in its southwestern basin. Developing well-informed policies concerning the future of the southwestern basin called for the estimation of its economic benefits. For this purpose, market and non-market benefits have been compared in a single study, combining the TCM with the Contingent Valuation Method. The latter presented two different scenarios: a business-as-usual one and an alternative, in which Dead Sea hotels are to be closed due to climate change policies. Ultimately, the total non-market benefit loss was found at $EUR\ 24.4\ million$ annually, about 19% of the overall benefits (Lavee & Menachem, 2018).

Following the same line of reasoning, the TCM has been applied along with a partial cost-benefit analysis in order to compare the recreational surplus to maintenance costs of three beaches in the Nerbioi estuary, North Spain. In the early 1990s, the construction of a Wastewater Treatment Plant in the vicinity enhanced the water quality of the surrounding area of these beaches, creating new opportunities for recreation. The findings of this study concluded that the annual $EUR\ 3.5\ million$ consumer's' surplus could fully cover the annual maintenance expenses and partially (12%) fund the operating costs of the sewage system. These benefits correspond to $EUR\ 5.99, 7.06\ and\ 8.09$ per trip, with these prices varying, because of the different visitor's profile of each destination (Pouso et al., 2018).

A study conducted in Finland, a country with extensive coastlines and several lakes, where water-based activities are of major recreational importance, opted to evaluate the impact of changes in water quality on recreational benefits, especially swimming trips. This study employed national recreation inventory data and a combination of the TCM and Contingent Behavior approach to estimate the value of a swimming trip in Finland at $EUR\ 16$ per trip.

Furthermore, results showed that under a water quality worsening scenario, the value would drop to $EUR\ 8$ per trip, while under an enhanced water quality scenario, it would be elevated to $EUR\ 19$ per trip. This means that the annual value of all swimming trips would increase by $53-80\%$ with water quality improvement but decrease by approximately 80% with water quality decline (Lankia et al., 2019).

The idea of co-benefits, first emerging in the 1990s, referred to GHG restriction policies concerning climate change. In a 2021 study conducted by the University of Catania, it is applied to natural capital protection strategies. This study assessed the landscape co-benefits produced by the NATURA 2000 networks with respect to "Timpa di Acireale", a coastal region in Sicily, North Italy. Both TCM and Contingent Valuation were employed, and data were collected via questionnaires for 159 local visitors and 75 non-local visitors. The cost-effectiveness of the existing management plan was calculated with a discounted cash flow analysis. The results indicated that residents-users', local tourists' and foreign visitors' co-benefits reach $EUR\ 755$ thousand, $EUR\ 100$ and $EUR\ 2\,thousand$ per year, respectively. Weaknesses in the site's management plan were attributed to poor infrastructure (Trovato et al., 2021).

Another study conducted in Finland, used a combination of TC and Contingent Behaviour model, in order to evaluate the impact of water quality changes on water recreation. The case study was Lake Puruvesi, a popular tourist site of remarkable water quality, that has lately presented signs of eutrophication. To avoid further water quality decline, researchers sought to reveal the spatial distribution of visitors. This was succeeded by utilizing an "Epanechnikov" kernel function, which estimated the density surface of the 5 chosen "hot spots". Data were collected through an on-site, as well as an online survey, that allowed the integration of spatial information. Results, at the current state of water quality, showed that the surplus per visit was around $EUR\ 71$. However, this number is much higher for car travellers, reaching $EUR\ 300$. As expected, the estimated consumer surplus decreases with water quality deterioration. The methodology proposed in this study helps policymakers prioritize the most vulnerable locations within the examined area (Tienhaara et al., 2021).

The frequency of jellyfish blooms in the Northeast Atlantic region is reportedly increasing, as evidenced by multiple jellyfish-human interactions in coastal recreation areas. In order to evaluate the negative impact of these instances, a study applied the TCM, at St Ives, a popular coastal destination in Cornwall, UK. Data were collected via questionnaires administered to beachgoers, further exploring potential changes in total visitation under different jellyfish bloom scenarios. The results indicate that beach closures due to jellyfish stingers would cause a daily loss of $EUR\ 9.7\,thousand$, while non-stinger blooms would result in a daily loss of $EUR\ 3\,thousand$. The study also found that beach users are willing to donate to anti-jellyfish management schemes, with a projected benefit of over $EUR\ 5\,thousand$. The study suggests that jellyfish blooms could have a significant impact on coastal recreation in the UK, and so developing an anti-jellyfish management plan may lessen the impact (Kennerley et al., 2022).

Another multi-site study was carried out in 2021 across half of the EU member states, using TCM and Contingent Behaviour approach. This research focused on blue spaces and went further than the existing literature by using a unified online survey, including different types of blue spaces, integrating user's opinion on water quality changes and exploiting a multivariate Poisson lognormal regression model instead of the usual Poisson lognormal. The findings yielded were that the annual average visits to these sites are 47 per person, which corresponds to a recreation value of about $EUR\ 41$, which in turn suggests a total of $EUR\ 631\ billion$ per year. Based on the water quality standards dictated by the “Bathing Water Directive”, it is found that a 1-level increase in water quality causes 6.7% more annual visits, while 1-level decrease causes a 20.8% drop (Börger et al., 2021).

When estimating the value of natural areas for their incorporation into larger development plans, single-sited TCM evaluations may not prove sufficient. For example, a study conducted in 2022 attempted to compare the recreation value of six contrasting case studies across Norway, Denmark, Finland, and Sweden, so that its findings would potentially support a future, unified, Nordic bioeconomy policy. Using TCM in conjunction with survey data, the study found varying results depending on the type of ecosystem, whether it was urban, rural, forested, or including waters and rivers. The total annual values ranged from $EUR\ 3.1\ million$ for a forested area run by a river, up to an impressive $EUR\ 120.8\ million$ for a historic agricultural landscape. Moreover, the study revealed that the recreation benefits were strongly linked to water quality (Juutinen et al., 2022).

The TCM is rarely applied on a large scale, including a network of areas, as it is usually site-specific. However, a study conducted in 2018 included as many as 728 protected areas in New South Wales, South Australia. Most of them were wilderness areas, open to the public and providing multiple recreation activities. The data required for the random utility TCM were obtained through a phone survey of over $62{,}000$ people. The results illustrated a strong influence of the built infrastructure available on visitor demand and indicated an annual value of $EUR\ 3\ billion$, with most of it attributed to frequent visitors within the state of New South Wales (Heagney et al., 2018, 2019).

Another study integrated data from geotagged photos on social media into the so-called crowdsourced TCM (CTCM). The results are validated using value estimates from on-site surveys for 16 German national parks and value transfer techniques. The study finds that demand curves for park access follow standard economic and consumer demand theory and that consumer surplus ranges from around $EUR\ 17$ up to $EUR\ 35$. By incorporating social media data, the CTCM offers an innovative and cost-effective method for estimating economic values of recreational sites, thereby helping researchers and decision-makers to better understand and manage these areas. (Sinclair et al., 2020).

Metadata of geotagged photographs from social media have been another alternative data source to value recreation. A study conducted in 67 Italian protected areas utilized this material as input to build TC count data models, with a zero-truncated Poisson model returning down sloping demand curves for 50 out of 67 sites. A significant travel cost coefficient was returned for 33 sites, which allowed for the estimation of consumer surplus. The welfare estimates were found to fluctuate from $EUR\ 6$ up to $EUR\ 87$, so the mean value was about $EUR\ 33$ per trip. The study's use of social media data for valuing recreation in protected areas highlights the potential of big spatial data as a novel source for environmental research. Despite challenges, the study's findings could inspire new forms of data collection and analysis (Giuffrida & Salvo, 2022).

Error! Not a valid bookmark self-reference. illustrates key information on state-of-the-art research regarding ecosystems valuation using the TCM.

Table 2.3 Overview of studies from across the world that have utilized the Travel Cost Method

Year	Authors	Country	Type of Ecosystem	Valuation Method	Data	Consumer Surplus per Trip/Visitor (€)	Analysis	Annual Economic Value (€)
				Non-European Countries				
2018	Riesti T., Indah S.	Indonesia	6 Beaches	ITCM	on-site survey	–	log-linear model	$190\ thousand$
2018	Dong et al.	Taiwan	Bay	ITCM	on-site survey	234	truncated Poison model, truncated binomial distribution model, on-site Poison model	$221\ million$
2020	Mukhopadhyay et al.	India	Coastal zones	ZTCM	on-site survey	–	panel regression	$47\ billion$

2020	Kheyri et al.	Iran	Lake	ZTCM	on-site survey	74	linear regression	$1.7\ million$
2018	Lavee D., Menachem O.	Israel	Lake	ITCM+CVM	on-site, online, telephone surveys	17	linear regression	$24.4\ million$
2021	Houngbeme et al.	Benin	Beach	ITCM	on-site survey	0.76	Poisson model, negative binomial regression	$-$
2018	Zambrano et al.	Ecuador	Beach	ITCM	on-site survey	15	zero-truncated negative binomial regression	$18\ million$
2020	Menendez-Carbo et al.	Ecuador	Urban Park	ITCM	online survey	14	zero-truncated negative binomial regression	$271-334\ million$
2019	Poscoe S.	Australia	Beach	ITCM	online survey	15.5	hurdle model	$-$
2021	Rolfe et al.	Australia	5 Coastal towns	ITCM + Choice Experiment	on-site survey	40	advanced logit models	$-$

2018	Heagney et al.	Australia	Various	ITCM	telephone survey	28	random effects ordered logit model	$3\ billion$
				European Countries				
2018	Clara et al.	Australia + Portugal	Lagoon	ITCM+CVM	on-site survey	130	negative binomial model	$-$
2021	Soares J.O., Soares F.C.	Portugal	2 Beaches	ZTCM	on-site survey	$23-114$	linear, linear-log, log-linear, log-log models	$3.6\ million$
2018	Pouso et al.	Spain	3 Beaches	ITCM + partial cost benefit analysis	on-site survey	7	Poisson model	$3.5\ million$
2021	Trovato et al.	Italy	Coastal zone	ITCM+CVM	on-site survey	$-$	linear regression	$3\ million$
2022	Sinclair et al.	Italy	Various	CTCM	geotagged photographs	33	zero-truncated Poisson model	$0{,}3-174\ billion$
2019	Latinopoulos D.	Greece	Lake	hybrid TC	on-site survey	59	log-linear regression	$0.2\ million$

2022	Hynes et al.	Ireland	Bay	ITCM	on-site survey	11	negative binomial model	$0.6\ million$
2022	Deely et al.	Ireland	Coastal zones	ITCM	on-site survey	295	logit model, negative binomial model	–
2022	Kennerley et al.	UK	Coastal zone	ITCM+CVM	on-site survey	–	negative binomial regression	–
2020	Sinclair et al.	Germany	Various	CTCM	geotagged photographs	$17-35$	log-log ordinary least squares regression	$1{,}67\ billion$
2020	Rousseau S., Tejerizo Fuertes A.	the Netherlands	Estuary	ITCM + Choice Experiment	online survey	$108-197$	log-linear regression	$22\ million$
2019	Lankia et al.	Finland	Coastal zones	ITCM+CVM	on-line, mailed paper survey	16	Poisson model, negative binomial regression	–
2021	Tienhaara et al.	Finland	Lake	ITCM+CVM	on-site survey	71	Poisson model	–
2022	Juutinen et al.	4 Nordic Countries	Various	ITCM	on-site survey	$21-64$	negative binomial models	$3{,}1-120{,}8\ million$

2021	Börger et al.	14 EU countries	Coastal zones	ITCM+CVM	online survey	41	multivariate Poisson lognormal regression	$631\ billion$

3. METHODOLOGY

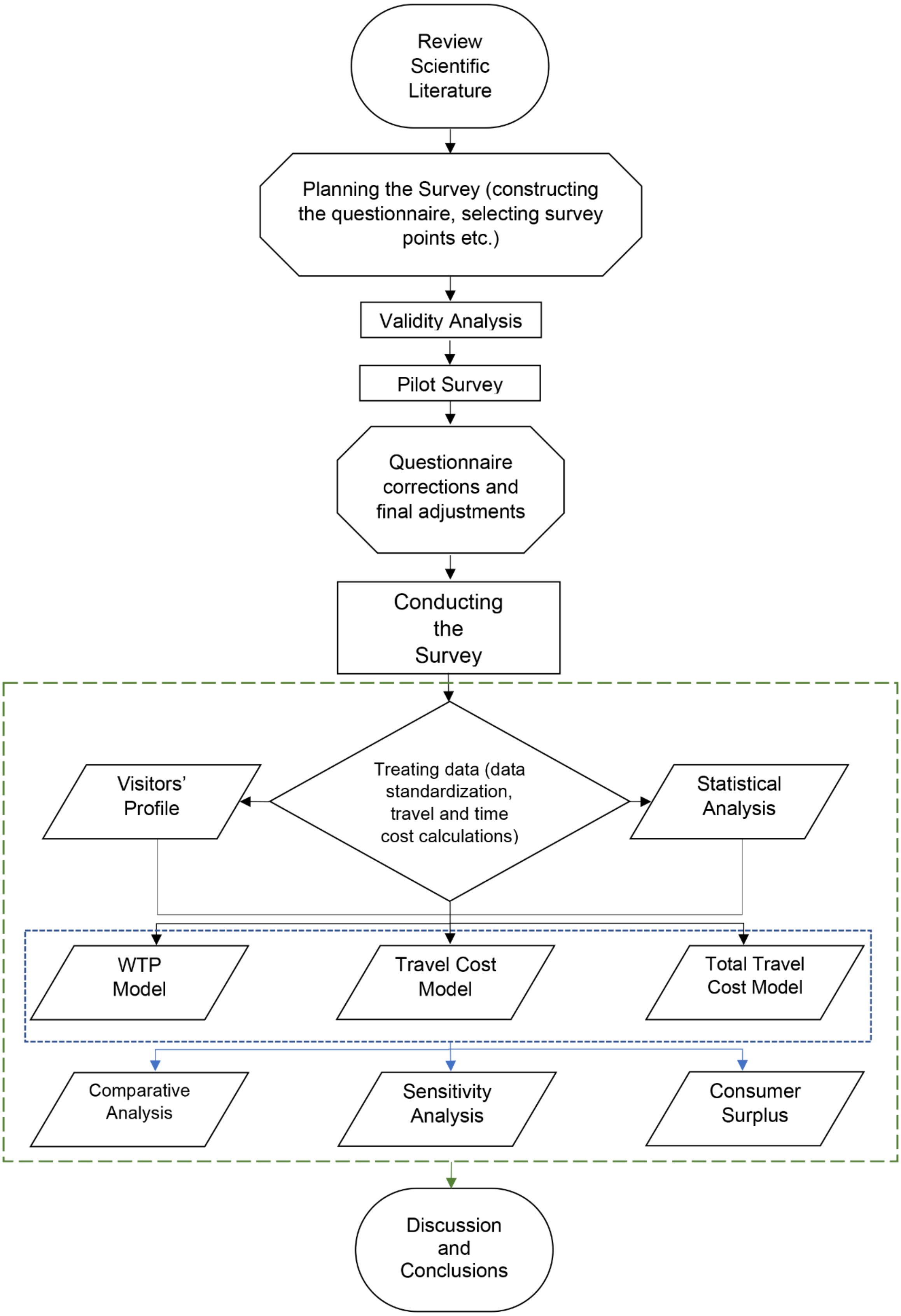

Diagram 3.1 Flowchart of methodology: a visual representation of the research process

3.1. Case Study: Balos Lagoon

According to the Millennium Ecosystem Assessment, coastal zones occupy approximately 4% of the total global land area and 11% of the total global ocean area. These areas provide habitat for over 30% of the world's human population, which is 3 times denser than that of inland regions. Coastal zones boast an array of natural features such as wetlands, estuaries, coral reefs, mangroves, and beaches. Amongst them, beaches, in particular, possess a significant amount of natural capital. Subsequently, their overexploitation would potentially damage ecosystems and decrease associated services (Zambrano-Monserrate et al., 2018).

The selection of a case study was based on ecosystem sensitivity and high environmental, social and economic impact, thus providing an ideal arena for sustainability assessment. Moreover, Mediterranean ecosystems were a priority, and particularly ones in close vicinity, for practical purposes, besides being under high tourist pressure of unsustainable character (Mancini et al., 2022).

Balos lagoon (Figure 3.1) presents the perfect candidate, as a N2K site and popular tourist attraction, while there is already demand by local communities for the implementation of conservation measures and the development of a sustainable management plan (Skiniti et al., 2022).

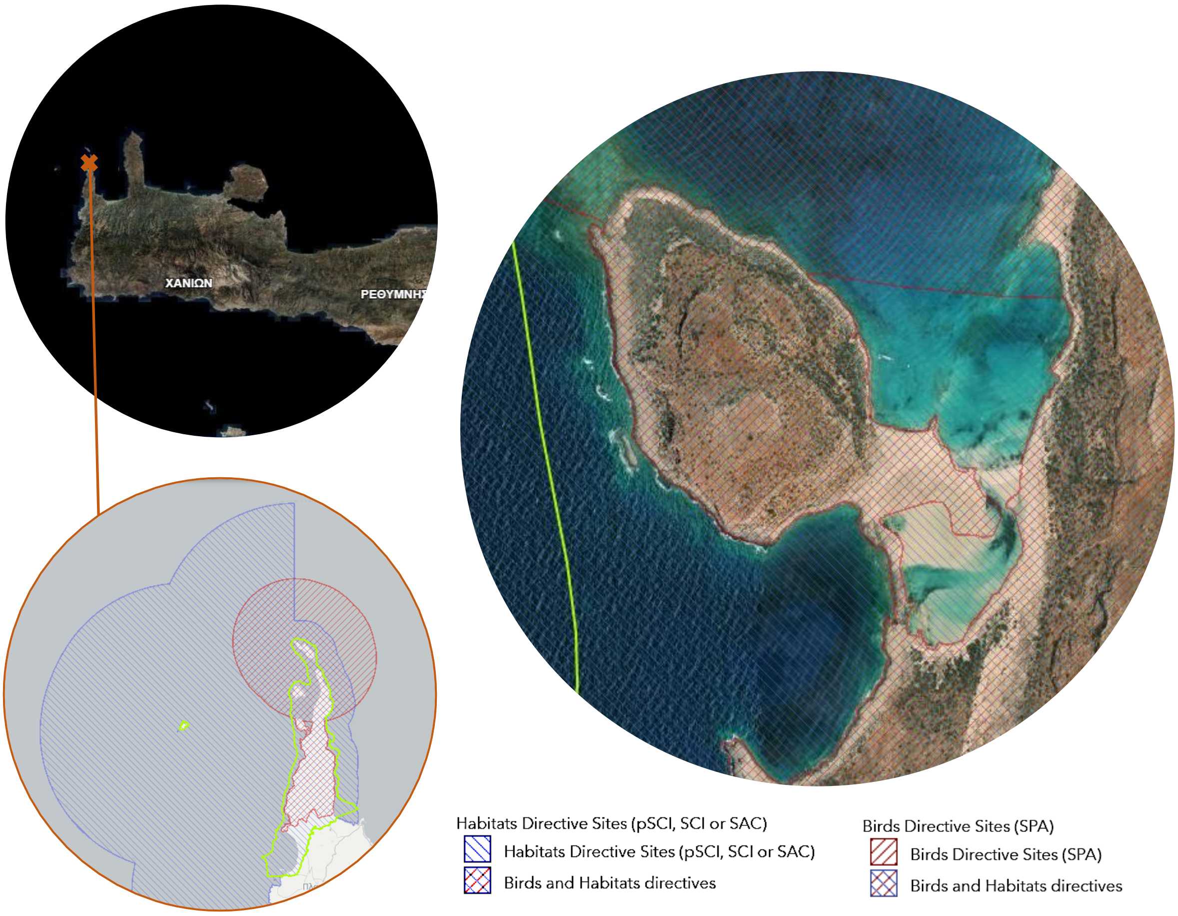

Figure 3.1 Case Study: Balos Lagoon, a N2K site in Crete
(Source: https://maps.gov.gr/gis/map/, https://natura2000.eea.europa.eu/)

3.1.1. A sensitive Ecosystem

Balos lagoon is located in Crete, Greece, and belongs to the municipality of Kissamos. The lagoon is formed by an uncovered, narrow strand of land between the Gramvousa Cape and the peninsula of Tigani. The land area is estimated at $2{,}898.0\ ha$ and the total area at $2{,}898.84\ ha$. The area is declared protected, under the institutional framework of N2K (code GR4340001) and Corine biotopes, owing to its ecological, social, cultural and aesthetic value. Balos is managed by the Forest Directorate of Chania and Samaria National Park Management Body, though according to the NATURA 2000-Standard Data Form filled out by the Hellenic Ministry of Environment and Energy, the wider protected region of Imeri and Agria Gramvoussa – Tigani, Falasarna-Pontikonisi and Ormos Livadi-Viglia still lacks an actual management plan.

The most important plant and animal species found in this area are listed in Table 3.1. Notably, according to IUCN Red List of Threatened Species *Centaurea pumilio* has been designated as rare in EU and Greece, in 1988 and 1993 respectively, and is protected under Greece's Presidential Decree 67/81. *Cynara cornigera* and *Silene fabaria* also belong to the Red List and are reportedly encountered in less than 100 sites in the European Community.

