

Socio-economic impact assessment

Action C.2.2

iLIFE-TROODOS Project

Troodos National Forest Park: Promoting natural values and Ecosystem Services

Nicosia

2020

The present report has been prepared by Frederick University within the framework of the project LIFE16 GIE/CY/000709 entitled '*Troodos National Forest Park: Promoting natural values and Ecosystem Services*'. The Project is co-funded by the European Union in the framework of the LIFE programme.

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Action C.2.2

1. Introduction

Sub-action C.2.2 of iLIFE-TROODOS project focuses on the preparation of a socio-economic impact assessment of the project. The report includes the results derived from the methods used in sub-action C.2.1 along with an evaluation of the economic benefits that the area could obtain.

This sub-action is essential as the project is expected to have significant positive socio-economic impacts on local communities that live in the areas within or near the site. These impacts are not easily perceived by the local population; therefore, this action will identify, analyse and disseminate the socioeconomic benefits of the project and the importance of the Network in a comprehensible way for communities to appreciate, thus facilitating further acceptance of the Natura 2000 network in Cyprus.

2. Sociological impact

The project's impacts are included in detail at the related deliverable of sub-action C.2.1 ([Final report on findings from the annual research surveys and interviews](#)). The conclusions reached through the analysis of the project's surveys (interviews, online surveys, telephone surveys and group interviews) show that the overall impact of the project on the target groups was very satisfactory and the initial objectives of the Project were achieved (Table 1).

Table 1: Impact of project on initial objectives.

S/N	Objective	Expected results	Final Evaluation
1	Promote public awareness of the targeted audience, towards the need for the protection of Natura 2000 network.	The project was expected to increase awareness for inhabitants of Cyprus by 50%, children by 40%, youth by 50%.	Increased awareness of the inhabitants of Cyprus by 57%, the youth by 60% and of the children by 50%.
2	Increase awareness on natural values for which the Troodos National Forest Park was included in the Natura 2000 network.	The project was expected to increase awareness for visitors/ tourists by 20%.	Increased awareness of visitors/ tourists by 60%.
3	Change negative attitudes of Cyprus inhabitants, regarding Natura 2000 network and ES, using various means.	The project was expected to increase awareness and change perceptions for inhabitants of	Increased awareness of the inhabitants of Cyprus by 57% and the local communities and local authorities by 70%.

S/N	Objective	Expected results	Final Evaluation
		Cyprus by 50%, local people and local authorities by 80%.	
4	Spread knowledge about the natural values and ES provided by Natura 2000 network to professional target groups.	The project was expected to increase awareness and build capacity for policy implementers (including representatives of the tourism industry sector) by 40%.	The increase in awareness and build capacity for policy implementers will only become apparent after a few years.
5	Create and provide toolsets regarding the Natura 2000 network, the conservation of natural values and the provision of ES in order to be forwarded to the public and be used more widely in a national and international context.	The project was expected to increase awareness for visitors/ tourists by 20% and for people with disabilities by 25%.	Increased awareness of visitors/ tourists by 60%. Raising awareness on the people with disabilities was not possible (their association did not respond to the call for participation in the Stakeholders meetings).

The major conclusions reached per method implemented are:

A. Telephone survey

- a) There is an increase in the public that chooses to visit or pass through the Troodos National Forest Park (TNFP) at least once a year (from 32% to 39%).
- b) There is an increase of those who declared that the main reason of their visit to the TNFP is recreation (increase from 82% to 94%). Inhabitants of nearby communities also choose to visit the area for recreation purposes.
- c) There is an increase of those who declared that what they mostly prefer in the TNFP is the forest and the environment (from 65% to 75%).
- d) There is a slight increase of those who declared that they visit the TNFP for photography (from 24% to 27%), for trekking (from 45% to 53%) and for collecting mushrooms/herbs (from 15% to 18%). The locals choose to visit the area mostly for day-trips and trekking.
- e) A stronger argument regarding the restriction of hunting revealed through the three studies (from 18% in the 1st study, to 23% in the 2nd study and 43% in the 3rd study).
- f) There are clear arguments regarding the development of infrastructure which could improve cycling (from 42% to 59%), camping (from 40% to 59%), off-road driving (from 13% to 28%), birdwatching (from 25% to 51%) and horsing (from 29% to 40%).

It is noted that the number of randomly selected participants in the telephone survey that were also from nearby communities was about 3%, and very few conclusions could be reached through this method.

B. Group interviews

- a) All participants (either locals or not) stressed the importance of the TNFP by referring to its natural beauty, unique biodiversity, the importance of vegetation and trees to the quality of the air as well as the importance of the water resources it provides.
- b) Both local residents and owners of SMEs stated that Troodos is a source of income, as it attracts visitors and tourists during the winter and summer season, e.g. for agrotourism purposes.
- c) Some of the local residents stated that the development of Troodos would not benefit their own communities or improve the quality of their lives. However, the investments carried out or planned sustainably, are welcome, since they increase the job positions in the area and provide a work place for younger generations.
- d) Local residents and owners of SMEs reported that their region is neglected by the government and local authorities.
- e) The risk of fire was identified as the greatest threat for TNFP. Furthermore, the need for housing, more jobs (e.g. through local artisanship) and health infrastructure was brought up as major issues for the inhabitants.
- f) Local residents noted that they want their area to be more promoted (e.g. through the Deputy Ministry of Tourism, former Cyprus Tourism Organisation); all groups had seen/ heard the information included in the LIFE-TROODOS campaign.

C. Online survey

Online polls showed that participants were aware of TNFP ecosystem services. The polls were also successful in creating “buzz” around the iLIFE-TROODOS project with reach being between 929 and 3245 per post and engagement of up to 250.

3. Economic impact

The Troodos National Forest Park (TNFP) provides a significant number of ecosystem services (more than 30 have been identified), with an estimated total carbon sequestration of $\sim 1,482 \text{ kt C y}^{-1}$. In case of a fire event, the restoration cost would exceed €6 mil (not including personnel cost), while its annual management cost (of the Department of Forest) reaches €2.2 mil. The visitors to the establishments of the nearby communities contribute about more than €900.000/year to the area's income, while the expenses of hunters reach €100.000 every year. Furthermore, the visitor's centres located within the TNFP (Troodos Environmental Education Center and Troodos Geopark Visitors Center) sold tickets amounting to approximately €12.500 during 2017.

3.1 Context analysis

Business activities and employment

The communities neighbouring TNFP are lightly populated; where a bit more than 8000 people comprise the permanent population of 21 communities (Table 2). Various economic activities are carried out at these communities, which fall under 19 of the 21 Level 1 codes of the Statistical Classification of Economic Activities in the European Community (NACE) (Table 3).

Table 2. Population of communities neighbouring TNFP (8029 people in total) according to the 2011 census (*Source: Statistical Service of Cyprus, 2020*).

