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Revista de cercetare și intervenție socială

ISSN: 1583-3410 (print), ISSN: 1584-5397 (electronic)
Selected by coverage in Social Sciences Citation Index, ISI databases

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Revista de cercetare și intervenție socială, 2014, vol. 44, pp. 160-180

The online version of this article can be found at:
www.rcis.ro, *www.doaj.org* and *www.scopus.com*

Published by:
Expert Projects Publishing House

On behalf of:
„Alexandru Ioan Cuza" University,
Department of Sociology and Social Work
and
Holt Romania Foundation
REVISTA DE CERCETARE SI INTERVENTIE SOCIALA
is indexed by ISI Thomson Reuters - Social Sciences Citation Index
(Sociology and Social Work Domains)

Determination of the Recreational Value of Botanic Gardens. A Case Study Royal Botanic Gardens, Kew, London

Aynur DEMIR[1]

Abstract

In this study the recreational use value of the Royal Botanic Garden (RBG) at Kew is determined through The Individual Travel Cost Model (TCM). For the valuation, a survey was applied to 460 randomly chosen visitors in the RBG and the results were evaluated using Linear Regression with SSPS. The number of visits was taken as the dependent variable (DV) in the model. Travel costs, entrance fee, distance from botanic garden to settlement, age and expenditures made during the visit in the botanic garden were evaluated as independent variables (IV). The negative β value of the variable of the distance to the settlement indicates that there is an inverse relationship between the distance to settlement and the number of visits in a year. Within the scope of the TCM in consequence of the analysis performed, individual consumer surplus was determined as £165/person and total consumer surplus were determined as £268,950,000/year. This value corresponds to an annual recreational use value of the RBG. In addition, while 91% of the people who visited the RBG for the first time found botanic garden entertaining, 96% of those expressed that they were pleased with the visit. Activities such as exhibitions, picnics, meeting with friends, natural beauty and the pristine landscape offered to visitors all played a role in increasing the degree of satisfaction.

Keywords: botanic gardens; Royal Botanic Gardens – Kew; the Travel Cost Model; the Recreational Use Value; Consumer Surplus.

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Introduction

Botanic gardens constitute a special garden category, being scientifically based, having spectacular vegetation designs, focusing on the plant conservation and contributing to environmental training. Botanic gardens assume an important role in drawing people and plants together. They give us pleasure by displaying the attractive characteristics of the rare plants, also serving as natural laboratories for botanical researchers and they have a key role in the protection of endangered species (Oldfield, 2007). Botanic gardens are also establishments where plant collections are protected, displayed, holding various documents for training and scientific research and they also play an important role in the entertainment, recreation and resting of the people (Anonymous, 2011a). When considered from this aspect, they have a significant economical value in terms of recreation and eco-tourism, in particular.

Recreational activities are generally chosen by the participants who expect to derive a "benefit" from the activity. The value of this benefit for a participant, in terms of economic impact is partly reflected by the amount which a participant is willing to pay to enjoy the activity. If there is an entrance fee for a botanic garden, this can be said to be the price or economic value of the benefit to the participant. Travel costs and the cost of time spent getting to and from the recreation site are parts of the "price", not only the entrance fee. The participant or consumer of the benefit derives enjoyment from the visit in return. Generally the value of the amount is calculated as the "consumer surplus" (Garrod *et al*., 1993; Shresha *et al*., 2002).

In this study, the Travel Cost Model (TCM) was used in determining the value of recreation. The advantages of using this technique include its origins in consumer theory, reliance on actual market data of travel costs, and the ability to represent consumer preferences accurately (Shresha *et al*., 2002). The TCM has been widely used in the past for the values of recreational activities (Bennett, 1996; Haab and McConnell, 2002; Prayaga *et al*., 2010). However, there are relatively few papers that have assessed the recreational value of botanic gardens (Garrod *et al*., 1993). When considered from this point of view, this study and its results are thought to contribute to the sustainable utilization of botanic gardens for recreational purposes. This increases the importance and significance of the study.

The value of goods and services traded in the market place are reflected by their prices. Clearly, botanic garden services are not bought and sold in a competitive market setting. A central problem in estimating the value of natural resources is that many of their services are not commonly traded in competitive markets. Botanic gardens services have value in current use, value in the option for future use, or value in existence. Existence value is generated by simply

knowing that some commodity exists, while use the value occurs as a result of the satisfaction derived from resource use (Randall and Stoll., 1983; Downing and Roberts, 1991).