Table 3.1 Most important species of flora and fauna found in the protected area of Balos lagoon (GR4340001) (Source: https://natura2000.eea.europa.eu/natura2000/SDF.aspx?site=GR4340001)

Important Species of Flora and Fauna

Group	Scientific Name	Category	Group	Scientific Name	Category
Plant	*Allium rubrovittatum*	Present	Reptile	*Chalcides ocellatus*	Common
	Anthemis ammanthus			*Hierophis gemonensis*	
	Asperula rigida			*Hemidactylus turcicus*	Present
	Asperula taygetea			*Lacerta trilineata*	Common
	Centaurea argentea			*Mediodactylus kotschyi*	Very Rare
	Centaurea pumilio			*Podarcis cretensis*	Common
	Cynara cornigera			*Telescopus fallax*	Rare
	Filago cretensis				
	Inula candida				
	Limonium frederici				
	Scutellaria sieberi				
	Silene fabaria				
	Trigonella rechingeri				

3.1.2. Balos Lagoon under Tourism pressure

As a popular tourist destination of high visitation lacking a sustainable management plan, Balos lagoon has recently presented environmental degradation and negative socioeconomic impact challenges. A recent study has pinpointed the main issues and reported their seasonality, based on TripAdvisor reviews for 2020 and 2021. Proposed measures were hierarchized through a multi-criteria decision analysis for stakeholder groups, including local authorities, tourism sector, environmental groups, government, academia and financial investors (Skiniti et al., 2022).

These issues are shown in Table 3.2.

Table 3.2 Sustainability issues encountered in Balos lagoon (Skiniti et al., 2022)

Type of Issue	Issue
Ecological	Marine tar residue as ship-generated waste
	Presence of microplastics at the beach
	Litter
Physical	Overcrowded beach
Social-psychological	Number of cars exceeds parking space
	Road condition unsuitable for most cars
	Overcrowded ferries

The following charts (Diagram 3.2 a. Monthly tourist flows during 2017, 2018, 2019 and 2021, b. annual percentage of TripAdvisor users' complaints (Skiniti et al., 2022)) illustrate Balos' visitation from 2017 till 2019 and the perception of the emerging issues stated above by TripAdvisor users, for 2020 and 2021.

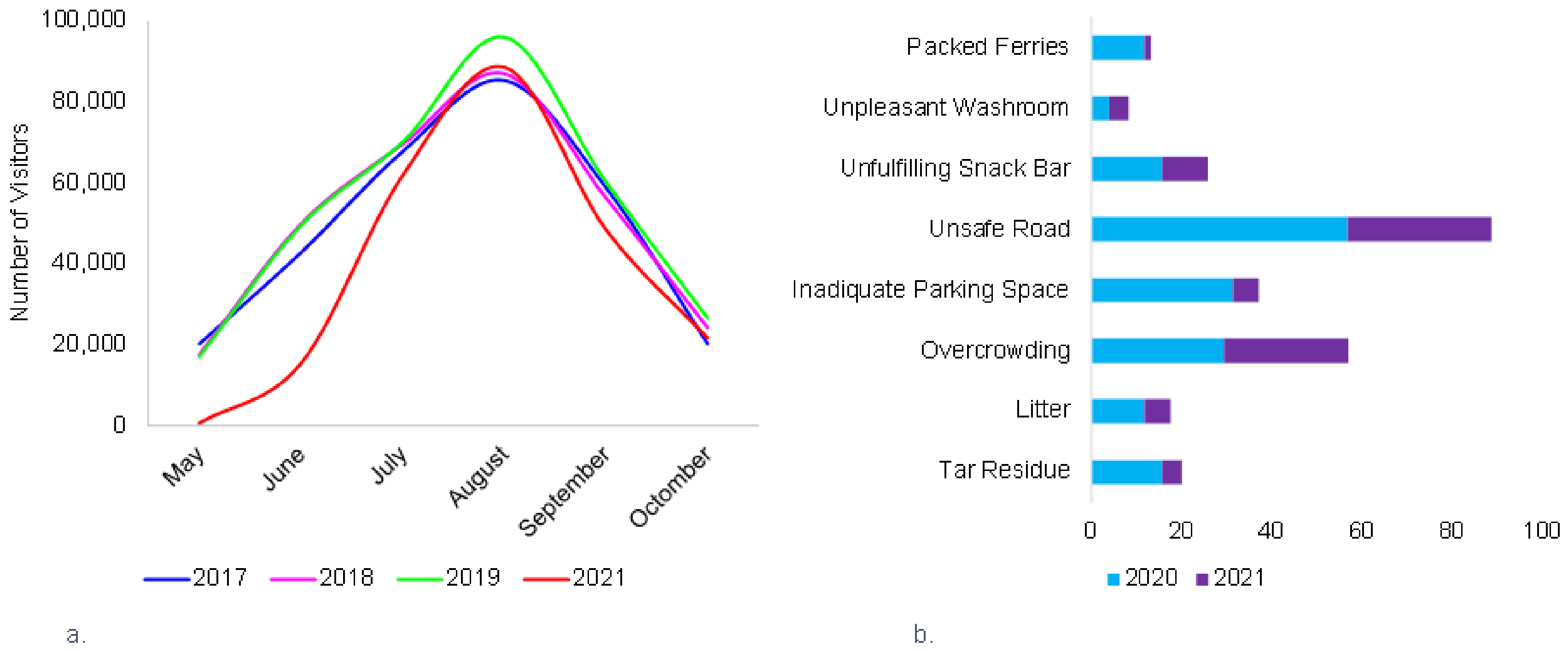

Diagram 3.2 a. Monthly tourist flows during 2017, 2018, 2019 and 2021, b. annual percentage of TripAdvisor users' complaints (Skiniti et al., 2022)

Some of the problems mentioned are reflected in the following pictures (Figure 3.2 a. Tar balls at the beach, b. litter in the water, c. sunbeds in Balos lagoon, d. overcrowded parking lot (Source: https://earth.google.com/web/), e. untreated dirt road to the beach, f. extensive area at the beach, fully covered in tar residue (Images 3.2 a, b, c, e and f captured by Nikolaos Skarakis)). Most of them were taken during the online survey carried out for this project.

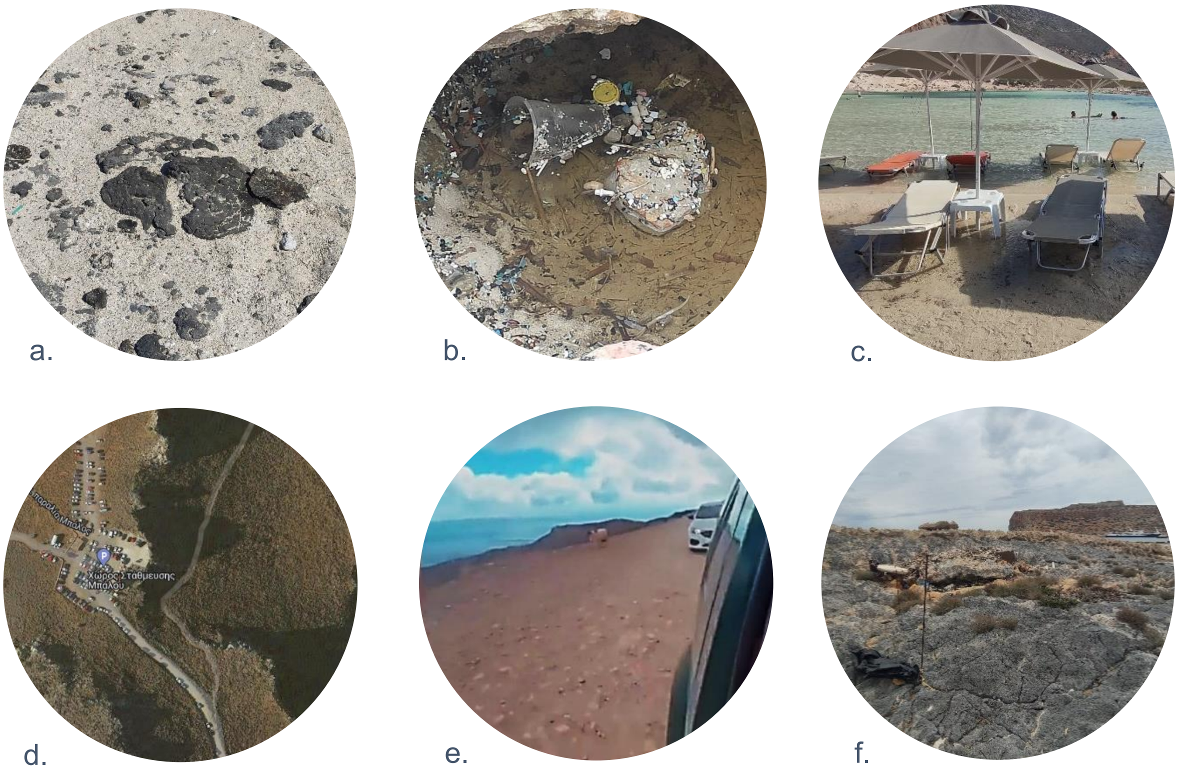

Figure 3.2 a. Tar balls at the beach, b. litter in the water, c. sunbeds in Balos lagoon, d. overcrowded parking lot (Source: https://earth.google.com/web/), e. untreated dirt road to the beach, f. extensive area at the beach, fully covered in tar residue (Images 3.2 a, b, c, e and f captured by Nikolaos Skarakis)

3.2. Data Collection

The required data were collected via a mixed-mode survey, i.e., online and in-person, in order to obtain as many thoroughly answered questionnaires as possible, with an initial sample target size of 300. Validity tests were used (to check how the methods used, measure what are intended to measure/ results correspond to the ones of the real word) and a pilot test was conducted prior to the official administration of the survey, aiming along other things to assess the comprehensibility of the questionnaire in both Greek and English.

The web-based survey was available for submissions during the second half of September 2022. During this time, the field survey was conducted in 6 rounds (different days and hours of a week), using paper questionnaires as well as tablets. Alternatively, some visitors were given cards containing a QR code to participate online at their convenience. Although the survey was not in the form of an interview, participants were provided clarifications when needed (Figure 3.3).

The questionnaires were distributed to visitors through a random sampling, in order to eliminate any further sampling bias, participants were surveyed on board back to Kissamos, at the beach and at the parking lot. These key spots were strategically picked as the two exits and the main area of Balos lagoon. Individuals were initially randomly chosen and asked whether they had completed their visit to the site. The ones who did were asked to fill out the questionnaire, since they had a complete picture of the experience, whereas the ones that had just arrived were purposefully avoided.

The information obtained in this survey concern visitors' last trip to Balos and was the following:

- *level of satisfaction from visitor's experience in Balos*,
- *type of co-travellers,*
- *means of transportation to the beach*
- *trip's starting point,*
- *travelling time,*
- *length of stay at the beach,*
- *number of visits to the beach this year,*
- *existence of equally (or more) enjoyed destinations visited during this trip,*
- *cost of entrance fee to sustain Balos lagoon and*
- *demographics (gender, country of permanent residence, purpose of travel, age group, education, income).*

These questions were suitable to reveal the major attributes that affect participation and the data needed to calculate the cost of travel for each respondent. Questions regarding accommodation and food costs were not included.

Most questions were close-ended, primarily for data handling simplification. Especially for the alternative destinations question, respondents were provided with a pre-established list in order to assist their recollection.

It should be noted that in accordance with **GDPR** guidelines, the survey conducted for this research study was designed to be anonymous, with no personally identifiable or sensitive

Figure 3.3 Data collection process. A bather (left) filling out the questionnaire (Image captured by Georgia Skiniti)

information collected from participants. The anonymity of the survey was emphasized within the questionnaire.

Finally, 406 questionnaires were collected, but 5 of them were excluded from the analysis as they were either incomplete or incorrectly filled out.

3.3. Data Analysis

Initially, all "raw" data collected from both web-based and paper questionnaires were treated using ***Microsoft Excel for Microsoft 365 v2303***. The travel and time cost estimations were also executed in the same spreadsheet, as well as the sensitivity analysis and the output comparisons among the structured models mentioned bellow.

The rest of the statistical analysis was done in ***IBM SPSS Statistics 27.0.1*** (Apostolakis et al., 2022; Pallant, 2005) and included frequencies that outline visitors' profile, correlation and independence tests among most of the variables and the development of three models that express the impact of tourist flows on the Entrance Fee to Balos lagoon.

The calculation of the consumer surplus was done via the online ***Microsoft Math Solver.***

3.3.1. Travel and Time Cost Estimations

The roundtrip distance, as well as travelling time, were estimated through Google Maps.

In order to estimate the Travel Cost for each individual that did not state a price herself/himself or claimed an unordinary price, the following equation was utilized:

$$TC_i = \frac{fuel\ price \times \frac{standard\ fuel\ consumption}{100} \times roundtrip\ distance}{1 + number\ of\ co - travellers}$$

The standard fuel consumption prices were $7\ L/100km$ and $6.65\ L/100km$, for cars and motorcycles or ATVs, respectively, in accordance with (Latinopoulos, 2019). Fuel prices per day, for the field study period, are presented in Annex. For families, TC was split in 2, i.e., between parents.

For this study, the adjusted Net National Income per capita, i.e., "*GNI minus consumption of fixed capital and natural resources depletion (forest, energy and mineral)*" was provided by the World Bank for 2020 (https://www.worldbank.org/en/home), as the closest value to the net income. The adjusted NNI was then divided by the standard $158\ hours$, that corresponds to the 8 hours a day/ 5 days a week work, and multiplied by the estimated roundtrip travel time, generating each visitor's opportunity cost of time, tC_i.

$$tC_i = \frac{1}{3} \times \frac{adjusted\ NNI\ (€/year)}{12 \times 158\ (h)} \times roundtrip\ travel\ time\ (h)$$

For those countries, such as Malta and the Isle of Man, where the adjusted NNI values were not available, the mean value of the stated income range was used instead.

3.3.2. Correlational Analysis

A series of correlation/independence tests were conducted between continuous variables (linear regression) and categorical ones (cross-tabulation), based on the values of R^2 and χ^2, respectively. In order to confirm the lack or not of correlation, Income, Education and Rating were transformed into dichotomous variables and tested against continuous ones, using linear regression. Additionally, TC, TTC and Entrance Fee were transformed into categorical variables for the same purpose (see Table 3.3). The $p-value$ was the main indicator of a statistically significant (<0.05) or not s.s. correlation. In Table 3.4 the non-statistically significant are marked with ×, the statistically significant with ✓, whether strong or not, and the grey regions show that there was no need for a correlation test.

Table 3.3 Categorical variables tested in correlational analysis

Variable	Symbol	Type	Category code
Categorical Travel Cost	CTC	Categorical	[0-5]
			(5-10]
			(10-30]
			(30-50]
			50+
Categorical WTP_Entrance Fee	CEF	Categorical	0
			(0,1]
			(1,5]
			(5,10]
			10+
Categorical Total Travel Cost	CTTC	Categorical	[0-20]
			(20-40]
			(40-60]
			60+
Gender	G	Dichotomous	Male
			Female
Annual Income	I	Categorical	Less than 12,000 €
			12,001 €-30,000 €
			30,001 €-60,000 €
			60,001 €-80,000 €
			More than 80,000 €
Income	Id	Dichotomous	30,000- €
			30,000+ €
Education	ED	Categorical	Prefer not to disclose
			Primary/ Basic
			High School
			Bachelor
			Master
			PhD
Education	EDd	Dichotomous	High School and below
			Bachelor and above
Age	A	Categorical	Under 18
			18-24

			25-34
			35-44
			45-54
			55-64
			65-74
			Over 75
Ethnicity	E	Dichotomous	Greek
			Foreigner
Satisfaction Rating	R	Categorical	Not at all satisfied
			not really satisfied
			Mildly satisfied
			Satisfied
			Very satisfied
Satisfaction Rating Dummy	Rd	Dichotomous	Mildly satisfied and below
			Satisfied or very satisfied
Group Type	GT	Categorical	Alone
			Family
			Friends
			Partner
Purpose of travel	P	Dichotomous	Vacation
			Other
Substitute Destination	S	Dichotomous	NO
			YES
Geographical Zone	Z	Categorical	Chania
			Rethymno
			Heraklion
			Lasithi
Transport mode	TR	Dichotomous	Land
			Maritime
Survey Method	SM	Dichotomous	Online
			Paper-based

Table 3.4 The correlations tested among continuous and among categorical variables. Some were not statistically significant (marked with ×) and some were statistically significant (marked with ✓). The grey region indicates that no test was conducted

	TC	CTC	EF	CEF	tC	TTC	CTTC	G	A	I	ED	E	GT	R	S	TR	P	ST	Z	Id	EDd	Rd
TC	1																					
CTC		1																				
EF	✓		1																			
CEF				1																		
tC					1																	
TTC						1																
CTTC				×			1															
G			✓	×				1														
A		×		×					1													
I		×		×			×			1												
ED		×		×							1											
E	✓		✓									1										
GT		×		×									1									
R		×		×			×							1								
S	✓	×	✓	×			✓								1							
TR	✓	✓	✓	✓												1						
P			✓														1					
ST			✓															1				
Z				×															1			
Id	✓			×																1		
EDd	✓		✓	×																	1	
Rd	✓		×	×												×					×	1

TC: Travel Cost, **CTC**: Categorical Travel Cost, **EF**: Entrance Fee, **CEF**: Categorical Entrance Fee, **tC**: Time Cost, **TTC**: Total Travel Cost, **CTTC**: Categorical Total Travel Cost, **G**: Gender, **A**: Age, **I**: Income, **ED**: Education, **E**:Ethnicity, **GT**: Group Type, **R**: satisfaction Rating, **S**: Substitute destinations, **TR**: Transport mode, **P**:travel Purpose, **SM**: Survey Method, **Z**: geographic Zone, **Id**: Income Dichotomous, **EDd**: Education Dichotomous, **Rd**: satisfaction Rating Dichotomous, **×**: -non statistically significant correlation ($p-value > 0.05$), ✓: statistically significant correlation, -whether strong or weak

3.3.3. Constructing the Entrance Fee Models

Five different travel models were constructed (using three different methods/models), that express the cost of the entrance fee with respect to tourist flows (both number and percentage of visitors). The first was the "Willingness to pay" model that considered the entrance fee stated by the participants. The second was the "Travel Cost" model, that considered the average travel costs for different zones, as well as the current entrance fee, of $EUR\ 1$. The last model, i.e., the "Total Travel Cost" model also included the cost of time. Different fitting curve models were tried out (for the construction of each one of the above-mentioned models), and the value of R^2 provided the basic criterion for the best fit (in each case), as seen in Table 3.5.

Table 3.5 Fitting curve selection for each model considered

Model Trials	Willingness to Pay Method	Travel Cost Method		Total Travel Cost Method	
	Willingness to Pay Model[1]	*Number of Visitors-Travel Cost Model[2]*	*Travel Cost Model[3]*	*Number of Visitors-Total Travel Cost Model[4]*	*Total Travel Cost Model[5]*
Linear model	✗			✗	
Quadratic model	✗			✗	✗
Cubic model	✓		✗		✗
log-linear model	✗	✗			
Logarithmic model			✗		
Exponential model		✗	✓	✗	✓
Power model		✓	✗	✓	✗

[1]Model for WTP_Entrance Fee (dependent variable) and percentage of visitors (independent variable), [2]model for number of visitors (dependent variable) and average Travel Cost (independent variable), [3]model for Travel Cost (dependent variable) and percentage of visitors (independent variable), [4]model for number of visitors (dependent variable) and Total Travel Cost, that includes the cost of time (independent variable) and [5]model for Total Travel Cost (dependent variable) and percentage of visitors (independent variable).

3.3.3.1. Willingness to Pay Method

The demand curve for Balos lagoon was plotted using the WTP methodology. For every entrance fee stated, the corresponding percentage of visitors willing to pay up to that price was measured. Two different -fitting curves (formulas) linking the entrance fee to the percentage of visitors and the number of visitors were produced.

3.3.3.2. Travel Cost Method

The Zonal Travel Cost method was employed, whereby Crete was divided into four (4) zones (Figure 3.4) from where visitors initiated their trip, based on its administrative boundaries: zone 1 represents Chania, zone 2 represents Rethymno, zone 3 represents Heraklion and zone 4 represents Lasithi. With this numerical coding system, it can be inferred that an increase in the numerical designation of a zone corresponds to an increase in distance from the site of interest.

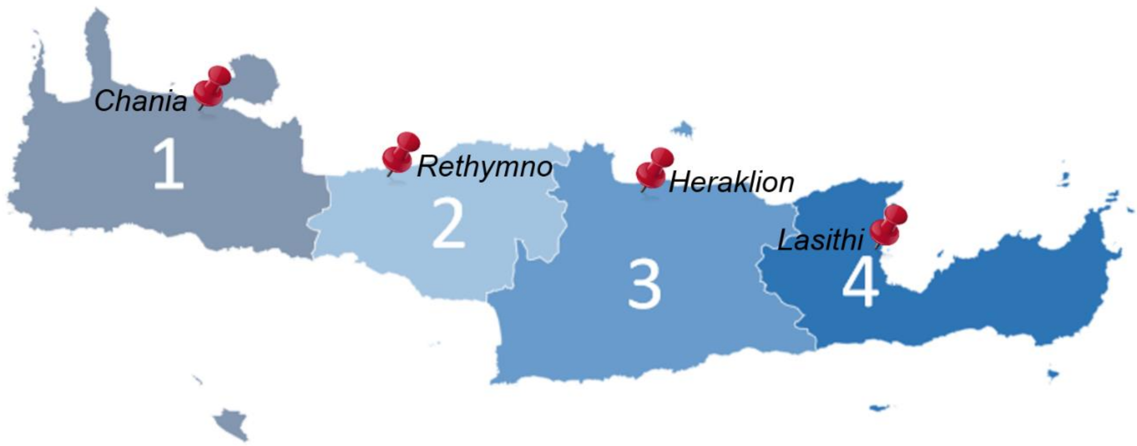

Figure 3.4 Zonal Map of Crete for both Travel Cost and Total Travel Cost models. The zones are: 1=Chania, 2=Rethymno, 3=Heraklion and 4=Lasithi (Provided by Bing © GeoNames, TomTom).

