

# INDIVIDUAL SINGLE-SITE TRAVEL COST MODEL FOR CZECH PARADISE GEOPARK

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## Abstract

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Geotourism is a new phenomenon, which has emerged in the tourism literature during the past two decades, and whose meaning suffered from global census. Geotourism is still a new discipline and relatively little has been written about its demand side, demonstrated by a lack of studies in the literature. This article studies the recreational value of geotourism areas, and focuses on the first geopark in the Czech Republic, namely the Czech Paradise Geopark. To assess the recreational value the travel cost method is applied, specifically the individual travel cost model. The necessary research data was gathered through intensive tourist surveys conducted in the study area. Data gathered in the respondents' survey served to determine the consumer surplus as a measure of recreational value and to develop the single site travel cost model. The dependent variable in the conducted model is the number of visits in the area and among the independent variables, studied age, education, travel cost, family status, economic activity and income. The results were subsequently compared to findings in the available literature, research works and case studies.

geotourism, recreational value, travel cost method, single site model

The recreational value of tourist sites is measured by methods commonly used for assessing the economic value of non-market goods. Among such methods the Travel Cost Method and Willingness to Pay Method is commonly used in research works and case studies.

## Travel Cost Method

The Travel cost method (TCM) is a consumer-oriented method commonly used for assessing environmental amenities connected to recreational areas, nature reserves and other natural areas. The reasoning behind TCM is the presumption that the traveler/tourist has to visit a site if he/she can use the environmental and other services provided by the site. The money spent by getting to the site represents the travel cost the tourist is willing to pay for being in the site and for the use of the services. Changes in the value of travel cost are adequate to changes in a number of visits (Dvořák, 2007).

TCM is considered the oldest method for assessing environmental amenities, developed by Harold

Hottelling in 1947 (Ward and Beal, 2000). Hottelling's model consisted of estimating the visit rate based on the distance tourists had to travel. His model was extended by Clawson and Knetch who employed the price of substitutes and quality of evaluated destinations (Clawson and Knetsch, 1971). Even though their approach meets the economic theory principles, they pointed out several limitations, especially other variables determining the final value of destination (Ward and Beal, 2000). Burt and Brewer (1971) focused on the individual travel cost model. They estimated the demand functions for lake recreation, including variables of travel time, substitute destinations, length of visit and destination attributes. Other iterations of the travel cost model can be seen in the works of Brown and Nawas (1973) or Gum and Martin (1974) who developed a new approach based on travel time, travel costs and socioeconomic characteristics.

Since the 1970s the travel cost method has become a popular method among researchers evaluating recreational value. For example the works of

Sohngen *et al.* (1999) assessed the value of Erie Lake; river recreation value studied by Johnstone and Makandya (2005); or estimating the recreational value of nature reserves in Africa by Day (2002).

There are two basic approaches that can be attributed to TCM. The first is the zonal model and the second, an individual model. Parson (2003) specified a further two models derived from those above – the single site model and the random utility model.

**Zonal model** is the simplest and least costly approach. It uses prior knowledge taken from gravity models, in which the recreational area is divided into zones in order to quantify travel costs in each zone. Fleming and Cook (2008) stress two different approaches used in research works, Clawson and Knetsch's approach and gravity models. Zonal models are rarely used in current research principally because it assumes the same characteristics of all respondents in the surveyed areas and also it has weak ties to microeconomic theory (Dvořák, 2007). Nevertheless some works can be found, e.g. Nillesen and Justus (2005) who estimated the value of the park for hiking and camping in Bellenden Park (Australia).

**Individual model** tries to eliminate the limitations of the Zonal model, and employs data about visitors rather than zonal data. Haab and McConnell (2002) defines four conditions needed for getting appropriate results. The first and second condition is that travel cost and travel time to the destination cannot bring any utility for visitors, it presents only the price of the visit. The third condition requires a constant length of stay, and the final condition requires that recreation is cited as the only reason for the visit. Assessing value by the individual model is demanding with respect to compiling the research data. It has been used in the works of Albertini *et al.* (2006) and Wilis and Garrod (1991).

**Single site model** is used for assessing the recreational value of single destinations which have no, or relatively few, substitutes. This model enables the measurement of consumer surplus, which is the difference between the visitors' willingness to pay for a visit and the real costs of travel (Parson, 2003). This model was used by Herath and Kennedy (2004) who estimated the recreational value of Mount Buffalo National Park, or Chen and Hong (2004) who assessed the value for Xiamen Island.