Community	Population
(Kato) Amiantos	228
Chandria	162
Evrychou	827
Foini	391
Galata	581
Kakopetria	1274
Kaliana	200
Kalopanagiotis	263
Kato Platres	148
Korakou	521
Kourdali	19

Community	Population
Kyperounta	1516
Mandria Lemesou	107
Moniatis	275
Moutoullas	174
Pano Platres	239
Pedoulas	132
Prodromos	123
Sinaoros	228
Spilia	123
Temvria	498

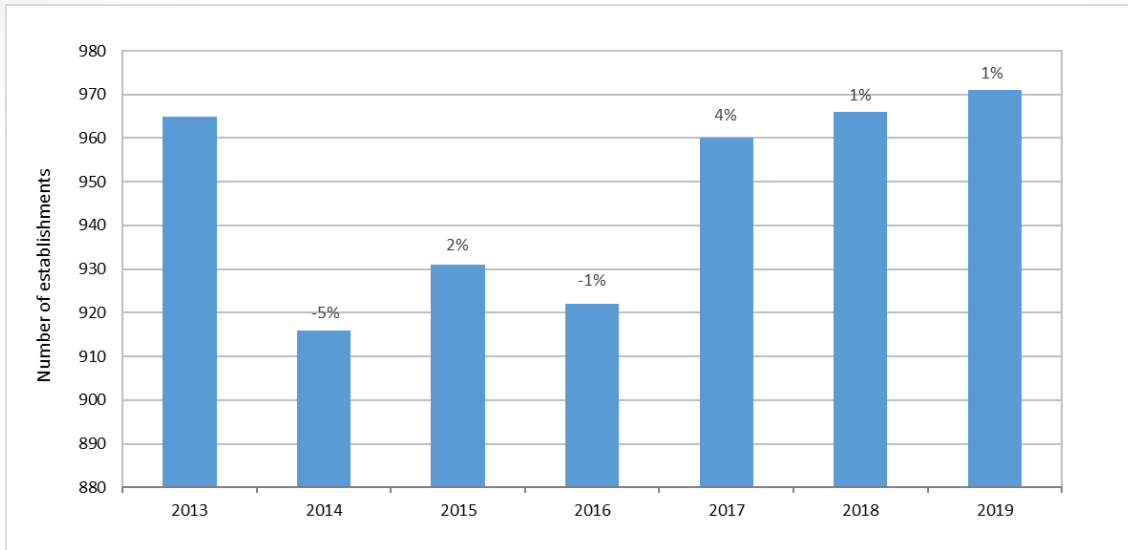
Table 3. Statistical Classification of Economic Activities in the European Community (NACE), Level 1 Codes. The communities at the area do not have activities falling under codes B and U (*Source: European Commission, 2020*).

Code	Economic Area
A	Agriculture, Forestry and Fishing
B	Mining and Quarrying
C	Manufacturing

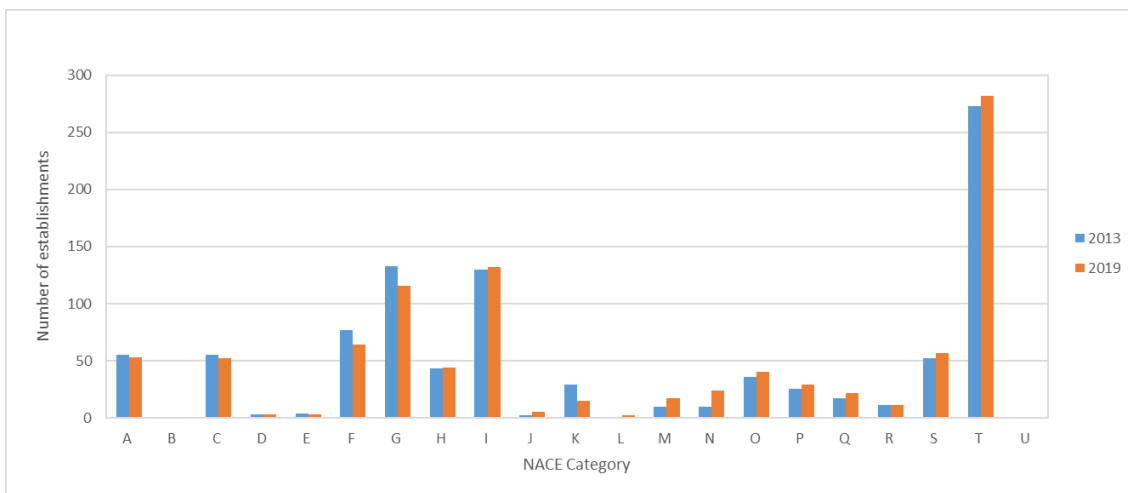
Code	Economic Area
D	Electricity, Gas, Steam and Air Conditioning Supply
E	Water Supply; Sewerage, Waste Management and Remediation Activities
F	Construction
G	Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
H	Transportation and Storage
I	Accommodation and Food Service Activities
J	Information and Communication
K	Financial and Insurance Activities
L	Real Estate Activities
M	Professional, Scientific and Technical Activities
N	Administrative and Support Service Activities
O	Public Administration and Defence; Compulsory Social Security
P	Education
Q	Human Health and Social Work Activities
R	Arts, Entertainment and Recreation
S	Other Service Activities
T	Activities of Households as Employers; Undifferentiate Goods and Services Producing Activities of Households for Own Use
U	Activities of Extraterritorial Organisations and Bodies

The number of establishments at the communities neighbouring TNFP, for the period 2013-2019, are presented in Picture 1. The data prior to 2013 did not include establishments in NACE code A (Agriculture, Forestry and Fishing) and were therefore not included in the analysis. In addition, one small community, Kourdali, is counted with the larger neighbouring community, Spilia, at the official statistics. It is noted that in 2013 Cyprus underwent a severe financial, crisis which impacted many of its businesses and a number of them had to foreclose. This is also the case at the mountainous areas, where the number of businesses was reduced by about 5% between 2013 and 2014. The area needed a few years to regain its financial capability and 971 businesses operated in 2019, at these communities.

The number of establishments at the communities, per NACE activity for 2013 and 2019, is presented in Picture 2. Most of the businesses are under code T (Activities of Households as Employers; Undifferentiate Goods and Services Producing Activities of Households for Own Use), where this is about 29% of all NACE activities. The next categories are codes G (Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles) and I (Accommodation and Food Service Activities), where each category comprises about 13% of all activities. Manufacturing (code C) and Construction (code F) amount for less than 15% of the activities, where a decrease of 2% was also noted between 2013 and 2019 for these activities.