The next step involves generating a relationship between the number of visitors, V, and the average Travel Cost, TC, considering the current $EUR\ 1$ entrance fee, using the number of visitors for each zone and the equivalent mean Travel Cost. Subsequently, using this model, the number of visitors were predicted for every additional $EUR\ 1$ for the entrance fee, up to $EUR\ 50$, the largest value observed as a proposed fee. This is done for each zone, separately, since their average travel costs differ. The new Travel Cost Model fits the new set of points.

3.3.3.3. Total Travel Cost Method

Under this scenario, the Opportunity Cost of Time, tC_i, was calculated for each traveller and added to their Travel Cost. The average Total Cost was then estimated for the different zones. After that, this methodology follows the same steps as in the Travel Cost Method.

3.3.4. Sensitivity Analysis

In order to examine the robustness of all three cost models, a sensitivity analysis was performed, estimating how dependent their output is to the change of important parameters that affect Willingness to Pay, Travel Cost and the Opportunity Cost of Time. These parameters were increased and decreased by 10% and 20%, using a baseline value.

For the WTP model, the parameters tested were the stated entrance fee. For the TC model, it was Fuel Consumption, Fuel Cost, Average Roundtrip distance and WTP_Entrance fee, and for the TTC model it was additionally, Annual Income and Average Roundtrip time.

3.3.5. Juxtaposing scenarios: A comparative analysis

A comparative analysis sought to examine all three cost models' results under different conditions. This included fluctuation of the Entrance Fee for different daily visitation percentages, predictions of annual revenue over a period of 5 years (2017-2021) and predictions of the potentially maximum annual revenue compared to the actual ones.

The annual revenue of Balos, according to each model, is obtained by multiplying the percentage of visitors by the price of the Entrance Fee and the total number of visitors per year:

$$Annual\ Revenue = \%\ Percentage\ of\ Visitors \times Entrance\ Fee \times Annual\ Number\ of\ visitors$$

The annual number of visitors for different years, estimated and provided by ReSEL, TUC.

3.3.6. Consumer Surplus Estimations

The consumer surplus, CS, reflects the economic value of Balos lagoon, and is the area under the demand curve, within the lower limit of zero visitation and the upper limit being the number of visitors of $EUR\ 1$:

$$CS = \int_{0}^{V_{1€}} EF_i(V)dV$$

where $EF_i(V)$: the equation that links the Entrance Fee to the number of visitors for each model and

$V_{1€}$: the number of people paying a $EUR\ 1$ Entrance fee according to each model.

4. RESULTS

4.1. Demographics

This section presents the visitor's profiles, based on a total of 401 usable questionnaires collected through the field study conducted in Balos, 36% of which were filled out online and the rest were paper ones. There were 226 women respondents and 166 men, corresponding to 56% and 41% of the sample, respectively, while around 3% preferred not to disclose their gender. The age distribution of the sample was 19% under the age of $24, 44\%$ between $25-34$, 16% between $35-44$, 7% between $45-54$ and 14% over 55. As far as the educational level is concerned, 3% were elementary school graduates, 17% were high school graduates, 30% were bachelor's degree holders, 45% had a master's degree and 5% had a PhD. Interestingly, the majority (80%) was highly educated.

The following chart illustrates the visitors' income distribution (Diagram 4.1).

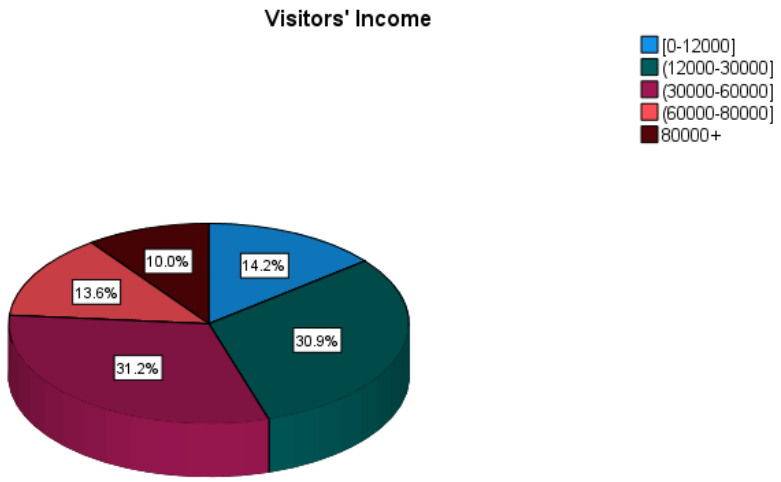

Diagram 4.1 Pie chart displaying the distribution of visitor income categories

As shown in Diagram 4.2 the majority of the participants (93%) were foreigners, and the top 3 countries of origin were Germany (13%), France (11%) and Poland (10%). The primary purpose for visiting was for leisure, as only 4% stated other reasons. More than half of the sample (60%) had already visited another competitive site in their trip, that enjoyed as much or even more than Balos lagoon. The distribution of these substitute sites is presented in Annex.

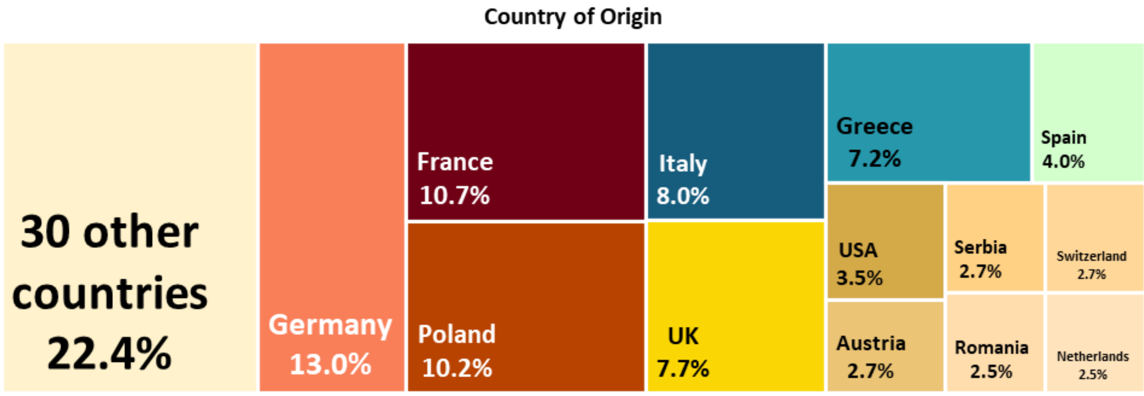

Diagram 4.2 Tree map of visitors' country-wise distribution

Around 81% of the visitors stayed in Chania, whereas 9% came from Rethymno and another 10% from Heraklion and Lasithi. They were equally distributed to the two available means of transportation: half of them used land transportation (car or bus) and the other half maritime transportation (cruise ship).

Their overall experience was evaluated on a 5-point Likert scale, were 1 stands for "not at all satisfied" and 5 for "very satisfied" (Table 4.1). Diagram 4.3 Bar chart illustrating in red that most visitors are satisfied with their overall experience in Balos shows that 84% claimed to be satisfied.

Table 4.1 Frequency and percentage of visitors' satisfaction on a 5-point Likert scale

Rating	Frequency	Valid Percent
Not at all satisfied	2	0.5%
Poorly satisfied	10	2.5%
Neutral	52	13.0%
Satisfied	171	**42.6%**
Very Satisfied	166	**41.4%**
Total	401	100.0%

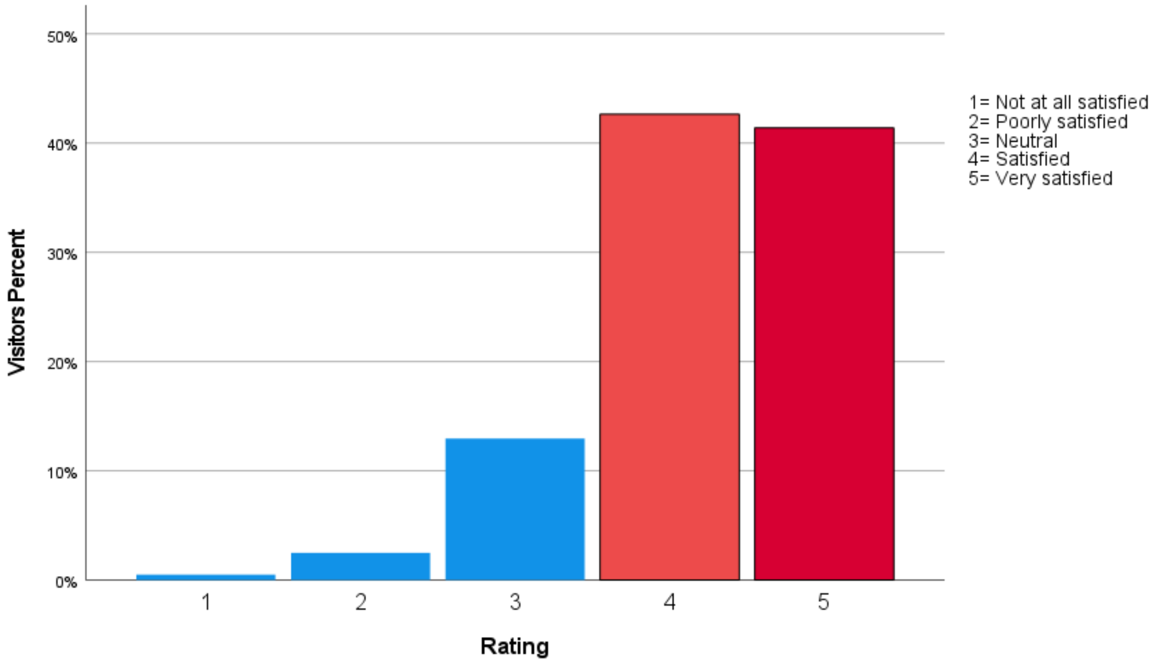

Diagram 4.3 Bar chart illustrating in red that most visitors are satisfied with their overall experience in Balos

Data were also collected regarding the type of group they travelled with, i.e., alone or with family, friends, or partner. Over half of the participants travelled with their partners (Diagram 4.4).

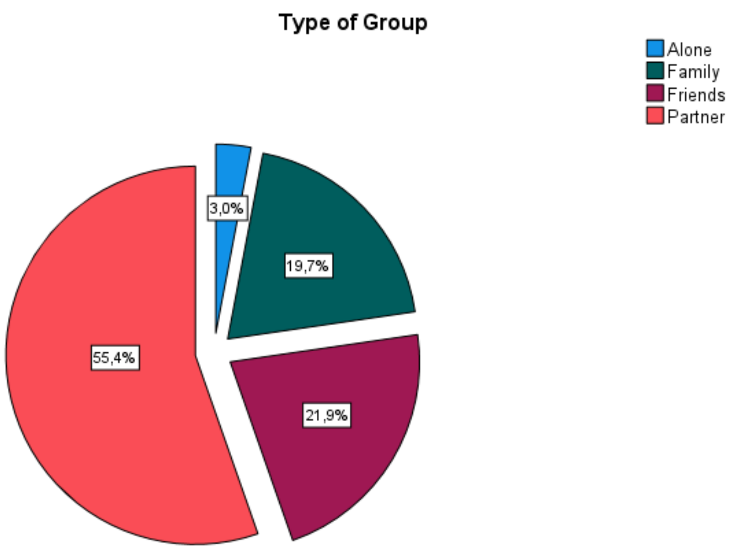

Diagram 4.4 Pie chart of travel groups: percentage of visitors travelling solo, with family, friends or partner

Descriptive Statistics measures the continuous variables of Travel Cost (TC), the Opportunity Cost of Time (tC), the total Travel Cost ($TC + tC$) and the stated WTP_Entrance Fee are summarized in Table 4.2 (in euros).

Table 4.2 Descriptive statistics of Travel Cost, Time Cost and Entrance Fee variables include minimum and maximum values, as well as statistical mean and standard errors

	N	Minimum	Maximum	Mean	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Travel Cost (TC) (€)	401	0.00	160.00	**24.90**	1.14
Time Cost (tC) (€)	398	0.72	72.73	**16.43**	0.55
TC+tC (€)	398	3.69	178.53	**41.17**	1.38
WTP_Entrance Fee (€)	378	0.0	50.0	**8.46**	0.57

Evidently, Travel Cost ranges up to EUR 160 and the Opportunity Cost of Time is almost up to EUR 73 (maximum value). The mean Travel Cost including the Time Cost is assessed as EUR 41.17 with a standard deviation of EUR 1.38.

The mean entrance fee is calculated as EUR 8.46. The distribution of the "WTP_Entrance Fee" variable shown in Diagram 4.5 reflects that the visitors' majority are willing to pay a small token to visit the beach, while few individuals are willing to pay up to EUR 50, which is the maximum value.

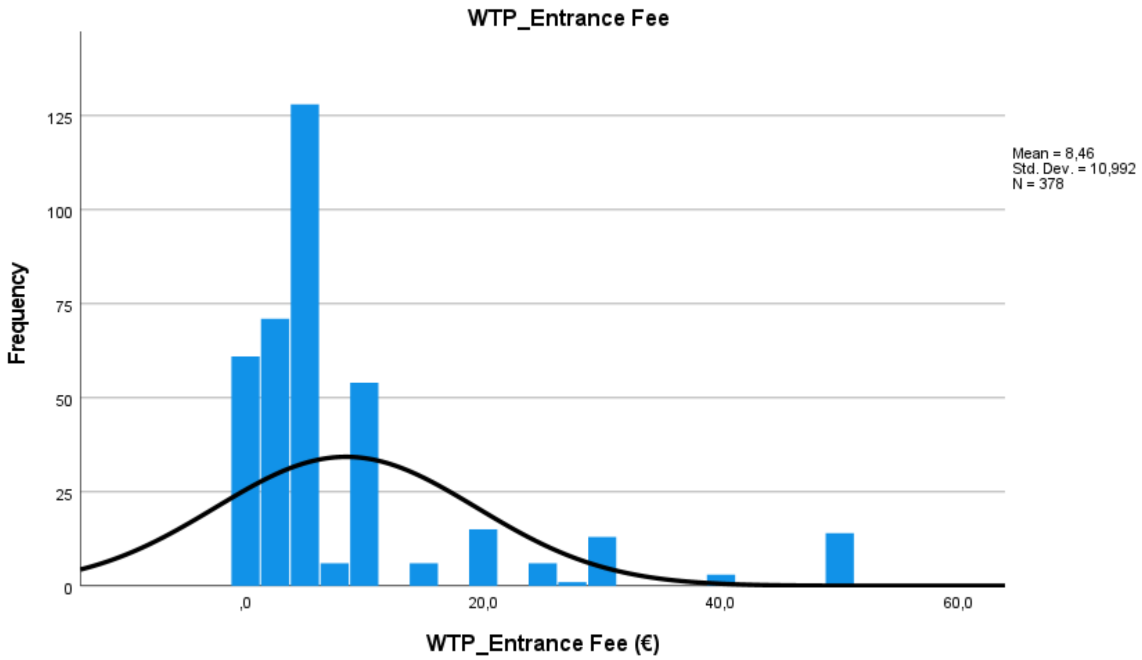

Diagram 4.5 Histogram of WTP_ Entrance Fee (stated by participants) (WTP_Entrance Fee doesn't follow a normal distribution)

4.2. Correlations

Table 4.3 The R^2 and χ^2 values generated by the correlation tests/independence tests performed among the continuous and among the categorical variables respectively. Some were not statistically significant (marked with ×), but the statistically ones were either weak (marked in red) or strong (highlighted). The grey region indicates that no test was conducted.

	TC	CTC	EF	CEF	tC	TTC	CTTC	G	A	I	ED	E	GT	R	S	TR	P	ST	Z	Id	EDd	Rd
TC	1																					
CTC		1																				
EF	$R^2 = 0.09$		1																			
CEF				1																		
TTC						1																
CTTC				×			1															
G			$R^2 = 0.01$	×				1														
A		×		×					1													
I		×		×			×			1												
ED		×		×							1											
E	$R^2 < 0.01$		$R^2 < 0.01$									1										
GT		×		×									1									
R		×		×			×							1								
S	$R^2 = 0.02$	×	$R^2 < 0.01$	×			$\chi^2 = 15.9$								1							
TR	$R^2 = 0.57$	$\chi^2 = 326,1$	$R^2 = 0.05$	$\chi^2 = 24$												1						
P			$R^2 < 0.01$														1					
ST			$R^2 < 0.01$															1				
Z				×															1			
Id	$R^2 = 0.02$			×																1		
EDd	$R^2 = 0.02$		$R^2 = 0.01$	×																	1	
Rd	$R^2 < 0.01$		×	×												×					×	1

TC: Travel Cost, **CTC**: Categorical Travel Cost, **EF**: Entrance Fee, **CEF**: Categorical Entrance Fee, **tC**: Time Cost, **TTC**: Total Travel Cost, **CTTC**: Categorical Total Travel Cost, **G**: Gender, **A**: Age, **I**: Income, **ED**: Education, **E**:Ethnicity, **GT**: Group Type, **R**: satisfaction Rating, **S**: Substitute destinations, **TR**: Transport mode, **P**:travel Purpose, **SM**: Survey Method, **Z**: geographic Zone, **Id**: Income Dichotomous, **EDd**: Education Dichotomous, **Rd**: satisfaction Rating Dichotomous, ×: non statistically significant correlation/independence relation ($p - value > 0.05$).

4.2.1. Travel Cost and Transport

Although a dependence relation between travel cost and means of transportation may seem obvious (and it is, as shown in Table 4.5 and Table 4.6: $\chi^2 = 326.06, p-value < 0.001$ and $\varphi = 0.90, p-value < 0.001$), Table 4.4 provides valuable insight into which transportation costs more. The majority of visitors from land spent less than $EUR\ 10$, while most those who chose a cruise spent over $EUR\ 30$.

Table 4.4 Cross-tabulation analysis between travel cost and means of transportation

		Travel Cost (€)					
		$[0,10]$	$(10,20]$	$(20,30]$	$(30,40]$	$40+$	Total
Transport mode	Land	$\mathbf{41.6}\%$	5.2%	2.5%	0.2%	0.2%	49.9%
	Maritime	1.2%	1.0%	14.7%	$\mathbf{12.7}\%$	$\mathbf{20.4}\%$	50.1%
Total		42.9%	6.2%	17.2%	13.0%	20.7%	100.0%

Table 4.5 Chi-squared test performed to indicate dependence relation between travel cost and means of transportation

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	$326.063a$	4	< 0.001
Likelihood Ratio	410.870	4	< 0.001
Linear-by-Linear Association	293.676	1	< 0.001
N of Valid Cases	401		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12,47.

Table 4.6 Phi and Cramer's V coefficients for the dependence relation between travel cost and means of transportation

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	0.902	< 0.001
	Cramer's V	0.902	< 0.001
N of Valid Cases		401	

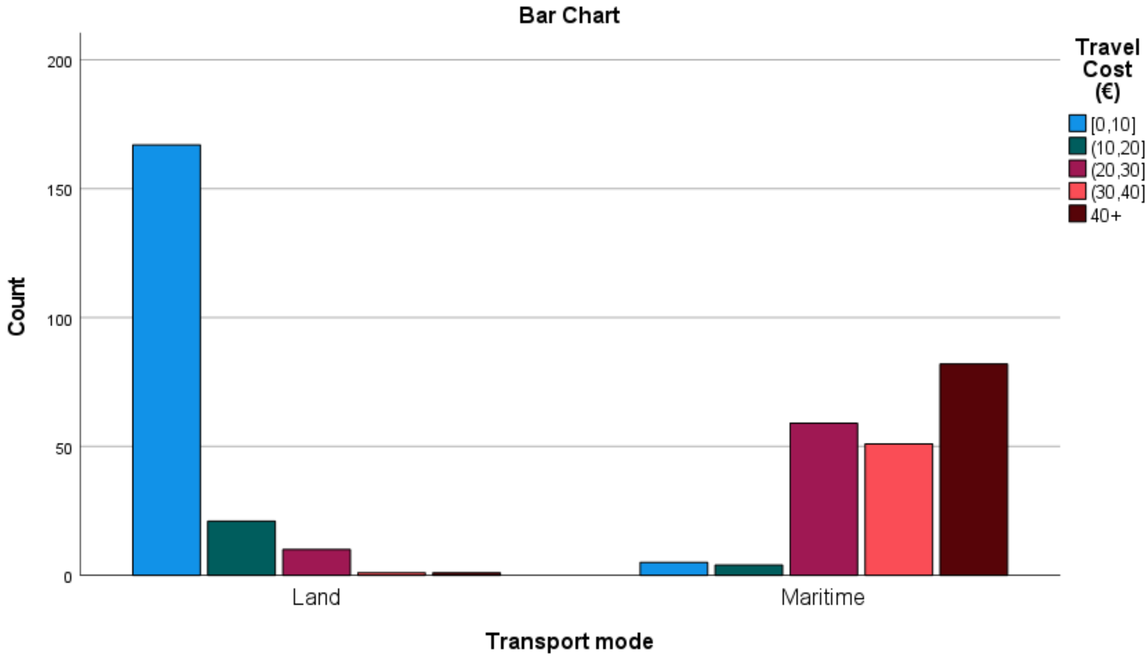

Diagram 4.6 Bar chart depicting the (strong) dependence relation between travel cost and means of transportation

4.2.2. Total Travel Cost and Substitute Sites

The cross-tabulation analysis between the Total Travel Cost (cost of time included) and the visiting of a Substitute Site or not, yielded a statistically significant weak dependence relation: $\chi^2 = 15.93, p - value < 0.001$ and $\varphi = 0.2, p - value < 0.001$. Half of the participants (50.3%) who didn't visit a substitute site spent over $EUR\ 40$, whereas the majority of the ones who did (60%) spent less than $EUR\ 40$ (Table 4.7). This shows that visitors who had only been to Balos on their trip spent more than the ones who have been elsewhere, thus the presence of substitute sites affects travelling planning and choices.

