Economic value analysis of the use of springs for household consumption needs

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Abstract. Water is a natural resource that is very important for human survival. Not only does it provide biological benefits, but water also affects social, economic, cultural, political and national security aspects. The excessive use of water resources management that is not wise can threaten the sustainability of water sources. This study aims to estimate the economic value of the use of springs in Popalia Village, Wakatobi, Indonesia. Types of data are primary data obtained from the water user community, and secondary data obtained from the Popalia Village office. The method used is the Willingness To Pay (WTP) approach with the Contingent Valuation Method (CVM) analysis method. The results showed that the average value of Willingness To Pay (WTP) was IDR 5,969.32 per month and the total value of Willingness To Pay (WTP) is IDR 1,724,961.54 per month. The economic value of springs in Popalia Village in one year is IDR 37,584,482.28. The government is expected to be able to apply payment for environmental services to water use and design water source management so that it can be sustainable and sustainable.

1. Introduction
Air resources are the air and the potential contained in the air, air sources, including facilities and infrastructure as well as irrigation that can be utilized, but not including animal wealth, which is included. Water is a natural resource that is very important for human survival. Dependence on air provides not only biological benefits, but also involves social, economic, cultural, political, and national security aspects related to welfare.

Water resources are strategic resources because they involve the lives of many people. Based on the 1945 Constitution of the Republic of Indonesia (the 1945 Constitution) Article 33 Paragraph 3, which reads "Earth and Water and all-natural resources contained therein are controlled by the State and used following the budget for the prosperity of the people. Law number 7 of 2004 concerning water resources article 3, agreed that "Water resources are used in full, integrated and environmentally sound to realize the benefits of water resources managed for the greatest prosperity of the country [1]. Indirectly this indicates that every Indonesian citizen has the right to use existing water resources with the source of sustainability of the air resources.
Water is one of the natural resources that provide value that is vital to human life. The contribution of water to development has begun since the beginning of human civilization, where all sources of human civilization began not far from air sources such as rivers, springs, and lakes [2]. This, of course, signifies the development of human civilization can not be separated from the role and contribution of air.

Indonesia, as a tropical country, can be categorized as a country that has abundant water resources. Even so, the problem of the clean water crisis is still common. For example, the dry season compilation will decrease air resources, while in the rainy season it will probably be abundant in terms of quantity, but in terms of air quality will increase. Therefore, it fits for the use of air resources to be managed with the assistance that is oriented towards sustainable development [3].

The community of Popalia Village has long used springs as the main supplier of clean water needs. In addition to the inaccessibility of the Regional Drinking Water Company (PDAM), the strategic location of Popalia Village under the foot of the mountain causes the availability of abundant water resources so that it can be utilized. The use of springs in Popalia Village has been carried out since 2012 when the management of a water drainage system in the form of a reservoir that was accompanied by pipes for drainage facilities for residents by using self-help funds from community members was carried out. Along with the increasing number of population and increasing water needs, then in 2014, another five reservoirs were built along with pipelines at the new spring source by the Wakatobi District Public Works Agency to meet the needs of clean water for Popalia villagers. Now there are 1,791 people out of 321 households who use spring water for clean water needs of households that use drinking, cooking, bathing, washing and latrines (MCK). The Popalia Village community uses two sources of water to meet the needs of clean water as a public good that can be obtained free of charge. Utilization without the use of water costs has the potential for inefficiencies.

Viewed from an economic perspective, the abuse of the use of shared resources arises because there is no self-arising balance mechanism that can limit exploitation [4]. These shared resources (e.g., water, air and land) are free (free) so that the real scarcity is not reflected in the costs for each utilization. Water resources as environmental services have limitations in terms of quantity and quality. Excessive use and poor management of water resources will eventually make water a rare item. The threat of water scarcity in Popalia Village should change the view of the local community that water is no longer a cheap item but an item that has an intrinsic value based on the assumption of limitations and scarcity. Therefore a quantitative assessment of the economic value of water is needed to provide awareness about the importance of preserving water resources based on the background above. The title to be raised in this study is "Economic Value Analysis of the Use of Springs for Household Consumption Needs in Popalia Village, Binongko Subdistrict, Wakatobi Regency. Based on the above explanation, the problem formulation in this study is How much economic value is the use of springs for household needs in Popalia Village?