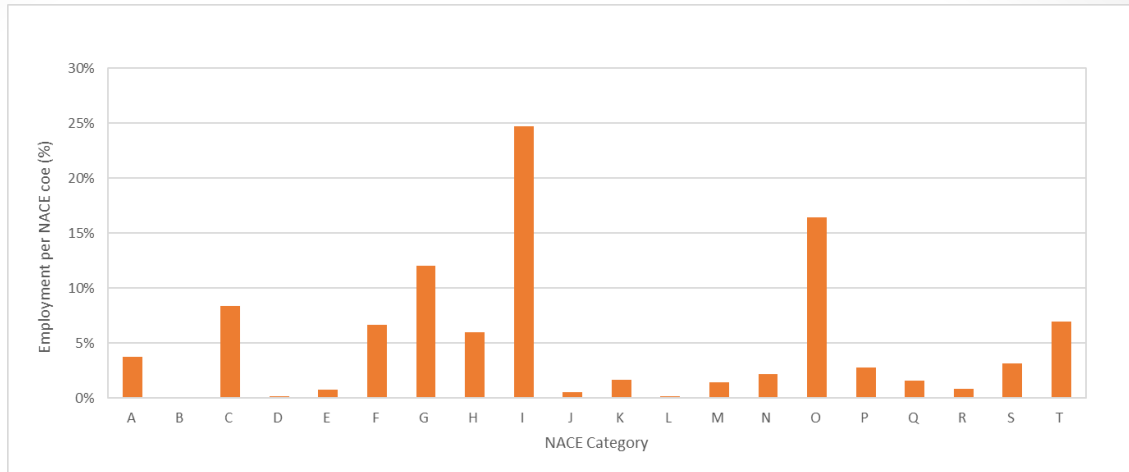


Picture 1: Number of establishments at communities neighbouring TNFP in the period 2013-2019. The percentage change in the number of establishments is noted, where 2013 is the reference year (Source: Statistical Service of Cyprus, 2020).



Picture 2: Number of establishments at communities neighbouring TNFP, per NACE activity for 2013 and 2019 (Source: Statistical Service of Cyprus, 2020).

The number of people employed per NACE activity is presented in Picture 3. For the elaboration of the graph, the people employed in Cyprus (in each category, for 2019) was used, and the businesses with more than 250 employees were removed. The graph indicates that about 25% of the people are employed in NACE I (Accommodation and Food Service Activities), 16% in NACE O (Public Administration and Defence; Compulsory Social Security) and 12% in NACE G (Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles). Furthermore, during the census undertaken in 2011 by the Statistical Service of Cyprus, 3249 people were economically active and 252 were unemployed. Out of the 2997 working people, 7% were employed in the Primary Sector (NACE A and B), 24% in the Secondary (NACE C to F), 69% in the Tertiary Sector (NACE G to U) and 1% did not declare any occupation.

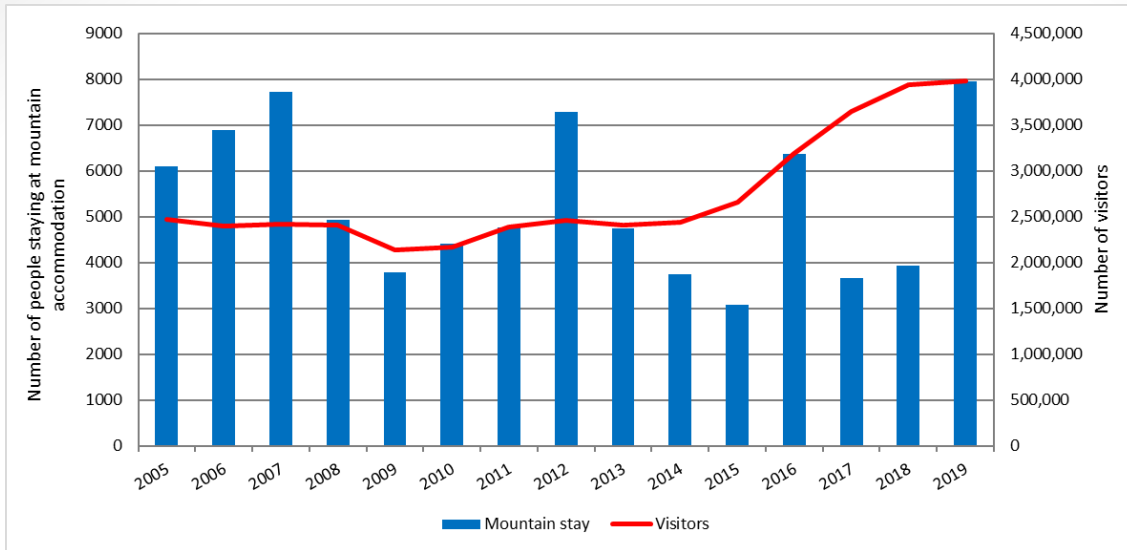


Picture 3. Percentage of employment at communities neighbouring TNFP, per NACE activity for 2019 (Source: Statistical Service of Cyprus, 2020).

Visitors and accommodation

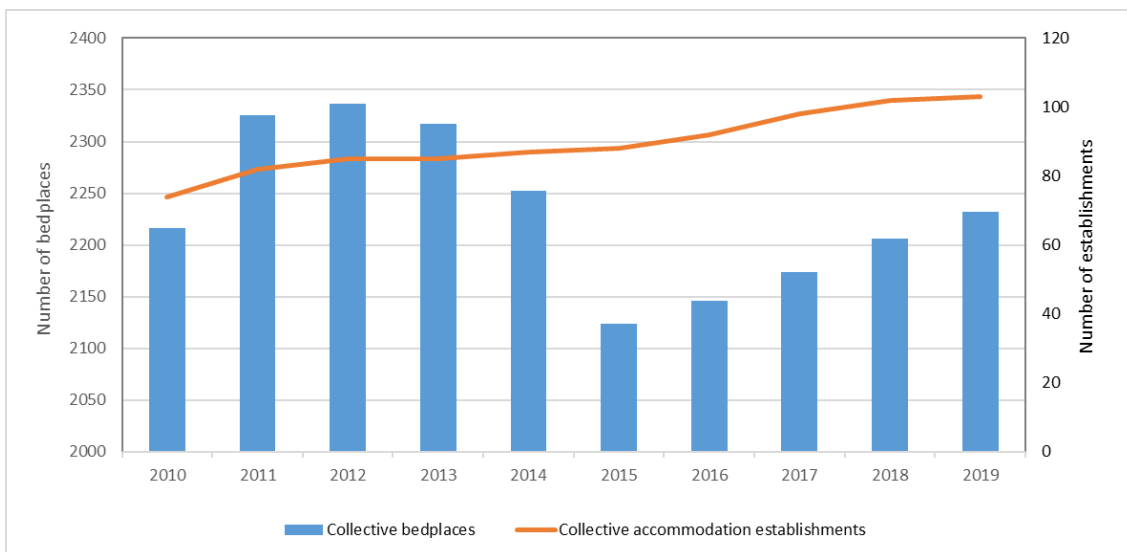
Cyprus is an island where the revenue of many people depends on tourists. As shown at Picture 4 below, the visitors to the island (where visitors are defined as those choosing to stay for at least one night) was constant to about 2.5 million per year from 2005 until 2015 (with a slight decrease during the global recession years of 2009 and 2010). After that, the numbers increased reaching almost 4 million in 2019. Even though many of these visitors go to the mountainous parts of Cyprus, few choose to stay.