**Random utility model** is used for visitors' choice among multiple destinations. This model is considered the newest evolution of TCM, but also the most difficult and expensive for assessing recreational value (Parson, 2003).

According to Smith (1993) the travel cost method is a valuable tool for evaluating natural resources and has a prominent place in applied economics research programs in the environmental field. These findings are supported also by Ward and Loomis (1986) and Bockstael *et al.* (1991). Ward and Beal (2000) adds that the estimations meet the

economic theory and consumer demand function characteristics, it also enables the estimation of demand elasticity and empirical studies have proven the ability to determine consumer preferences.

Even though TCM has been in development since the 1970s, it still faces a number of limitations. Models are not appropriate for destinations close to locations with high population densities for example. It also does not take into consideration option value, and other variables (see Seják, 2003). Amoako-Tuffour and Martíz-Espineira (2012) discuss these issues, the subject of their critique predominately being with the calculation of opportunity cost of the travel time and on-site time.

### The single site model

The single site model is used for assessing recreational value for one site. The recreational value is equal to consumer surplus. The linear single site model has the following formula (Parson, 2003).

$$r = f(tc_r, tc_s, y, z) = b_{tc_r} tc_r + b_{tc_s} tc_s + b_y y + b_z z, \quad (1)$$

where  $r$  is the number of visits by one individual,  $tc_r$  the total travel costs to the studied destination (including travel costs, entry fees, accommodation and other related costs),  $tc_s$  is a vector for substitute destination  $y$  is any income, and  $z$  is a vector of socioeconomic characteristics. The  $b$  coefficients determine the impact of independent variables on the dependent variable.

The model is influenced by the travel time visitors need to get to the destination. Ward and Beal (2000) point out that without taking into consideration the variable of time, the recreational value is underestimated. Dvořák (2007) compares the time costs to visitors' hourly wage. Casario (1976) suggests including from one third to one half of visitors' wages. McConnell and Strand (1981) argue to calculate based on 60% of an individual's wages.

Income is also proven to be an important predictor of recreational value. Empirical studies proved that higher incomes lead to higher frequency of visits, e.g. Chakraborty and Keith (2000) who studied the recreational value of mountain biking, or Bin (2005) who assessed the economic value of beaches in North Carolina. Surprisingly Chae *et al.* (2012) found income to have a negative influence on the number of visits. They pointed out that relatively lower income respondents had a tendency to visit Lundy more frequently during the last three years. Among socioeconomic characteristics influencing recreational value include gender, age, level of education or social position. The strength of influence of these variables on recreational value on single site is not the same across empirical studies. Tianian (2009) proved the significant relation between age and number of visits in Yuelu park in Changsha. Wang *et al.* (2005) together with Scott and Jackson (1996) points out the number of visits decrease by visitors over 50 years. Stoeckl (1993)

found that visits to Hinchinbrooke Country Park increased with the higher the education level of visitors. However this is challenged by Albertini and Longo (2006) who observed a negative relation between education and the number of visits. Also the family status can influence the number of visits, this was studied by Liu *et al.* (2011), also Norman *et al.* (2002).

## MATERIALS AND METHODS

The presented research aims to study the recreational value in the geopark Czech Paradise. In order to study the recreational value, a single site model is applied to determine the consumer surplus of individual tourists and to study the socio-economic variables in the developed single site model.

### Studied area

The geopark Czech Paradise is situated north-west of Prague. Its area of 700 km<sup>2</sup> reaches the region of Trutnov, Jilemnice, Nová Paka, Jičín and Sobotka. Its area includes a number of geological phenomena, mineralogical, paleontological and archeological attractions. In 2005 the site was introduced into the European Geopark Network as the first geopark in the Czech Republic.

### Data collection

Respondents' surveys were conducted from April to October 2012. Data was collected on pre-selected spots in the studied area to ensure the reliability of data. Respondents were questioned in face-to-face style interviews to ensure that all questions were properly understood.

The questions used in the survey were formed from two categories. One category referred to the socioeconomic characteristics of respondents, such as age, family status, the highest obtained education,

employment and income. The other category referred to the visit to the geopark itself and included questions on actual travel costs<sup>1</sup>, or motives for the visit. A total of 734 tourists were interviewed.

