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Travel Cost Adjustment of International Multiple Destination Visitors to the Kilim Karst Geoforest Park, Langkawi, Malaysia

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Abstract: Kilim Karst Geoforest Park (KKGP) located in Langkawi island offers pristine nature-based attractions to visitors. Apart from local visitors, the park receives many international visitor arrivals from all over the world. The demand model of international visitors to the park can be developed using one of the common environmental valuation techniques, the Travel Cost Method (TCM). And, using the demand curve, the benefit obtained by the international visitors to the park can be estimated using the concept of consumer surplus. In this research, the Individual Travel Cost Model (ITCM) has been employed. One of the common issues in travel cost studies is to obtain the specific travel cost attributable to the specific location for multiple destination visitors. Thus, the article determines the consumer surplus value of international visitors from the travel cost adjustment. A structured questionnaire and face-to-face data collection method were employed to obtain the primary data from 330 international visitors using the purposive sampling technique. The study has found that the consumer surplus estimated using the unadjusted travel cost model was greater than for the adjusted travel cost model thus suggesting an overestimation of the benefit gained by visitors. The consumer surplus value was estimated to be €216/ RM 864.

Key words: Adjustment · Consumer surplus · Demand · Individual travel cost method · International visitors

INTRODUCTION

There are three types of visitors; namely, pure visitors, transit visitors and meanderers [1]. They emphasized that the allocation of total travel cost incurred to a particular site is relevant only to visitors for whom the study site is the only site they intend to visit (pure visitors). However, the allocation of travel cost for the transit visitors should only be a small portion from the total travel cost incurred to arrive at the site. Finally, for meanderers (those who visit the site as one of the many visited sites), the travel cost should be apportioned accordingly to all the sites visited. Similarly, the researchers pointed out that the failure to apportion the travel cost for multiple destination (MDT) visitors would result in an overestimation of the consumer surplus.In the case of KKGP, the majority of the international visitors arriving at KKGP were transit visitors or meanders implying that Langkawi Island was not the only destination of their visit. Therefore, the specific benefit gained or allotted by the international visitors specifically to the park out of their overall holiday trip has remained unknown. This carries a need to divulge the specific value attributable by the multiple destination visitors on the geopark for a better decision making pertinent to the management of the park. The need to identify the specific value allotted by the international visitors rather than the local visitors was due to a reduction in the number of

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international visitors arriving at KKGP at about 25% from 168, 528 in 2011 to 126, 982 in 2012 [2]. Besides that, there was an increase in arrivals of international visitors from 2006 (21, 188) to 2012 (126, 982), which was about (83%), which necessitates the need to identify whether the international visitors to the park obtained benefits from their visit. Therefore, the study has determined the benefits attained or the consumer surplus value of the international visitors from the travel cost adjustment.

The following discussion covers the literature review, research model, steps for travel cost adjustment, sampling and adiscussion on the analysis made and ends with the conclusion section.

Literature Review: Many techniques have been employed by researchers to overcome the problem of identifying the specific travel cost incurred by multiple destination (MDT) visitors to a specific site. The first technique is through the determination of the travel cost beginning from the day or last stop prior to visiting the study site [3]. However, the technique has been strongly criticized by [1] because they claimed that the findings of the consumer surplus value would be an underestimation of the benefits obtained from the visitors. This is because the approach fails to take into account the travel cost from the point of departure (home of the visitor) of the visitors that should be apportioned accordingly, until the study site. Similarly, researchers [4] criticized the approach with a claim that the finding was biased particularly when the distance from the last stop to the study site was short. A shorter travel distance would result in a smaller cost, thus, the travel cost was lower and, therefore, the consumer surplus would have been underestimated.