Botanic gardens are collections of plants, a great number of which are priceless, but not valueless (Oldfield, 2010). Even though there are many rare and unique species in the world, choices and decisions are made on a regular basis that implicitly assign a finite value to them. Not only the individual plants but also groups or families, individuals in a collection, collections themselves and groups of collections have value. Furthermore, the land upon which the collections are located, historical buildings, associated landmarks and the recreational experiences of people visiting gardens have value.

Evidence of the demand for services provided by botanic gardens is reflected in a variety of ways. Thousands of people visit botanic gardens each year. A plethora of gardening books, identification manuals and reference materials are published each year and several magazines are devoted entirely to plants and the lives of plants. All of these are indicative of a broad national interest in plants and gardens, indentifying botanic gardens as museums of living natural resources.

The main objective of this study is to determine the recreational use values at Royal Botanic Gardens (RBG), Kew by using the TCM. In this study the determination of use value, demand for recreational use and the variables (socio-economical, cultural and demographical) affecting the tendency of users to pay the entry fee to RBG were examined. It is considered that the results of this comparison will guide the cost-benefit analyses which also include the environmental costs and will play a key role in developing policies concerning the protection of natural sites. In accordance with the results obtained, proposals may be developed to ensure sustainability with the rational use of the site by providing the current and future benefits to be taken into account depending on the recreational use of RBG.

In the development, protection and rational use of botanic gardens, which are the assurance of sustainable use of biological resources, such studies and the expansion of these studies are seen as extremely important.

Methodology

Data Collection

Data required for the research was obtained by an extensive literature search relating to botanic gardens, a field study, observations, photographic and survey applications. In accordance with the data acquired, survey questions were prepared concerning the Travel Cost Method. The target audience surveyed with questionnaires were visitors to the RBG over the age of 18. For the determination of

sample size the average number of visitors to the botanic garden for each of the four weeks in July 2011 was taken. The average number of visitors per week in July was 22,000 and 378 people are planned to participate in the study with an acceptable margin of error at 5% and 95% reliability. Given the potential 20% drop-out rate it was determined that 454 participants are required for this study. For populations that are large, Cochran (1963:75) developed the Equation (*Eq.1*) to yield a representative sample for proportions.

$$n_0 = \frac{Z^2 pq}{e^2} \qquad \text{(Eq.1)}$$

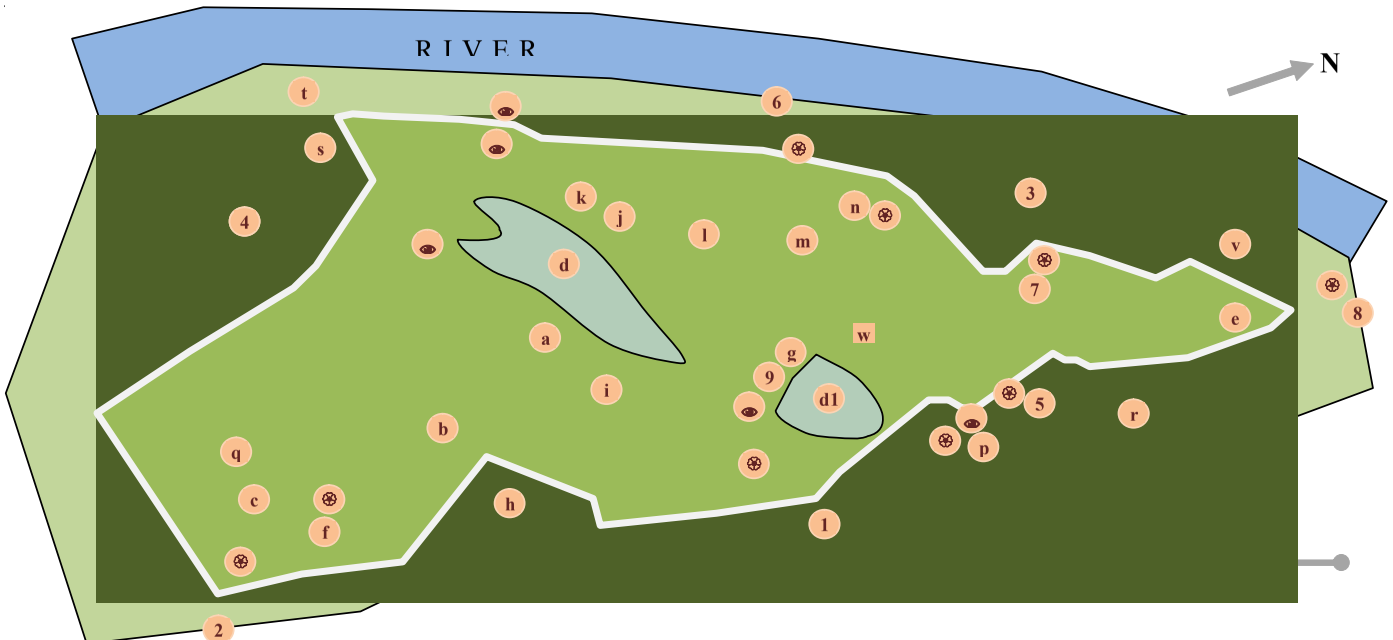
Where n_0 *is the sample size,* Z^2 *is the abscissa of the normal curve that cuts off an area* α *at the tails (1-*α *equals the desired confidence level, e.g., 95%)*[1]*,* e *is the desired level of precision,* p *is the estimated proportion of an attribute that is present in the population, and* q *is 1-*p*. The value for* Z *is found in statistical tables which contain the area under the normal curve.*

