Comparing Value of Urban Green Space Using Contingent Valuation and Travel Cost Methods

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Abstract. Green urban open space are an important element of the city. They gives multiple benefits for social life, human health, biodiversity, air quality, carbon sequestration, and water management. Travel Cost Method (TCM) and Contingent Valuation Method (CVM) are the most frequently used method in various studies that assess environmental good and services in monetary term for valuing urban green space. Both of those method are determined the value of urban green space through willingness to pay (WTP) for ecosystem benefit and collected data through direct interview and questionnaire. Findings of this study showed the weaknesses and strengths of both methods for valuing urban green space and provided factors influencing the probability of user's willingness to pay in each method.

1 Introduction

Urbanization causes urban population increase so demanding development in various aspects, especially the physical development of cities and infrastructure. Unfortunately, the city has limited land and space, so in the end urban green space that tends to dormant and has a low economic value become into alternative land development. Urban green space is a natural city resource and has an important role in maintaining the quality of urban environment. Urban green space may include urban forests, city parks, green fields (sports and golf fields), farmland, riverbanks, and un-built land [1]. Urban green space provides very diverse benefits. It can be used as a conservation land to preserve various types of flora and fauna. The urban green space that has enough vegetation can also balance the urban temperatures that tend to be high, absorb air and sound pollution, absorb carbon, reduce rainwater runoff, and prevent floods [2].

It also plays an important role for social life and urban communities, especially public spaces such as urban parks because they are able to provide access to all circles of society without distinction of age, gender, and occupation. Park city has been widely used by the community to gather and conduct socialization, it's also used by the community for various outdoor activities that can improve physical and mental health. For children, city parks are a space that gives them a chance to play safely [3]. It is also able to influence the price of houses and surrounding buildings [4]. In some cities of the world, the provision of urban green spaces is done as part of the city's regeneration plan because the increase in the value of houses and buildings will increase the

taxes earned. it also has the potential to attract tourists [5] and increase sales of local products.

Although urban green space has many benefits but it is difficult to get the economic value because most benefits are non use value, public goods, and do not have market prices. For example, city parks, city park users are never charged for accessing them, but that does not mean the city park has no economic value because if its existence is lost then there will be consequences or losses that require other costs. An assessment of the urban green space economic value has been widely used to compare the costs of provision and benefits gained in the scale of land use planning and management [6]. Most commonly used method to estimate economic value from urban green space are contingent valuation (CV) and travel cost method (TCM). Both of these methods basically measure the perceived benefits through the willingness to pay (WTP) by visitors and measure value of non-market good [7]. However, there are fundamental differences where TCM is only able to estimate the economic value of urban green space based on recreational benefits while the CV is able to estimate the overall economic value.

The purpose of this study was to compare the use of CV and TCM methods in estimating the economic value of urban green space. Weaknesses and strengths of both methods will be reviewed based on the results of previous studies. There are at least 30 national and international journals with economic value of urban green space including the value of urban forest, City Park, riverbanks, and agricultural land using CV and TCM method. This paper has the structure and framework as follows, section 2 provides the overview the use of CV and TCM methods in estimating the urban green space economic value. Section 3 provides

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comparison between CV and TCM and section 4 provides conclusions.

2. Contingent Valuation and Travel Cost Method Overview

2.1 Contingent Valuation Overview

The main concept of contingent valuation is to model individuals' responses in specific hypothetical situation. CV method is used to estimate the total economic value of various types of benefits or services produced by an ecosystem. The economic value is estimate through a question directly to the respondent who is a urban green space user about willingness to pay to provide a desired benefit or compensation of loss of a benefit. The WTP question modes have several variants such as dichotomous choice (DC), iterative open-ended bidding (OE) and payment cards. The receptor used in the CV is a user or resident around a location that has an age of 15-75 years or is in a productive age. This is because at that age, they already have income so as to provide real value of the WTP. Although CV may be used to estimate economic value based on use and non use benefits but CV is used more to estimate economic value related to non use benefits. This is why most of the research related to the economic value of urban green space using CV has object urban forest. However, the estimates of economic value obtained different from each other [8], in accordance with those proposed by other research hat estimates of economic value can be different from one to another due to differences in variables, time, and location [9]. Some research results on the economic value of green space also shows that the highest economic value of urban parks has the highest economic value compared with urban forest, agricultural land, riverbanks, or un-built land. This is because the estimated economic value of the urban green space depends on the number and type of its usefulness and the availability of substitute.

In addition to estimating the economic value, research conducted in general describes the motivation of respondents in providing the value of WTP. The motivation of respondents becomes something very interesting to discuss because the benefits of urban green space are public goods whereby anyone can access and without pay or the cost of management is charged to the government. Even from some sample research found not a few respondents who are not willing to pay for the benefits they feel or commonly called "protest" responses [10]. Based on the set of various studies and journals some of the most common motivations are (1) the respondents consider that urban green space will make the urban environment better; (2) as an inheritance for future generations; and (3) to protect and conserve resources especially in urban areas. The magnitude of the WTP given by respondents is also related to the socio-economic characteristics of the respondents. The results of 8 out of 10 studies show that income is the main factor affecting the value of one's WTP. Furthermore, the level of education and number of visits

also have a positive effect on the value of the WTP. Other findings on some studies that involve not only visitors but also local residents are value for WTP influenced by visitor and residence status, residents will be willing to pay more for surrounding urban green space compared to visitors, as they can feel the impact directly related to prices of houses and buildings.

