

# Integration of Economic Valuation and Geographic Information System for Mapping and Optimizing the Tourism Objects Potential in Indonesia

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**Abstract.** Geographic Information System Mapping for tourism objects that performed in Rawa Pening Lake, Salatiga, and Kabupaten Semarang is based on a regional economic value. The economic value reflects the potential of local economic value of area that can provide economic value of tourism information. The method applied in the assessment of tourism object in Rawa Pening Lake is Travel Cost Method (TCM). This method is principally calculate the value of a natural resource recreation demand that has no market value using the travel costs. The function of Geographic Information System is for analyzing the attribute of spatial data which has been obtained by economic valuation using Travel Cost Method. Based on the result, the value of tourism object of Rawa Pening Lake is Rp 107 908 334 100. This value reflects an economic asset of the tourism object of Rawa Pening Lake. The result of this study is an integrated map which has two information, i.e., economic information and geographic information. From the economic side, the value that has been calculated can be as a solution for governments as the basic reference materials in spatial decision making for tourism object taxes, conservation costs and prevention costs. Meanwhile, from the geographic side, the map that has been made can be used as reference for government in the spatial public policy, especially to determine and monitoring the tourism objects potential. Those two benefits can be implied for tourism object potential in Indonesia due to the fact that Indonesia has a lot of potential of tourism objects that needed to be explored and developed, thus the monitoring process in the terms of tourism object management and development can be done optimally. If the implementation of economic valuation for tourism objects and mapping can be applied to all parts of the region in Indonesia properly and optimally, the author believe that the product of this study can provide significant benefits. This study's result can be used as a solution to the economic problems of tourism objects in various regions in Indonesia which has low public awareness and promotion.

**Keywords:** *Economic Valuation ; Geographic Information System (GIS); Rawa Pening Lake; Travel Cost Method (TCM)..*

## A. INTRODUCTION

A geographic information system (GIS) has many functions to visualize, question, analyze, and interpret data to understand relationships, patterns, and trends. GIS benefits organizations of all sizes and in almost every industry, there is a growing interest in and awareness of the economic and strategic value of GIS [3].

Economic valuation is an assessment of the economic benefits of goods and services performed by a person for a particular purpose [2].

Integration between economic valuation and geographic information system can produce a map which contains economic information and spatial information. This map is final product from this study that can be used as reference of Indonesian government in the term of monitoring and developing tourism objects potential in Indonesia. One of tourism objects in Indonesia that has potential in economic value but has a low public awareness and promotion is Rawa Pening Lake, located in Salatiga, Kabupaten Semarang. This object is made a study object in this case.

## B. ECONOMIC VALUATION

### 1. *Economic Value*

Economic value is one of many possible ways to define and measure value. Although other types of value are often important, economic values are useful to consider when making economic choices – choices that involve tradeoffs in allocating resources [6].

The method applied in the economic valuation of Rawa Pening Lake is Travel Cost Method (TCM). This method is principally calculate the value of a recreation object demand that has no market value using the travel costs [4], [5].

### 2. *Travel Cost Method*

Travel Cost Method is the oldest method for measuring the economic value indirectly. The method is derived from the idea that developed by Hotelling in 1931 then formally introduced by Wood and Trice (1958) and Clawson and Knetsch (1966) [1], [4].

Travel Cost Method (TCM) is one of the indirect assessment method to estimate the value of benefits in order of visits to recreation sites [8], [9], [10].

Travel Cost Method is used to obtain the data needed as basic data in calculating the economic value of the tourism object based on the travel expenses. There are several parameters needed in calculating the economic value, there are, transportation cost (TC), age of the visitors (AGE), level of visitors' education (EDU), visitors' income (INCO), frequency of visits (V), object options (OPT) and duration of visits (DUR) [4], [7].

$$V = \beta_0 * TC^{\beta_1} * AGE^{\beta_2} * EDU^{\beta_3} * INCO^{\beta_4} * DUR^{\beta_5} * OPT^{\beta_6} \quad (1)$$

**a. VARIABLES**

There are 7 variabls that used to calculate each parameters, they are:

- 1). Beta 0 = intercept regression coefficient
- 2). Beta 1 = TC regression coefficient
- 3). Beta 2 = AGE regression coefficient
- 4). Beta 3 = EDU regression coefficient
- 5). Beta 4 = INCO regression coefficient
- 6). Beta 5 = DUR regression coefficient
- 7). Beta 6 = OPT regression coefficient

A formula is defined to find the value of economic using frequency of visits (V) and calculate the V value using 7 variables, each of regression coefficient

$$V := \frac{7.671874989 EDU^{0.014685883} INCO^{0.868716198} DUR^{0.164470473}}{TC^{1.360267188} AGE^{-0.043923823} OPT^{0.795995342}}$$

$$DUVtotal := 1.079083341 10^{11} \quad (2)$$

Thus, it can be seen that the total of economic value of one object based on its function as a provider of travel services is Rp 107 908 334 100.