### Individual travel cost model specification

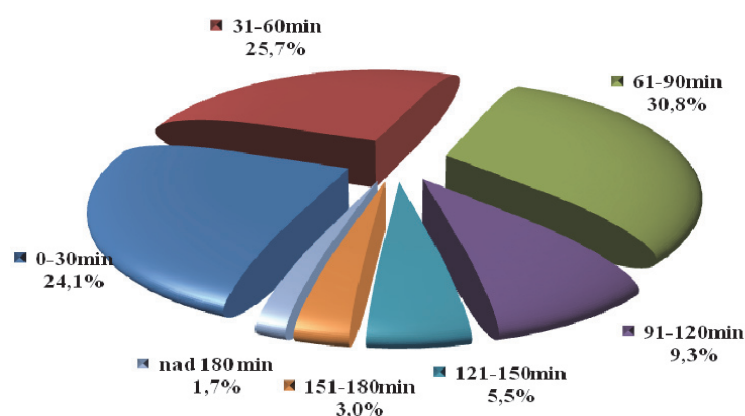
The data gathered from the survey were adjusted, especially the independent variable of travel costs. The travel cost variable as determined in the model comprised the real travel cost to (and from) the destination and the travel time needed to get to (and from) the destination. The travel time is assessed as  $\frac{2}{5}$  of hourly wage, which is the most commonly used rate in case studies according to Cesario (1976).

The hourly wage is determined as the ratio of the mean value of income interval and the number of family members. Standard working time hours were taken into consideration, which are 40 hours per week.

The independent variables in the proposed model are travel costs, the age of respondents (categories of 0–24 years; 25–34 years; 35–44 years; 45–54 years; 55–65 years; the reference category is 65+ years), the highest obtained education (elementary; trained; high-school; the reference category is represented by respondents with university degrees), family status (single, married, divorced; reference category are widows), monthly income (in intervals of CZK 10,000; the reference category being income over CZK 100,000), and economic activity (employed, not employed; reference category, not economically active). The model is determined based on the equation (1). The consumer surplus is measured as an area under the demand function but above the price.

## RESULTS

The tourist survey showed that the majority of tourists came from the Liberec region (25.3%),



1: Travel time to geopark  
Source: Author

<sup>1</sup> The travel cost is defined as the monetary expression for the cost of getting to and from the destination from the current place of residence.

I: *Distribution of total costs spent on visit*

Accommodation	21.5%
Boarding	30.2%
Food & Beverages	15.7%
Entry fees	13.4%
Rents	3.1%
In-region travel costs	2.4%
Presents and souvenirs	9.2%
Information materials, maps	4.4%
Others	0.2%

Source: Author

followed by tourists coming from the Central Bohemia region (24.5%) and tourists living in Prague (23.6%). Analyzing respondents according to city of residence, the majority of visitors to Czech Paradise Geopark lived in Prague. The distance between place of residence and the geopark influenced the time needed to get to the geopark. Almost half of respondents got to the geopark from their place of current residence in one hour (24.1% within 30 minutes; 25.7% between 31 and 60 minutes). The

journey took between 61 to 90 minutes for 30.8% respondents; between 91 and 120 minutes for 9.3% of respondents, whilst 1.7% of respondents needed more than 3 hours for their journey (see Fig. 1).

The majority (47.3%) of tourists spent between CZK 50 and 100 to get to the destination. This was followed by 31.6% of tourists who spent up to CZK 50. 8.4% spent between CZK 100 and 150 and 3% spent more than CZK 250. The other cost are presented in Fig. 2.

The majority of tourists (36.2%) visited the geopark just once a year. Twice a year (16%), three times a year (2.5%), four times a year (7.2%) and five times a year (8.0%). And they came mainly for one day visits (33.3%); 25.3% of tourists for two days, 17.3% of respondents for three days, and 12.2% spent more than 5 days in the geopark.

