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Contingent Valuation and Mosaic Display Analysis: How Role Circular Economy for Kiosk Seller? Evidence: Borobudur Temple Area, Indonesia

Ainina Ratnadewati[1], Evi Gravitiani[1*], Nur Widiastuti[2], Ika Alicia Sasanti[1]

[1] Magister of Economic and Study Development, Universitas Sebelas Maret, Jawa Tengah 57126, Indonesia
[2] STIE Widya Wiwaha, Kota Yogyakarta 55162, Indonesia

Corresponding Author Email: evigravitiani_fe@staff.uns.ac.id

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ABSTRACT

Increasing the number of visitors is becoming a business opportunity for local sellers in the area of heritage tourism. However, the surge in tourists and local sellers has led to a rise in waste production. The adoption of a circular economy by these local sellers could effectively address these adverse consequences. This study aims to determine the average value and factors that influence willingness to pay (WTP) local sellers for waste retribution in the Borobudur Temple area to implement a circular economy. Data was collected through interviews and observations with 117 local sellers and then analyzed using the contingent valuation method (CVM) and mosaic display orange data mining. The result obtained in this study is that the value of environmental awareness calculated through WTP of waste retribution is IDR 13.500 (USD 0.86), greater than the cost of regional retribution regulated in regional regulations, which is IDR 10.000 (USD 0.64). The amount is influenced by age, length of education, income, and knowledge of circular economy implementation.

1. INTRODUCTION

The global waste issue remains unresolved and can become increasingly worrying due to uncontrolled growth in the amount of waste [1]. According to a report titled What a Waste 2.0 by the World Bank, each year, the world produces around 2.01 billion tons of solid urban waste [2]. Unfortunately, about 33% of the waste is not managed properly and it has a negative impact on the environment. In the same report, the World Bank also projects that the amount of global waste will increase by 70% by 2050, reaching 3.40 billion tons per year [3, 4]. This is fueled by rapid urbanization, population growth, and rapid economic development [5].

One of the challenges faced by many countries in facing the global waste problem is the financing of waste management systems. Especially in low-income countries, the operational costs of sustainable waste management are a serious problem. In high-income countries, operational costs, including collection, transportation, processing, and disposal, generally reach more than $100 per ton [6]. This is in stark contrast to low-income countries that only allocate about $35 per ton to operational waste handling costs. Waste collection and management facilities are an important part of the infrastructure that must be in place to address the global waste problem. If this infrastructure is inadequate, then waste handling will not run optimally. In addition, the lack of infrastructure also has the potential to cause social problems, threats to health, and environmental damage [7].

The pros and cons of linear economic modelling have been widely responded to by some researchers and are considered no longer effective and efficient [1-3]. The linear economic model is considered incapable of managing available resources on Earth. Apart from using resources more efficiently, the solution to this problem is designing inclusive and sustainable economic growth and minimizing the waste of resources. The circular economy (CE) model is a reparative and regenerative method for maximizing future progress to ensure that products, components, and resources sustainably retain their use and value.

CE is an extension of the linear economy, which aims to extend the life cycle of products, raw materials, and resources so they can be used as long as possible [2, 3]. CE implementation is carried out as a waste management effort. The waste generated originates from various sectors, one of which is the tourism sector. Indonesia has multiple international-scale tourism sectors, including the Borobudur Temple. Borobudur Temple was named a world heritage by the United Nations Educational, Scientific and Cultural Organization (UNESCO) on December 13, 1991, and designated as a super-priority tourist destination by the Government of the Republic of Indonesia [8]. The impact of the crowning of Borobudur Temple as a world heritage has caused the temple to become increasingly recognized by local and foreign communities, increasing the number of visitors [7, 9].

The number of visitors to Borobudur Temple increases yearly, as shown in Figure 1. Increasing the number of visitors in the Borobudur Temple area is one of the benefits for the people who live around Borobudur Temple. People who live around the Borobudur Temple area take advantage of these

benefits by selling souvenirs, providing lodging services, and renting out vehicles. The number of sellers in 2019 was 3,459; as many as 117 were kiosk sellers in Borobudur. A total of 117 kiosk sellers are residents around the Borobudur Temple area, as seen in Figure 2 [10].