The second technique is by excluding multiple destination (MDT) visitors in the sample of the study [5, 6]). This is followed by the travel cost adjustment and consumer surplus adjustment techniques. Both in the travel cost adjustment and the consumer surplus adjustment, the adjustments are made based on the time spent (revealed preferences) at the site and satisfaction attained at the site (stated preferences). The assumption that has been made for the revealed preferences technique is that the benefits obtained from the visitors are proportional to the expenditure and time allotted for the site [7]. Next, the increase in the period of stay or time spent at a particular site would augment the opportunity to enhance the visitor's value. Therefore, the benefit obtained by the visitors relies on the period of stay or time spent at the site.

On the other hand, the stated preferences technique assumes that decisions made to travel to a particular site are based on the visitor's hope of obtaining positive impacts [8]. In addition, it is assumed that the visitors would be able to rank the sites they had visited based on their preferences or the weightage they allocated to the sites. Other adjustments of the stated preferences besides the satisfaction approach comprises ratings, ordinal rankings and geographical weightings, fixed-point scoring and paired comparisons [9]. Ordinal ranking is the technique to rank the sites visited by the visitors based on the most preferable to the less preferable. With this technique, a greater portion of the total travel cost would be allocated to the most preferable sites [6].

MATERIALS AND METHODS

The methodology section elaborates a little on the study area then, explains the technique used to overcome the issue on MDT visitors, the model of study, explanations of the variables, consumer surplus estimation and sampling and ends with some discussions on data analysis.

Langkawi Island is located between Sumatera and Western Thailand and at the northwest of Peninsular Malaysia. The descriptions of the island by [10] are as follows. Langkawi Island is an archipelago comprising 99 islands with a total area of 47, 848 hectares or 466.51 square kilometres. Out of all the islands, only three are inhabited, which are Langkawi Island, Dayang Bunting Island and Tuba Island. Langkawi is approachable by sea from Kuala Perlis (30 km), Kuala Kedah (51.5 km) and Penang Island (105km). It is also approachable by air via the International Airport at Padang Mat Sirat. The total land area of Langkawi is 47, 848 hectares and is divided into six districts; namely, the districts of *Kuah, Padang Mat Sirat, Ayer Hangat, Bohor, Ulu Melaka and Kedawang*. About two-thirds of the island is hilly-mountainous land and covered with virgin jungles.

On 1st June 2007, Langkawi Island was gazetted by the United Nations Educational and Scientific Organisation (UNECSO) Global Network of National Geoparks as one of the first geoparks in Southeast Asia [11]. A geoforest park is a special conservation area within a Permanent Forest Reserve (PFR). It has supreme geological and biological resources, geared towards a sustainable tourism practice, promotes multidisciplinary research and enriches community awareness about the natural integration of various forest resources [12].