The demand function can be expressed as  $y = -500\ln(x) + 1221.4$ . The consumer surplus can subsequently be assessed to be CZK 497.9, expressed as a consumer surplus of one individual tourist for one recreational stay. The constructed model predicts the number of visit as 2.76 with 0.52 price elasticity, which determines the demand to

II: *Single site travel cost model*

Variable	Estimate	Std Error	Prob>ChiSq
Intercept	2.758	0.337	< .0001*
Travel Cost	-0.002	0.000	< .0001*
Age (0-24 years)	0.456	0.207	0.0245*
Age (25-34 years)	0.963	0.209	< .0001*
Age (35-44 years)	0.860	0.204	< .0001*
Age (45-54 years)	0.948	0.198	< .0001*
Age (55-64 years)	-0.292	0.226	0.195
Education (elementary)	0.486	0.107	< .0001*
Education (treained)	0.288	0.104	0.0062*
Education (high-school)	0.345	0.073	< .0001*
Family status (single)	0.255	0.122	0.0337*
Family status (married)	0.307	0.120	0.0089*
Family status (divorced)	-0.034	0.131	0.795
Employment (employed)	-0.027	0.095	0.775
Employment (not employed)	-0.633	0.194	0.0009*
Number of family members	-0.134	0.033	< .0001*
Income (0-10.000 CZK)	0.169	0.340	0.616
Income (10.001-20.000 CZK)	-0.731	0.289	0.0192*
Income (20.001-30.000 CZK)	-0.855	0.292	0.0073*
Income (30.001-40.000 CZK)	-1.071	0.288	0.0009*
Income (40.001-50.000 CZK)	-1.001	0.283	0.0016*
Income (50.0001-60.000 CZK)	-0.599	0.284	0.0485*
Income (60.0001-70.000 CZK)	-0.342	0.290	0.255
Income (70.0001-80.000 CZK)	-0.842	0.295	0.0086*
Income (80.0001-90.000 CZK)	-0.898	0.331	0.01*
Income (90.0001-100.000 CZK)	-0.484	0.328	0.151

\*\*Statistical significance  $\alpha = 0.05$ 

Source: Own research



be inelastic. The influence of the socioeconomic characteristic is specified in Tab. II, and a detailed analysis of the variables is subsequently conducted.

### Age

The comparison of individual age groups shows that in the case of travel expenses of 1800 CZK, the frequency of visits ranges without significant differences between age intervals around 0.5 trips per year. Where travel costs are CZK 50; the model predicts a total number of visits to be 27 by people aged between both 25–34 years and between 45–54 years. The lowest frequency of visits is observed for persons aged 55–64 years. Tourists in the range 55 years and older conducted more than 50% fewer trips than people in the younger categories.

### Education

The results of the research prove that trained respondents and respondents with a high school education have similar frequency of visits. However the greatest disproportion can be seen between respondents with elementary education and those with university degrees. The maximum number of visits expected for tourists with elementary education who make 17 visits a year if travel expenses were CZK 50. On the contrary, tourists with university degrees make 10 visits in the same period. As travel costs rose, the observed differences between the groups decreased. In case that travel cost are 1,800 CZK the frequency of visits varies among all groups approximately 0.4 trips per calendar year.

### Family status

Demand for recreation in the Czech Paradise Geopark by divorcees and widows or widowers followed a similar curve, they are almost identical. When travel costs are set at CZK 50 the model predicts for these two groups 10 trips a year to the study area. In the case of the other two groups, single and married, the frequency of visits varies by less than one trip. If these two groups paid the same travel expenses as the previous two groups, the model predicts for these groups 14 trips to the geopark.

### Economic activity

Whilst the economically inactive and employed tourists visit the geopark 10 times a year, unemployed tourist visits the geopark only 5 times a year. With the price of CZK 1,000; the difference between these groups is reduced to one trip. Almost the identical number of visits is predicted when travel costs are CZK 1,800 and more.

### Income

The model reveals that tourists with a family income over CZK 10,001 will visit the geopark 12 times a year if travel costs are CZK 50. This is the highest frequency of visits predicted by the model. If

a tourist has an income higher than CZK 10,001, he/she conducts only 10 trips. The biggest difference can be seen in the frequency of visits among tourist with incomes up to CZK 10,000 and those having an income between CZK 30,001 and 40,000. Tourists in the income group CZK 30,001 to 40,000 represent the group with the lowest frequency of visits. These tourists have also traveled more than one hour to get to the geopark.

## DISCUSSION AND CONCLUSION

The conducted research studies the recreational value and demand of geopark Czech Paradise through a developed single site model. The results of the research analyzed the price elasticity of demand. The results proved that the demand is inelastic (coefficient 0.52). This result corresponds with studies published by Phaneuf and Smith (2005), Melichar (2007) and Gum and Martin (1974) who found the demand for recreational sites to be inelastic. The consumer surplus was determined as CZK 497.9.