In total 460 surveys were evaluated. The number and profile of visitors to RBG varies during weekends and weekdays and also according to the weather conditions. RBG is open to visitors between the hours of 09:30am - 18:00pm on weekdays during the summer season and 09:00am -18:00pm at weekends. Surveys were applied between the 22nd and 30th of August 2011. Considering the visitors' visit time survey applications were carried out between 13:00pm-18:00pm during weekdays and weekends. Potential participants were intercepted at random and an in-person written survey was conducted while visitors were relaxing in the visitor centre, cafe, gardens and restaurant. Each survey took 10-15mins.

Research Area

The Royal Botanic Gardens, Kew cover an area of over 132 hectares on the South bank of the River Thames in South-west London (Anonymous, 2001; Oldfield, 2010), attracting over 1,630,000 visitors per year (Anonymous, 2011b) (*Figure 1*).

Figure 1. *The Royal Botanic Gardens, Kew Layout (Adapted to the RBG, Kew web site 2011)*



The vast number and variety of plants on display allows the nature of Kew Gardens to change according to the seasons. Out in the grounds and inside the plant houses, thousands of specimens' progress through their annual flowering, fruiting, growing and resting cycles. All year long, there are plants to be seen at their glorious best (Anonymous, 2001; Raven, 2006). But Kew is much more than one of the world's best showpiece gardens. It's an internationally respected centre of scientific excellence, identifying and classifying plants, researching their structure, chemistry and genetics, collecting and conserving endangered species, maintaining reference collections and sharing all this knowledge with interested parties throughout the World (Anonymous, 2001; Oldfield, 2007; Anonymous, 2011a).

RBG, Kew hosts one of the world's greatest botanical gardens with extensive living collections, millions of herbarium specimens, a rapidly expanding seed bank and an important library and repository of botanical art. It is an international centre of economic botany and research in taxonomy, molecular biology and biological interactions. World plant conservation is one of its principal missions and its work includes scientific expertise in plant diversity and sustainable development in the UK and around the world (Desmond, 2007).

It was accepted as a UNESCO World Heritage Site in July 2003, representing the historical landscape of the past 250 years. The site houses over 40 listed buildings and other impressive structures including the Palm House, Temperate House, Orangery and Pagoda as well as two ancient monuments, Queen Charlotte's Cottage and Kew Palace (Desmond, 2007; Blomfield, 2011). There are many activities that can attract the attention of local and foreign visitors. For example, visitors can sit and read in the natural beauty, take a walk or have a picnic, visit an exhibition or museum, get information about the collections of plants that grow in many parts of the world, have a nice lunch in the restaurant and cafeteria, shop or meet with friends (*Figure 2*). The presence of the entertaining and training areas plays an important educational role for school visits. All these services offered increase the use of RGB for recreation and eco-tourism purposes.

Figure 2. Artificial Lake and Bridge from KEW (Sackler Crossing) (Photo by author, 2011)

Figure 3. *Waterlily House from KEW (Photo by author, 2011)*

Figure 4. *Pathways from KEW (Photo by author, 2011)*

Figure 5. *Viewpoint from KEW (Photo by author, 2011)*

Figure 6. *Exhibition Area from KEW (Photo by author, 2011)*

Figure 7. *Information Panel from KEW (Photo by author, 2011)*

The Individual Travel Cost Model (TCM)