2. Methods
This research was conducted in Popalia Village, Binongko District, Wakatobi Regency. The object of research is the community that uses water from the Popalia Village spring that is used for household water needs. The population in this study was 321 households using water from springs in Popalia Village. The research sample is the head of the family or the person who plays a role in the household who can provide the required information. Determination of the number of samples in the study using incidental sampling method (by chance) amounted to 30 respondents or 10% of the total population of 321 families. Determination of the number of respondents was determined to refer to Walpole (1997) in Sudin (2014) which states that the number of 30 respondents can already represent the population because if the sample size is greater or equal to 30 respondents, the sample withdrawal can guarantee results that can represent the population. Also, the aspect of population diversity in this study is possible to take a sample of 10% because the water user community in Popalia Village is homogeneous. In this study, the data collection used was a direct interview technique using a prepared questionnaire. Questionnaires are addressed to household water users. The interview was conducted to get information directly from the community who use spring water in Popalia Village as a respondent [5].

3. Results and Discussion
The title to be raised in this study is "Economic Value Analysis of the Use of Springs for Household Consumption Needs in Popalia Village, Binongko Subdistrict, Wakatobi Regency. Based on the above explanation, the problem formulation in this study is How much economic value is the use of springs for household needs in Popalia Village?"
The data obtained will be analyzed, statistically quantitatively. Data processing and analysis is done manually and uses a computer with Microsoft Office Excel 2007. The analytical method used is quantitative analysis through the Contingent Valuation Method (CVM). CVM Analysis is a survey technique to ask someone about their willingness to pay (willingness to pay / WTP) or give value to an environmental service. There are several stages in determining CVM, namely:

1. Making Market Hypotheses. The market hypotheses in this study are: The people of Popalia Village are people who use springs to meet their daily clean water needs. At present, the springs in Popalia Village are still able to provide adequate water supply for its users. However, several factors can threaten the availability of water supplies in the future. As we all know that the springs in Popalia Village are included. This research was conducted in Popalia Village, Binongko District, Wakatobi Regency. The object of research is the community that uses water from the Popalia Village spring that is used for household water needs.

2. Into the category of groundwater which in the event of damage will take a long time to be recovered. Continuous use of the less prudent and the absence of a special management system for water sources, as well as the absence of payments imposed on the use of water, causes a very low appreciation for water which even leads to waste. This is if it is left unchecked continuously, there may be a shortage of water supplies in the future. Regarding the issue, for the sake of the sustainability of spring water, community contributions are needed in the effort to procure conservation funds and operational funds for maintaining spring resources. Suppose that you, as a user of a local water source, must pay for the preservation of the water source.

3. Obtaining a Bid for the WTP Value (Obtaining Bids). After the questionnaire was completed, sampling was carried out. At this stage, interviews are conducted directly to the respondent. The bidding technique used is the open-ended question method. This method is done by directly asking the respondent what is the maximum number of their PAPs without the suggested initial value.

4. Estimating the WTP Average Value (Calculation Average WTP). The estimated average value of respondents WTP obtained by the formula:

\[ EWTP = Wi \cdot Pfin \]  

Where:
- \( EWTP \) = estimated average value of WTP (IDR)
- \( Wi \) = WTP in class 1
- \( Pfi \) = relative frequency of class 1
- \( n \) = Amount of data i = class \( (1, 2, ..., n) \)

Estimating the WTP Demand Curve (Estimating Bid Curve). To estimate the demand curve in this study is to use the cumulative number of individuals who answer a WTP value. This method assumes that households that are willing to pay a certain WTP value will also be willing to pay at a smaller WTP value.