Data collected through face-to-face interviews enabled the development of a single site model, taking into consideration the number of visits. The gathered data also enabled researchers to gain a better knowledge about tourists coming to the studied area, their expenditure, and distance travelled. Wynen (2013) points out that distance travelled is an important determinant of expenditure and a key determinant for location choice.

The single site travel cost model included the variables of travel costs, age, highest obtained education, family status, economic activity and family income. The results of the analyzed model proved that the positive influence of age on the number of visits in all age groups (except the age group 55–64 years). Tourists in the age group 55 years and older make about 50% fewer trips than their younger counterparts. Similar results have been proven by Wang *et al.* (2005) and Scott and Jackson (1996). The results also proved the positive correlation between the number of visits and the highest obtained education. These results correspond to Albertino and Longo (2006). Analyzing family status, the most prominent group visiting the geopark were single and married visitors. Similar results are published by Liu *et al.* (2011), Norman *et al.* (2002) and Starbuck *et al.* (2004). Economic activity also had significant influence on the demand for geopark visits. The difference can be identified among the groups of economically inactive and employed tourists and unemployed tourist. In addition, Income also significantly influenced the demand for the geopark. The biggest difference is identified between respondents having up to CZK 10,000 and those with a family income in the interval CZK 30,001–40,000. Detailed analysis showed that the differences between these groups of tourists is also in travel costs and the distance

travelled. The influence of income on the number of visits is confirmed by numerous research works (e.g. Dargay, 2007).

The conducted research focused on domestic tourists. Therefore it is important to stress that other groups of respondent, especially foreign tourists, would behave in different ways, as also demonstrated in the existing literature (Hesseln *et al.*, 2003, Loomis *et al.*, 2001).

In addition to the research revealing some factor influencing the number of visits of the geopark, it also highlighted some characteristics of the tourists coming for visits. These results may serve to guide

local authorities in their decision-making process and managing the geopark development. A greater knowledge of tourists is not only key for public authorities, but also for private tourism enterprises and the wider hospitality industry.

The findings of the research in geopark Czech Paradise are compliant with the theory of the travel cost method (TCM), in so far as it assumes a higher frequency of visits by tourists living closer to the studied area than by tourist with remote current residence. The theory is also proved by the decreasing frequency of visit with increasing travel costs.

## SUMMARY

The recreational value of tourist sites and attractions is commonly measured using methods used for assessing non-market goods. One of these methods is the Travel Cost Method (TCM). This method is also the oldest one used for assessing the demand for recreational sites. The conducted research studied the recreational value and the demand for recreation in the Czech Paradise Geopark by applying the single site travel cost model. The demand function is determined and the consumer surplus is identified as a measure of recreational value of tourist sites.

The data necessary for answering the predefined aims were gathered through a tourist survey conducted in the studied area. Data gained through this survey was adjusted and a single site travel cost model developed. The dependent variable in the model was the number of visits in the area conducted by an individual traveller. Whereas the independent variables were age, education, travel cost, family status, economic activity, and income.

The research showed that tourists travel mostly between 61–90 minutes to get to the geopark (30.8%), and almost a half of tourists (47.3%) spent CZK 50–100 to get there. The knowledge about tourists' expenditure enabled the authors to determine the demand function ( $y = -500\ln(x) + 1221.4$ ) and consumer surplus (CZK 497.9). Subsequently, the single-site travel model was developed to identify statistically significant variables influencing the number of visits. Analyzing these variables showed that tourists aged 55–64 years had the lowest frequency of visits; the greatest disproportion in number of visits was observed between respondents with elementary education and those with university degrees and subsequently the maximum number of visits is expected for tourists with elementary education who make 17 visits a year if travel expenses are CZK 50. In contrast, the group with the lowest frequency of visits are tourists in the income group CZK 30,001 to 40,000. Tourists with a family income over CZK 10,001 will visit the geopark 12 times a year if the travel costs are CZK 50. The results gained from this research are therefore congruent with the findings in literature, research works and case studies. The findings of the research in geopark Czech Paradise are also compliant with the theory of travel cost method, in that it assumes a higher frequency of visits by tourists living closer to the studied area than by tourists with remote current residence. The theory is also proven by the decreasing frequency of visits with increasing travel costs.

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