Table 4.7 Cross-tabulation analysis between travel cost and the visiting of a substitute site during the same trip

% within Substitute		Total Travel Cost (€)				Total
		[0,20]	(20,40]	(40,60]	60 +	
Substitute	NO	16,6%	33,1%	**22,9%**	**27,4%**	100,0%
	YES	**30,9%**	**29,1%**	24,7%	15,2%	100,0%
Total		24,6%	30,9%	23,9%	20,6%	100,0%

4.2.3. WTP_Entrance Fee and Transport

Apart from the statistically significant dependence relation of moderate strength ($\chi^2 = 24, p - value < 0.001$ and $\varphi = 0.25, p - value < 0.001$) between visitors' proposed entrance fee and means of transportation, the analysis (Table 4.8) shows that a larger share of people visiting by boat were willing to pay more, compared to the ones that drove to Balos. A vast 78.8% of the latter consider that the entrance to the beach should be free of charge.

Table 4.8 Cross-tabulation analysis highlights that most visitors driving to Balos propose a free entrance to the beach

% within Transport

		WTP_Entrance Fee (€)				
		0	(0,1]	(1,5]	(5,10]	Total
Transport	Land	**78,8%**	12,6%	**5,1%**	3,5%	100,0%
	Maritime	**56,6%**	19,8%	**16,5%**	7,1%	100,0%
Total		68,2%	16,1%	10,5%	5,3%	100,0%

4.3. Entrance Fee Models

Table 4.9 shows the value of R^2, for the different fitting curves constructed for each one of the five entrance fee models considered. The ones ultimately used are highlighted.

Table 4.9 The value of R^2 for different fitting curves tried for each one of the five fee models

R^2 of candidate model	Willingness to Pay Method	Travel Cost Method		Total Travel Cost Method	
	Willingness to Pay Model	*Number of Visitors-Travel Cost*	*Travel Cost Model*	*Number of Visitors-Total Travel Cost*	*Total Travel Cost Model*
Linear model	0.665			0.399	
Quadratic model	0.866			0.801	0.939
Cubic model	0.949		0.965		0.981
log-linear model	0.92	0.900			
Logarithmic model			0.910		
Exponential model		0.900	0.978	0.900	0.992
Power model		0.943	0.968	0.938	0.953

[1]Model for WTP_Entrance Fee (dependent variable) and percentage of visitors (independent variable), [2]model for number of visitors (dependent variable) and average Travel Cost (independent variable), [3]model for Travel Cost (dependent variable) and percentage of visitors (independent variable), [4]model for number of visitors (dependent variable) and Total Travel Cost, that includes the cost of time (independent variable) and [5]model for Total Travel Cost (dependent variable) and percentage of visitors (independent variable).

4.3.1. Willingness to Pay Model

Different fitting data curves were tried out: the R^2 for the linear and quadratic ones was 0.665 and 0.866, respectively, statistically significant (< 0.05), as well as a log-linear model ($R^2 = 0.920$), were the logarithm of the visitor's percentage served as the independent variable. However, the **cubic model** (Diagram 4.7) provided the best fit with $\boldsymbol{R^2 = 0.949}$. More details about these trials are presented in Annex G.

The following curve links the Entrance Fee, EF_{WTP}, with the percentage of visitors to Balos lagoon, V_p (for more information, see Annex Table 18).

$$EF_{WTP} = (48.11 \pm 2.21) - (2.32 \pm 0.22) \cdot V_P + (0.038 \pm 0.005) \cdot {V_P}^2 - (1.96 \pm 0.34) \cdot 10^{-4} \cdot {V_P}^3 \left[\frac{€}{\% \ visitors}\right]$$

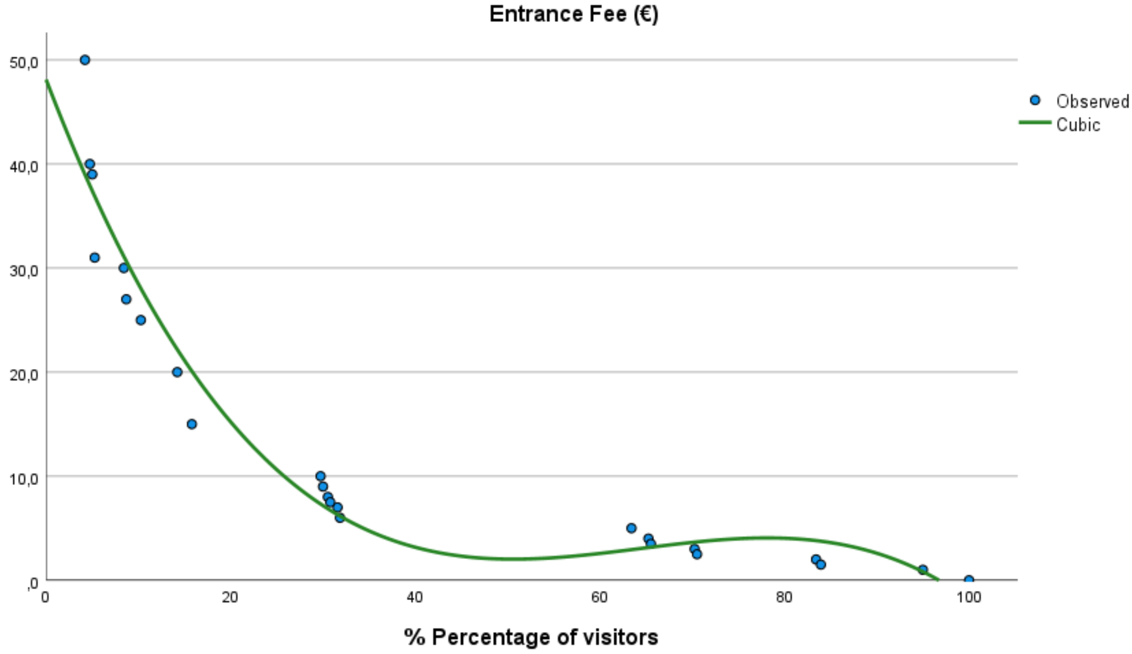

Diagram 4.7 Graphical representation of Willingness to Pay cubic curve/model (Entrance fee-percentage of Visitors)

Alternatively, the relationship between the EF_{WTP} and the *number* of visitors, V, is shown below, with $R^2 = 0.949$ (standardized t-statistics have absolute values that vary between 3.92 to 8.13).

$$EF_{WTP} = (48.11 \pm 2.21) - (0.61 \pm 0.06) \cdot V + (0.003 \pm 3.6 \cdot 10^{-4}) \cdot V^2 - (35{,}69 \pm 6.24) \cdot 10^{-7} \cdot V^3 \left[\frac{€}{person}\right]$$

4.3.2. Travel Cost Model (Opportunity Cost of Time excluded)

Table 4.10 shows the average Travel Cost, TC, considering the current $EUR\ 1$ entrance fee and the equivalent number of visitors for each zone.

Table 4.10 Average travel cost (current ticket to the beach included) per zone

Zone	Average Travel Cost + Current Entrance Fee (€)	Number of Visitors
1	22,18	321
2	33,12	35
3	47,52	35
4	101,00	2

Several data fitting curve models were investigated, for the number of visitors V (see Annex H), but the most accurate one is given by the following power function:

$$V = 4{,}055{,}150.16 \cdot (TC + EF)^{-3.137 \pm 0.547}$$

where EF: the cost of Entrance Fee, $EF \in [1,\ 50]$. For t-statistics see Annex Table 21.

Ultimately, an exponential model was chosen, for the Entrance fee w.r.t percentage of visitors. as the one with the highest level of coherence and consistency with the underlying data ($R^2 = 0.978$), compared to a cubic, power and logarithmic one, all statistically significant showing a strong relation (R^2 equal to $0.965, 0.968$ and 0.910, respectively, and $p - value < 0.05$). The graphical representation can be seen in Diagram 4.8.

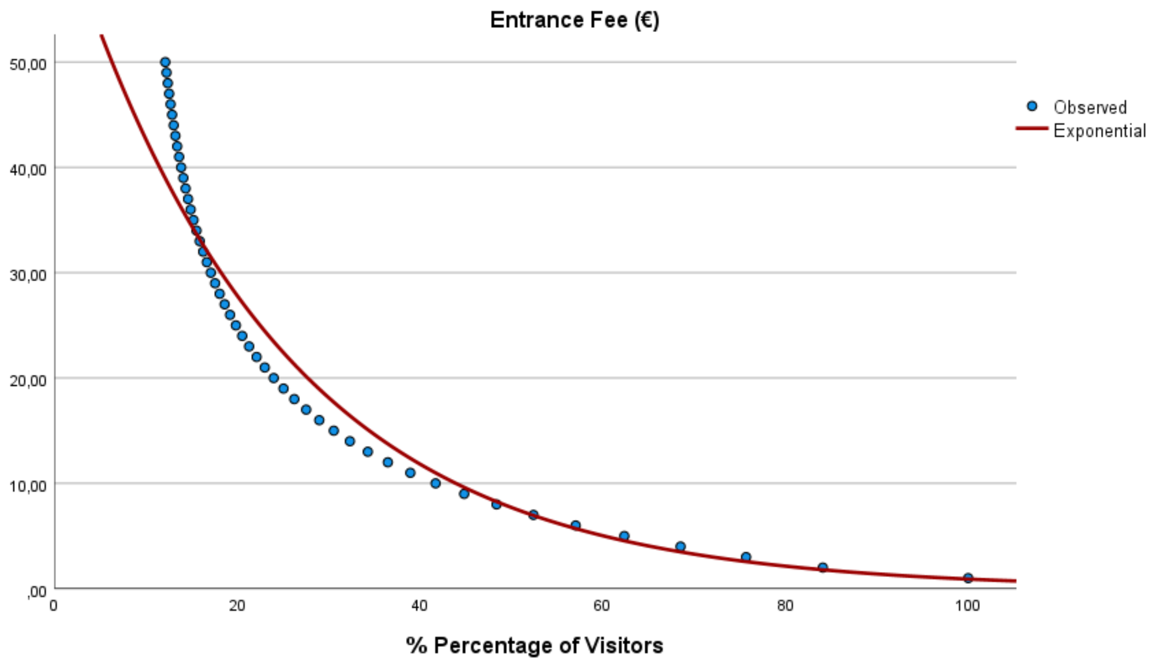

Diagram 4.8 Graphical representation of Total Travel Cost exponential model (Entrance fee-percentage of Visitors)

The equation that describes the association between the Entrance Fee, EF_{TC}, and the proportion of visitors is the following:

$$EF_{TC} = (65.47 \pm 2.10) \cdot e^{(-0.043 \pm 0.001) \cdot V_p} \left[\frac{€}{\% \ visitors}\right]$$

The standardized t-statistic for the coefficient of V_p is 1 and 31.21 with a $p - value < 0.01$.

The analogous equation that associates EF_{TC} with the number of visitors, V has $R^2 = 0.978$ and is:

$$EF_{TC} = (65.47 \pm 2.10) \cdot e^{(-0.011 \pm 0.00023) \cdot V} \left[\frac{€}{person}\right]$$

The standardized t-statistic for the coefficient of V is 1 with a $p - value < 0.01$.

4.3.3. Total Travel Cost Model (Opportunity Cost of Time included)

As expected, the cost of time increases as Balos lagoon and the trip's starting point are getting further apart (Table 4.11).

Table 4.11 Average TTC (time cost and current fee included) per zone

Zone	Average Total Travel Cost (€) (Time and Current Entrance Fee Cost considered)
1	36.20
2	50.42
3	69.71
4	139.46

Following the process as in the previous section, different fitting data curve models were examined to map the Average Total Travel Cost per zone, TTC, to the number of visitors (see Annex JI), with the power model being the best fit with the largest $R^2 = 0.938$:

$$V = 65{,}945{,}352.34 \cdot (TTC + EF)^{-3.501 \pm 0.635}$$

where EF: the cost of Entrance Fee, $EF \in [1{,}50]$.

Again, the number of visitors were predicted for every additional $EUR\ 1$ for the entrance fee, up to $EUR\ 50$ for each zone. Next, the function that describes the relationship between the Entrance fee and the percentage of visitors is built (Diagram 4.9):

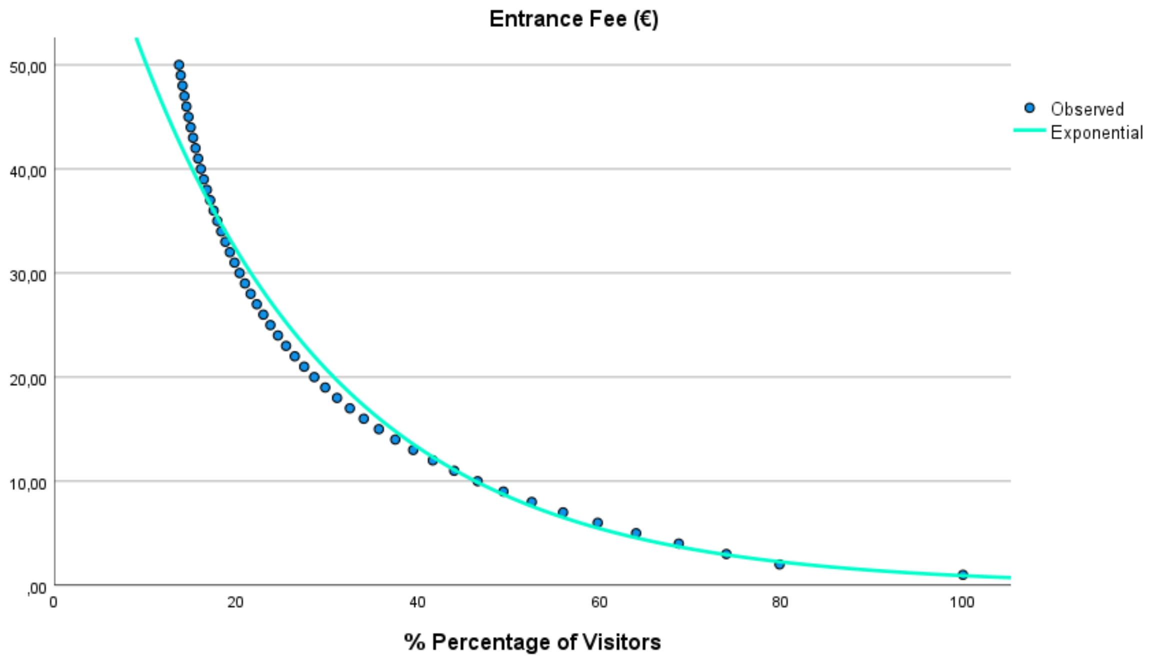

Diagram 4.9 Graphical representation of Total Travel Cost exponential model (Entrance fee-percentage of Visitors)

$$EF_{TTC} = (78.47 \pm 1.65) \cdot e^{(-0.04 \pm 0.01) \cdot V_p} \left[\frac{€}{\%\ visitors}\right]$$

The equation that expresses EF_{TTC} with the number of visitors, V, with $R^2 = 0.992$, is:

$$EF_{TTC} = (78.47 \pm 1.65) \cdot e^{(-0.011 \pm 0.001) \cdot V} \left[\frac{€}{person}\right]$$

For more information on these two models see Annex KII.

4.4. Sensitivity Analysis

4.6.1. WTP model sensitivity analysis

Parameters tested: Entrance Fee (Table 4.122).

Table 4.12 Impact of entrance fee change on Willingness to Pay model output

WTP Model	*Entrance Fee Change*			
	Entrance Fee (€)	Predicted Number of Visitors	V_p	ΔV
Baseline scenario	**5**	130	34%	
+10%	5.5	126	33%	−3%
−10%	4.5	135	36%	4%
+20%	6	122	32%	−6%
−20%	4	126	33%	−3%

4.6.2. TC model sensitivity analysis

Parameters tested: Fuel Consumption, Fuel Cost, Average Roundtrip distance (Table 4.133) and Entrance Fee (Table 4.144).

Table 4.13 Impact of fuel consumption and cost, as well as average roundtrip distance changes on tourist flow according to the Travel Cost Model

Travel Cost Model	*Fuel Consumption, Fuel Cost or Average Roundtrip distance Change ($EF = 1€$)*			
	TC (€)	Predicted Number of Visitors	V_p	ΔV
Baseline scenario	**22.18**	212	54%	
+10%	24.40	159	40%	−25%
−10%	19.97	290	74%	37%
+20%	26.62	122	31%	−42%
−20%	17.74	412	105%	95%

Table 4.14 Impact of Entrance fee changes on tourist flow, according to the Travel Cost Model

Travel Cost Model	$TC = 22.18$			
	EF (€)	Predicted Number of Visitors	V_p	ΔV
Baseline scenario	5	128	33%	
+10%	5.5	121	31%	−6%
−10%	4.5	136	35%	6%
+20%	6	115	29%	−11%
−20%	4	144	37%	12%

4.6.3. TTC model sensitivity analysis

<u>Parameters tested</u>: Fuel Consumption, Fuel Cost, Average Roundtrip distance (Table 4.155), Annual Income, Average Roundtrip time (Table 4.166) and Entrance Fee (Table 4.177).

Table 4.15 Impact of fuel consumption and cost, as well as average roundtrip distance changes on tourist flow according to the Total Travel Cost model

Total Travel Cost Model	*Fuel Consumption, Fuel Cost or Average Roundtrip distance Change*				
	tC (€)	TC (€)	Predicted Number of Visitors	V_p	ΔV
Baseline scenario	**14.01**	**22.18**	209	53%	
+10%	14.01	24.40	171	44%	−18%
−10%	14.01	19.96	260	66%	24%
+20%	14.01	26.62	141	36%	−33%
−20%	14.01	17.74	327	83%	56%

Table 4.16 Impact of annual income and average roundtrip time changes on tourist flow according with the Total Travel Cost model output

Total Travel Cost Model	*Income or Average Roundtrip Time Change*				
	tC (€)	TC (€)	Number of Visitors	V_p	ΔV
Baseline scenario	$\mathbf{14.01}$	$\mathbf{22.18}$	209	53%	
+10%	15.41	22.18	184	47%	−12%
−10%	12.61	22.18	240	61%	14%
+20%	16.81	22.18	162	41%	−22%
−20%	11.21	22.18	276	70%	32%

Table 4.17 Impact of Entrance fee changes on tourist flow, according to the Total Travel Cost Model

Total Travel Cost Model	$TC = 22.18$ *and* $tC = 14.01$			
	EF (€)	Number of Visitors	V_p	ΔV
Baseline scenario	$\mathbf{5.00}$	146	37%	
+10%	5.50	140	36%	−4%
−10%	4.50	153	39%	4%
+20%	6.00	135	34%	−8%
−20%	4.00	160	41%	9%

4.7. Comparing results

This section aims to compare results among the three (Entrance fee constructed) models under different conditions. The following table shows the fluctuation of the Entrance Fee for different daily visitation percentages (Table 4.18). It appears that for less than 30% reduction of visitors, the WTP model generates the highest prices, and at precisely 30%, all models agree to a price of $EUR\ 3.23 - 3.61$. The two travel cost models almost agree that an Entrance Fee of $EUR\ 4.96 - 5.60$, would cause a 40% reduction of visitors, while the WTP model matches the $EUR\ 5$ ticket to almost 70% drop (as a $EUR\ 5$ ticket corresponds to almost $30 - 40\%$ tourist flow). The choke price also varies among the models, as $EUR\ 48.11, 65.47$ and 78.47, for the WTP, TC and TTC model, respectively.

Table 4.18 Willingness to Pay, Travel Cost and Total Travel Cost models output juxtaposition, for different percentage of Visitors

% Percentage of Visitors	EF_{WTP} (€)	EF_{TC} (€)	EF_{TTC} (€)
99	1.40	0.93	1.01
90	2.48	1.37	1.50
80	3.95	2.10	2.32
70	**3.58**	3.23	**3.61**
60	2.54	**4.96**	**5.60**
50	2.01	7.63	8.69
40	3.16	11.72	13.50
30	7.17	18.02	20.96
20	15.21	27.70	32.55
10	28.47	42.59	50.54
0	48.11	65.47	78.47

For percentages in descending order with a step size of 1 unit instead of 10 between each successive value, a more detailed data set is obtained.