Although the use of CV techniques tends to be easier and more flexible to use but there are some weaknesses that have the potential to cause consistent errors in estimating a value or called "bias". Some of them are:

1. CV rely on the hypothesis and assumptions of the respondents so that the value of WTP does not have a direct impact on the respondent, it is not uncommon to cause excessive assessment by the respondents
2. CV only estimates value based on compensation and profit equivalent to benefits obtained but can not estimate value identically or specifically
3. The implementation of the CV is often constrained by the problems of the survey design and the given questionnaire, this may affect the value of the WTP
4. Unresponsive responders' responses such as refusing to pay or providing less than average WTP value due to lack of understanding of indirect benefits of urban green space such as rainwater absorber and flood prevention
5. Urban green space has a very difficult number of visitors to determine because of the unavailability of data on the number of visitors, this causes the samples used do not represent actual populations especially during certain seasons or vacation times.

2.2 Travel Cost Method Overview

The travel cost method is used to estimate the value of ecosystem use or the location used for recreation. The estimated cost or value is related to:

- Changes in access fees for a recreational location
- Removal of the existence of a recreational location
- Addition of a new recreation site
- Changes in environmental quality at a recreational location [11].

The basic assumption of the travel cost method is that the travel time and expenses people spend traveling to a location present a "price" for accessing a location [12]. Thus the willingness to pay when visiting the site can be estimated based on the number of trips with different travel expenses. The use of TCM methods to estimate the economic value of green open space is widely used in urban forests and urban parks, as TCM is only able to estimate the economic value based on the benefits of recreation. In TCM there are two approaches, namely zonal travel cost method and individual travel cost method. ZTM estimates the economic value by gathering information about the number of visits at a site from several different locations that have been grouped previously, while ITCM estimates the economic value of recreation based on the individual cost of travel approach [13]. In some studies TCM requires data on the number of annual visitors to estimate the number of requests and the economic value generated during the year. This led

to most of the research being undertaken starting with pilot survey activities and using secondary data on the number of visitors [14].

Estimation of economic value using TCM is usually followed by an analysis of access or road network, modes of transportation, frequency of visits and socio-economic conditions of its respondents. Some things that have a positive relationship with the value of WTP is the type of activity, mode of transportation, and income. This is because the three factors are very determine the cost of travel responder. Some of the obstacles seen in estimating the economic value of green open space through TCM are:

1. One of the requirements of TCM is that the respondent must have 1 travel destination (not multiple trips), this can minimize the number of samples because many visitors encounter more than one travel destination [15].
2. Most research difficulties in estimating the value or cost of time sacrificed to visit a site, so that the use of time is negligible [16].
3. The use of TCM in urban areas has many limitations, this is related to the number of replacement locations, various types of transportation, and the relatively close distance, resulting in very low travel costs [17].
4. Specifically on ZTCM the use of zip codes and zone determination usually ignores road routes and uses only linear lines, it also has the potential to cause error measurement [18].

3. Comparation of CV and TCM

CV and TCM is a method to estimate economic value based on ecosystem benefits obtained by willingness to pay (WTP). However there are several fundamental differences between TCM and CV studies. A first difference is that CV analyzes stated behaviour and preferences in hypothetical situations, while TCM studies analyze actual behavior and preference based on what they purchase. Secondly, CV can estimate value for both use and non-use value as a whole, but TCM can only estimate use value for recreational benefits, so when compared to CV application will be more flexible and easy compared to TCM. In addition there are also some differences in the results of economic value obtained. In some studies that have one object and analyzed through both these methods show the economic value through CV method has a lower value than TCM. This is because the value by using CV is obtained based on the assumption of respondents who have no consequences on what they get while the TCM value is obtained based on real market price. In addition there is a tendency that residents will provide higher WTP values in CV compared to visitors because of the benefits they feel directly, but instead with TCM, the residents will provide a zero value because they do not incur transportation and time costs to access that place. In general, the use of both methods is also followed by an analysis of the related socio-economic factors of respondents, and most of them, whether the value of

WTP generated from CV or TCM has a positive relationship to income, number of visits, and facilities at a particular location. This positive relationship means that people with higher incomes will have the opportunity to visit a location more often, especially those with tourist attraction. While urban green space with various types of supporting facilities will attract more visitors (19).

4. Conclusion

CV and TCM are the most commonly used methods in various studies to estimate the economic value of urban green spaces. Each method has certain weaknesses and strengths in estimating economic value. For example, CV can be estimate economic value for both use and non-use, where TCM is only able to estimate the value of use value on recreational benefits. Several studies on CV and TCM also analyzed the relationship between the WTP value provided by the respondent and the socio-economic condition. The result is the factor of income, the type of facility, and the number of visits is the most common factor.

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