5. Adding Data (Aggregating Data)

Adding or aggregating data is a process when the average bid is converted to the total population in question. The formula:

\[ TWTP = WTPi \cdot ni \cdot 1 \cdot n \cdot P \]  

Where:
- \( TWTP \) = Total WTP
- \( WTPi \) = i. Individual sample PAP
- \( ni \) = Amount of sample i who is willing to pay as much as WTP
- \( n \) = Number of samples
- \( P \) = Total Population
- \( i \) = The second respondent who is willing to pay for environmental services
To further clarify the real definition of variables in the scope of the study, the operational definition of variables is needed as follows: Economic Value: in this study what is meant by economic value is the calculation of the monetary value of the springs by looking at the willingness to pay the community for water use services in Popalia Village Mata Mata Air: in this study what is meant by the source of the spring is the source of the spring that is distributed to the houses of the people who are used to fulfill the clean water of the household. Community Water Users: in this study, what is meant by the community of water users is the people who use the Popalia Village spring for household needs. WTP: in this study WTP (Willingness to Pay) is the willingness to pay the community for the use of springs in Popalia Village.

3. Results and discussion

In this study using the Contingent Valuation Methods (CVM) approach. The CVM approach was used to analyze respondents' Willingness to Pay (WTP) and obtain economic value from the use of eye resources in Popalia Village. The steps of the implementation in the CVM method are as follows:

1. Making Market Hypotheses. The market hypotheses in this study are: The people of Popalia Village are people who use springs to meet their daily clean water needs. At present, the springs in Popalia Village are still able to provide adequate water supply for its users. However, several factors can threaten the availability of water supplies in the future. As we all know, the springs in Popalia Village fall into the category of groundwater, which in the event of damage will take a long time to recover. Continuous use of the less prudent and the absence of a special management system for water sources, as well as the absence of payments imposed on the use of water, causes a very low appreciation for water which even leads to waste. This is if it is left unchecked continuously, there may be a shortage of water supplies in the future. Regarding the issue, for the sake of the sustainability of spring water, community contributions are needed in the effort to procure conservation funds and operational funds for maintaining spring resources. Suppose that you, as a user of a local water source, must pay for the water supply efforts.

2. Obtain the Offer for the Value of WTP. This research was conducted by interviewing respondents directly. The bidding technique used is the open-ended question method. This method is done by asking the respondent directly how much is the maximum amount of money he wants to pay to get the WTP value. Based on the results of the offer, the WTP value is obtained, starting from the lowest WTP of IDR 300 KK/month to the highest WTP of IDR 16,600 KK/month

3. Estimating the average value of WTP (Willingness to Pay). Estimates of respondents’ average WTP (EWTP) values are calculated based on the data of respondents’ WTP distribution. WTP classes are obtained from determining the smallest value before the largest value of the PAP offered by the respondent.

| Table 1. Distribution of Willingness to Pay (WTP) respondents in Popalia Village |
|------------------------------------------------|
| No | Category Of WTP (IDR/KK/Month) | Frequency (KK) | Frequency relative (Pfi) % | Amount (IDR/ Month) |
|----|---------------------------------|----------------|--------------------------|-------------------|
| 1  | 3,200                           | 3              | 0.21                     | 311.54            |
| 2  | 3,400                           | 2              | 0.02                     | 99.21             |
| 3  | 4,100                           | 3              | 0.03                     | 310.91            |
| 4  | 6,310                           | 11             | 0.34                     | 2307.69           |
| 5  | 8,200                           | 3              | 0.12                     | 436.41            |
| 6  | 12,040                          | 2              | 0.18                     | 1251.78           |
| 7  | 16,600                          | 2              | 0.1                      | 1251.78           |
|    | **Total**                       | **26**         | **1**                    | **5,969.32**      |
Based on the table above, the average WTP (EWTP) value of IDR. 5,969.32. This value is a picture of the desire to pay the community for the use of springs. This means that the respondents consider that the price of water resources in Popalia Village is IDR. 5,969.32 per month.

4. Estimating a Willingness To Pay Curve (WTP). The respondent's WTP curve is based on the respondent's WTP value to the number of respondents who chose the WTP value. Below describes the WTP demand curve for payments for environmental services.

![WTP Request Curve](image)

Figure 1. WTP Request Curve

Based on Figure 4.2 it can be seen that the higher the value of the PAP, the fewer the number of people willing to pay. This means that respondents are willing to pay at the lowest WTP value level. This curve assumes that individuals who are willing to pay a certain WTP value will also be willing to pay on a smaller WTP value.

5. Add Data Willingness to Pay (WTP). The total value of WTP or called TWTP is calculated based on WTP distribution data using formula 3.2. The total results of PAPs can be seen in the following table.