Even so, NACE activity I (Accommodation and Food Service Activities) is the most important activity in the area, employing more than 10% of the total population. The number of people choosing to use mountainous accommodations reached its peak in 2007 and had a negative trend after that. The efforts undertaken by the locals and the government had some positive results, where in 2019, the number of people choosing to stay at these accommodations doubled in comparison to the previous years. Even though no direct association can be made, it should be noted that in 2019 the information and awareness activities of the project were intensified.

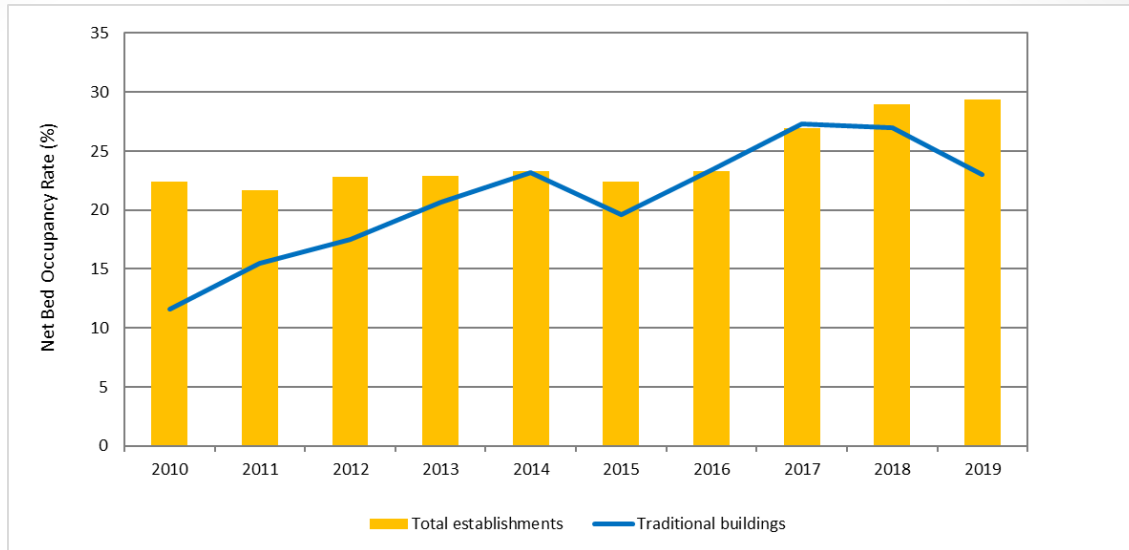


Picture 4: Number of people choosing mountain accommodation and total number of visitors to Cyprus. The exact number of people should be read with caution due to its small volume (Source: Statistical Service of Cyprus, 2020).

The trend above, is reflected to the number of accommodation establishments, where there is an increasing trend in the past decade (period 2010-2019). However, the corresponding number of bedplaces has significantly decreased (as of 2012). (Picture 5). During the same period, the occupancy rate at these establishments varied from 22 to 30%, showing an increasing trend in the last 5 years. The occupancy rate at traditional buildings is also increasing, where from 12% in 2010 reached 23% in 2019 (having its peak in 2017, with 27.3%) (Picture 6).



Picture 5: Number of establishments and bedplaces at mountain areas (Source: Deputy Ministry of Tourism, 2020).

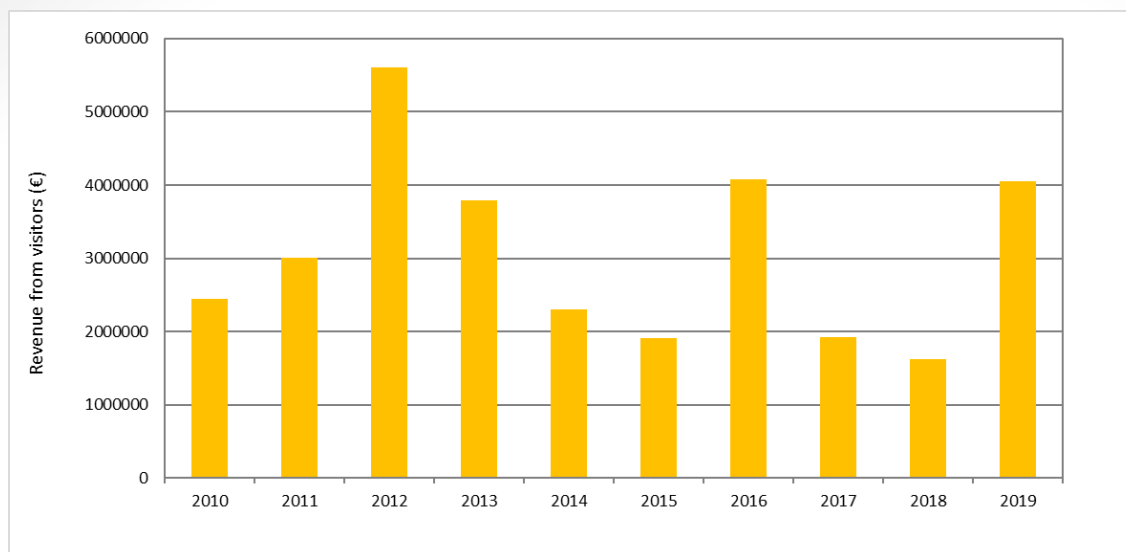


Picture 6: Net bed occupancy rate at mountain areas (Source: Deputy Ministry of Tourism, 2020).

The daily expenses per person during their stay is presented in Table 4, where the total expenses peak by 2013 and are then reduced. As previously presented, after the financial crisis of 2013, a number of business faced financial problems. This is also shown at the table below, where various establishments reduced their accommodation costs to sustain their businesses. Picture 7 shows this impact in the local businesses revenue, which had a negative trend since 2012 (with some deviations). The prices used (as published from the Statistical Service of Cyprus) were not processed to deflect inflation.

Table 4: Daily expenses per person during their mountain accommodation (Source: Statistical Service of Cyprus, 2020).

YEAR	ACCOMMODATION (€)	OTHER EXPENSES (€)	TOTAL EXPENSES (€)
2010	166.30	389.70	556.10
2011	342.30	291.10	633.30
2012	369.90	400.90	770.80
2013	291.70	507.70	799.40
2014	110.30	505.60	615.90
2015	174.50	445.80	620.30
2016	311.00	328.80	639.80
2017	197.46	328.77	526.23
2018	187.47	223.94	411.41
2019	213.11	296.28	509.39



Picture 7: Revenue based on total expenses and visitors at mountainous areas.

During the project’s implementation, the visitors of the area were counted in some locations. Specifically, this took place at four nature trails. Data on the users/ visitors was collected between June and September, for three years (2018 to 2020). Table 5 presents data for 31 days across this period, where the number of visitors increased, especially at nature trails. A more than double increase between 2018 and 2019, was recorded at “Kaledonia Nature Trail”. Even during 2020 (COVID-19 pandemic), the number of visitors at the nature trails remained higher than in 2018. Also, the annual visitors at the Troodos Environmental Information Center, the Troodos Botanical Garden and the Troodos Geopark Visitor Center for the period 2017-2019 is presented in Table 6.