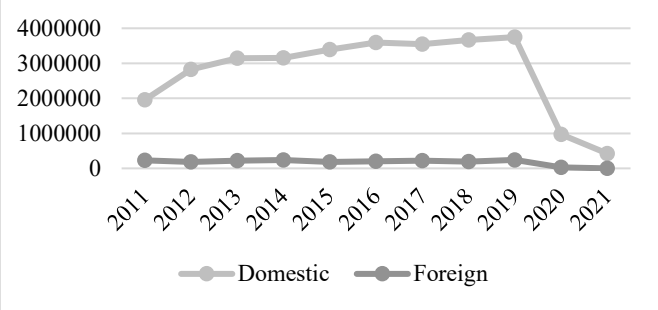

Figure 1. Number of visitors to Borobudur Temple in 2011 – 2021

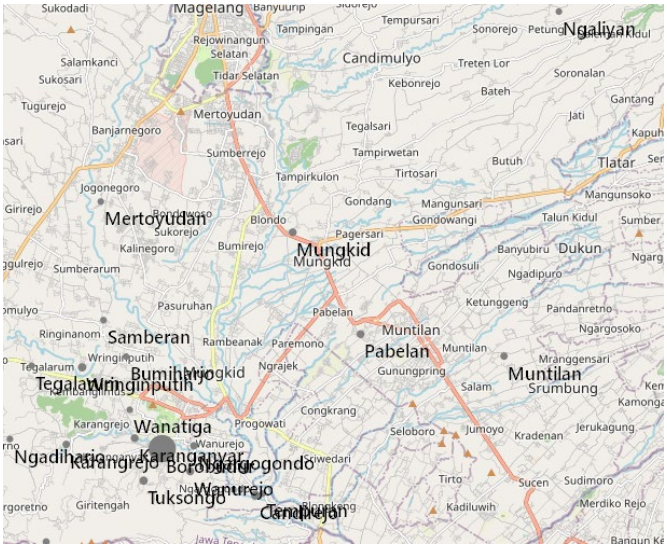

Figure 2. Distribution of locations kiosk seller's origin

The number of visitors and local sellers has a side effect on environmental conditions in the Borobudur Temple area. The side effect is the waste generated by local sellers. The generation of waste is a form of negative externality [11, 12]. The waste produced in the area comes from local sellers and visitors, with the majority of waste coming from local sellers. Based on the data, the amount of waste is predicted to reach 12 to 24 tons every week. The amount is calculated based on the fact that every day, two waste transport trucks transport the waste. Each truck is able to transport 12 tons of waste so that in one day, the waste transported reaches 12-24 tons of waste. There are several types of waste produced, namely organic waste, plastic, cans, and others (Figure 3).

The majority of waste produced by local sellers is organic waste. In one week, they can make 300 kg of waste dominated by waste in the form of young coconut shells and food scraps. The waste, in addition to polluting the environment, also takes up a lot of space. This makes the conditions around the waste dirty and seems shabby. Other waste produced is plastic waste and used beverage cans. Visitors have less of a role in donating trash on-site; the trash they bring is, on average, not much, but some of them are still found not to dispose of waste in its place [13]. This condition is exacerbated by stagnant water, which causes pollution through an unpleasant odour. Several factors cause this: the lack of trash bins at the location of the local sellers, the lack of education regarding waste management of the local sellers, and the absence of a place to manage the waste generated by the stall vendors at that location. This can be overcome by implementing a circular economy.

CE is one of the implementations of handling efforts by utilizing waste generated by sellers. CE activities focus on 5R: Reduce, Reuse, Recycle, Refurbish, Renewal. The action areas in CE for the seller sector cover six areas: design, procurement, production, distribution, use or consumption, and recovery [3, 9, 10], as shown in Figure 4. Efforts to utilize waste can be carried out by the Borobudur Temple area manager and by getting support from kiosk sellers in the area.

CE sector that can be applied to local sellers in the Borobudur Temple area is the recovery sector in the form of reuse, namely the reuse of goods or materials that can still be used and recycled. The processing of goods and materials can still be reprocessed. The recovery sector was chosen because of adjustments to the seller sector at the Borobudur Temple area, namely the small sellers, retail, and food industries. Recycling efforts can be done by processing coconut shells into charcoal or briquettes using pyrolysis technology, as shown in Figure 5. However, the processing is still in the initiation stage of the management of the Borobudur Temple area.

On the other hand, the recycling effort that has been carried out is the processing of organic food waste into compost, the results of which have begun to be distributed and sold to the community, as shown in Figure 6, for the utilization of inorganic waste such as plastic waste, namely through processing efforts using the eco brick method. Ecobricks are plastic bottle containers that have been filled with plastic waste that has gone through a previous cleaning and drying process [14-16]. The ultimate goal is not to destroy plastic waste but rather to extend its lifespan and turn it into useful objects that humans can reuse.