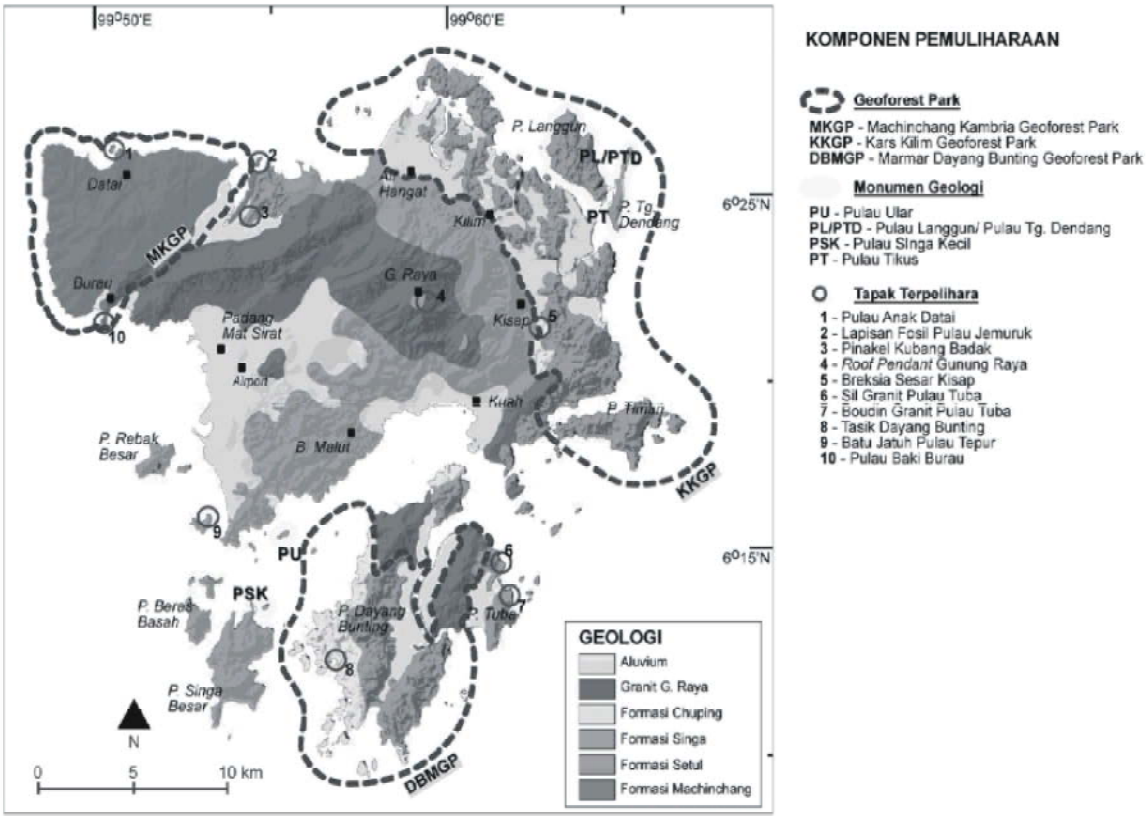

Fig. 1: Location Map of the Kilim Karst Geoforest Park
Source: MohdShafeea, (2010)

'Geopark' is a national protected area containing a number of geological heritage sites of particular importance, rarity, or aesthetic appeal [13]. These Earth Heritage sites are part of an integrated concept of protection, education and sustainable development. The geo-heritage conservation is carried out under the jurisdiction of the Forestry Department. Kilim Karst Geoforest Park is one of the three geoparks on Langkawi Island.

Referring to Figure 1, there are three geoforest parks in Langkawi Island; namely, the Machinchang Cambrian Geoforest Park, Kilim Karst Geoforest Park, (the study site) and Dayang Bunting Geoforest Park. Kilim Karst Geoforest Park (KKGP) is located in the north of Langkawi Island, while Dayang Bunting Geoforest Park is located in the south followed by the Machinchang Cambrian Geoforest Park in the west of Langkawi Island. Out of the three geoforest parks, KKGP was chosen as the study site due to a high number of international visitor arrivals to the park. The high arrivals are associated with many nature-based attractions offered in the park as compared to the other parks. For example, the attraction at Dayang Bunting is only the Dayang Bunting Lake whilst the attractions in Machinchang are mainly the cable car and the Oriental Village.

KKGP is surrounded by protected mangrove swamps with an area of approximately 100sq.km. It has been developed by the oldest limestone in the country, namely, the Setul Formation. The KKGP features breathtaking landscapes of nearly vertical karstic hills with pinnacles of various shapes and sizes [13]. Perhaps amongst the main factors contributing to the formation of such a beautiful karstic landscape are its generally thin beds and flat to gently dipping altitudes with many high angle vertical faults and fractures as well as its exposure to the open sea [13]. It comprises several elongated hills and islands with narrow valleys in-between. The valleys are home to one of the best-kept and unique limestone mangrove forests in the world. Many caves with beautiful features can be found within the park, for example GuaKelawar, GuaBuaya, GuaLandak and GuaCerita. In addition, a small fresh water valley has developed in Pulau Langgun.

Some of the attractions available at the park are the greenish mangrove swamps, Kilim River, narrow valleys, limestone caves of the tunnel variety, wildlife, etc. The wildlife in the park comprise the belly sea eagles, brahminy kite eagles, brown winged kingfishers, monkeys, monitor lizards, swimming macaques, etc. Next, in the fish cage, there are fish, eels, crabs, mantis prawns, stingrays and sea bass. The physical facilities available at the park are boats, the Kilim jetty, a *Surau* and small restaurants.