Table 5: Number of visitors at four nature trails in three years (2018-2020). No data was available for Persefoni Nature Trail in 2020 (Source: Department of Forests, 2020).

YEAR	Platania Picnic Site	Pasia Livadi Picnic Site	Kalidonia Nature Trail	Persefoni Nature Trail
2018	7470	2464	13,257	1192
2019	9078	3001	29,848	1785
2020	7583	2922	20,270	0

Table 6: Annual visitors at the two information centers and the Troodos Botanical Garden, for the period 2017-2019. (Source: Department of Forests, 2020).

YEAR	Troodos Environmental Information Center	Troodos Botanical Garden	Troodos Geopark Visitor Center
2017	4600	16,563	3509
2018	4500	17,060	4187
2019	2968	21,760	5035

3.2 Willingness to Pay for Ecosystem Services

The project aimed to raising awareness and promoting Ecosystem Services. As such, it is difficult to understand and capture its economic impact in the local economy and society. To elicit monetary values and to quantify, to the extent possible, the economic benefits of preservation, the Willingness to Pay (henceforth “WTP”) methodology is implemented. An expressed Willingness to Pay represents a forecast of acceptability with a monetary value attached to it. As such WTP provides an estimate of the economic impact of visitation on the area and its surrounding communities. A widely used method of assessing WTP is the Contingent Valuation Method (hence forth “CVM”) in which a random sample of respondents addresses direct questions regarding their WTP given (contingent on) projected changes in environmental conditions. In turn, the respondents assign a monetary attribute to their express WTP by form of a fee or a contribution. This is the method employed.

In total, the project carried out three surveys to gather data for socio-economic analysis. Nevertheless, only the two surveys address explicitly WTP questions. Because the participants of the two relevant surveys are subject to the same qualitative characteristics, and to preserve greater statistical power, their answers are aggregated. In the ensuing paragraphs the sample is described, before the presentation of the WTP analysis.

Sample Demographics

The initial sample consists of 969 individuals. On a number of questions, the number varies slightly with only a few individuals neglecting or refusing to complete an answer. As such the analysis is based on a highly uniformed sample. Picture 8 breaks down the sample according to gender, educational level, age, employment status, nationality and monthly income.

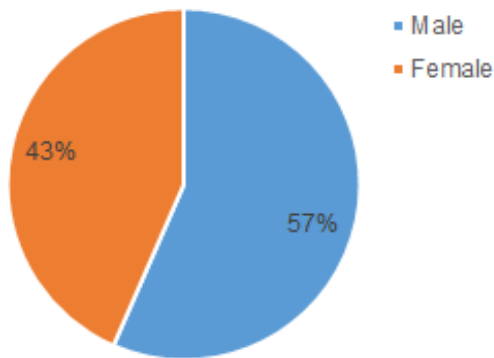
The proportion of men (57%) vs women (43%) is fairly balanced. The same can be said of the age composition of the sample since the representation of 5 age groups, ranging from 16-25 to 66+, varies between 11% to 22%. The combined set of three age groups, 26-35 plus 36-45 plus 46-55, make out 56% of the total sample. The least represented group appears to be the youngest, 16-25 with 11%. This is to be expected since the said group includes underage population that may not have transportation means to the natural area. The question of age also includes, understandably, the greatest number of non-responses (16%).

Looking at the nationality distribution can be confirmed that the respondents are overwhelmingly Cypriot nationals (91%) with the second biggest group being Greek nationals (5%). Russians and English (1% each) are also likely permanent residence. The uniformity of the sample, in terms of nationality, suggests that visitors to the natural area, fall under the category of “internal tourism” and imply a constant stream of repeated visits to the natural area.

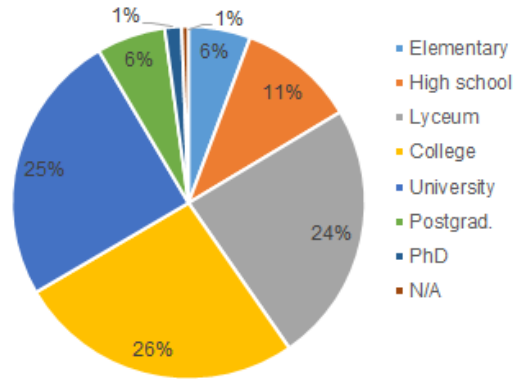
The educational level of the participants is high, typical of a uniformly population from Cyprus. Only 17% of the sample holds a high school leaving certificate or a lesser qualification. About 65% of the sample holds a

college, university or postgraduate studies degree. The high educational profile of the sample suggests that participants have answered the questionnaires with understanding and conviction, thus reinforcing the validity of the results. Employment status and monthly income statistics are in line with the relatively high educational status of the participants. Only 7% of the respondents are deemed unemployed without being specified if this is by choice. The percentage of the retirees (20%) is consistent with the percentage of more senior respondents (age 66+ at 17%). Finally, income distribution also appears to be in line with educational backgrounds and employment status, with salaries ranges corresponding to private and public sector compensation averages.