The travel-cost model assumes that an individual must visit a botanic garden to use its services. The non-market benefits accruing per person from the botanic site can be inferred from the relationship between travel-cost expenditures and the number of visits to the botanic site (Eq.2) (Pak, 2003; Lamtrakul *et al*., 2005; Hanley and Barbier, 2009; Mwebaze and Bennetta, 2011). Travel cost is used as a proxy for an entry price, with a change in price causing a change in consumption (Freeman, 1993; Mwebaze and Bennetta, 2011). In general, Individual TCM is formulated as follows (Wills and Garrod, 1991; Garrod *et al*., 1991; Iamtrakul *et al*., 2005; Hanley and Barbier, 2009):

$$V_{ij} = f\,(TC_{ij}, SS_{ij}, X_{ij,}\, e_i) \qquad \text{(Eq. 2)}$$

In the formula: V_{ij}:Number of visits by individual i to botanic site j in the previous 12 months, TC_{ij}:Travel cost variables by individual i to gain access to botanic garden /site j, these include distance costs for each individual i, time costs and entry fee, SS_{ij}: A dummy variable to capture whether individual i visited a substitute site to j, (it takes on the value 1 for substitute sites and zero otherwise), X_{ij}:Vector of socio-economic characteristics of individual i (income, education, age), e_i; Error term assumed to be normally distributed with constant variance and zero mean.

The individual travel cost method was employed to achieve the objectives of this study. The first step in the travel cost method is to estimate a regression model for predicting visits per person to the botanic garden from a sample of visitors. This model is known as the recreation demand curve. This demand curve predicts the quantity of visits made by survey respondents as a function of the price paid per visit and other explanatory variables such as income. Money and time spent for the botanic garden trip (total travel expenditure) are used as proxies for prices paid by visitors to enjoy the botanic garden.

In this study, travel costs for per person are taken into consideration. These were obtained so that the variable of total travel cost could be divided into the number of individuals in the group. Total travel costs including transportation costs, entrance fee, expenses within the RBG are calculated as the costs of opportunity cost of time. It is generally accepted in previous studies that the opportunity cost of the time spent on transport and the opportunity cost of the time spent in the Field of Recreation, namely, the economic value of the time required for transportation is as important as the actual cost of the travelling itself for determining the value of the recreation demand (Pak, 2003). In this study, Cesario's (1976) proposal to base results on 1/3 of hourly rate of individual's income is accepted for the calculation of the opportunity cost of recreation time

(Pak, 2003). In the calculation of travel costs, car running costs were estimated at Ł0.35 per mile, which takes account of the fuel cost and fixed costs such as depreciation, road tax, insurance and service costs (Anonymous, 1989). This approach has been adopted in previous travel-cost studies, in one of which a survey confirmed that such estimates of full car running costs are close to the costs that respondents estimate themselves for their trip (Willis and Garrod, 1991; Garrod *et al*., 1991).

Following the data collection work the Demand Function Model for RGB was created. In this study, Linear regression analysis was preferred as it is thought to provide continuity within the data set. In the standard, or simultaneous, model, all IVs enter into the regression equation at once; each one is assessed as if it had entered the regression after all other IVs been had entered. Each IV is evaluated in terms of what it adds to the prediction of the DV that is different from the predictability afforded by all the other IVs. (Tabachnick et.al, 2001), **(**Eq 2) has the simple and convenient property of allowing the estimation of consumer surplus per visit as the inverse of the travel cost coefficient (Englin and Shonkwiler, 1995; Shrestha *et al*., 2002; Prayaga *et al*., 2010). Data analysis was performed using SPSS for Windows, version 11.5 (SPSS Inc., Chicago, IL, United States). Data were shown as mean ± standard deviation for metric discrete variables and number of cases and percentages for categorical ones. The differences regarding to the discrete data among groups were analyzed by Kruskal Wallis test following Conover's multiple comparison test. Categorical data were evaluated by Pearson's Chi-Square or Fisher's exact test, where applicable**.** After the assessment, "Number of visits" was taken as the dependent variable. Determining the most important predictive factor(s) which affects the difference in numbers of visit (i.e. dependent variable) was evaluated by "Linear Regression" analysis Coefficient of regression, 95% confidence intervals for each independent variable was also calculated. A p value less than 0.05 was considered statistically significant.