CE is one application of the concept of economic valuation. Economic valuation is a tool that is often used to determine the environmental impact of human activities by providing the value of economic services [17-20]. This application can be used as an understanding for sellers and policymakers so they can utilize and manage waste in the Borobudur Temple area. Efforts to utilize waste require an economic instrument in the form of a willingness to pay (WTP) for waste retribution based on the cost of implementing a circular economy in the Borobudur Temple area. CE of WTP is part of an economic valuation that will provide a quantitative value of goods and services produced by the environment based on market and nonmarket values [11, 12, 21].

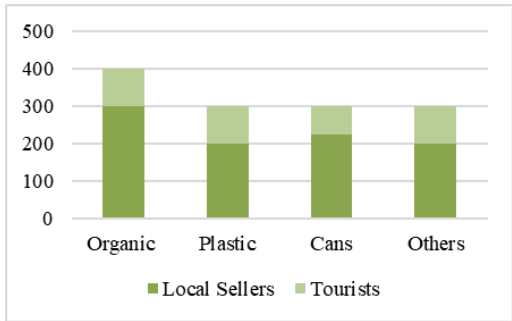

Figure 3. The amount of waste by type and source at Borobudur Temple in 2022

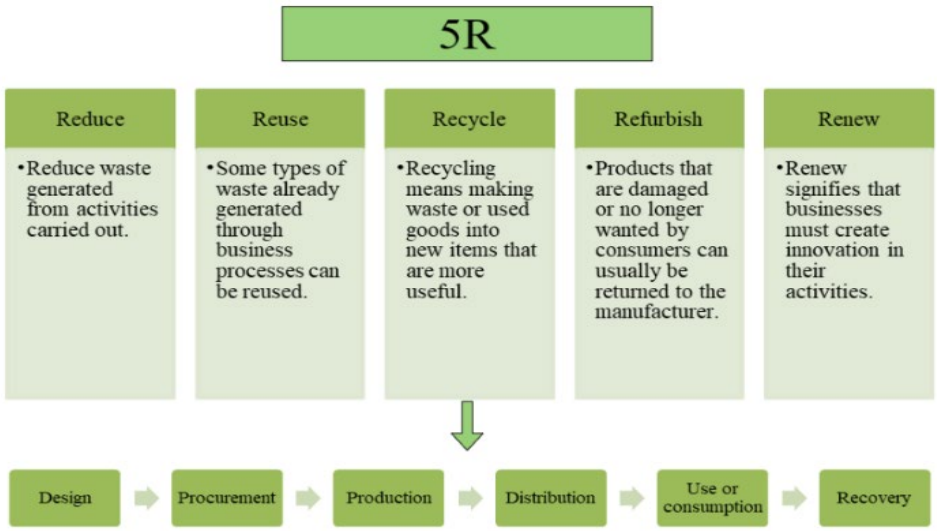

Figure 4. 5R program for CE

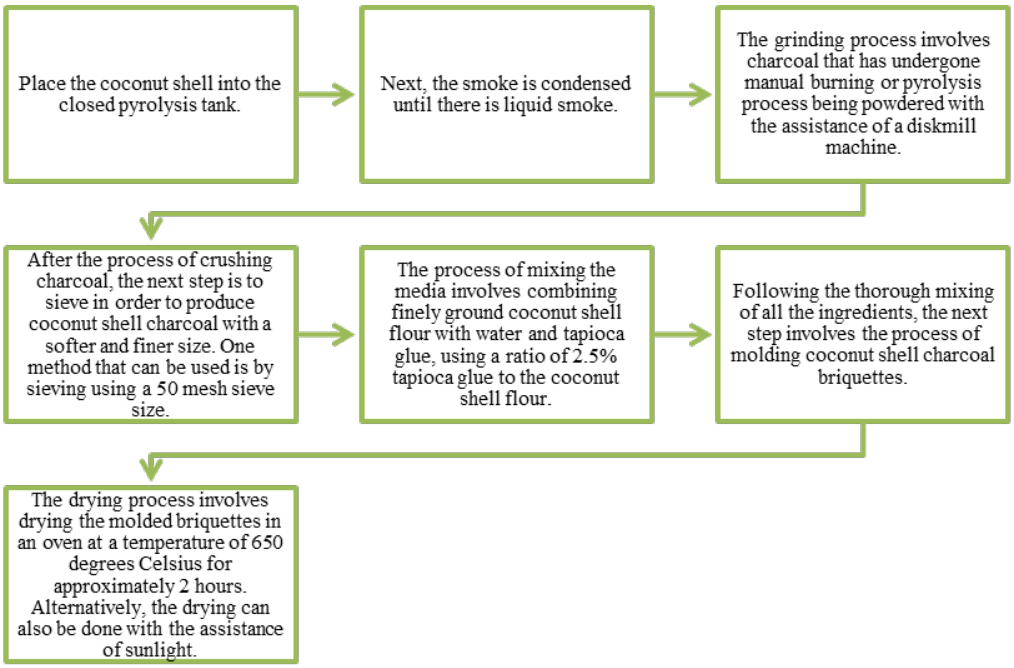

Figure 5. The process of making charcoal from coconut shells using pyrolysis method

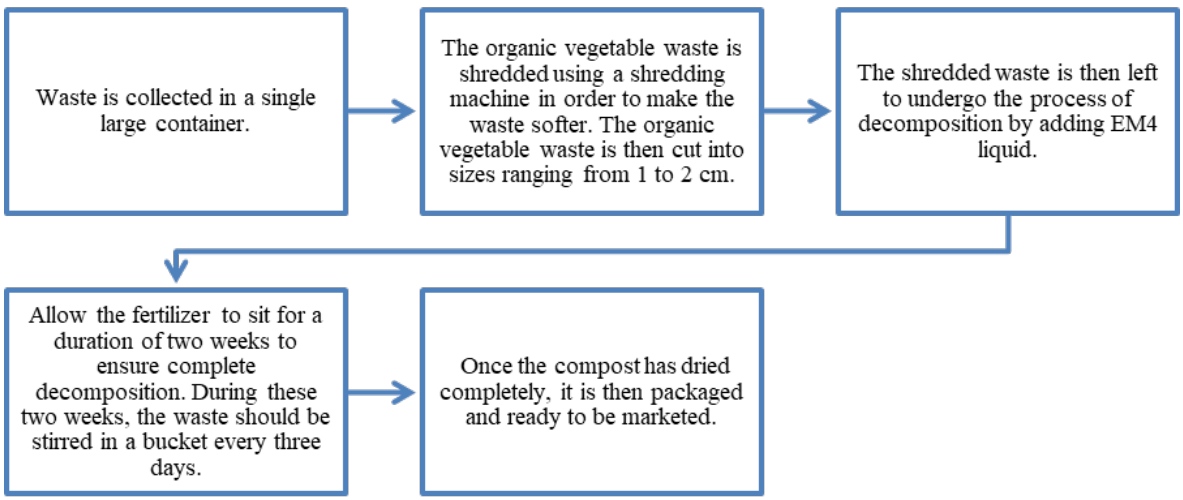

Figure 6. The process of processing organic waste into compost

Research on the implementation of CE in tourist attractions has been carried out [22] that CE can be applied as a solution to the problem of waste in tourist attractions, especially natural tourism, namely by carrying out bonding through counselling regarding the importance of maintaining the cleanliness of tourist attractions to the surrounding community. Different results show that CE can be applied in tourist attractions by creating synergy in optimizing waste management between the government, tourists, and the community around tourist attractions [23]. Similar