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Estimation of the Use and Non-use of the Agmon: a TCM and CVM Approach

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Estimation of the Use and non-use value of the Agmon: A TCM and CVM Approach[1],[2]

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Abstract

The Hula Wetland is an ecological tourist site, situated in the centre of the Hula Valley. The site is rich in species, some of which are unique to the area (endemic) and rare. It's an ancient site, physically preserved and undeveloped commercially. As an ecologically unique resource to Israel and the world, the wetland draws domestic visitors and those from abroad.

The wetland is the result of man-made flooding of agricultural lands... The project was undertaken with the approval of local farmers and residents with the objective of dealing with severe agro-technical problems that plagued the valley, including flow of water-borne pollutants to the Sea of Galilee and steep reductions in soil fertility, agricultural output and returns. The state of Israel sought to reduce its involvement in the area, in particular the ongoing obligation to financially subsidies the farmers. The cessation of agriculture would enable the farmers to undertake alternate enterprises in tourism and recreation and thereby develop a more stable livelihood from the land. The challenge was that the development of these activities could irreversibly damage local plant and animal life and the unique ecology of the wetland.

This strategic decision, the outcome of long-term ecologic and economic considerations resulted in serious objections among a portion of the Israeli public. The explanation that the value of recreation and nature are national resources that should be protected and managed by public bodies and not on the basis of profit and the notion that the preservation of these resources is at odds with their development for commercial purposes were not universally accepted.

The purpose of this research is to evaluate the benefits of this site in its current state. That is, before the process of opening the site to commercial tourism impacts on its unique features and variety of natural values and amenity as a site that exclusively provides ecological tourism services. The work deals with three principal areas, ecology and economics of natural resources and ecological tourism which derives from these two disciplines.

1. OBJECTIVES OF THE RESEARCH

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The main purpose of this research is the estimation of the economic benefits of the site in its current state; In other words, the Use and Non-use values of the site.

Estimation of the economic value of the site should supply information for the decision makers, and help planning of effective policy for preservation of the site. These values can indicate the level of importance that the public places on this issue. High values point to high importance placed by the Israeli public on the very existence of the site as it is and on its unique natural composition and landscape. They also give an indication for the formulation of policies and the need for policy intervention. In as much as public policy that takes into accounts the needs of the public and its preferences, there must be policies that act to preserve the site and minimize recreational activities that may damage it. On the other hand, a low value could be incentive to allow the opening of the land to development of commercial tourism.

These values permit the estimation using different methods that give an indication of the willingness of the public to pay for the development of the site and for its preservation. Therefore, the willingness of the public to pay to preserve the site can give an indication of the compensation that the Israeli public would be willing to pay to the farmers in return for not developing tourist facilities on land under their control. A high willingness to pay could indicate the setting of policies that would leave the site under the management of public bodies without having the state responsible for the financing the costs of compensation because these payments could be collected from the public. The site would not be in danger of disturbance or operation by private bodies. The site could be preserved as a unique ecological unit and an entity that decreases the pollution of the Sea of Galilee; both of these functions are potentially in conflict with the for-profit operation.

The estimated use value gives an indication of the value of ecological tourism of the site. It can also measure the administration of the site in terms of the amount that visitors pay to enter the site. (Mendelssohn and Tobias, 1991; Maille and Mendel son, 1993) These payments can finance the estimated $300,000 annual cost of ongoing maintenance at the site.

2. Estimation of Use value of the Wetland Using the Travel Cost Method

As mentioned previously, the main objective of this research is to find the use value of the site. An additional objective is to compare use value of the site obtained via the traditional Travel Cost Method and use value obtained via other models that are extensions of the traditional Travel Cost Method, models that give expression to components that are not considered in the traditional Travel Cost Method (Bookstall, 1980).

In addition, this work checks the relationship between specific explanatory variables and the rate of visitation at the site.

2.1 The Sample

The sample was taken over the months of March to August 2002. The samples were taken during holidays and weekends. No sampling was done on weekdays because that over this period, the number of visitors on these days was negligible. The visits to this site, in the main are made during the period that the birds are migrating. That is, during the months of November to March and during this period. From April, the rate of visitation falls a lot, stemming from the loss of the main feature that draws

visitors to the site and the visits are organized mainly on the days that large sections of the population are on vacation.