In terms of the technique used, out of all the techniques available, the present study chose the travel cost adjustment technique. This is because using the technique, the consumer surplus value is obtained from the true estimation of the KKGP models.

ITCM Model:

$$V = \beta_0 + \beta_1 RITC_{ij} + \beta_2 TTimeC_{ij} + \beta_3 MS + \beta_4 Age + \beta_5 Edu + \beta_6 GM + \varepsilon \quad \text{(Eq.1)}$$

where:

i	=	Origin (Main cities of respondents)
j	=	Kilim Karst Geoforest Park, Langkawi
V	=	Number of visitors in a group to the Kilim Karst Geoforest Park
$RITC_{ij}$	=	Total round trip travel cost of individual from i to site j
$TtimeC_{ij}$	=	Cost of travelling time of individual i to site j
MS	=	Quality of the Kilim Karst Geoforest Park as measured by the mean satisfaction
Age	=	Age of individuals
Edu	=	Education level of individuals
GM	=	Gross monthly income of individuals
$\beta_0 - \beta_6$	=	Coefficients to be estimated
ε	=	Random error

Specifically, in the present study there have been four models developed for the travel cost adjustment technique. First, two models are based on the travel cost to KKGP based on the number of hours or time spent ($RITC_{HOURS)}$ in which equation 2 is the unadjusted model whilst equation 3 is the adjusted model. Likewise, there are two models for the travel cost based on satisfaction attained in the park (*RITCSAT),* based on unadjusted (equation 3) and adjusted (equation 4).

Travel cost to Kilim based on the number of hours at the park:

$$V = f\ (RITC_{HOURSij}, TTimeC_{ij}\ MS, Age, Edu, GM, \varepsilon) \quad \text{(Eq. 2/3)}$$

Travel cost to Kilim based on the satisfaction at the park:

$$V = f\ (RITCSAT_{ij}, TTimeC_{ij}, MS, Age, Edu, GM, \varepsilon) \quad \text{(Eq.3/4)}$$

Figure 2 shows the process to get the specific travel cost attributable to the park by the international multiple destination visitors for whom KKGP is not the only destination of visit in their holiday trip.

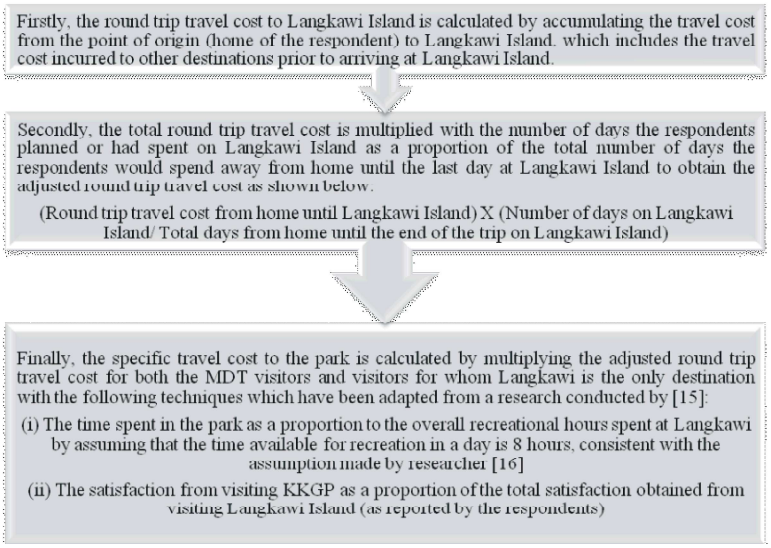

Fig. 2: Key steps involved in identifying the specific travel cost attributable to the KKGP

In terms of sampling, the respondents were chosen mainly at KKGP and those at the Langkawi International Airport who had visited KKGP within a duration of two weeks in the month of November. The purposive sampling technique was chosen because the purpose of the present study was only to determine the demand of the international visitors. Furthermore, only those who had visited the park were chosen as respondents. Out of 330 respondents, 30 questionnaires were discarded due to irrelevant information. Thus, only 300 samples were used for further analysis. A Poisson regression analysis was conducted to estimate the ITCM model using the Limited Dependent Variable (LIMDEP) software version 4.