### Table 2. Total respondent PAPs regarding payment of environmental services in Popalia Village

| No | WTP (IDR/KK/ Month) | Frequency (KK) | Popular | Amount Total (IDR/ Month) |
|----|---------------------|---------------|---------|---------------------------|
| 1  | 3,200               | 3             | 45      | 1,045,112.24              |
| 2  | 3,400               | 2             | 39      | 88,652.14                 |
| 3  | 4,100               | 3             | 21      | 51,673.12                 |
| 4  | 6,310               | 11            | 141     | 892,171.81                |
| 5  | 8,200               | 3             | 19      | 180,341.16                |
| 6  | 12,040              | 2             | 41      | 431,299.41                |
| 7  | 16,600              | 2             | 15      | 442,790.31                |
|    | **Total**           | **26**        | **21**  | **3,132,040.19**          |
Based on the calculation results, the total WTP value of the total participation is IDR 3,132,040.19 per month. The total WTP is the result of the average value of respondents' PAPs multiplied by the number of contributions. Based on these values, the potential economic value of the air source in Popalia Village can be calculated in one year, namely 12 x 3,132,040.19, amounting to IDR 37,584,482.28.

Economic value is an effort to provide quantitative value to goods and services produced by Natural Resources and the Environment, both the market value (market value) and non-market value (nonmarket value). Resource economic valuation is a tool that uses certain techniques to estimate the value of money from goods and services produced by natural resources and the environment that is effective and efficient. This causes the application of economic valuation to choose the relationship between natural resource expansion and economic development. Therefore, economic assessments can be used to increase public awareness of the use and management of natural and environmental resources.

Based on the research background, the study wanted to find out about the economic value of springs in Popalia Village. So based on the results of the study using the CVM analysis method to determine the economic value of water in Popalia Village, the total WTP (TWTP) value of the community is IDR 3,132,040.19 per month. TWTP is the result of the average value of respondents' PAPs multiplied by the number of contributions. Based on this value, the economic value of the eye source in Popalia Village can be calculated in one year of IDR 37,584,482.28. The estimation of the economic value of the Popalia Village eye resource can be used as a consideration for the community to use wise water and try to avoid losing their economic value. Also, this value can be taken into consideration by the government to manage and protect water sources in Popalia Village from continuing.

The estimation of the average WTP (EWTP) is IDR 5,969.32 per month. This value is a picture of the desire to pay the community for the use of springs. The magnitude of the average WTP value at that level is thought to influence the policies of neighboring villages, wherein Rukuwa Village there has been a tariff of IDR 4,900 per month. Therefore, this value can be a consideration for the government of Popalia Village to determine the amount of tariff that must be paid by the community if the management and protection of springs are carried out. The rate that can be taken is based on the average WTP value if rounded up is IDR 6,000 per month. This value is certainly smaller than the costs that must be incurred by each household in the event of damage or loss of function from springs. Based on the results of previous studies which generally show that an environmental service has a considerable economic value. The study by Anggraeni (2015) who tried to estimate the economic value of Cihideung Udik spring water protection where it was known that the desire to pay the community for the protection of spring water was IDR 13,063.6 / household / month. The economic value of the protection of the Cihedeung Udik spring is IDR 16,185,886 per year [6].

The results of the study indicate that there is conformity with previous research, the results indicate the existence of the economic value of environmental service. Even though the monthly WTP value is smaller, the economic value of the springs in this study is slightly greater than the economic value of the previous study which has a greater monthly WTP. This is due to differences in population numbers in the use of water sources. The population in this study is more so that with a lower WTP monthly, it can produce greater economic value.

4. Conclusion
Based on the results of analysis and discussion on the analysis of the economic value of the use of springs for household needs in Popalia Village, Binongko District, Wakatobi Regency. It can be concluded that the use of CVM (Continent Valuation Method) analysis method produces an average value of WTP (Willingness To Pay) of IDR 5,969.32 per month for each family head (KK), this value is an illustration of the desire of the community to pay for the utilization of the Popalia Village spring. The total value of the PAPs is IDR 3,132,040.19 per month so that the potential economic value of springs in Popalia Village in one year is IDR 37,584,482.28.
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