The annual number of Balos visitors for different years is displayed in Table 4.199.

Table 4.19 Annual number of Balos beach visitors for 2017, 2018, 2019, 2020, 2021

Year	2017	2018	2019	2020	2021
Annual Number of Visitors	295,277	304,533	319,560	79,042	236,673

The annual revenue for an Entrance Free of $EUR\ 1$ was calculated using all three (Entrance Fee) models and the results can be compared to the Real Annual Revenue (Table 4.20). The Real Annual Revenue is estimated assuming that the entrance fee costs $EUR\ 1$.

Table 4.20 The annual revenue of Balos for 2017, 2018, 2019, 2020 and 2021 according to Willingness to Pay, Travel Cost and Total Travel Cost models for a $EUR\ 1$ ticket and % difference ΔR of the actual ones

	2017	2018	2019	2020	2021
Real	$\mathbf{295,277}$	$\mathbf{304,533}$	$\mathbf{319,560}$	$\mathbf{79,042}$	$\mathbf{236,673}$
WTP	237,832	245,287	257,390	109,560	190,629
$\boldsymbol{\Delta R_{WTP}}$	−19,5%	−19,5%	−19,5%	**38,6%**	−19,5%
TC	280,144	288,925	293,385	74,991	217,287
$\boldsymbol{\Delta R_{TC}}$	−5,1%	−5,1%	**−8,2%**	−5,1%	**−8,2%**
TTC	29,429,420	313,969	318,496	78,778	244,006
$\boldsymbol{\Delta R_{TTC}}$	−0,3%	**3,1%**	−0,3%	−0,3%	**3,1%**

The WTP model prediction for 2020 is the worst, as it is 38.6% larger than the real annual revenue, and for the other years 19.5% less. The TC model predicts 5.1% less annual revenue, except for 2019 and 2021, when it is 8.2% less. The TTC appears to be the most accurate of all, making predictions that deviate by -0.3% to 3.1%.

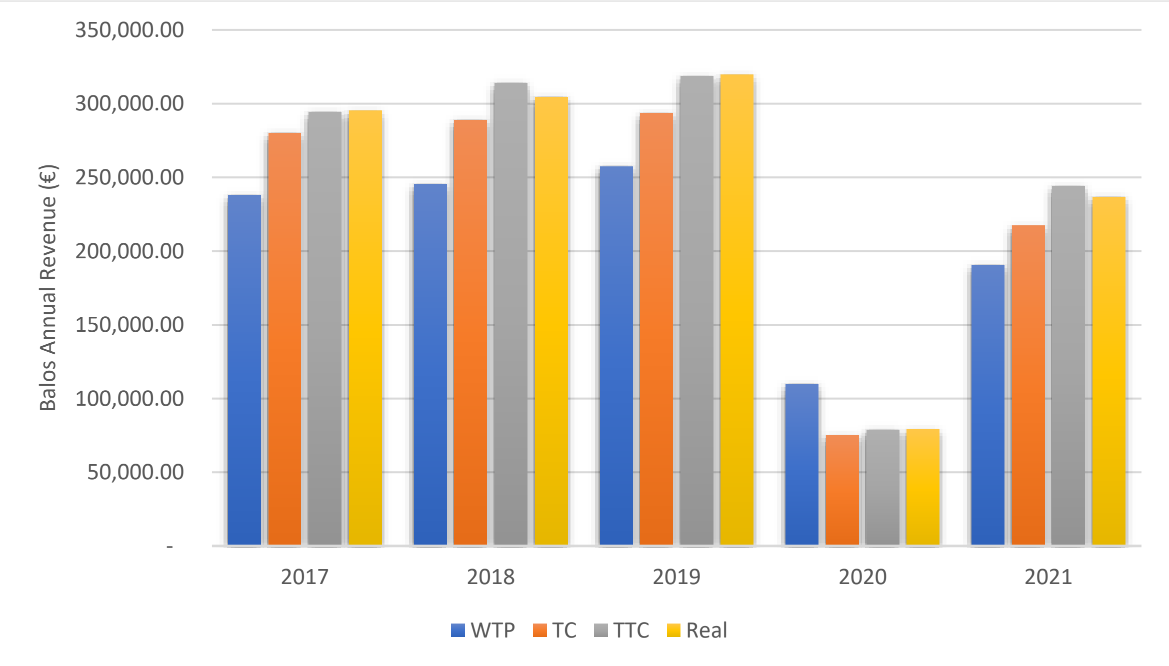

Diagram 4.10 Graphical representation of the annual revenue of Balos lagoon for 2017, 2018, 2019, 2020 and 2021 according to the three models and compared to the actual ones

Furthermore, it is estimated that the maximum annual revenue for the site is when only 16% of the visitors enter the beach, according to the WTP model, and 23% according to the other two. These percentages correspond to a ticket price of $EUR\ 19.82, 24.35$ and 28.52 for the WTP, TC and TTC model, respectively.

The following table displays the Potential Maximum Annual Revenue of Balos lagoon, compared to the Real Annual Revenue (Table 4.21). These numbers indicate that Balos lagoon could profit far more, particularly from 3.2 up to 6.6 times more, than it currently does (Diagram 4.11).

Table 4.21 Maximum annual revenue of Balos beach (theoretical) for 2017, 2018, 2019, 2020 and 2021

	2017	**2018**	**2019**	**2020**	**2021**
WTP	936,532	965,889	1,035,51	250,698	750,657
TC	1,554,524	1,705,640	1,789,803	442,701	1,325,567
TTC	1,833,623	1,997,836	**2, 096, 418**	518,541	1,552,652
Real	**295, 277**	**304, 533**	**319, 560**	**79, 042**	**236, 673**

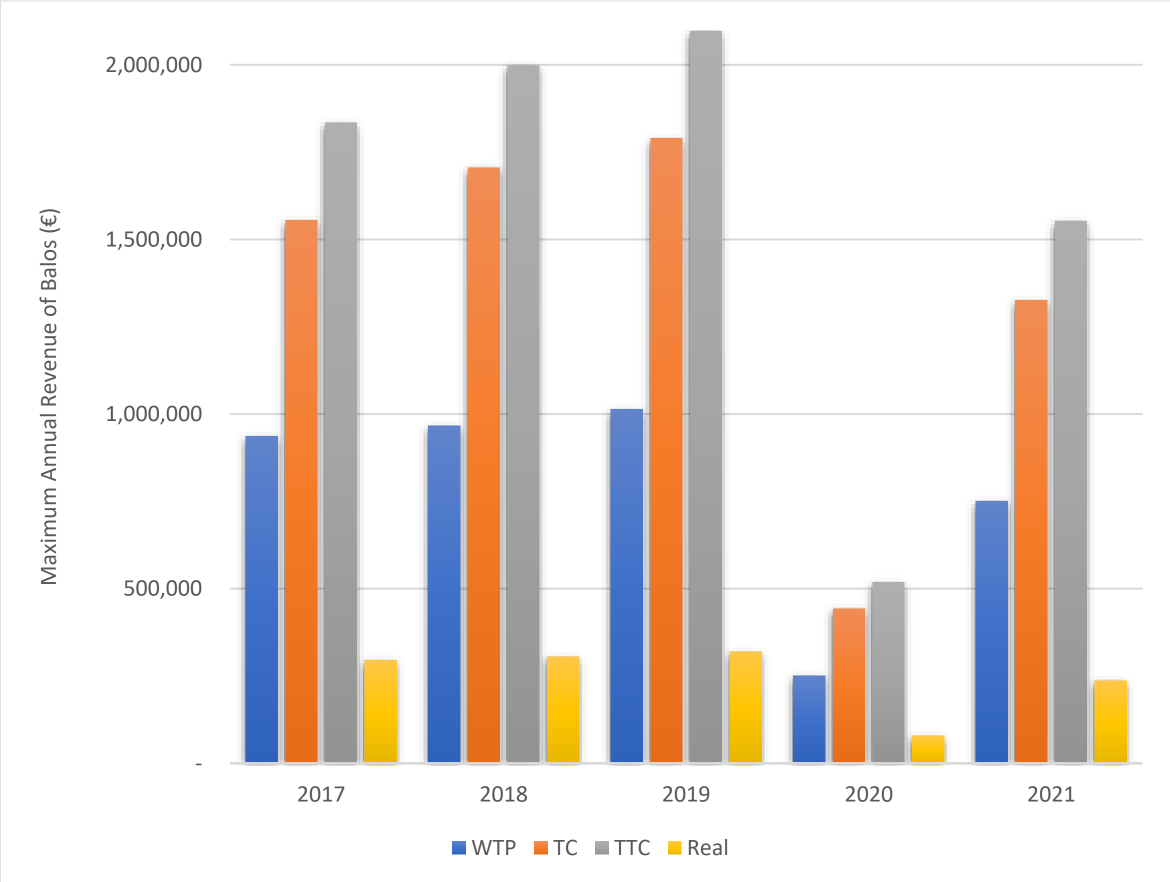

Diagram 4.11 Graphical representation of the potential maximum annual revenue of Balos lagoon for 2017, 2018, 2019, 2020 and 2021 according to the three models and compared to the actual ones

4.8. The Consumer Surplus

4.8.1. Willingness to Pay Consumer Surplus

$$CS_{WTP} = \int_0^{354} EF_{WTP}(V)dV = 3507.16\text{ €}$$

or

$$CS_{WTP} = 9.90 \frac{\text{€}}{person}$$

The WTP model predicts that each visitor receives an extra value of $EUR\ 9.90$ from using the beach. This suggests that they perceive Balos to be highly valuable and they are willing to pay more than they currently do.

4.8.2. Travel Cost Consumer Surplus

$$CS_{TC} = \int_0^{380} EF_{TC}(V)dV = 5860.76\text{ €}$$

or

$$CS_{TC} = 15.42 \frac{\text{€}}{person}$$

The TC model also predicts that individuals value the experience of visiting Balos at a higher level than the actual cost incurred. Here, the CS is greater than the one generated by the WTP model.

4.8.3. Total Travel Cost Consumer Surplus

$$CS_{TTC} = \int_0^{397} EF_{TTC}(V)dV = 7043.11\text{ €}$$

or

$$CS_{TTC} = 17.74 \frac{\text{€}}{person}$$

The TTC model produces the largest CS, almost half as much as the average Total Travel Cost of EUR 41.17 per person (Table 4.2).

5. DISCUSSION

Visitors' Profile

The findings indicate that the site tends to attract primarily European, but few non-Greek visitors (7.2%), for leisure, seemingly having a "tourists only" character.

A remarkable 80% were degree holders, and 62.1% reported a higher annual income between $EUR\ 12{,}000$ and $60{,}0000$.

Visitors also claimed to be satisfied with their overall experience, a result that agrees with the current ratings on TripAdvisor (Skiniti et al., 2022). Over half of them travelled with their partner and only 3.0% travelled alone, which shows that Balos is not preferred as a destination for solo tourism.

As far as costs are concerned, descriptive statistics revealed that the average travel cost spent to visit Balos is almost $EUR\ 25$ and the time cost spent is about $EUR\ 16$, showing that the cost of time is not negligible and should be included in Travel Cost analysis. Moreover, the average entrance fee that should be implemented according to the visitors' stated preference is $EUR\ 8.46$, far larger than the current $EUR\ 1$ ticket.

The distribution of the different costs (i.e., travel costs, time costs and WTP_Entrance Fee) is a right skewed one, which indicated that few visitors are willing to spend a larger more considerable amount of money.

Statistical analysis considerations

The Statistical analysis performed gave away a dependence relation between Travel Cost and Transport mode of choice, Total Travel Cost (that incudes the cost of time) and the visiting of another Substitute destination and also stated Entrance Fee price (WTP_Entrance Fee) and Transport mode.

Transport mode naturally illustrated the strongest correlation to Travel Cost. 66.2% of the visitors that chose a cruise trip to Balos spent over $EUR\ 30$. The -respective percentage for those who drove their way to Balos is merely 1%, as the majority spent less than $EUR\ 10$. It is to be mentioned that, although the costs differ greatly, cruises do include certain amenities in their prices (e.g., toilet), whereas drivers are faced with a dangerous dirt road.

The Total Travel Cost has been interestingly found linked to the existence of a substitute site. Most of the people who recognised another destination equally appealing to Balos spent less on their trip. This may be connected to the choice of place to stay, as time and travel cost estimations are primarily based on distances. People who chose to stay in Chania had the chance to enjoy other destinations, too.

Finally, the majority of visitors (68%) stated that the entrance to the beach should be free of charge, from whom 78.8% drove to Balos and 56.6% went by boat. Moreover, a smaller percentage of the former considered that the entrance fee should cost $EUR\ 1-5$, compared to the latter. This may indicate that choosing a cruise to Balos contributes to overall satisfaction and a sense of the value of the site.

Reflections on the three Entrance Fee models

For the WTP cubic model certain interpretational issues emerge, since certain values of entrance fee correspond to different visitors' percentages. However, the dependent variable (WTP_Entrance Fee) has a minimum value of 0. As a result, log transformation cannot be applied, and so power and exponential models cannot be calculated for this variable, although they would probably provide a more comprehensive demand curve.

The sensitivity analysis for the WTP model showed a percentage deviation of $3-6\%$ output change for up to 20% change in stated entrance fee. Due to the shape of the demand curve, a 20% decrease in entrance fee predicts a 3% decrease in tourist flow, instead of an expected increase.

The zonal TC models were created with the help of two original models that associate average travel cost (both including and excluding time cost) and entrance fee with the number of visitors to Balos. Since only four (4) points were available, corresponding to the four different zones, the power model provided a constant with a large standard error, indicating a poor fit.

This may justify the high sensitivity of both TC models to Travel Cost changes, associated with fuel consumption, fuel cost and average roundtrip distance. It was also observed that the TTC model is less sensitive to travel cost changes than the TC model, suggesting that the inclusion of time cost may act as a stabilizing factor, dampening the sensitivity of tourist flow to variations of travel and time costs individually. The TTC also proved more stable to entrance fee changes, indicating a more stable behaviour.

All three Entrance fee models were compared in terms of output. The WTP model indicates that a $EUR\ 5$ entrance fee would cause a tourist flow decrease of around $60-70\%$. For the TC models the equivalent percentage is around 40%. On the one hand, this shows that the results of both TC models agree. On the other hand, it shows that individuals are not willing to pay as much as their travel costs would suggest. There could be several reasons for this discrepancy including:

- hypothetical bias: some participants' self-reported WTP values may be unrealistic, as they do not fully understand the implications of their preference,
- market imperfections: the TC models do not accurately reflect all costs associated with visiting the site or certain market conditions, such as discounts, promotions or other factors that could lead to overestimating prices,
- site characteristics: although their overall experience is satisfying, lack in quality of certain amenities may affect their perception of Balos' value,
- budget constraints: as some participants visited alternative destinations during their trip, it is safe to assume that they did not travel to Chania explicitly for Balos. Consequently, lower WTP may be due to limited financial resources.

The choke price for the three models differs. WTP model has the smallest, around $EUR\ 48$, while the TC and TTC models have a choke price of $EUR\ {\sim}65$ and ${\sim}78$, respectively. This means that people don't value/appreciate the cost of time, or they consider it a part of the experience.

When compared to past years, the TTC model came closer to the actual annual revenue of the beach, while WTP predictions deviate the most, especially in 2020, when COVID-19 restrictions limited visitation to the beach. Maximizing their output shows that visitors could pay far more than they currently do.

The consumer surplus (CS), which expresses the monetary value of the benefits that visitors derive from their trip to Balos. The WTP, TC and TTC models gave roughly $10, 15\ and\ 18\ EUR/person$, respectively. This price range agrees with 32% of the CS regarding beaches, lakes, bays and coastal zones from across the world (**Error! Not a valid bookmark self-reference.** illustrates key information on state-of-the-art research regarding ecosystems valuation using the TCM.

Table 2.3).

6. CONCLUSIONS

This study intended to assess the sustainability of Balos lagoon, a sensitive ecosystem protected under the N2K network and internationally renowned tourist destination, located in western Crete. Balos is reportedly grappling with multiple sustainability challenges arising from overtourism, while lacking an actual management plan.

The Zonal Travel Cost method and Willingness to Pay method were both employed, via a field study, in order to estimate the economic worth of the site. Three models that estimate the entrance fee based on the percentage of visitors to the beach were constructed; a WTP cubic model and two Travel Cost exponential models -one that includes the Opportunity Cost of Time and one that doesn't, which associate the entrance fee to the beach with the percentage of visitors.

According to the results, Balos lagoon mostly attracts young, highly educated Europeans who visit the site with their partner for leisure. The transportation choices of visitors were equally split between cruise ships and land-based modes such as cars, buses, taxis etc., with the former spending far more than the latter on travel costs, but also willing to pay a higher entrance fee.

A sensitivity analysis of all models suggests that the TTC model, which includes the cost of time, is the most stable to change of basic parameters and it is also found that it produces the most accurate predictions, when compared to the actual annual revenue of the past 6 years.

The majority of the visitors proposed that the beach should be accessed for free. Comparing all three models for output, WTP model predicts $60-70\%$ decrease in tourist flow with a $EUR\ 5$ fee, while travel cost models predict around 40%. Results indicate that visitors are willing to pay less than they currently do for beach access.

Moreover, the consumer surplus was estimated as $9.90, 15.42$ and $17.74\ EUR/person$ by the WTP, TC and TTC model, respectively, suggesting that visitors benefit far more than they pay to access the site. Introducing a higher entrance fee to Balos lagoon could help regulate tourist flows throughout the year, without dropping the annual revenue.

This methodology provides information that describes the target group of the destination, as well as its value in monetary terms. Thus, it could be integrated into the development of a management plan and future tourist packages that include the beach and the surrounding area. Since it is a site-specific methodology, it could be implemented in other coastal protected areas stressed due to tourism.

The WTP and TC methodology both have weaknesses based on generalizations and assumptions inherent to their approach. In order to improve, more thorough research could be carried out, including sampling throughout the year, conducting more detailed interviews and expanding to the adjacent protected regions that encompass substitute destinations.

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Websites | Online tools

1. NATURA 2000-Standard Data Form at: N2K GR4340017 dataforms (europa.eu)

2. FILOTIS - Database for the Natural Environment of Greece at: NatureBank - Τοπίο (ΤΙΦΚ) - Μπάλος (Γραμβούσα) (ntua.gr)

3. NATURA 2000 Network Viewer at: https://natura2000.eea.europa.eu/

4. Greek National Cadastre Viewer at: https://maps.gov.gr/gis/map/

5. Google Maps at: https://www.google.com/maps

6. The World Bank at: https://data.worldbank.org/indicator/NY.ADJ.NNTY.CD

7. ExchangeRates at: https://www.exchangerates.org.uk/USD-EUR-exchange-rate-history.html

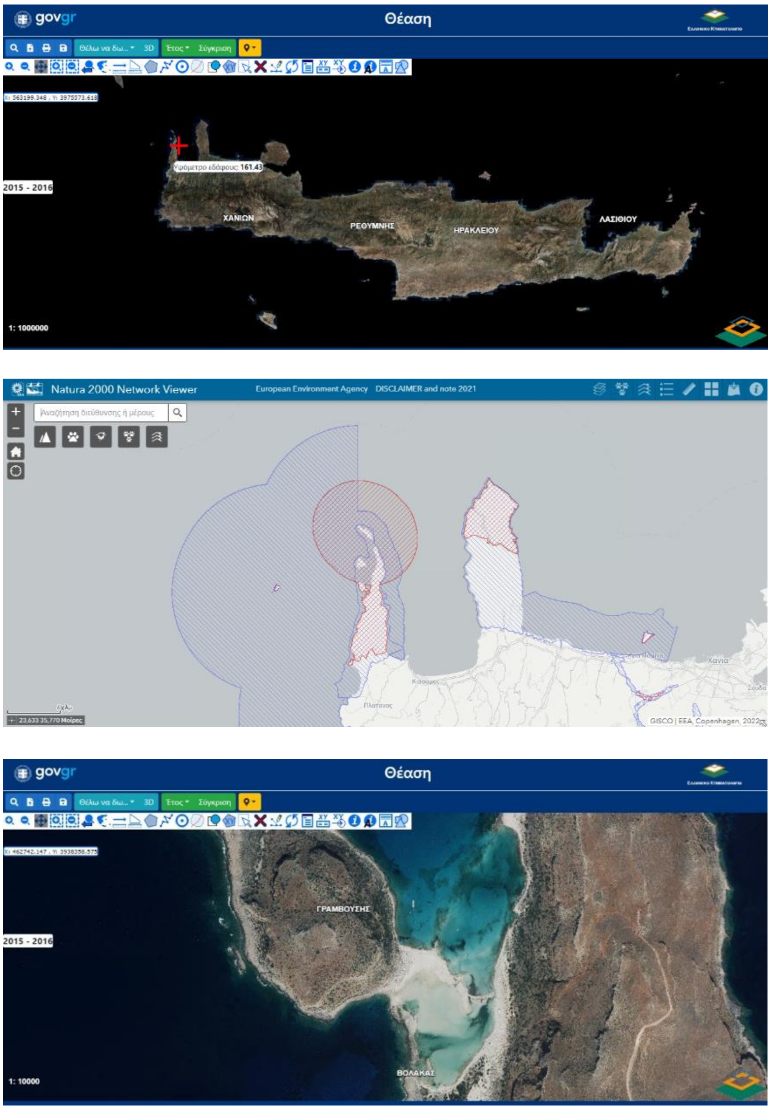
8. Microsoft Math Solver at: Microsoft Math Solver - Math Problem Solver & Calculator

9. United Nations at: United Nations | Peace, dignity and equality on a healthy planet

10. Liquid Fuel Price Observatory, of Greek Ministry of Development, Competitiveness, Infrastructure, Transport and Networks at: http://www.fuelprices.gr/

ANNEX

A Case Study



Annex Figure 1 a. Gramvousa Peninsula (marked red), in Crete, b. N2K sitecode GR4340001 SAC and SPA, c. Balos top view at a 1:10,000 scale
(Source: https://maps.gov.gr/gis/map/, https://natura2000.eea.europa.eu/)

B Exchange Rates

Provided by Exchange Rates UK (https://www.exchangerates.org.uk/USD-EUR-exchange-rate-history.html, last visited: 28/02/2023).