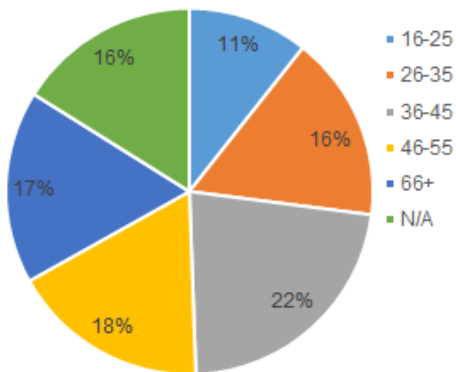
Gender



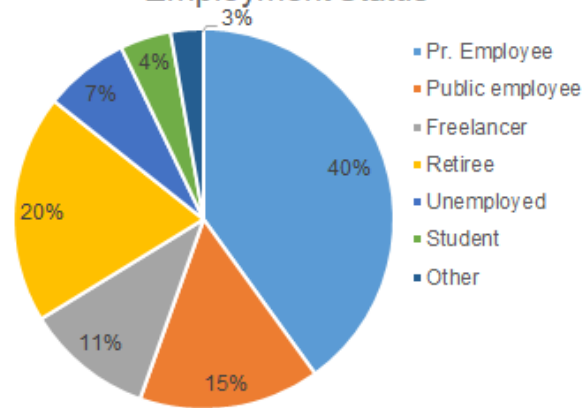
Educational Level



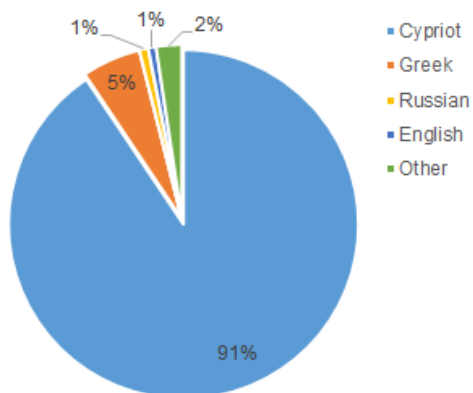
Age Groups



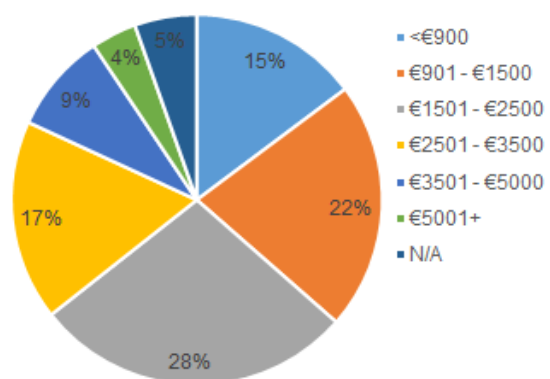
Employment Status



Nationality



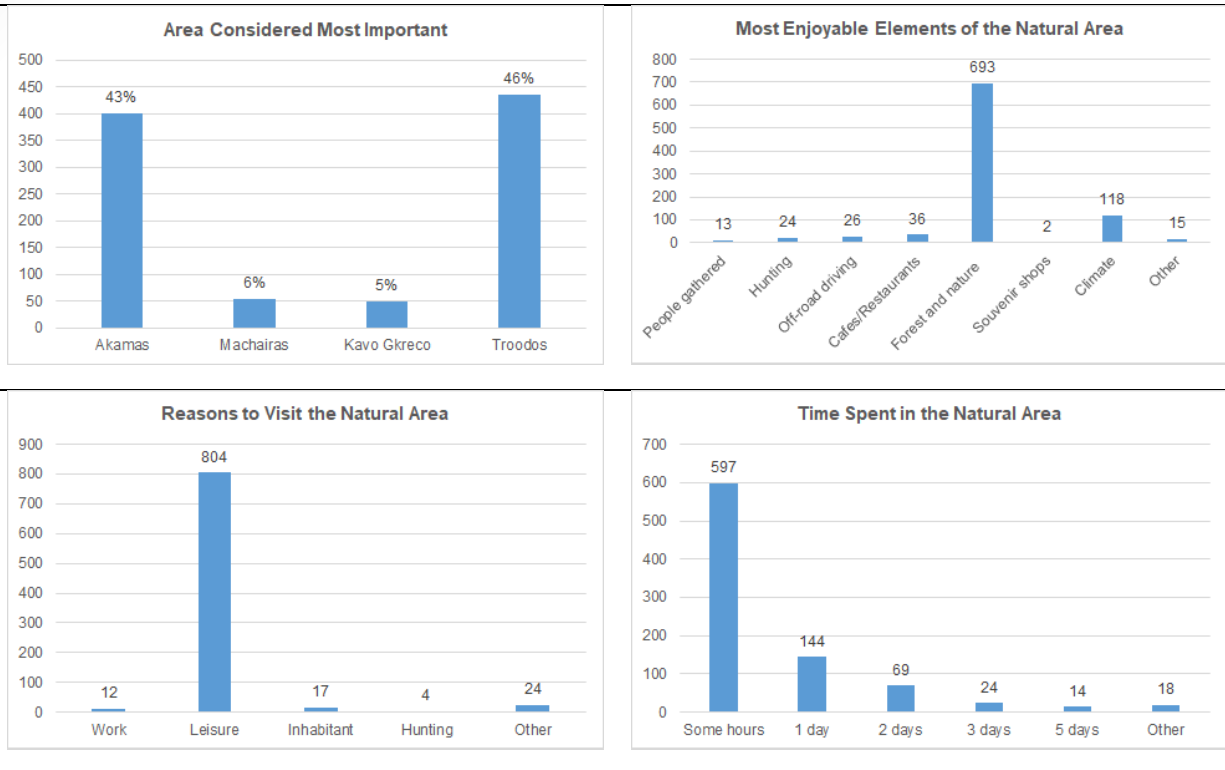
Monthly Income



Picture 8. Sample Demographics.

Visitors' Preferences

The second set of graphs (Picture 9) presents the expressed preferences of visitors to the natural area.

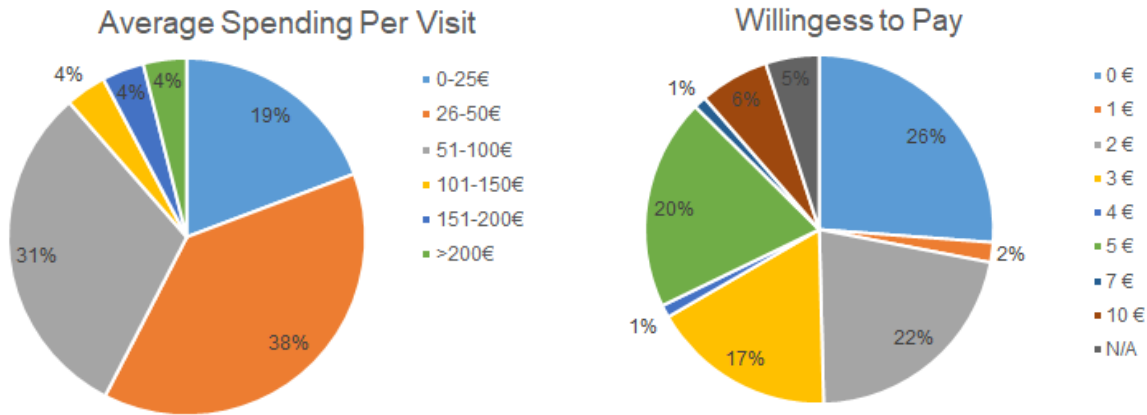


Picture 9. Visitors' Preferences.

Looking at the areas considered most important, visitors value more greatly two natural areas, namely Akamas (43%) and Troodos (46%). These are the areas that are more strongly perceived as “nature”. The primary reason for visiting the natural area is Leisure and to that end, the most enjoyable element of the natural area is deemed to be Forest and Nature. Finally, the overwhelming majority of visitors appear to spend only some hours on site, suggesting a daytrip rather than an overnight visit. This appears to be reasonable given the short-distance and the relatively sound road network of the island, as well as the composition of the sample being internal tourists.

Visitors' Spending and Willingness to Pay

This section presents the analysis of visitors' spending and willingness to pay (WTP). First, descriptive statistics for the average spending per visit and visitors' willingness to pay are extracted (Picture 10), based on questionnaire responses.



Picture 10. Average Spending and Willingness to Pay.

In the average spending per visit breakdown about 60% of the respondents indicate that they spend up to 50 EUR for themselves and accompanied persons. Another 31% raises the spending to a range of 51-100 EUR. To assess WTP the respondents were presented with a range of potential entrance fees from 0 EUR to 10 EUR (in increments of 1 EUR) and asked which of the 11 options were willing to accept, in return of future preservation and improvement of the natural area.