RESULTS AND DISCUSSION

Referring to Table 1, the 'unadjusted' function was the model which applied travel cost, which was 'not adjusted' for the multiple destination (MDT) visitors. On the other hand, the 'adjusted' function was the model that applied travel cost that was 'adjusted' for the MDT visitors. The measure of goodness of fit (Pseudo R^2) was found to be lower in the unadjusted models. Also, the log-likelihood value supported a good model fit as a whole indication. Besides that, it should be noted that the beta coefficient value for the unadjusted travel cost variable was lower than the beta coefficient value for the travel cost variable in the adjusted model. A lower beta value would result in a higher consumer surplus value, since the CS was determined by dividing $1/\beta tc$. Therefore, the finding suggests that, the failure to apportion the specific travel cost to the study site would lead to an overestimation of the consumer surplus value.

It should be noted that the time spent model (Kilim hours) outperformed the satisfaction model, statistically, since both the unadjusted and adjusted models had higher pseudo R^2 and log likelihood values. Further, the decision to ascertain the best model was made by referring to the highest pseudo R^2 and highestmodel fit value (log likelihood), which were recorded for the adjusted model. Therefore, further discussion has been based on that adjusted time spent model. With this, the consumer surplus estimation was determined based on the adjusted time spent model.

Referring to Table 1, the Pseudo R^2 (multiple determination coefficient) value for the adjusted Kilim hours model (39%), suggests that only 39% of the total variation in the endogenous variable could be explained by the exogenous variables. All the variables were significant at the 90% level of confidence except for the income variable (GM). The travel cost variable was found significant with a negative coefficient consistent with the demand theory. The negative coefficient implies a downward sloping demand curve from the left to right. Similarly, researchers [17] who studied on river recreation visitors to the Caribbean National Forest in Puerto Rico, United States, found a negative coefficient in the Poisson regression analysis for ITCM. Thus, visitors who incur more travel cost would make fewer visits to the park. For instance, a 10% increase in the travel cost would cause a reduction in visits by 0.009% based on KKGP, based on the number of hour's model. By assuming a 10% increase in the travel cost for all international visitors to KKGP in 2012 (126, 982) at the average travel cost of RM 244 based on hours, the reduction in the number of visits would be 1, 143 based on the hours model.

The quality of site variable measured by the satisfaction attained by the visitors was found to be significant at the 95% level of confidence with a negative coefficient. Likewise, a researcher [18] found a negative coefficient in the Poisson regression analysis for ITCM. The age variable was found significant at the 95% level of confidence with a positive coefficient. Similarly, researchers [19] found a positive coefficient for the age variable. This implies that the number of visits to the site is positively related to the age of the visitors. Hence, the demand for goods would shift outwards for an increase in the age of the visitors. Next, a positive coefficient found in the education variable suggests that the demand for goods will shift outwards for visitors with higher levels of education. The finding is consistent with the findings from [20, 21] who found a positive relationship between the education level of visitors and the demand for the site.

The time cost variable was significant at a 95% level of confidence and inversely related to visits to the park in the Kilim hour's model. This suggests that visits to the park by visitors would be reduced following an increase in the opportunity cost of time. For instance, based on the Kilim hour's model, a 10% increase in the time cost incurred by visitors would reduce the visits by 0.0044%. Finally, the income variable was found to be insignificant thus implying that the cost of a visit to the park would not be the main consideration but rather the attractions available in the park.

The findings on the consumer surplus estimation is shown in Table 2 below. The consumer surplus was estimated using the coefficient of the travel cost variable using the formula shown below.