Annex Table 1 USD to EUR exchange rate during data collection phase

Annex Table 2

	EUR												
	13-Sep	**14-Sep**	**15-Sep**	**16-Sep**	**17-Sep**	**18-Sep**	**19-Sep**	**20-Sep**	**21-Sep**	**22-Sep**	**23-Sep**	**24-Sep**	**25-Sep**
1 USD =	1.0030	1.0017	1.0006	0.99851	0.99842	0.99807	0.99729	1.0030	1.0163	1.0170	1.0319	1.0321	1.0316

C Fuel Cost Data

The following data were found on the website of the Liquid Fuel Price Observatory, of Greek Ministry of Development, Competitiveness, Infrastructure, Transport and Networks.

Annex Table 3 Price of Unleaded Gas (in €) for different Municipalities of Crete stated as trips' starting point, during data collection phase

Municipality	Price of Unleaded Gas (€)												
	13-Sep	14-Sep	15-Sep	16-Sep	17-Sep	18-Sep	19-Sep	20-Sep	21-Sep	22-Sep	23-Sep	24-Sep	25-Sep
Chania	2.001	1.998	1.998	1.997	1.999	1.998	1.999	2.000	1.999	1.997	1.995	1.994	1.993
Apokoronas	2.001	1.998	1.998	1.997	1.999	1.998	1.999	2.000	1.999	1.997	1.995	1.994	1.993
Georgioupoli	2.001	1.998	1.998	1.997	1.999	1.998	1.999	2.000	1.999	1.997	1.995	1.994	1.993
Kantanos	2.001	1.998	1.998	1.997	1.999	1.998	1.999	2.000	1.999	1.997	1.995	1.994	1.993
Kissamos	2.001	1.998	1.998	1.997	1.999	1.998	1.999	2.000	1.999	1.997	1.995	1.994	1.993
Platanias	2.001	1.998	1.998	1.997	1.999	1.998	1.999	2.000	1.999	1.997	1.995	1.994	1.993
Kolymbari	2.001	1.998	1.998	1.997	1.999	1.998	1.999	2.000	1.999	1.997	1.995	1.994	1.993
Rethymno	2.038	2.032	2.030	2.028	2.025	2.022	2.022	2.023	2.021	2.019	2.018	2.019	2.020
Gouves	2.013	2.010	2.003	2.004	2.002	2.022	2.001	2.002	2.000	2.001	2.000	1.999	1.996
Heraklion	2.013	2.010	2.003	2.004	2.002	2.022	2.001	2.002	2.000	2.001	2.000	1.999	1.996
Chersonissos	2.013	2.010	2.003	2.004	2.002	2.022	2.001	2.002	2.000	2.001	2.000	1.999	1.996
Milatos	2.019	2.015	2.013	2.014	2.014	2.011	2.009	2.013	2.013	2.013	2.010	2.010	2.009
Malia	2.013	2.010	2.003	2.004	2.002	2.022	2.001	2.002	2.000	2.001	2.000	1.999	1.996

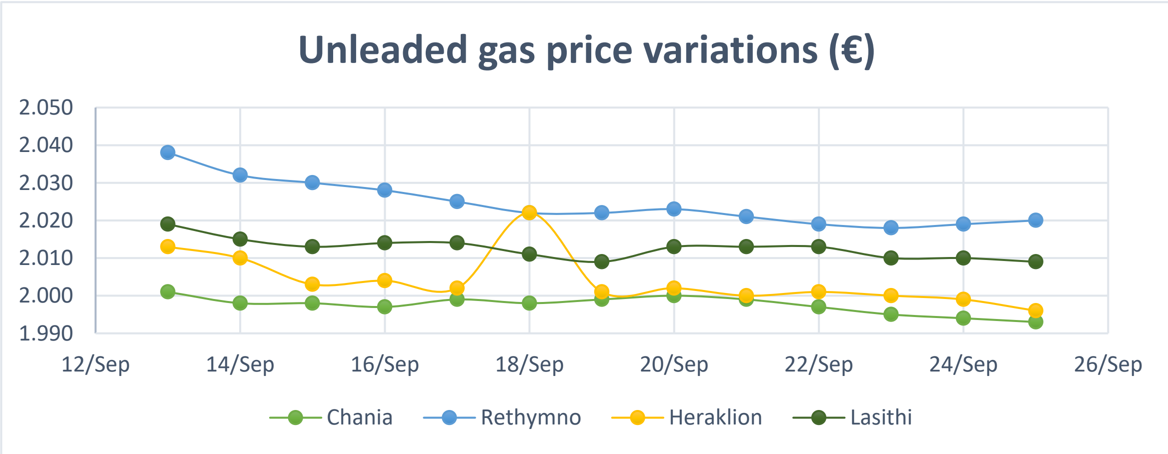
A shorter form based on the defined zones is the following:

Annex Table 4 Price of Unleaded Gas (in €) for the 4 different zones (Chania, Rethymno, Heraklion and Lasithi), stated as trips' starting point, during data collection phase

Price of Unleaded Gas (€) per day per zone

Municipality	13-Sep	14-Sep	15-Sep	16-Sep	17-Sep	18-Sep	19-Sep	20-Sep	21-Sep	22-Sep	23-Sep	24-Sep	25-Sep
Chania	2.001	1.998	1.998	1.997	1.999	1.998	1.999	2.000	1.999	1.997	1.995	1.994	1.993
Rethymno	2.038	2.032	2.030	2.028	2.025	2.022	2.022	2.023	2.021	2.019	2.018	2.019	2.020
Heraklion	2.013	2.010	2.003	2.004	2.002	2.022	2.001	2.002	2.000	2.001	2.000	1.999	1.996
Lasithi	2.019	2.015	2.013	2.014	2.014	2.011	2.009	2.013	2.013	2.013	2.010	2.010	2.009

The unleaded gas price fluctuations are illustrated below.

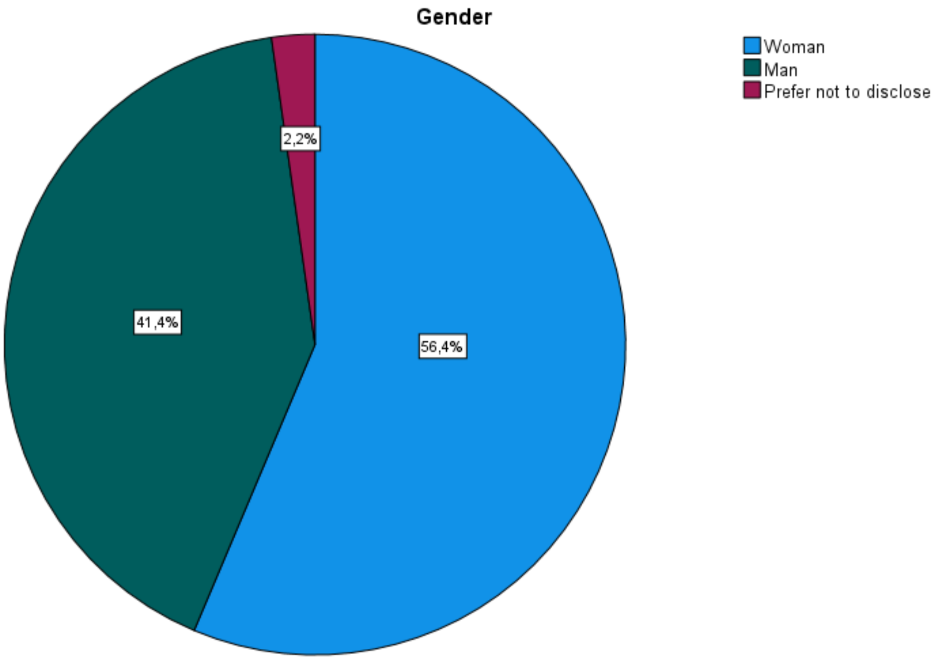


Annex Diagram 1 Unleaded gas price fluctuations (in €) within data collection phase, for the 4 different zones (Chania, Rethymno, Heraklion and Lasithi)

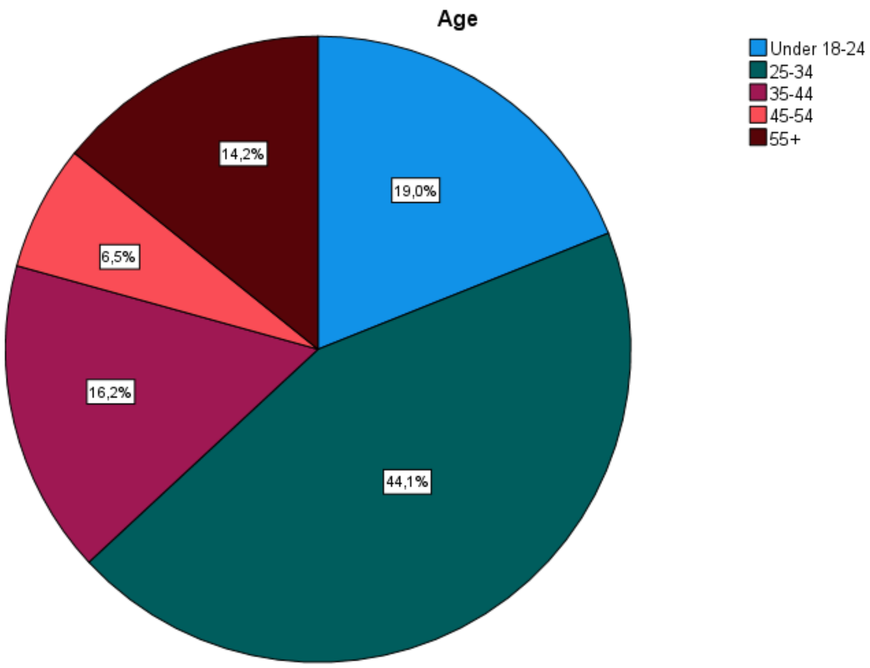
D Demographic Characteristics of the 401 Respondents

Annex Table 5 Detailed demographic characteristics of all respondents (frequencies and percentages)

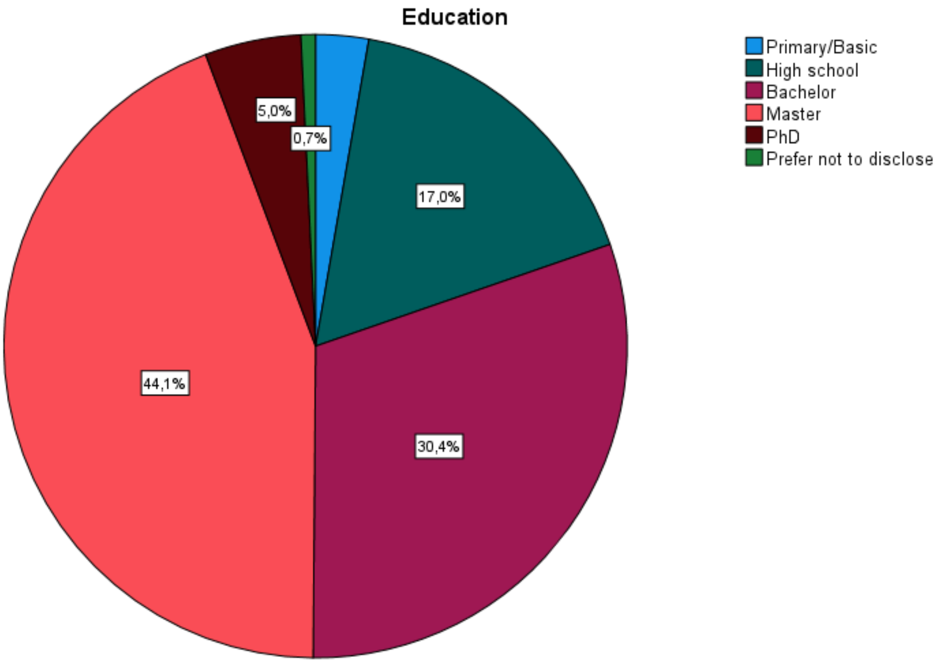
Respondent Characteristic		**Frequency**	**Percentage %**
Gender	Man	166	41.4
	Woman	226	56.4
	Prefer not to disclose	9	2.2
Annual Income	Prefer not to disclose	71	17.7
	Less than 12,000 €	47	11.7
	12,001 €-30,000 €	102	25.4
	30,001 €-60,000 €	103	25.7
	60,001 €-80,000 €	45	11.2
	More than 80,000 €	33	8.2
Age group	Under 18	5	1.2
	18-24	71	17.7
	25-34	177	44.1
	35-44	65	16.2
	45-54	26	6.5
	55-64	53	13.2
	65-74	2	0.5
	Over 75	2	0.5
Level of Education	Prefer not to disclose	3	0.7
	Primary/ Basic	11	2.7
	High School	68	17.0
	Bachelor	122	30.4
	Master	177	44.1
	PhD	20	5.0
Purpose of travel	Vacation	386	96.3
	Work	4	1.0
	Both	8	2.0
	Other	3	0.7
Questionnaire	online	143	35.7
	paper	258	64.3
Country	Germany	52	13.0
	France	43	10.7
	Poland	41	10.2
	UK	31	7.7
	Greece	29	7.2
	Spain	16	4.0
	USA	14	3.5
	Austria	11	2.7
	Serbia	11	2.7
	Romania	10	2.5
	Switzerland	11	2.7
	The Netherlands	10	2.5
	Italy	32	8.0
	Other	90	22.4



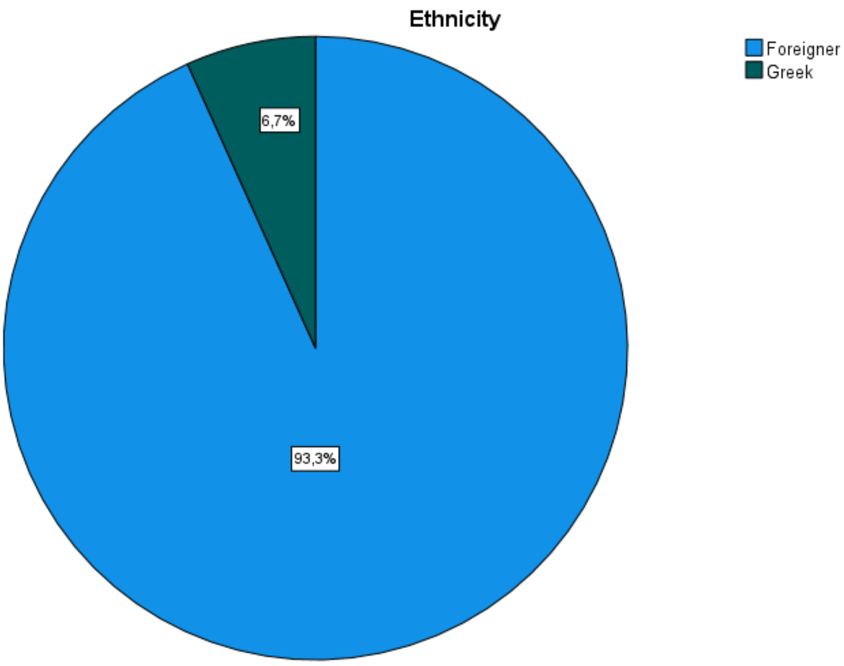
Annex Diagram 2 Pie chart of participants' gender distribution



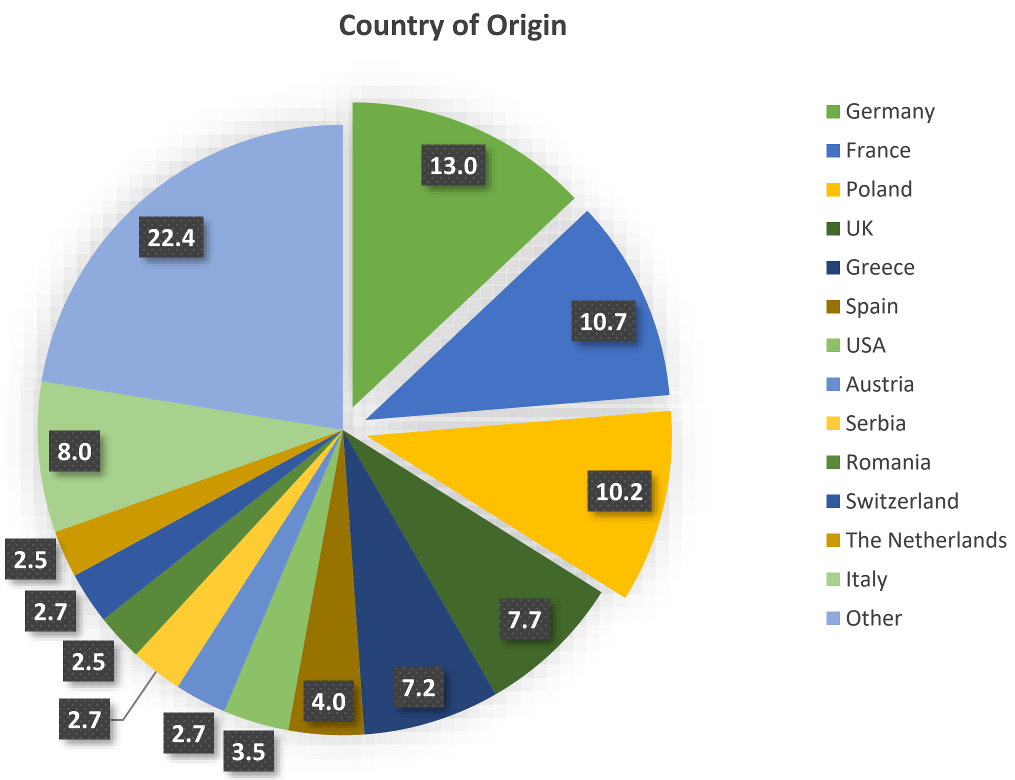
Annex Diagram 3 Pie chart of participants' age distribution



Annex Diagram 4 Pie chart of participants' level of education

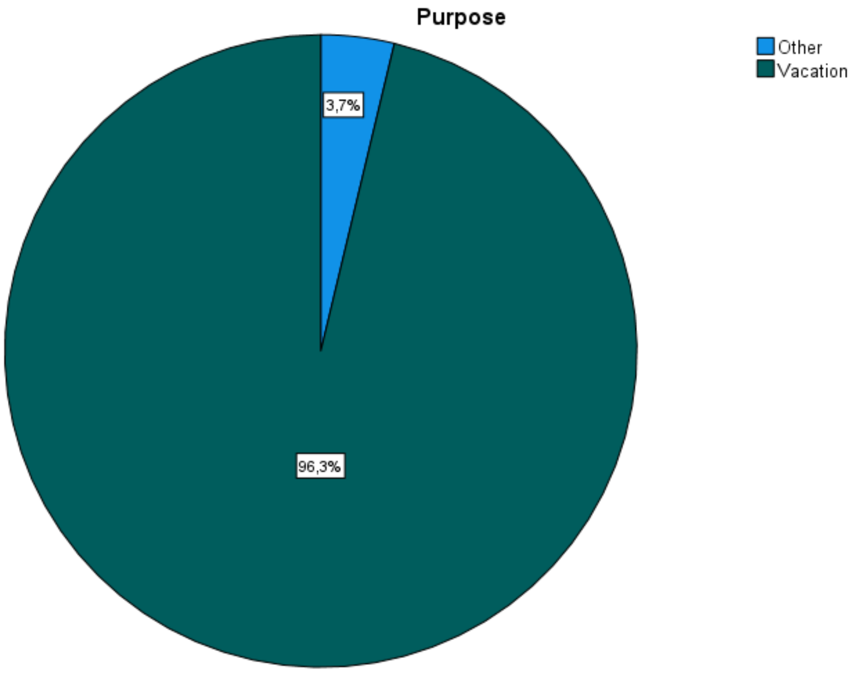


Annex Diagram 5 Pie chart of participants' ethnicity (Greek or foreigner)