The sampling was done at the site itself. Questionnaires to be filled out were distributed to respondents. The sample included only those who arrived in private cars and the car served as an observation. People who arrived in organized transport were not included in the sample because the calculation of the cost of their transport differs from the calculation of transport cost for those coming in private cars and it was not possible to derive these travel costs. In total, 247 observations were taken. Of these, fourteen were disqualified because the visitors had arrived in organized transport or too many details were missing from the completed questionnaire. In total, the sample was composed of 233 observations.

2.2 Calculation of the Rate of Visitation and Number of Visits from the Area

These are the important values for finding the consumer's surplus. They are calculated as follows:

First, the distance from the site and the greatest distance from which people travel are measured. Using a 1:500,000scale map, eleven circles, each having a radius of twenty-five kilometers was designated. The outermost circle had as its outer boundary, the furthest community from which visitors to the site had come. In the second stage, the number of residents in each circle was found. This was calculated by summing up the total number of residents in each city, administrative area and municipal area located in each circle. In the instance that a community was located in a locale that was split between two circles, the population value for that circle was calculated on the basis of each individual community. The data in this section of the work was obtained from the Internet site for local authorities: Meida-Ir.

In the next stage, the total number of visitors coming from each area was aggregate. This information was obtained from a specific question asked of the respondents. They were asked to indicate the total number of people in the car. The total number of people in the cars that came from each area gave an indication of the number of visitors coming from each area. The rate of visitation from each area was found in the fourth stage. This value was calculated by dividing the number of visitors coming from each area by the total number of visitors sampled. The next step was to find the number of visitors from each area. To calculate these values, one must first estimate the number of visitors to the site in one year.

According to Fleischer and Tsur (2000) estimates, based on data from KKL that enumerated the visitors at the site over the months December to February, 2002, the number of visitors to the site during the September to March of this year was between 60,000 and 80,000. According to the results of the sample that we put together, for the months, April to August, 4,918 visitors visited the site. According to the estimates by the KKL, the number of visitors during the entire year 2002 was 100,000. Nevertheless, Fleischer and Tsur as well as the KKL, indicate that the year was exceptional in terms of the large number of visitors relative to earlier years.

Because the site has only existed for a limited number of years, there has been no census of the visitors there, we don't know whether the number of visitors who came to the site this year is a one-time occurrence or the beginning of an upward trend in the number of visitors to the site as a result of advertising and increased awareness on the part of the Israeli public regarding the site. In any case, according to the following findings, the minimum estimate of the number of visitors to the site annually is at least 65,000 and this number of visitors is attributed to this research.

2.2 Construction of the Demand Curve for Visits to the Site

The demand curve represents the relationship between the total number of visitors and the rate of increase in price (the cost of travel). In the table in Appendix 1, it is possible to see that the cost of travel to the site from a given area increases as the distance of the area from the site increases and the rate visitation from an area decreases as its distance from the site increases.

2.3 Calculation of the Number of Visits as a Function of the Increase in the Cost of the Visit

The assumption is that when the price is not a variable (price increase=0), the rate of visitation from all areas is as it is today. Therefore, the total, current, number of visits is 65,000. An additional assumption is that when the price increase, the travel cost of the specific area comes to equal to the travel cost of the next area, the rate of visitation from the area will be equal to the rate of visitation from the more far-away area. That the rate of visitation taken from the area, depends on the travel costs and for every travel cost, there is a corresponding rate of visitation. In this way, the total number of visitors at the site is estimated. [The number of visitors as a function of a specific increase, (X) in the travel cost appears in Appendix 2.]

The most complicated thing is to set the cost or the price increase those results in changed behavior on the part of the visitors from different areas.

The following method, used to calculate the travel cost, assumes distribution between the characteristics of the population in the sample and the characteristics of the general population; specifically the socio-economic characteristics and the characteristics of the travel costs. The statistical assessment that we used here in order to get the indication of the costs of travel from an area is the average.

Beginning with the entire area, the average of the costs of travel was prepared for all the respondents from the same area.