After the determination of the demand function, individual consumer surplus[2] was calculated. Total consumer surplus was calculated by multiplying the calculated values of the individual consumer surplus with the number of visitors who visit the area in a year, 1 million 630 thousand people (Anonymous, 2011b). This amount of surplus represents the annual Total Value of Recreational Use. The demand patterns and Consumer surplus for recreational visits is set out in Equation 3. (Englin and Shonkwiler, 1995; Shrestha *et al*., 2002; Pak, 2003; Prayaga *et al*., 2010):

[2] Consumer surplus or consumers' surplus is the monetary gain obtained by consumers because they are able to purchase a product for a price that is less than the highest price that they would be willing to pay. Producer surplus or producers' surplus is the amount that producers benefit by selling at a market price that is higher than the least that they would be willing to sell for (Englin and Shonkwiler, 1995; Shrestha et al., 2002).

$$InV_r = \beta_0 - \beta_1 TC + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots \beta_n X_n + e_i \qquad \text{(Eq.3)}$$

$$CS = -1/\beta TC$$

$$CS = q/ - \beta$$

Where; V_r *; the expected number of visits,* TC*; travel costs per trip,* X_n *; a vector of explanatory variables affecting demand.* CS*; individual consumer surplus.* q*; the average number of visits made by the individual in a year,* β*: the slope of the demand function (expenditure coefficient)*

Results and discussions

The results of the analysis are presented in two parts. First, we present and discuss the estimated travel cost models (Section 3.1), followed by the presentation and discussion of the results of the economic analysis (Section 3.2).

Estimated Travel Cost Models

According to the results of the survey carried out at the RBG, Kew, 39% of visitors were male and 61% were female. It was seen from the results of the survey that there is a wide range of age groups of visitors. When visitors were analysed according to age group it was determined that the majority of visitors were between the ages of 26-65. There is a positive relationship between age and frequency of visits. It was seen that visitors between the ages 36-45 are especially predominant. The data showed that 51% of visitors had a university degree, and that 32% of visitors had a post-graduate degree. Professionally speaking it was seen that 32% worked in the private sector, and 24% had retired, with 20% of visitors incomes between Ł20,000 - 30,000 and 22% with Ł50,000 and above. It was determined that 68% of the visitors come from Britain and that 32% of the visitors came from other countries. The purpose of visiting the botanic gardens and the factors affecting the nature of visit were also analysed. The data collected showed that 44% of visitors were in the RBG for the sole purpose of enjoying the aesthetically pleasing landscape, another 34% were there on picnics and entertainment, and 15% for eco-tourism. Visitors were also asked if they felt the visit had been good value for money, with 95% of visitors stating that the visit was indeed good value for money and 98% stated that they had had fun in the RBG. While 62% of participants have come to the RBG for the first time, 17% have been 2-4 times. The relationship between the number of visits and the independent variables were also evaluated in the analysis. According to the results of this analysis, time and money spent in the botanic garden decreases as the number of visits increases. This is directly related to the proximity of the settlement of the participants to the RBG. Another important association was observed between the number of visits and satisfaction level of visitors, age, education, level of income.

As previously mentioned the number of visits decreases as the distance from botanic garden to settlement increases. There is also a significant relationship between the number of visits and the purpose of visits. In particular as the number of visits increases, recreational activities such as enjoying the landscape, picnicking and entertainment positively affect the number of visits *(Table 1)*.

Table 1.*The Demographic distribution and the relationship between the independent variables and the number of visits according to the survey results of Travel Cost Method*

			The number of visits (%)				
Variables	**n=460**	**%**	**First Time**	**2-4 Times**	**3-6 Times**	**More than 6**	**p-value**
AGE							<0.001
18-25	34	7.5	10.7	5.2	-	-	
26-35	84	18.5	22.1	15.6	7.1	12.1	
36-45	82	18.1	15.3	22.1	32.1	18.2	
46-55	95	21.0	22.8	23.4	7.1	16.7	
56-65	88	19.4	18.1	23.4	25.0	18.2	
66+	70	15.5	11.0	10.4	28.6	34.8	
GENDER							
Male	179	39.0					
Female	280	61.0					
EDUCATION							0.100
Primary school only	4	0.9	0.7	1.3	-	1.5	
Secondary school	75	16.7	18.1	10.4	18.5	17.6	
Technical / University Degree	227	50.6	53.3	46.8	55.6	42.6	
Post-graduate degree	143	31.8	27.9	41.6	25.9	38.2	
OCCUPATION							
Government officer	56	12.2					
Private sector	145	31.5					
Self- employed	61	13.3					
Unemployed	7	1.5					
Retired	108	23.5					
Full-time student	24	5.2					
Full-time parent	9	2.0					
Other	50	12.8					
INCOME							0.339
Less than £ 10,000 pound	59	14.7	13.3	20.3	8.7	16.9	
£10,001-20,000	61	15.2	16.1	10.1	26.1	13.5	
£20,001-30,000	80	20.0	17.3	24.6	30.4	22.0	
£30 .001-40,000	52	13.0	12.9	14.5	8.7	11.9	
£40,001-50,000	60	15.0	14.9	10.1	8.7	23.7	
More than £50,001	89	22.2	25.7	20.3	17.4	11.9	
NATIONALITY							
Britain	315	68.5					
Other	145	31.5					
THE PURPOSE OF VISIT							
Eco-tourism	47	11	19.4	11.7	3.6	2.9	<0.001
Aesthetic and Landscape	204	45	41.7	50.6	50.0	47.1	0.454
Education	30	7	9.9	10.4	-	5.7	0.238
Scientific research	11	2.4	2.5	3.9	-	1.4	0.509
Picnic and entertainment	158	34.4	30.7	39.0	39.3	41.4	0.239
Other	10	0.5	15.5	6.5	10.7	14.3	0.215
THE DISTANCE							<0.001
0-10 miles	154	34.4	15.7	41.3	67.9	87.0	
11-20 miles	72	16.1	20.1	16.0	10.7	2.9	
21-30 miles	44	9.8	10.9	13.3	3.6	4.3	
31-40 miles	36	8.0	9.5	6.7	14.3	1.4	
More than 41 miles	142	31.7	43.8	22.7	3.6	4.3	
THE DEGRE of SATISFACTION							0.017
Excellent	116	25.2	21.6	28.6	25.0	38.6	
Good	192	41.7	42.8	37.7	53.6	41.4	
Ok	129	28.0	32.0	29.9	21.4	15.7	
Poor	16	3.5	3.6	3.9	-	4.3	
VISIT any OTHER BOTANIC GARDENS							
YES	193	42.0					
NO	262	57.0					