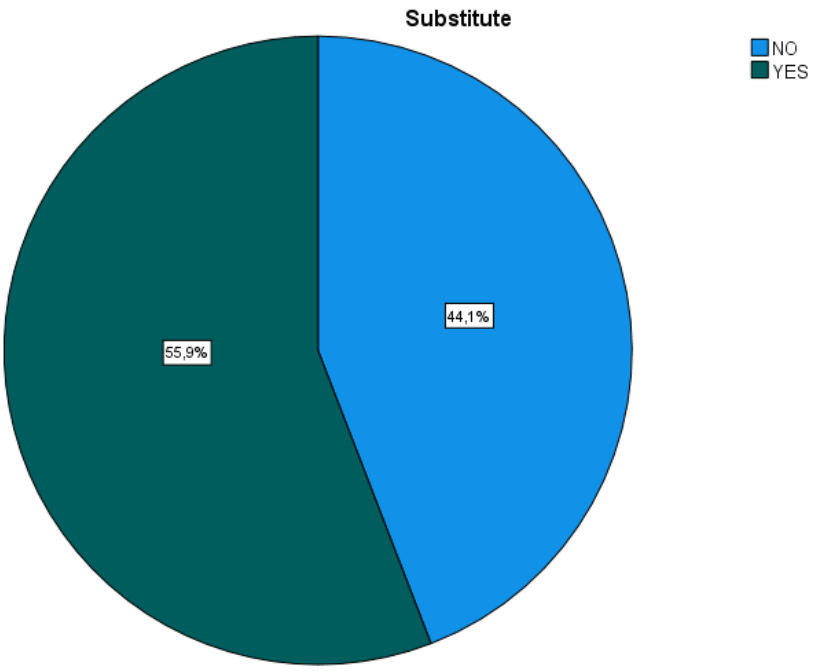


Annex Diagram 6 Pie chart of most regular countries of origin

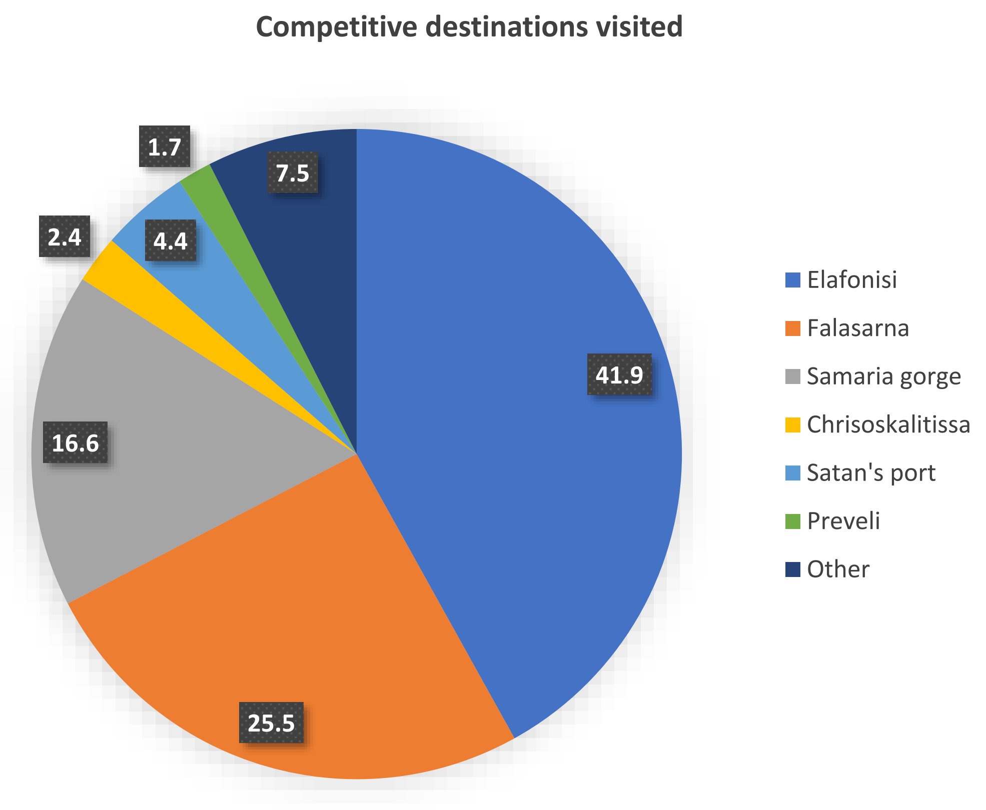
E Travel Characteristics of the 401 Respondents



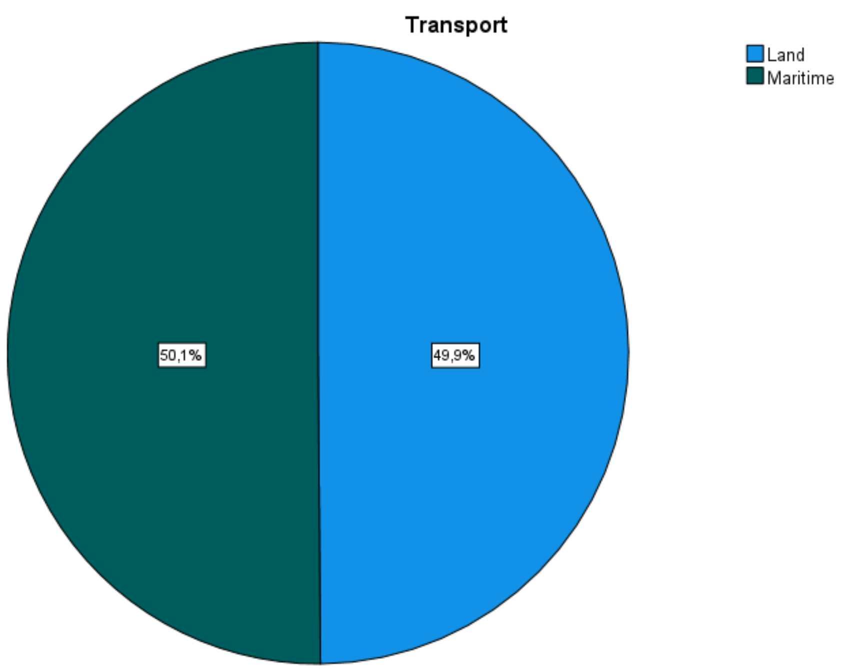
Annex Diagram 7 Pie chart of participants' purpose for visiting Balos lagoon (Vacation or other)



Annex Diagram 8 Pie chart of the distribution of participants who visited a substitute site, i.e., an equally enjoyed or better preferred destination, during their trip (YES) and those who did not (NO)



Annex Diagram 9 Pie chart of competitive destinations visited, that could serve as potential substitutes to Balos lagoon



Annex Diagram 10 pie chart of participants transportation of choice (land or maritime)

F Annual Income per Country

Annex Table 6 Annual Income per country (Source: https://www.worldbank.org/en/home)

Country	Annual Income [adjusted NNI[1]] (US$)	Number of visitors
Albania	4,208	2
Argentina	7,212	2
Australia	40,141	1
Austria	38,848	11
Belgium	36,491	4
Brazil	5,801	1
Bulgaria	8,440	1
Canada	35,025	4
China	7,572	2
Cyprus	22,557	1
Denmark	52,666	9
Finland	39,366	6
France	31,772	43
Germany	38,426	52
Greece	14,752	29
Hungary	12,756	4
Iceland	48,047	1
Ireland	41,464	4
Isle of Man	-	1
Israel	37,545	3
Italy	25,982	32
Latvia	13,735	1
Lithuania	17,026	4
Luxembourg	67,967	3
Malta	-	5
Moldova	4,110	1
New Zealand	33,724	3
Norway	53,514	3
Peru	5,300	1
Poland	13,315	41
Portugal	17,468	4
Romania	10,735	10
Serbia	6,310	11
Singapore	42,049	1
Slovakia	15,629	2

[1] Adjusted NNI for 2020, source: The World Bank

Slovenia	20,263	4
Spain	22,546	16
Sweden	44,552	4
Switzerland	63,794	11
Netherlands	42,296	10
United Kingdom	36,248	31
Ukraine	3,329	2
United States	53,329	14

For the visitors coming from Malta and Isle of Man there was a lack of data. As a solution, the midpoint of stated income range was calculated and used as the corresponding income value.

G Willingness to Pay: Model trials

The associated variables are the WTP_Entrance Fee, i.e., Willingness to pay (dependent), and the Percentage of Visitors (independent).

I Linear Model

Annex Table 7 Willingness to Pay linear model summary

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.816	**.665**	.650	8.640

Annex Table 8 Willingness to Pay linear model ANOVA analysis

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	3263.500	1	3263.500	43.713	**.000**
Residual	1642.458	22	74.657		
Total	4905.958	23			

Annex Table 9 Willingness to Pay linear model coefficients

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Percentage of Visitors	-.371	.056	-.816	**-6.612**	.000
(Constant)	29.273	2.852		**10.266**	.000

II Quadratic Model

Annex Table 10 Willingness to Pay quadratic model summary

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.931	**.866**	.853	5.593

Annex Table 11 Willingness to Pay quadratic model ANOVA analysis

ANOVA

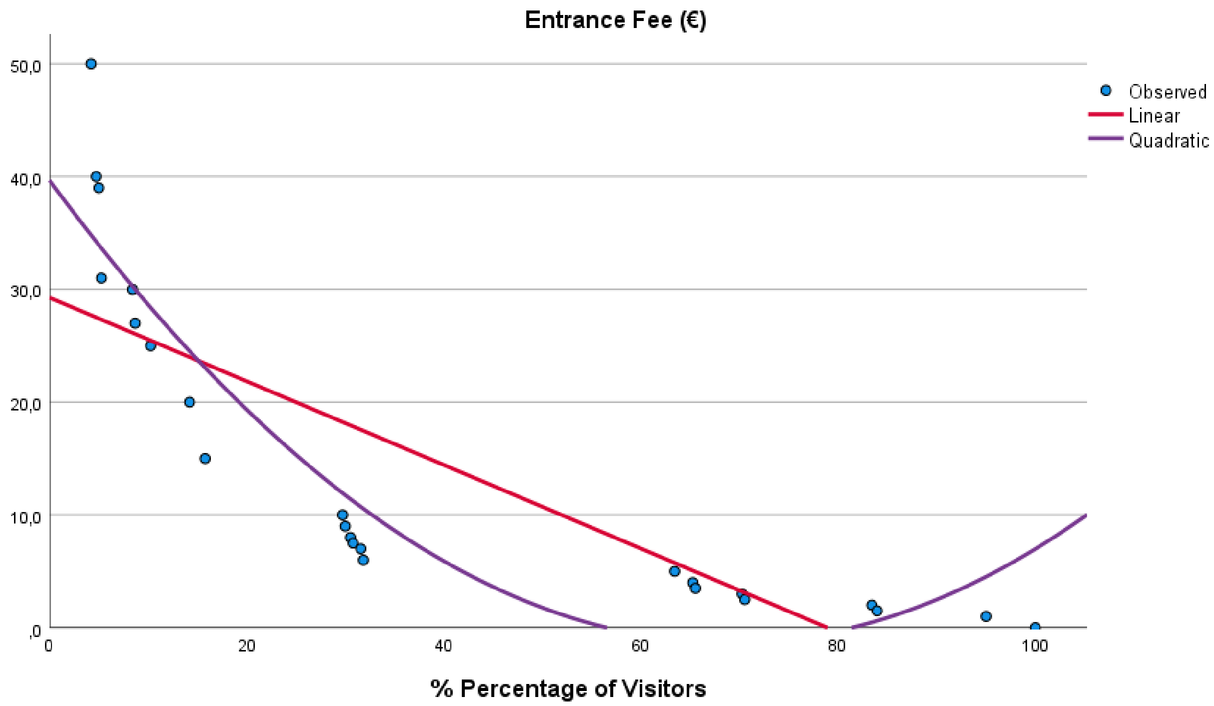
	Sum of Squares	df	Mean Square	F	Sig.
Regression	4249.018	2	2124.509	67.913	**.000**
Residual	656.941	21	31.283		
Total	4905.958	23			

Annex Table 12 Willingness to Pay quadratic model coefficients

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Percentage of Visitors	-1.189	.150	-2.615	**-7.915**	.000
Percentage of Visitors ** 2	.009	.002	1.854	**5.613**	.000
(Constant)	39.679	2.616		**15.167**	.000

Graphical Representation of Linear and Quadratic Models



Annex Diagram 11 Graphical representation of Willingness to Pay linear and quadratic models (WTP_Entrance Fee-percentage of Visitors)

III Log-linear Model

Here the independent variable is $\log V_p \equiv \log_{10}(\%\ Visitors'\ Percentage)$

Annex Table 13 Willingness to Pay log-linear model summary

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,959	**,920**	,917	4,214

Annex Table 14 Willingness to Pay log-linear model ANOVA analysis

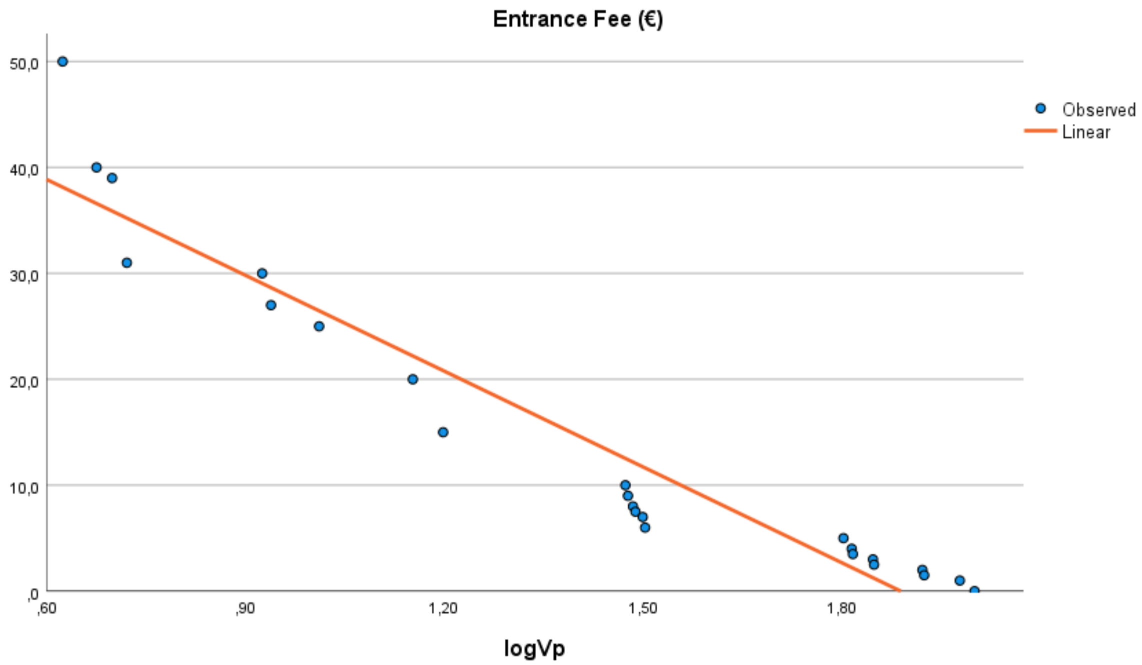
ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	4515,342	1	4515,342	254,309	**,000**
Residual	390,617	22	17,755		
Total	4905,958	23			

Annex Table 15 Willingness to Pay log-linear model coefficients

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
logVp	-30,165	1,892	-,959	**-15,947**	,000
(Constant)	56,971	2,801		**20,338**	,000



Annex Diagram 12 Graphical representation of Willingness to Pay log-linear model [WTP_Entrance Fee-log(percentage of Visitors)]

IV Cubic Model

The cubic model served as the final choice.

Annex Table 16 Willingness to Pay cubic model summary

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.974	**.949**	.942	3.529

The independent variable is **Percentage of Visitors.**

Annex Table 17 Willingness to Pay cubic model ANOVA analysis

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	4656.846	3	1552.282	124.625	**.000**
Residual	249.112	20	12.456		
Total	4905.958	23			

Annex Table 18 Willingness to Pay cubic model coefficients

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Percentage of Visitors	-2.323	.220	-5.107	**-10.577**	.000
Percentage of Visitors ** 2	.038	.005	8.131	**7.282**	.000
Percentage of Visitors ** 3	.000	.000	-3.916	**-5.722**	.000
(Constant)	48.109	2.213		**21.743**	.000

H Number of Visitors-Travel Cost Model trials (Time Cost excluded)

I Power Model

The power model was the one ultimately used. The rest models produced and presented in this section give less accurate predictions. Once again, the important indicators are in bold.

Annex Table 19 Number of Visitors-Travel Cost power model summary

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,971	**,943**	,914	,611

Annex Table 20 Number of Visitors- Travel Cost power model ANOVA analysis

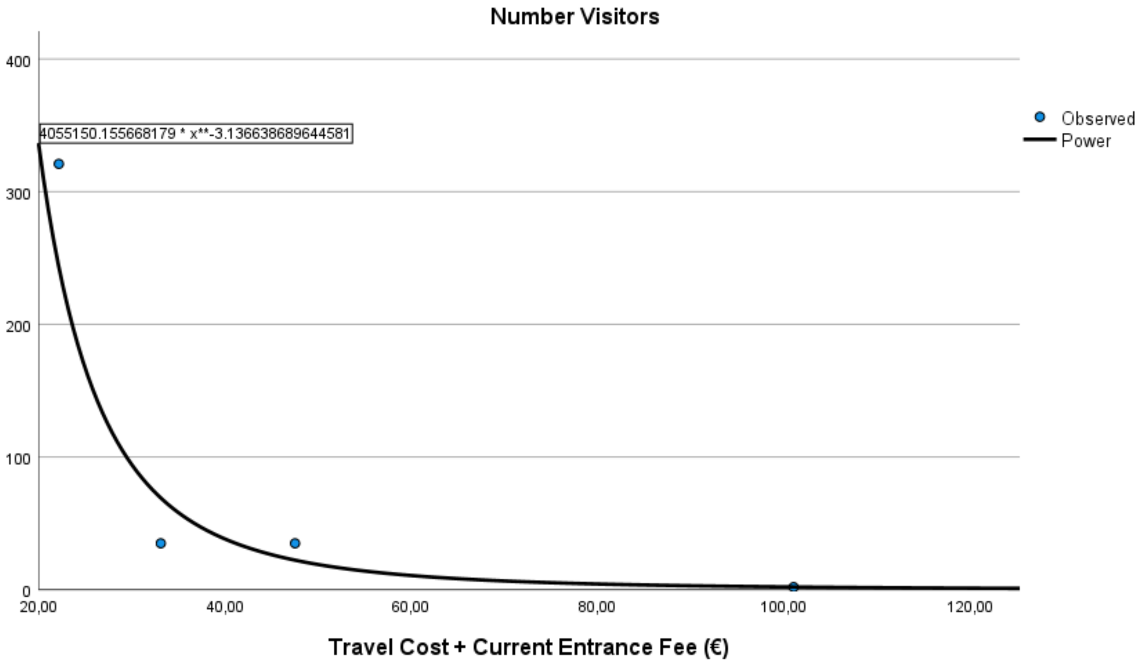
ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	12,252	1	12,252	32,822	**,029**
Residual	,747	2	,373		
Total	12,999	3			

Annex Table 21 Number of Visitors- Travel Cost power model coefficients

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
ln(TC+1 EUR)	-3,137	,547	-,971	**-5,729**	**,029**
(Constant)	4055150,156	8458844,889		**,479**	**,679**



Annex Diagram 13 Graphical representation of Number of Visitors- Travel Cost power model (Number of Visitors-Travel Cost)

II Exponential Model

Here the dependent variable is the natural logarithm of the number of visitors, lnV.

Annex Table 22 Number of Visitors- Travel Cost exponential model summary

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,949	**,900**	,850	,806

Annex Table 23 Number of Visitors- Travel Cost exponential model ANOVA analysis

ANOVA

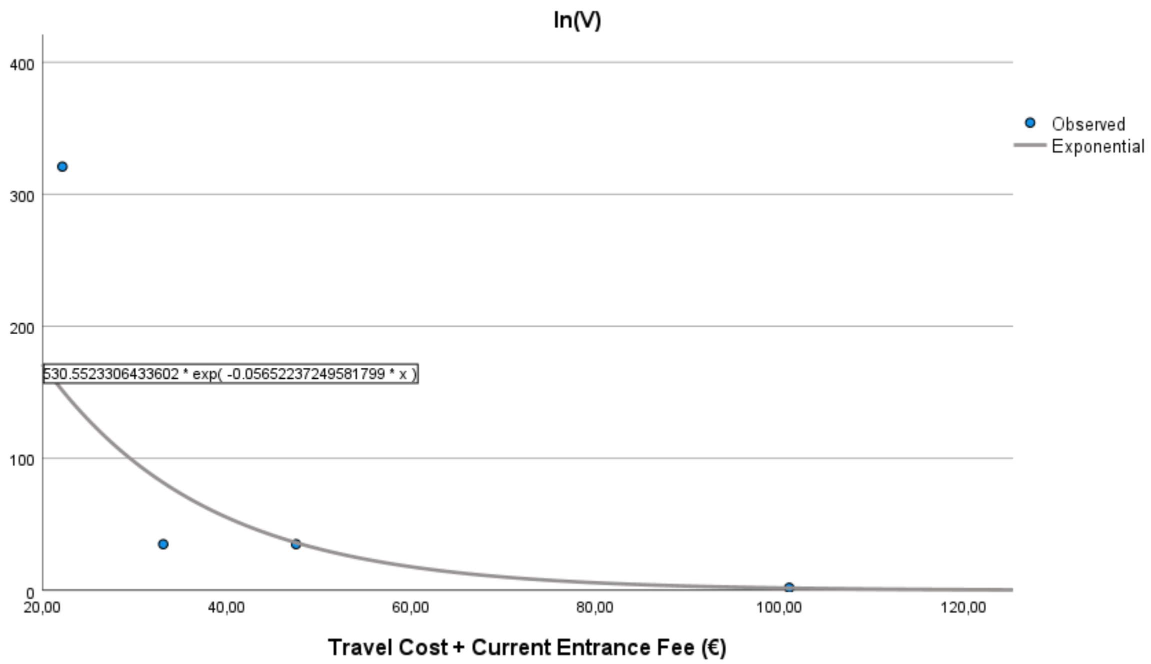
	Sum of Squares	df	Mean Square	F	Sig.
Regression	11,701	1	11,701	18,023	**,051**
Residual	1,298	2	,649		
Total	12,999	3			

Annex Table 24 Number of Visitors- Travel Cost exponential model coefficients

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
TC+1 EUR	-,057	,013	-,949	**-4,245**	**,051**
(Constant)	530,552	418,610		**1,267**	**,333**

The dependent variable is ln(V).