The function:

$$P(\text{average},z,m) = \sum P_{znm}/n_z \qquad \begin{array}{l} z=1,2,3\ldots\ldots\ldots,11 \\ n=1,2,3,\ldots\ldots\ldots,n \\ m=1,2,3,4,5,6 \end{array}$$

Where:
P(average,z,m) = the costs of travel, on average from area z, calculated using model m
P_{znm} = cost of travel for observation n from area z in model m
n_z = number of observations from area z

2.4 Calculation of Consumer's Surplus

Consumer's Surplus in the linear model is the area under the demand curve. In the Semi-Logarithmic and Logarithmic models, Consumer's Surplus is the integral of the demand function.
In the functions:

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The Linear Model: $CS = (P_{MAX} - P_0) * (V_{P0} - V_{PMAX}) / 2$
Where,
V_{P0}=total number of visits when P=0
V_{PMAX}= total number of visits when $P = P_{MAX}$

The Semi Log-Model (P):
$P = e^{a-bv} = e^a / e^{bv}$
$CS = \int e^a / e^b * 1 / e^v = e^{a-b} \int e^{-v} = e^{a-b} * e^{(-v+1)}/v+1$

The Semi Log Model (V):
$CS = av - b \int \ln V = av - b *(V - V \ln V)$

The Log-Log Model:
$e^{\ln P} = e^{a-b\ln V}$
$P = e^a / e^{b\ln V} = e^a / e^{\ln(Vb)} = e^a / V^b$
$e^a * V^{-b} = e^a \int V^{-b}$
$CS = e^a * V^{-b+1} / -b+1$

 The average individual Consumer's Surplus is calculated by dividing the total
Consumers' Surplus for site visits by the total number of visits per year.
$CS_{(per\ visitor)} = CS_{(site)} / V$

3. MEASUREMENT OF THE BENEFITS OF THE WETLAND USING C.V.M

3.1 Objectives of the Research

Another important objective of the research was to test for the non-use value of the
site. This includes: existence value, option value and bequest value of the wetland.
However, we could also use the overall value derived from the CVM used here in
order to test for reliable answers that will be implied for the non-use value. Another
way to check for consistency is by running a regression on some explanatory
variables to see if the sign is reasonable and significant.
        The expected explanatory variables to be examined are: level of knowledge,
membership in a "green" organization, age, gender, and previous visits to the site,
family status, income and level of education. In each of the different non-use values,
the relationship between past site visits to the site and the willingness to pay was also
checked.

3.2 The Sample

        During the months, May to August 2002, 154 questionnaires to be filled out
individually were distributed. The questionnaires were distributed to each population
group. Each questionnaire was treated as an observation. Seven questionnaires were
disqualified because of   incorrect responses. The sample included 147 observations
in total.

3.3 Construction of the Willingness to Pay Curve

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The willingness to pay curve describes the relationship between the specific sum of money and the frequency with which people in the population are willing to pay this sum.

The process of deriving the willingness to pay curve in each of the categories was conducted as follows:

First, the observations were split up according to their explanation. Category one concentrated on all the observations from which it was possible to derive existence value; the second category concentrated on all the observations from which it was possible to derive option value; and so on for each of the values. The next stage was the totaling of the number of observations in each of the categories.

The next stage of work was the calculation of the number of people who were willing to pay a specific sum in each of the categories. The assumption at this stage of the work was that the number of people willing to pay a specific sum would also be willing to pay a lower sum but not a higher sum. Therefore, the lowest amount that the respondents in each category declared that they were willing to pay was considered as the sum that all of the respondents would be willing to pay. Those willing to pay the next sum in the sequence were thought of as the total number of respondents in the same category minus the number of respondents who were willing to pay the lowest amount, and so on. When the highest willingness to pay amount was reached, the number of respondents declaring the intention to pay this amount will be identical to the number of people willing to pay this amount.

The rate of willingness to pay a specific sum in each category was obtained by dividing the number of people willing to pay it by the total number of observations. Because the total rate of observations represents the whole population related to the sample, the value obtained gives an indication of the readiness to pay a specific sum in a specific category over the entire population.

3.4 Assessment of the Economic Values in each of the Categories

The economic value assessment for different categories is obtained by multiplying the average willingness to pay in each category by the value of the population from which the observations in the category were drawn.

The population value in each category was obtained as follows: First, the value of the total population to which the sample results were related was calculated. This value was assessed at 2,887,200 people. It was calculated as follows:

The population to which the sample results were attributed was composed of people aged 18 or over only.   The assumption was that this population was able to pay. The number of people able to pay was calculated by omitting the number of children (people under 18 years of age) from the total population of the country.

The payment was obtained from those thought of as a single economic unit. If people were unmarried, each individual was thought of as an economic unit. Married couples were thought of as a single economic unit and therefore they were treated as a single payment in the formula:

POP(cap.t.p)-POP(mar.ind)+POP(mar.cap) POP (ref) =
Where:
POP (ref) = number of people to whom the sample results are ascribed
POP (cap.t.p) = number of people able to pay
POP (mar.ind) = number of married people
POP (mar.cap) = number of married couples

The numerical data on each of the populations:

Israeli Population	Children under 18 years	Married Couples	Single Economic Unit
6,369,000	2,337,800	1,244,000	2,488,000

The data are taken from the Central Annual Statistical Account, 2001.