In this study, the purpose of visiting the botanic gardens and the factors affecting the nature of visit were also analysed. The data collected showed that 44% of visitors were in the RBG for the sole purpose of enjoying the aesthetically pleasing landscape, another 34% were there on picnics and entertainment, and 15% for eco-tourism. The average entrance fee of RBG is Ł13.90. While 58% of the participants stated that the entrance fee was reasonable, 42% stated that it was too expensive. Of the participants surveyed 52% preferred to use public transport, with 37% preferring to travel by car. It was found that 92% of the visitors were from outside the Kew-Richmond district and arrival time of 45% of those was between 31-60mins. Another 34% of visitors came from a distance of between 0-10 miles and a further 32% came from a distance of 41 miles or more. On average visitors spend about 4.5 hours in the RBG and spend approximately Ł23 (excluding entrance fee) during this time. Total travel cost was calculated at about Ł55 per person. It was also observed from the initial analysis that 80% of the visitors don't have a relationship with any NGO (Non-Governmental Organization) related with the environment (*Table 2*).

Table 2. *Visits to the area according to the survey results of Travel Cost Method*

Items	**Answers**	**n (%)**
Entrance fee (Ł)[3] (n=405)	**Ł** 13.90	
	Too expensive	170 (42.0%)
	About right	233 (57.5%)
	Too low	2 (0.5%)
Arrive at KEW (n=460)	With a tour group	17 (3.7%)
	By car	170 (37.0%)
	By public transports (e.g. buses, underground, train etc.)	238 (51.7%)
	Others (e.g walking, cycling etc.)	35 (7.6%)
By car		median=2 (min:1-max:6)
With children(n=460)	YES	104 (22.6%)
	NO	356 (77.4%)
Place of residence (n=460)	Kew/Richmond	36 (7.8%)
	Outside Kew/Richmond	424 (92.2%)
The travel time (m/h)(n=459)	Less than 30 minutes	125 (27.2%)
	31-60 minutes	209 (45.4%)
	More than one hour	125 (27.2%)
Member of NGO (n=456)	YES	88 (%19.1)
	NO	368 (%80.0)
Length of trip (hours)		4.5±1.9
Money spend during visit		22.4±24.4
Total Travel Cost		55.2±18.6

[3] The entrance fee is Ł13.90 per person with a reduction for children, 0.A.P.'s and a season ticket is available.

This function type selected in the creation of the demand model in this study and selected for the linear regression analysis was carried out to determine the value of the consumer surplus found importance at the level of 0,001 and the multiple coefficient of determination of the pattern or the amount of disclosure was determined as (R^2) 39.5% *(Table 3).*

Table 3. *Variance Analysis*

Model	Sum of Squares	df value	Mean Square	F-Value	p-değeri
Regression	83,361	5	16,672	39,726	<0,001*
Residual	123,385	294	,420		
Total	206,747	299			