Annex Diagram 14 Graphical representation of Number of Visitors- Travel Cost exponential model [ln(Number of Visitors)- Travel Cost]

III Log-linear Model

Here the dependent variable is logV and the independent one the Travel Cost.

Annex Table 25 Number of Visitors- Travel Cost log-linear model summary

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,949	**,900**	,850	,350

Annex Table 26 Number of Visitors- Travel Cost log-linear model ANOVA analysis

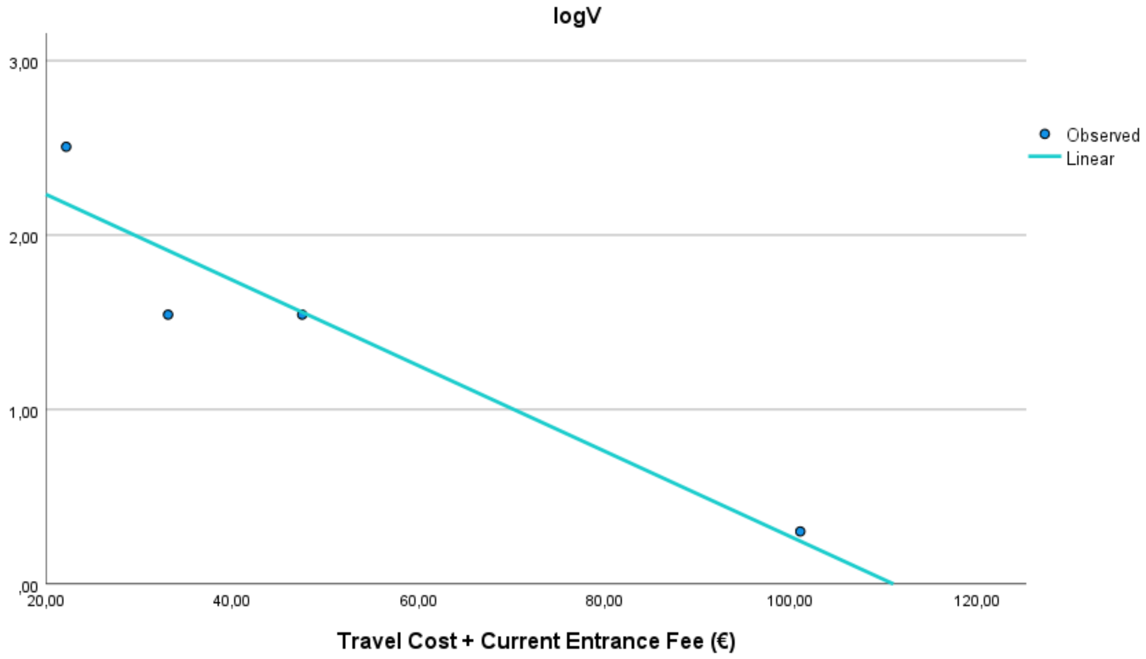
ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	2,207	1	2,207	18,023	**,051**
Residual	,245	2	,122		
Total	2,452	3			

Annex Table 27 Number of Visitors- Travel Cost log-linear model coefficients

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
TC+1 EUR	-,025	,006	-,949	**-4,245**	**,051**
(Constant)	2,725	,343		**7,952**	**,015**



Annex Diagram 15 Graphical representation of Number of Visitors- Travel Cost log-linear model [log(Number of Visitors)-Travel Cost]

I Travel Cost Model trials (Time Cost excluded)

I Cubic Model

Annex Table 28 Travel Cost cubic model summary

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,982	**,965**	,962	2,834

Annex Table 29 Travel Cost cubic model ANOVA analysis

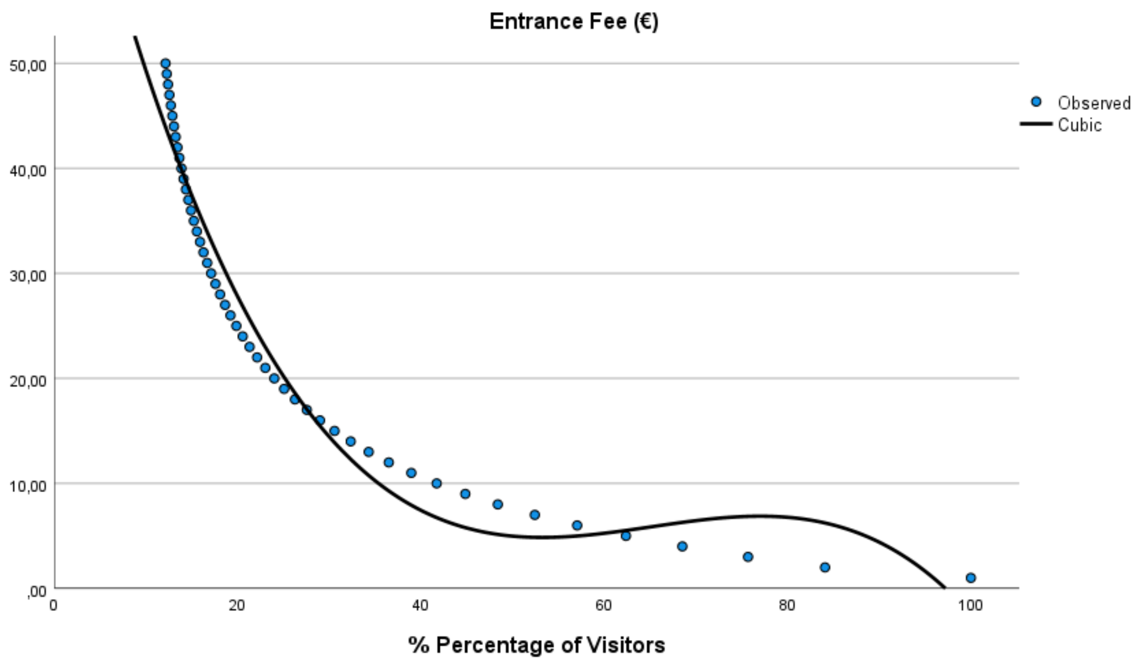
ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	10042,949	3	3347,650	416,699	**,000**
Residual	369,551	46	8,034		
Total	10412,500	49			

Annex Table 30 Travel Cost cubic model coefficients

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Percentage of Visitors	-3,707	,230	-5,228	**-16,131**	,000
Percentage of Visitors ** 2	,059	,005	7,931	**11,270**	,000
Percentage of Visitors ** 3	,000	,000	-3,657	**-8,950**	,000
(Constant)	80,787	2,653		**30,447**	,000



Annex Diagram 16 Graphical representation of Travel Cost cubic model (Entrance fee-percentage of Visitors)

II Power Model

The dependent variable here is $ln(EF_{WTP})$.

Annex Table 31 Travel Cost power model summary

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,984	**,968**	,968	,160

Annex Table 32 Travel Cost power model ANOVA analysis

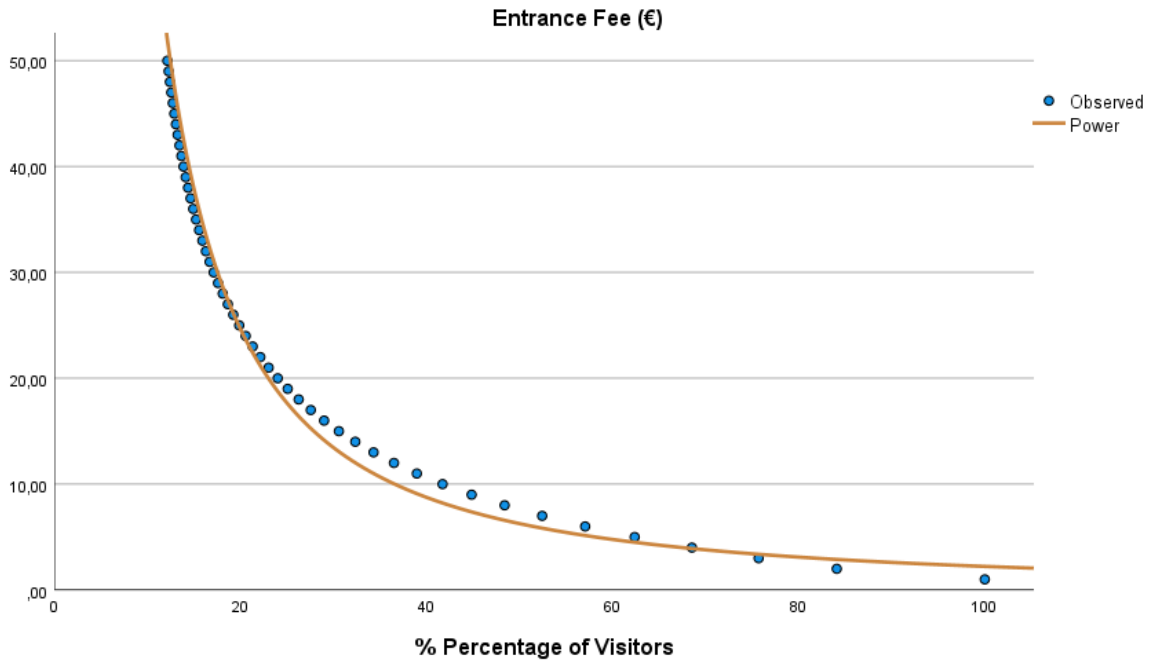
ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	37,518	1	37,518	1473,904	**,000**
Residual	1,222	48	,025		
Total	38,740	49			

Annex Table 33 Travel Cost power model coefficients

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
ln(Percentage of Visitors)	-1,494	,039	-,984	**-38,391**	,000
(Constant)	2164,766	270,064		**8,016**	,000



Annex Diagram 17 Graphical representation of Travel Cost power model (Entrance fee-percentage of Visitors)

III Logarithmic Model

The independent variable for this one is V_p.

Annex Table 34 Travel Cost logarithmic model summary

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,954	**,910**	,908	4,428

Annex Table 35 Travel Cost logarithmic model ANOVA analysis

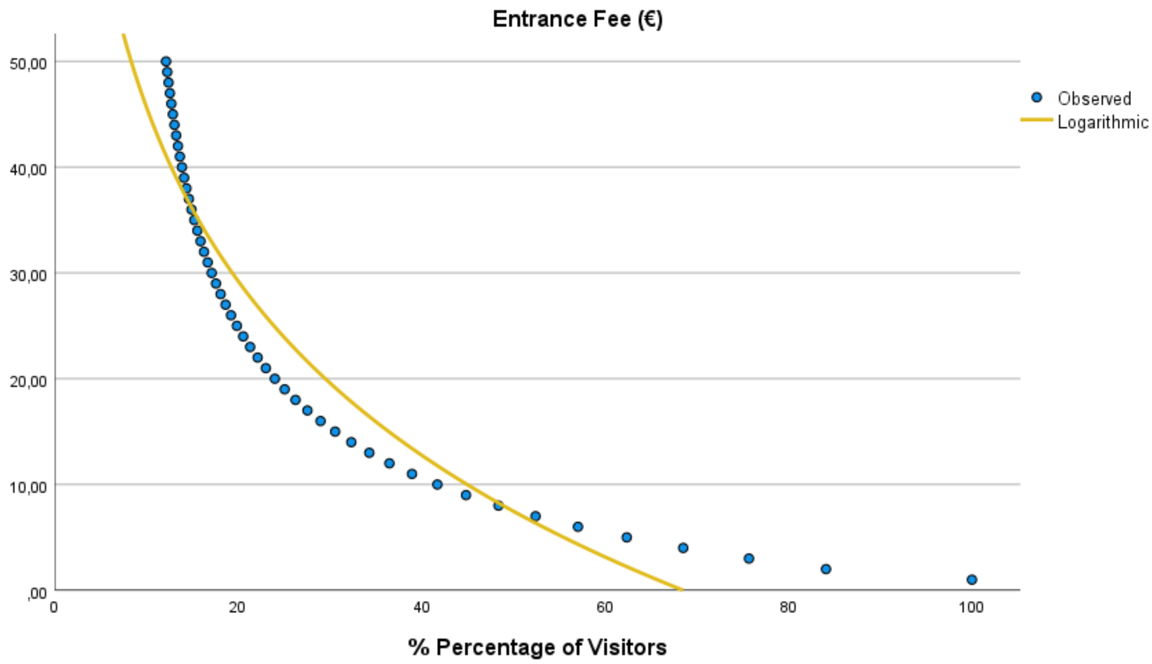
ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	9471,215	1	9471,215	482,976	**,000**
Residual	941,285	48	19,610		
Total	10412,500	49			

Annex Table 36 Travel Cost logarithmic model coefficients

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
ln(Percentage of Visitors)	-23,739	1,080	-,954	**-21,977**	,000
(Constant)	100,343	3,463		**28,979**	,000



Annex Diagram 18 Graphical representation of Travel Cost logarithmic model (Entrance fee-percentage of Visitors)

J Number of Visitors-Total Travel Cost Model trials (Time Cost included)

I Linear, Quadratic and Exponential Models

Annex Table 37 Number of Visitors-Total Travel Cost linear, quadratic and exponential models' summary

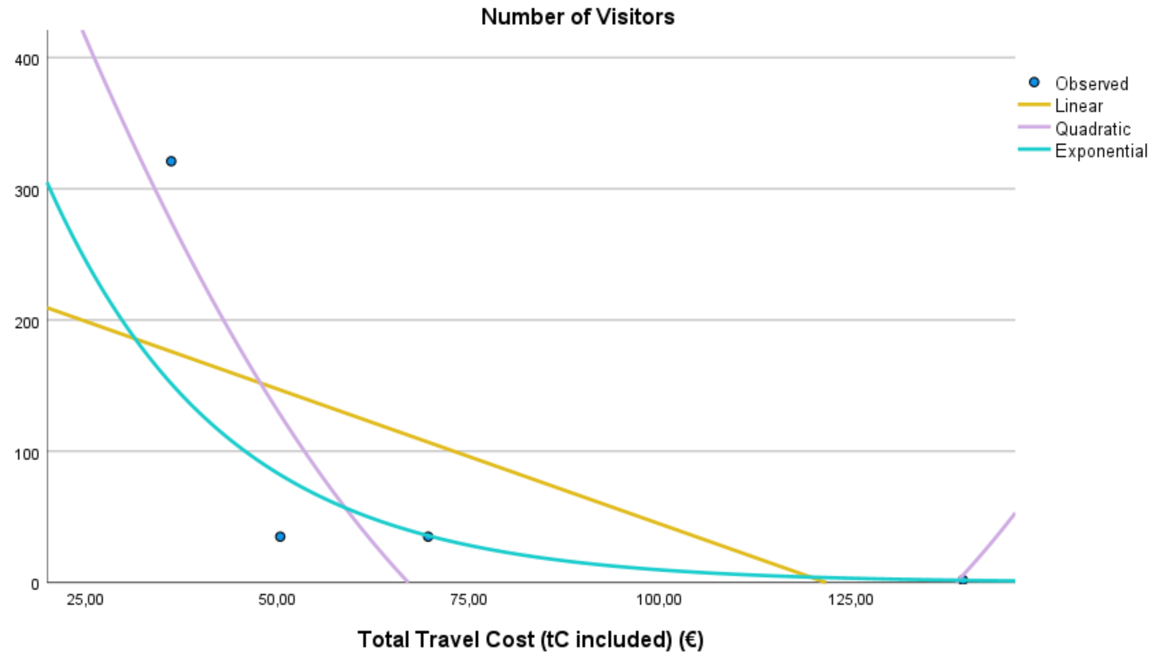
Model Summary and Parameter Estimates

Dependent Variable: Number of Visitors (per Zone)

Independent Variable: Average Total Travel Cost (per Zone)

	Model Summary					Parameter Estimates		
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2
Linear	**,399**	1,329	1	2	**,368**	250,624	-2,061	
Quadratic	**,801**	2,013	2	1	**,446**	807,332	-17,850	,087
Exponential	**,900**	17,910	1	2	**,052**	722,337	-,043	

Graphical Representation:



Annex Diagram 19 Graphical representation of Number of Visitors- Total Travel Cost linear, quadratic and exponential models (Number of Visitors- Total Travel Cost)

K Total Travel Cost Model trials (Time Cost included)

I Quadratic, Cubic and Power Models

Annex Table 38 Total Travel Cost quadratic, cubic and power models' summary

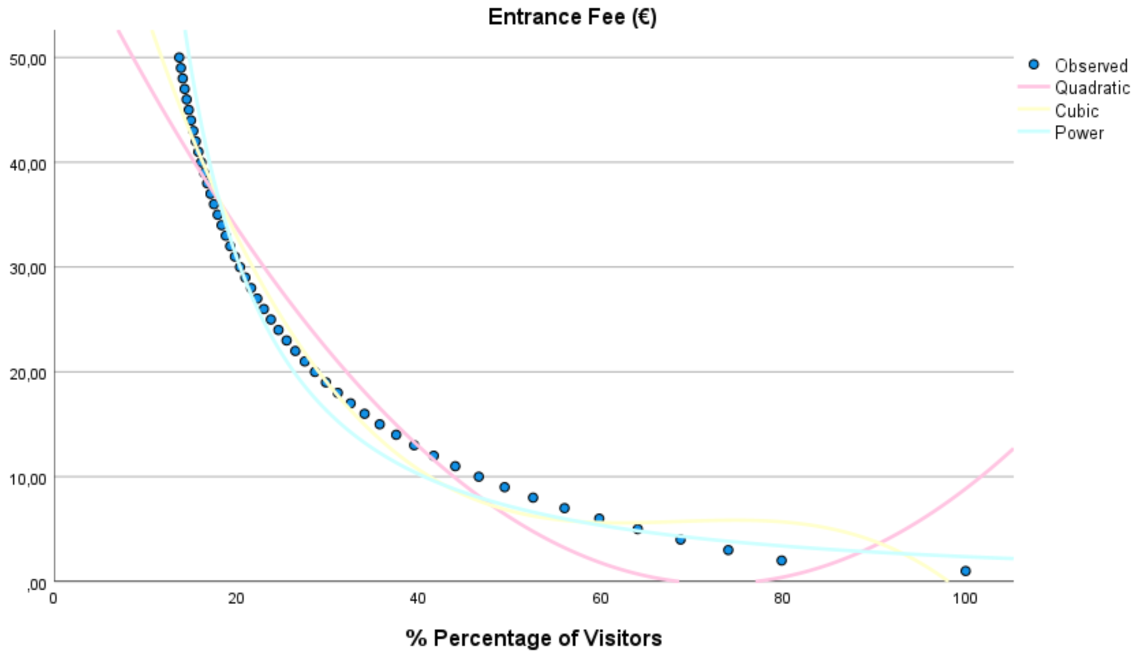
Model Summary and Parameter Estimates

Dependent Variable: Entrance Fee

Independent variable: % Percentage of Visitors.

	Model Summary					Parameter Estimates			
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Quadratic	**,939**	364,159	2	47	**,000**	64,461	-1,778	,012	
Cubic	**,981**	803,860	3	46	**,000**	84,743	-3,525	,052	,000
Power	**,953**	968,732	1	48	**,000**	3709,027	-1,597		

Graphical Representation:



Annex Diagram 20 Graphical representation of Total Travel Cost quadratic, cubic and power models (Entrance fee- Total Travel Cost)

II Exponential Model

This is the one ultimately used under time cost included scenario.

Annex Table 39 Total Travel Cost exponential model summary

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,996	**,992**	,992	,079

Annex Table 40 Total Travel Cost exponential model ANOVA analysis

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	38,437	1	38,437	6097,511	**,000**
Residual	,303	48	,006		
Total	38,740	49			

Annex Table 41 Total Travel Cost exponential model coefficients

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
PercentageofVisitors	-,044	,001	-,996	**-78,087**	,000
(Constant)	78,471	1,654		**47,437**	,000

The dependent variable is $\ln(Entrance\ Fee)$

The corresponding information regarding the Entrance Fee and Number of Visitors are shown below.

Annex Table 42 Total Travel Cost exponential model summary (for number of visitors)

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,996	,992	,992	,079

The independent variable is Number_ofVisitors.

Annex Table 43 Total Travel Cost exponential model ANOVA analysis (for number of visitors)

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	38,437	1	38,437	6097,511	,000
Residual	,303	48	,006		
Total	38,740	49			

The independent variable is Number_ofVisitors.

Annex Table 44 Total Travel Cost exponential model coefficients (for number of visitors)

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Number_ofVisitors	-,011	,000	-,996	-78,087	,000
(Constant)	78,471	1,654		47,437	,000

The dependent variable is ln(EntranceFee).