The next stage is the calculation of the population value attributed to the results of each category. The economic population value to which the sample results are attributed is the specific value related to the non-use value category. As previously mentioned, this category includes all the observations in the sample and the assumption is that the sample is representative of the entire population.

The calculation of the population value of the last category, was done as follows: Finding the number measure of observations in each category relative to the entire population (represented by the entire sample) by dividing the number of observations in each category by the total number of observations.

By multiplying the number rate of observations in each category by the economic population to obtain the population value attributed to the sample results for each category.

Determination of the average willingness to pay in each category was done by running a regression of the willingness to pay on all the variables that were expected to have explanatory power for the willingness to pay. Here, the willingness to pay was the dependent variable and all the other variables were the independent variables. Four types of regressions were estimated:

Linear Regression:

$$\text{W.T.P} = \beta_1 + \beta_2 \text{KNOW} + \beta_3 \text{GREEN} + \beta_4 \text{AGE} + \beta_5 \text{GEND} + \beta_6 \text{CHILD} + \beta_7 \text{INCOME} + \beta_8 \text{EDUC} + \beta_9 \text{VISIT}$$

Where VISIT was not run regarding use value.

The semi-logic type was obtained once by running a regression of the natural logarithm (ln) of the dependent variable on the independent variables and was called the semi-log (Y) and the second time by regressing the dependent variable on the natural logarithm of the independent variables. It was called semi-log (X).
In the log-log type of regression of the ln of the dependent variable on the ln of the independent variables.

From the initial regression obtained in each one of the different regression types, the variables that were not significant at the 10% level were removed gradually. Each time, the least significant variable was removed from the regression variables until the remaining regression contained only significant variables. This was the final regression.

With respect to each category, the best performing type was chosen, that is, the one that can produce the best willingness to pay. In this regression, the variables are ranked according to their average over the entire population. In this way, the average willingness to pay value for the whole population was obtained. In categories for which, no variables were significant, the average willingness to pay for the respondents was used as an estimate of the average willingness to pay of the population.

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The value obtained in the first clause was the average sum that the respondents declared that they were willingness to pay, once a year, each year over the coming ten years. The present value of the sum, at a 5% annual rate of interest was calculated as follows:

$$PV (w.t.p) = W.T.P (av.pop)/0.05 * [1- 1/1.05^{10}*0.05]$$

Where,
PV(w.t.p.) = the present value of the willingness to pay
W.T.P. (av.pop) = Average willingness to pay of the population
In order to obtain the different value assesses with each category for the year, PV (w.t.p.) obtained in each category multiplied by the general population for each category.

The different regressions run on the data also make it possible to achieve the second objective of the research. This is the checking of the relationship among the different expected explanatory variables and the willingness to pay or whether it is possible to produce with the help of the explanatory variables the willingness to pay.

4. Results.

Table 1 summarizes the main results for each category.

TABLE 1. Average Willingness to Pay and the Value Obtained in Each Category

Category	WTP (ave. per person)	PRESENT VALUE (10 years) of the average WTP per person per year	POP. VALUE CATEG.	PRESENT VALUE OF EACH CATEGORY PER YEAR	DUNAM VALUE OF LAND (per 1,000 dunams)	DUNAM LAND VALUE OF divided land (per 6,000 dunams)
Non-Use Value	36.5	14.01	2,887,200	40,449,672	40,449	6,741.61
Existence Value	31.33	12.09	2,297,975.5	27,782,524	27,782	4,630.42
Option Value	37.3	14.39	1,021,322	13,072,927	13,072	2,178.82
Bequest Value	33.2	12.8	726,710.2	9,301,891	9,301	1550.31
Use Value	59	22.7	707,069.4	16,050,475	16,050	2,675.079

5. Discussion of Results:

The correlation test done between the different variables in the regression shows that in terms of each of the categories, correlation between the different explanatory variables is very weak. This gives an indication that between the dependent variable and each of the independent variables, there will not be interference from the other variables in the regression.

The performance of the difference types of regression differs from category to category. That is to say, it's not possible to indicate a specific form of the regression that gives the best representation of the relationship between the different explanatory variables and the willingness to pay. In each category, a different regression form for the regression best satisfies this requirement. In terms of the category of use value, the performance of none of the forms of the regression is good. The following analysis relates to the final regressions in each category.