** Significant at 0.001 alpha level.*

The dependent variable in the model established under the travel cost method was the number of visits. The independent variables are travel cost, entrance fee, distance from home to botanic garden, age and the expenditures made within the botanic garden *(Table 4)*. The results obtained from the model variables are compatible with theoretical expectations in the travel cost method implementations. This is consistent with Creel and Loomis (1990), and Grogger and Carson (1991). The negative β value of the variable of the distance to settlement indicates that there is an inverse relationship between the number of visits and the distance from settlement. To summarize, the number of visits decreases as the distance to settlement increases. According to the model, travel cost is another major influencing factor. Travel cost as a price variable with negative sign is the main result of the recreation demand model indicating a downward sloping demand curve. This implies that as the transport costs increase, botanic garden visitors will take fewer trips. This would suggest that the price elasticity of demand for trips (measured in terms of transport costs) is highly significant in explaining consumer behaviour, in determining the number of annual trips to botanic sites. For example, a policy option that is characterised by changing the pricing rates of parking fees or entrance fee might well change consumer recreational behaviour. The most influential factor on the number of visits is the entrance fee. Alternatives such as discounts for children, season tickets or annual membership to the RBG are all offered to visitors, in an attempt to increase visitor numbers. This situation has a positive impact on demand for recreational use of visitors particularly for those living close to the botanic garden. All these factors play a clear role in increasing the frequency of visits in a year.

Table 4. *Independent variables and coefficients that affect the number of visits*

Variables	Coefficient of Regression (β)	Std. Error	Standardized Coefficients	t-statistic	p-value	95.0% CI for β	
						Lower Bound	*Upper Bound*
Constant	1.320	1.129		1.169	0.243	-0.903	3.543
Age	0.107	0.028	0.198	3.874	**<0.001**	0.053	0.162
Female Factor	0.091	0.083	0.057	1.099	0.273	-0.072	0.254
Education	0.109	0.058	0.094	1.869	0.063	-0.006	0.224
Income	0.051	0.035	0.114	1.445	0.150	-0.018	0.120
Other Nationalities	-0.158	0.085	-0.095	-1.860	0.064	-0.324	0.009
Alternative sites	-0.089	0.119	-0.052	-0.745	0.457	-0.323	0.146
The distance	-0.104	0.026	-0.212	-3.966	**<0.001**	-0.156	-0.052
The entrance fee	0.029	0.003	0.474	9.293	**<0.001**	0.023	0.035
Total travel cost	-0.015	0.006	-0.195	-2.485	0.014	-0.026	-0.003

Results of Economic Analysis

The demand patterns and Consumer surplus (CS) for recreational visits is set out in *Eq. (3)*. For the amount of *CS*, the individual consumer surplus is established first. The value *q* in the formula is the average of the total visits done by 460 visitors participated in the economic analysis in a year. The frequency of the visits is 2.47 *(Eq.3)*. In general, the longer trip duration is more likely to reduce the frequency of visits to the selected botanic gardens. The consumer surplus for the Linear Function type is as follows:

$$CS = £\ q / -\beta \qquad \text{(Eq.3)}$$

CS = £ 2,47/-(-0.015), CS = *£165* per person

Total Consumer Surplus (TCS) is obtained by multiplying the calculated value of individual CS with the total number of visitors per year to RBG. According to the data from the year 2011, the annual number of visits to RBG, Kew was 1,630,000 (Anonymous 2011b).

Accordingly, the Total Consumer Surplus is:

TCS = CS x 1,630,000

= *165 x 1,630,000* = *£268,950,000* /year.

In consequence of the analysis done and in light of these results, within the scope of TCM, individual consumer surplus was determined as Ł165 and total consumer surplus was determined at £268,950,000/year. This value corresponds to an annual recreational use value to RBG, Kew.

Conclusion

In the study, the economic value for the purpose of recreational use of the Royal Botanic Garden at Kew is determined via the individual travel cost method. Recreational trips to the botanic gardens are an important activity in the UK and the average number of visits is 2.47. Being a historical site, distance from the city centre and transport costs are the predominant factors that affect the frequency of visits and the subsequent use of recreational amenities. Recreational trips of those surveyed to the botanic gardens are largely influenced by transport costs, entrance fee, distance, length of trip (hours), money spent during visit, the degree of satisfaction, the purpose of the visit and visitors' socio-economic characteristics such as age, gender and income.

Distance from botanic garden to settlements and transportation time negatively affects the number of visits and as the distance increases the number of visit decreases. However, the time and money spent in the botanic garden by visitors who come from longer distances increases. They spend approximately 4.5 hours and Ł55. This increases the recreational use value of the RBG, significantly. Especially first-time visitors and those travelling from greater distances spend longer time in the RBG and actually spend more money.