A relatively large proportion (26%) respondent with a “protest zero”, thus refusing to accommodate the idea of the introduction of any fee for accessing the natural area. This response is likely explained by the ingrained notion in Cyprus that public goods should be freely available. In the case of forest and nature, it is unlikely that the respondents take into consideration that a portion of their tax contribution is already allocated towards preservation of the environment; this would imply an attitude of refusing to double-pay, or over-pay for ecosystem services. Instead, it is more likely that respondents lean to the idea that the environment “exists in itself” and will continue to be so independently of human interference towards preservation. It is also likely that protest participants do not appreciate the potential threat of losing the natural area if more funding is not raised for its conservation. To that end, the asked fee is perceived as a net loss because no contingency (i.e. destruction of the environment) is attached to it. Finally, refusal to pay for a public good can also be traced to wider societal norms in Cyprus as to who owns natural resources: the Cyprus public has also resisted the introduction of entrance fee to recreational beaches dismissing added services tendered.

Looking at the distribution of those who do consider paying a fee, about 60% are willing to pay a fee between 2 and 5 EUR, while another 7% are willing to pay a fee of 7 EUR (1%) or 10 EUR (6%). 5% of the sample declined the question. To get a relative perspective of the amounts WTP the data is combined with average spent per visit and the total number of accompanied persons (number of persons included in the visit spending). This allows to express the WTP as a percentage of the total spending per visit per person (see Table 7).

Table 7. Descriptive Statistics of Income, Spending and WTP.

	<i>Mean</i>	<i>St.Dev</i>	<i>Min</i>	<i>Median</i>	<i>Max</i>
Monthly Household Income	2,135	1,353	0	1,889	5,001+
Time Spend on Natural Area	0.85	0.78	0.08	0.5	5
N. of Accompanied Persons	4	2	0	4	10
Amount spent during visit (total)	75.79	51.67	0.00	63.83	200+
Amount spent during visit (per person)	18.85	12.85	0.00	15.88	62.50
Amount Willing to Pay (WTP) as entrance fee	3.01	2.30	0.00	2.30	10.00
% of WTP on total spending per person	16.7%	12.5%	0.0%	14.5%	53.0%

Dividing the average spending per visit by the number of persons involved in the spending (the visitor plus the number of his/her accompanied persons) average spending per visit, per person, of 18.85 EUR is estimated. To this, an average WTP 3.01 EUR as entrance fee amounts to 16.7% of total spending. The increase in expected spending per visit to the natural area does not seem unreasonable neither in absolute terms (3.01 EUR) or in relative terms (16.7%). Despite the relatively large number of protest zeros introducing such a fee could and should be considered as an effective policy towards environmental conservation.

Non-parametric estimation of WTP

In addition to descriptive statistics, a non-parametric estimation of WTP by a means of a quasi-Turnbull lower-bound estimator is employed here. The Turnbull estimates of WTP is premised on the idea that a respondent's positive answer to an assigned monetary fee value represents a willingness to pay *at least* the given amount. A negative response corresponds to a WTP less than the fee value. The lower bound of the estimate of mean willingness to pay is given by:

$$E(WTP)_{LB} = \sum_{j=0} t_j (F_{j+1} - F_j) \quad eq.1$$

where t_j is the fee amount for response j (ranked from a minimum of 0 to a maximum of k) and F is the % of respondents rejecting a specific fee amount t_j . The difference in frequency of "no answers" between a specific amount F_{j+1} and that of the next lowest amount F_j is a consistent estimator of the probability of WTP to lie in the closed bound $[t_j, t_{j+1}]$.

To calculate the % of "no" answers for each proposed fee the following assumptions are made: a) Positive WTP is transitive downwards. This suggests that a respondent who accepts a hypothetical fee of 5 EUR, will surely

accept, given a binary option, a fee of 3 EUR. b) Likewise, negative WTP is transitive upwards; a respondent who rejects a fee of 7 EUR will surely reject a fee of 10 EUR. Table 8 gives the results. In Panel A the zero-protests are included in the calculation of the Turnbull estimator. Panel B of the same table re-calculates the estimator omitting the protest-zeros.

Table 8. Turnbull Estimator.

<i>Panel A: Including Protest Zeros (N=824)</i>						
<i>Fee Amount (t_j)</i>	<i>N. Selecting (t_j)</i>	<i>N. Positives ("Yes")</i>	<i>N. Negatives ("No")</i>	<i>% Nos (F_j)</i>	<i>($F_{j+1} - F_t$)</i>	<i>$t_j (F_{j+1} - F_t)$</i>
0 €	227					
1 €	16	597	227	0.28	0.02	0.02 €
2 €	187	581	243	0.29	0.23	0.45 €
3 €	148	394	430	0.52	0.18	0.54 €
4 €	10	246	578	0.70	0.01	0.05 €
5 €	170	236	588	0.71	0.21	1.03 €
7 €	10	66	758	0.92	0.01	0.08 €
10 €	56	56	768	0.93	0.07	0.68 €
				1		
Total						2.86 €
<i>Panel B: Excluding Protest Zeros (N=597)</i>						
<i>Fee Amount (t_j)</i>	<i>N. Selecting (t_j)</i>	<i>N. Positives ("Yes")</i>	<i>N. Negatives ("No")</i>	<i>% Nos (F_j)</i>	<i>($F_{j+1} - F_t$)</i>	<i>$t_j (F_{j+1} - F_t)$</i>
1 €	16	597	0	0.00	0.02	0.02 €
2 €	187	581	16	0.02	0.23	0.45 €
3 €	148	394	203	0.25	0.18	0.54 €
4 €	10	246	351	0.43	0.01	0.05 €
5 €	170	236	361	0.44	0.21	1.03 €
7 €	10	66	531	0.64	0.01	0.08 €
10 €	56	56	541	0.66	0.34	3.43 €
				1		
Total						5.61 €

In Panel A, the lower bound of the Turnbull estimator yields an expected WTP of €2.86. The number is slightly lower than the sample average at €3.01. By means of policy implications the difference is not material as it is not sound to impose an entrance fee which is exact to two decimal points. Practically, the Turnbull estimator of €2.86 also points out to a rounded fee of €3.00.

In Panel B, "protest zeros" are excluded yielding a much higher WTP of €5.61. While the % of protest zeros is too high to be ignored, this number is maintained in later sensitivity analysis.