In each of the non-use value categories, each form of the different regressions succeeds in giving significant explanatory variables but not the final regression.

In the non-use value category, the type of regression that gives the best performance is the semi-log (X). The R^2 for this type of regression is higher than those obtained in this category and the number of significant variables is largest. Therefore, according to this regression, the average, population W.T.P. value is calculated.

In the existence value category, each type of regression performs well. The average W.T.P. value in the population was calculated according to the semi-log (X) regression, in spite of the identical number of significant variables in each of the regression. This regression has the highest R^2 and the highest significance levels for the significant variables.

In the option value category, the value of R^2 in each type of regression is identical and they are relatively high, compared to valuations obtained in other categories for this sample. As such, in each of the regressions, an identical number of explanatory variables were significant. The problem is that in the log-log , and the

linear regressions, the constants are not significant. Also, in this case, we related to the semi-log (X), as a model with the highest capacity to produce the results. We calculated, using it, the average, and population willingness to pay because the regressions are significant at the highest level and the constants are significant.

For the bequest value category, the log-log regression has the best performance. The variables have the highest level of significance; the constant is significant and the R^2 value is high relative to the other regressions for this category. This form of the regression was used to calculate the average, population W.T.P. value.

Each form of regression in each of the different models failed to point to the relationship between different variables and the willingness to pay for use value. The only variable that emerged as significant in the initial regression was income, although it stopped being significant when the less significant variables were removed from the regression. This is the reason that in this category, there is no final regression. That is to say, in this category, it is not possible to produce a regression with statistically significant variables. Therefore the average W.T.P. value is calculated according to the average value of the sample.

It's possible to see that among the non-use values of the site, existence value is the highest, followed by option value, with bequest value being the lowest. This is both logical and expected. In addition, it's possible to see that use value is smaller than non-use value by a factor of 2.5. This ratio corresponds to the relationship between two values found in other research works on this topic.

6. Summery:

This research was done in order to examine the ex-post benefits of a program that was not supposed to be a touristy attraction but actually came out as such. The paper shows that if compared to the commercial alternative, the preservation option is preferable. It slightly dominates it when only use values are taken into account and dominates it by a large margin when non-use values are added as well. It was shown that also in other countries such policy is beneficial (Alterman, 1997).

Controversies over the Use of CVM could also be tackled by papers as this one (see Kahneman and knetch, 1992). The use value derived from the CVM analysis was very similar to the actual use value derived from the TCM analysis. This points out about the reliability of the CVM approach in this case. However, reliability was found to be low when testing for significant of potential explanatory variables. Almost all variables besides income were found to be non significant.

Besides comparing alternatives, the results of such models can be of some help to decision makers when facing the problem of how to finance the operation and maintenance of the site itself. Raising the price to achieve maximum revenue or alternatively enough revenue to cover cost could be found from the use value demand function. Non-use value functions could be also of use in order to consider cost allocation between the users of the site and the government (tax payers). This however is left for future research.

Appendix 1

Region	Region's Population	Regional Visitors No. (survey)	Regional Visitors rate (survey)	Regional Visitors No.	Regional Visits rate
1	77542	161	0.210458	13679.74	0.176417
2	186431	117	0.152941	9941.176	0.053324
3	827210	135	0.176471	11470.59	0.013867
4	161500	26	0.033987	2209.15	0.013679
5	173600	26	0.033987	2209.15	0.012726
6	697600	85	0.111111	7222.222	0.010353
7	1657900	128	0.16732	10875.82	0.00656
8	1014800	56	0.073203	4758.17	0.004689
9	318800	17	0.022222	1444.444	0.004531
10	135000	7	0.00915	594.7712	0.004406
11	235500	7	0.00915	594.7712	0.002526
		765	1	65000	

Appendix 2

Additional cost	No. Visits
0	65,000
X	40,581
2X	33,021.62
3X	26,898.52
4X	17,147.73
5X	9,162.783
6X	6,280.759
7X	5,260.602
8X	3,261.87
9X	812.472
10X	195.838

Region	Average distance	Total Visitors No.	P (average in NIS)
1	12.5	65,000	30
2	37.5	40,581	90
3	62.5	33,021.62	150
4	87.5	26,898.52	210
5	112.5	17,147.73	270
6	137.5	9,162.783	330
7	162.5	6,280.759	390
8	187.5	5,260.602	450
9	212.5	3,261.87	510
10	237.5	812.472	570

11	262.5	195.838	630

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