findings [24] result in the application of CE, emphasizing the role of cleaning staff who collect and process waste at tourist sites—merchants who trade in the tourist area. Even though sellers are subjects who contribute to waste in tourist areas, this disagreement is exciting to study. Similar research regarding the application of CE in the tourism sector was also carried out [25] with indications that the connotation of CE in tourism is closely related to the green cycle. This study will discuss the application of a circular economy to kiosk sellers in the Borobudur Temple area through the collection of waste retribution.

2. METHODS

The application of CE to local sellers at Borobudur Temple is carried out, one of which is through WTP of waste retribution, which is analyzed using the Contingent Valuation Method (CVM) and can be seen in Figure 7. CVM is an economic technique that helps determine the monetary value of non-traded resources [26]. This includes goods and services that cannot be bought or exchanged, such as clean air, natural parks, and cultural heritage. CVM is based on surveys. In this method, respondents are asked about their WTP for specific public resources [27]. By measuring how much individuals are willing to pay, CVM provides a way for policymakers to assess the benefits of investing in public resources compared to the costs. This method is particularly important for environmental resources that do not have a market price. Thus, CVM allows us to measure the economic value of public goods and services, which can be used to influence and shape public policy decisions. This method has been widely used in the fields of environmental protection, biodiversity conservation, and healthcare [28].