Individual consumer's surplus is calculated at Ł165/person per trip in the research. The estimated individual consumer's surplus is triple the total costs an individual had for the RBG visit. The social benefits as provided by the individual have clearly been maximized, when it was evaluated in terms of the time spent, the visit frequency and total incurred expenses. It was estimated that the total value of the recreational use to the RBG was Ł268,950,000/year. The most important factor influencing this high value was the society's psychology and in this social psychology the maximum value which is the social benefits as provided by individuals.

People who want to escape from the stressful business tempo at work and relieve the pressure of a demanding urban lifestyle will need to indulge in leisure activities such as walking in natural areas, travel, recreation, festivals, concerts and exhibitions. The RGB provide many of these kinds of activities to its visitors and this increases its potential for being an important recreational area and indirectly alleviating many of society's psychological problems. In addition, the RGB is designed for visitors who want to spend their free-time with the family and will come to view this site as a great place for a family outing. These things and the degree of satisfaction from visits creates "positive added value in terms of its recreational use."

Furthermore, Kew garden is amongst the 10 most popular tourist attractions charging admission in Great Britain, with the number of visitors increasing every year. This plays an important role in increasing the perception of the value of

recreation. Another factor increasing the value of recreation is that of the degree of satisfaction. In the study, 91% of visitors, who visited the botanic garden for the first time, stated that the botanic garden was both entertaining and educational, 96% of visitors expressed a high degree of satisfaction. These results indicate that having fun and being satisfied with the facilities increase the recreational use and preference value of the botanic gardens. In addition, the wide range of recreational activities such as entertainment, music, painting, art, sports and shopping in the RBG can increase the value of recreational use of the RBG by attracting new visitors.

On average, respondents visited the selected botanic gardens between 2 and 4 times in a year with each trip lasting over 4 hours depending on the site. Note that the recreational experience not only includes learning about plant collections but also other potentially valued joint products such as relaxation, meeting and spending time with friends, gift and plant shopping, concerts, exhibitions, natural beauty and scenic view, and nature walks. A number of these motivating reasons given above, for example natural beauty and scenic views highlight the increasing value of the plant collections for visitors.

Having a limited number of studies on the recreational use of botanic gardens makes it difficult to make comparisons in this area. Nevertheless, in the paper written by Garrod *et al*. (1993), it was estimated the amount of consumer surplus obtained per visit was Ł0.91, Ł2.24, Ł0.35 and Ł0.26 respectively for each of four botanic gardens (Edinburgh, Sheffield, Cambridge, Westonbirt). And the total consumer surplus is annually Ł4,107,500, Ł267,600, Ł130,000, Ł161,000 respectively. Despite the use of similar variables, they are quite low according to the results of our study at Kew. Another researching in this area is that the study of Mwebaze and Bennett (2011), the economic value of biological collections in three major botanic gardens in Australia was estimated using the TCM. The study used truncated count data models to control for the non-negative integer and truncation properties of the number of visits to botanic gardens in Canberra, Melbourne and Sydney. Estimating consumer surplus values of approximately Aus $34 per trip to each botanic garden, and resulting in the total social welfare estimate of approximately Aus $96.9 million in 2010. Downing and Roberts (1991) showed that the user-demand and consumer surplus for visits to the University of Tennessee Arboretum could be estimated using the travel cost method. Results suggest that travel cost and income of consumers are important determinants of demand. At least in the case of visits to the University of Tennessee Arboretum and the consumer-use value may be derived from this demand. Consumer use value is estimated to be US $20.43 per person. The results of both studies are lower than the results of our research. Because we considered many new factors that directly affect visits to botanic gardens, such as urban psychology and culture, age, gender, income level, education, understanding of the natural world, landscape perception, interest in botanic gardens and the various services

and facilities provided to visitors by botanic gardens. Additionally, the method of statistical analysis used in the study and the period of data collection and research are important factors that affect the final recreational use value.

As a result, the realization of plans and projects to increase alternative social activities to be offered to visitors is essential for ensuring the continuity of botanic garden culture. Providing the sustainable use of botanic gardens as recreational facilities is only possible by this kind of research and the inclusion of the results into future management plans. Such studies will provide much needed guidance for the development of policies yet to be created. This study demonstrates a relatively high value of recreational use in the RBG in comparison to similar studies conducted in other parts of the world. The findings of this study would be important for resource management decisions in the Royal Botanic Garden at Kew and could serve as a valuable reference in assessing the sustainability of similar natural resources around the world.

Acknowledgments

I would like to express my gratitude to all employees of BGCI, in particular to Sara Oldfield and to Prof. Dr. Adil GUNER and to Prof. Dr. Aydin OZTAN.

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