Estimating the Economic Benefit of Introducing Fees

In this section, the economic benefits of introducing a nominal fee for accessing the natural area is assessed. To calculate the annual fee revenue, the estimated WTP fee per person combines with corresponding estimates regarding the number of visitors to the area. These estimates extrapolate over a 3, 5 and 10-year horizons. To provide an aggregated value of all years future revenues to present values are discounted. The process of discounting aims at capturing both the time value of money (the notion that future monetary values worth less than today's equivalents due to inflation) as well as the risk of future payoffs becoming realized. The present value of a constant stream of cash flows over a specified period can be calculated with the annuity formula:

$$PV = C \times \left[\frac{1}{r} - \frac{1}{r(1+r)^n} \right] \quad \text{eq.2}$$

where, C is the estimated annual revenue, r is the assumed discount rate and n is the number of periods (in this case $n=3, 5$ or 10). Because the implementation of eq.2 inevitably rests on assumptions, a certain degree of subjectivity is in place. To alleviate any concerns regarding the reasonableness of the base-case scenario a sensitivity analysis is performed by varying the basic assumptions, particularly for the 10-year period. To that end, a range of values is provided. The main assumptions regarding entrance fee values, number of visitors and discount rate are given below:

Entrance Fee

The expected lower-bound Turnbull estimator gives the base case value of entrance fee at € 2.86. This estimate includes the “protest-zeros” therefore, takes into consideration potential disconcert at introducing a fee. For the purposes of sensitivity analysis, two more estimates are employed: the first is the Turnbull estimator after excluding protest zeros (€ 5.86) which serves as the upper bound of the sensitivity analysis. The sample media (2.30 EUR) is used as the lower bound. Note that for all purposes, it is not practical to impose an entrance fee that is exact at 2 decimal points. Therefore, the three values are rounded to meaningful integers, which are 3 EUR, 5 EUR and 2 EUR.

Number of Visitors per Year

The number of visitors per year is estimated on counting data collected on:

- a) The number of visitors at the camping/recreational sites, nature walking paths and Information Centers.
- b) The number of cars passing through the two passages leading to Troodos on the same day.

The total number of cars is adjusted to account for permanent residents of the area¹. The number of visitors with the number of visiting cars is combined to calculate the average number of passengers per car. Finally, the number of visiting cars is multiplied with the average number of passengers to calculate the number of annual visitors to the site. Alternative assumptions with respect to secondary passages towards Troodos as well as seasonality patterns yield a range of 264,000 to 480,000 visitors per year². The base case scenario takes into consideration the mid-point of the range: 372,000. The minimum and maximum values of the range in the sensitivity analysis is retained.

Discount Rate

A discount rate is necessary in order to calculate the present value of future expected revenues and to aggregate the total economic benefits over a number of years. Investments that are considered “riskless” typically employ the interest rate (yield) earned in government bonds issued by solvent states. The Cyprus 10-year government bond used had a 0.273% yield (approximately). Introducing a nominal fee which can be considered low, both in absolute terms, as well as relatively to the total spending per visitor, appears to be a very low-risk endeavor. Nevertheless, in the spirit of conservatism, the 10-year government bond yield to 4% is augmented and this rate is used in the base case scenario. For purposes of sensitivity analysis, a rate of 3% (lower bound) and a rate of 5% (upper bound) is thereon assumed.

Growth Rate of Revenue

The amount of total revenue depends on the levels of the entrance fee and the number of visitors. Both variables may change, either increase or decrease for any reason, over a significant period of time. To calculate the present value of economic benefits over the period of 3 years and 5 years the assumption of 0 growth maintains. Likewise, to calculate the present value of the 10-year period, a zero-growth rate is assumed and the values of +1% growth and -1% growth as sensitivity analysis inputs are used. Table 9 gives the base-case scenario results for the 3-year, 5-year and 10-year periods.

Table 9. Base Case Scenario (fee=€3, N. Visitors=372,000, r=4%, g=0%).

<i>3-year Economic Benefit</i>	€ 3,097,002
<i>5-year Economic Benefit</i>	€ 4,968,234
<i>10-year Economic Benefit</i>	€ 9,051,760

¹ This has been made possible after the government imposed a COVID-19 lockdown preventing non-residents from accessing the area.

² The number of visitors could be even higher; further surveys need to be undertaken in order to more accurately proceed into the analysis.

The results suggest that the introduction of a €3 fee is likely to generate about €3 million in 3 years, €5 million in 5 years and €9 million in 10 years' time. The monetary benefit could and should be exclusively allocated towards environmental conservation of the natural area and the development of near-by communities.

The base case results rest on a number of valuation assumptions. To assess the impact of these assumptions on the estimated economic benefits a sensitivity analysis is performed with respect to alternative fee levels and number of visitors and with varying discount and growth rates. For brevity, Table 10 presents only the results over the period of 10-years.

Table 10. Sensitivity Analysis of the 10-year Economic Benefit.

<i>Panel A: Alternative Fee levels and Number of Visitors assumptions</i>				
		Number of Visitors		
		<u>264,000</u>	<u>372,000</u>	<u>480,000</u>
Entrance Fee	<u>€2</u>	4,282,553	6,034,506	7,786,460
	<u>€3</u>	6,423,829	9,051,760	11,679,690
	<u>€5</u>	10,706,382	15,086,266	19,466,150
<i>Panel B: Alternative Fee Discount Rate and Growth Rate Assumptions</i>				
		Growth Rate		
		<u>-1%</u>	<u>0%</u>	<u>1%</u>
Discount Rate	<u>3%</u>	9,124,829	9,519,706	9,935,603
	<u>4%</u>	8,683,191	9,051,760	9,439,756
	<u>5%</u>	8,273,054	8,617,456	8,979,834

Panel A allows the number of visitors to vary from the base case 372,000 to 264,000 (lower bound) and 480,000 (upper bound). The entrance fee likewise varies from €3 (base case) to 2 and 5. This set of alternative assumptions generates 6 more scenarios (2 x 3) for which the present value of the economic benefit is calculated. The scenario with the highest PV is that involving the highest number of visitors (480,000) accepting the highest fee (€5), while correspondingly the lowest PV entails the lower number of visitors (264,000) paying the lowest fee (€2). This creates a range of economic benefits between €4.3 million to 19.5 million for a 10-year period.

Panel B allows the discount rate and revenue growth rate to vary between 3%, 4% and 5% and -1%, 0% and 1% correspondingly. The analysis yields a second range between €8.3 million and €9.9 million. It is noted that the primary scenario is more robust towards these assumptions as the range given does not deviate significantly from the base result (€9 million). On the other hand, alternative assumptions with regards to entrance fee appear to play the most significant role in determining the estimated economic benefit.

4. Conclusions

The project, through its multi-dimensional informational and awareness raising campaign, by its conclusion:

- Increased awareness of the inhabitants of Cyprus by 57%, the youth by 60% and of the children by 50%.
- Increased awareness of visitors/ tourists by 60%.
- Increased awareness of the inhabitants of Cyprus by 57% and the local communities and local authorities by 70%.
- The increase in awareness and build capacity for policy implementers will only become apparent after a few years.
- Increased awareness of visitors/ tourists by 60%.

It is noted however, that for the medium / long term impact of specific messages to be remembered/ understood, a constant "reminder" is required.

As for the economic aspect, the area is highly appreciated amongst its visitors, for the natural and cultural environment. A potential benefit to the area could derive from using an entrance fee, where for a small ticket fee, a relatively large amount could be accumulated. During the evaluation of the economic aspect (Willingness to Pay) three scenarios of visitors/ ticket prices were used; for its intermediary scenario of €3/ ticket, the estimated income could be approximately €6.5 to 11.5 million (the visitors to the area could be even higher, thus altering the resulting cost).