Table 1: Unadjusted and Adjusted ITCM Model Estimation

	Kilim Satisfaction		Kilim Hours	
Variables	Unadjusted	Adjusted	Unadjusted	Adjusted
(Constant)	1.613 (4.628)**	1.618 (4.378)**	1.778 (5.056)**	1.672 (4.773) **
RITC	-.253E-03 (-3.875)**	-.440E-03 (-3.249)**	-.2845E-03 (-1.702)*	-.896E-03 (-1.814)*
TTimeC	-.155E-03 (-1.122)	-.416E-03 (-1.010)	-.194E-03 (-2.204)**	-.436E-03 (-2.040)**
MS	-.370 (-4.966)**	-.338 (-4.473)**	-.453 (-6.094)**	-.435 (-5.890)**
Age	.665E-02 (2.541)**	.711E-02 (2.725)**	.613E-02 (2.359)**	.609E-02 (2.352)**
Edu	.464E-01 (4.025)**	.491E-01 (4.226)**	.485E-01 (4.213)**	.507E-01 (4.390)**
GM	-.283E-04 (-2.762)**	-.292E-04 (-2.981)**	-.273E-04 (-1.694)	-.230E-04 (-1.524)
Pseudo R^2	0.363	0.382	0.366	0.385
Log likelihood function	-812.06	-823.293	-823.919	-853.232

Note: * Significant at 10% level, ** Significant at 5 percent level and in brackets is the t-statistics value whereas those without brackets are the coefficient value of the variable

Table 2: Consumer Surplus Estimation for ITCM

Travel cost Kilim (Hour)	Unadjusted	Adjusted
Total CS	€85 million/ RM 340 million	€27 million/ RM 108 million
Average CS value per person/ trip/year	€665/ RM 2, 660 million	€216/ RM 864

Note: * Exchange rate (1.0EUR: 4.0MYR) in January 2012

CS per visit/group = - 1/ b_{tc}

Later, the consumer surplus average CS value per person/ trip/year was determined by dividing the CS per visit/group with the average visit/ average number of people in a group which was 3.48. The adjustment was made based on the suggestion by researchers [22] who divided the CS per visit with the average visit in a study to determine the demand and economic value of Mountain Biking in Moab, Utah. Later the consumer surplus per visit/person/year (€216/ RM 864) was multiplied with the total number of international visitor arrivals to KKGP in 2012 (126, 982) to obtain the total consumer surplus-total recreational value, value of the park.

CONCLUSION

In the study, four models based on the satisfaction attained (unadjusted, adjusted) and number of hours spent(unadjusted, adjusted) in the park were developed to examine the effects of the failure to determine the specific travel cost attributable to the park through the use of travel cost adjustment. This examination is crucial since the failure to adjust the travel cost incurred by the multiple destination visitors would overestimate the consumer surplus or benefit obtained by the visitors; in this case, the international visitors. Therefore, it would fail to identify the specific travel cost or value allotted by the visitors specifically at the geopark. The time cost variable was found significant. This implies that the estimation result has incorporated the effect of opportunity cost of time on the number of visits to the park. Thus, it is deemed consistent with the assumptions of the travel cost method whereby the travel cost incurred by the visitors comprises both the monetary and time cost. Besides that, the mean satisfaction (as a measure of quality of site), age, education and income variables were found to have a significant relationship with the demand for the site.

The estimation results show that the time spent model outperformed the satisfaction model, statistically; therefore, the present study proposes the management of the consumer surplus value derived from this model. Findings on the monetary value of the park will alert the community regarding the importance of conserving the natural resources available at the park consistent with the National Ecotourism Plan [23]. Besides that, these findings will helpin justifying the utilization of park land for rural [24-31] development purposes that indirectly ensures the continued existence of the resources available at the site instead of utilizing it for any other form of alternative development that will eventually lead towards the damage and destruction of the natural resources available at KKGP. For example, the limestone available in the park can be used as building material, cement, or mortar used in the manufacture of ceramics, as cheap fillers used as fillers in some plastics and in the construction of roads. Furthermore, the findings can be useful for the Langkawi Development Authority (LADA) to efficiently manage the resources available in the park.

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