The method applied in the assessment of tourism object in Rawa Pening Lake is Travel Cost Method (TCM). This method is principally calculating the value of a natural resource recreation demand that has no market value using the travel costs [4]. Economic value mapping zone is able to provide information such as areas information, potential for tourism and regional economic value that can be used as input in the decision-making of economic policy, spatial (spatial economic) also can be used as a reference in public policy such as taxes, the cost of subsidies, conservation costs and prevention costs.

The method applied in this study is quantitative descriptive analysis method, which quantitative analysis is used to test the samples of data from questionnaire of the respondents to do a statistical test to determine the level of accuracy of the data that has been obtained. The method of analysis in this study using an approach of Travel Cost Method (TCM) or based on the travel cost expenses [4], [7], [8]. Collected data is processed to obtain the regression coefficients, then processed using Maple 14 software to calculate the direct economic value and the total economic value of the studied area by using the defined algorithms of Travel Cost Method. The results of appraisal or valuation area will be served as the basis for calculating the economic value of regions (tourism objects) [4], [7], [8].

**b. RESULT**

Table 1. Summary of Travel Cost Method Parameters.

No	Parameters	Variabls	Regression Coefficient
1		Beta 0	2.037561043
2	Travel Cost	Beta 1	-1.360267188
3	Age	Beta 2	-0.043923823
4	Education	Beta 3	0.014685883
5	Income	Beta 4	0.868716198
6	Duration	Beta 5	0.164470473
7	Option	Beta 6	-0.795995342

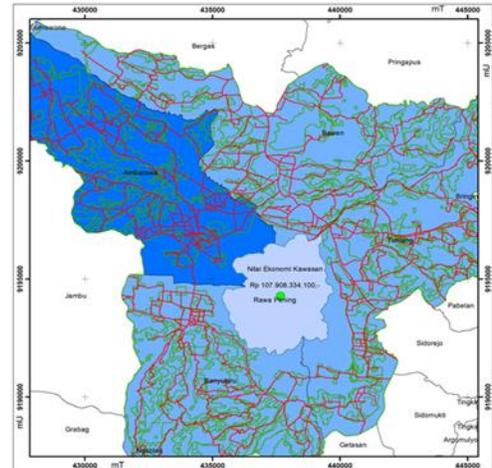


Fig. 1. The final map that contains spatial information and economic value of Rawa Pening Lake.

**C. GEOGRAPHIC INFORMATION SYSTEM (GIS)**

Geographic Information System is used for overlaying a spatial data. Spatial data which used in this study is Landsat TM 7 imagery.<sup>1</sup> The overlay analysis is one of the operating systems that integrate spatial data with attribute data that contains economic value. Overlay analysis is done by combining information from one layer another to obtain new information [3]. Overlaying which consisted of spatial data and economic value produced a map with new information of Rawa Pening Lake economic value and object's location (spatial information).

Geographic Information Systems Mapping for tourism objects that performed in Rawa Pening Lake, Salatiga, and Kabupaten Semarang is based on a regional economic value. This economic value reflects the potential of local economic value of area that can provide economic value of tourism information.

**D. CONCLUSION**

The result of this study is an integrated map which has two information, i.e., economic information and geographic information. From the economic side, the value that has been calculated can be as a solution for governments as the basic reference materials in spatial decision making for tourism object taxes, conservation costs and prevention costs [10]. Meanwhile, from the geographic side, the map that has been made can be

<sup>1</sup> Landsat TM 7 is a sensor of satellite for obtaining spatial data and produces an imagery

used as reference for government in the spatial public policy, especially to determine and monitoring the tourism objects potential. Those two benefits can be implied for tourism object potential in Indonesia due to the fact that Indonesia has a lot of potential of tourism objects that needed to be explored and developed, thus the monitoring process in terms of tourism object management and development can be done optimally.

If the implementation of economic value for tourism objects mapping can be applied to all parts of the region in Indonesia properly and optimally, the author believe that the product of this study can provide significant benefits. This study's result can be used as a solution to the economic problems of tourism objects in various regions in Indonesia which has low public awareness and promotion

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