Several factors influence the WTP of waste retribution, according to Marozzo et al. [29]. Women tend to have a higher awareness of the environment than men, so the WTP of the environment paid will be greater than men. Another influencing factor is a person's age. Age is one of the factors that affect a person's maturity level in making decisions; the more mature a person's age level is, it is expected to have a higher level of environmental awareness [30]. The next factor is marital status. A married person will have greater dependents than someone who is not married [31]. This ownership will affect the amount of WTP because it is related to more expenses and needs, so in addition to needs, it is also influenced by income [32]. A person's understanding and mindset regarding environmental concerns is also closely related to the education obtained. Studies conducted by Ismowati et al. [33] show that a person with a higher level of education will have more association and experience. Besides that, the point of view obtained will also be broader. Thus, information received regarding environmental issues will be easier to obtain. This will affect the WTP value to be paid [34].

Other factors that are considered to influence WTP in this study are based on its scope. The implementation of CE through the WTP waste levy is also related to local sellers' knowledge of environmental issues and the application of CE. Local sellers who know of it will be willing to pay a higher levy than those who do not have that knowledge [35]. These factors will be analyzed using Ordinary Least Square (OLS) regression, and then the comparison will be seen through mosaic display analysis. This study will discuss the application of a circular economy to local sellers in the Borobudur Temple area through the collection of waste retribution.

This research was conducted on 117 local sellers in the Borobudur Temple area, Magelang Regency, Central Java, who sell at kiosks. This number is the population of respondents, and all of them are used as samples. The local sellers were chosen as the object of this research because they have a contract with the management of the tourist park to pay monthly kiosk rental fees. The primary data used is from 2022 through direct interviews with local sellers. The research employs a quantitative approach through the utilization of CVM computations, with the objective of assessing the worth of environmental consciousness by gauging WTP for waste compensation and mosaic display analysis.

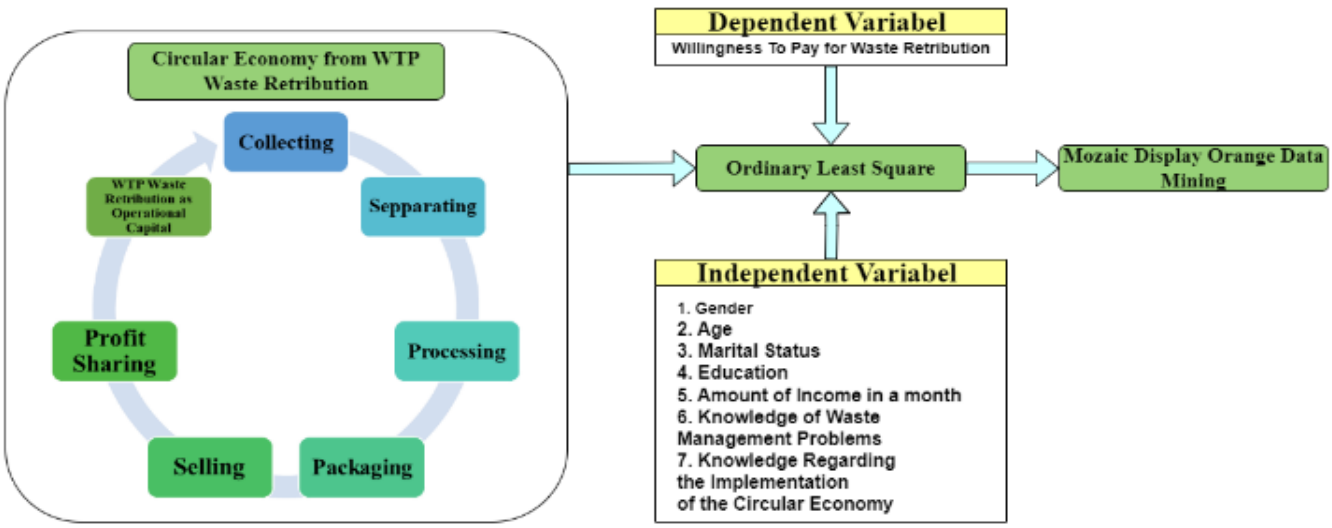

Figure 7. Mind map of CE and CVM

2.1 CVM

The data in this study were analyzed using the CVM. This method is used to analyze goods or services that do not have market value. These goods or services are closely related to the balance of the environmental ecosystem, especially in the Borobudur Temple area tourist destination. The presence of pollution caused by waste disrupts the function of the environment, resulting in pollution and affecting sustainability. Waste generated by vendors and visitors causes this pollution and requires evaluation to resolve. One evaluation that can be done is by managing waste through a circular economy. Waste management requires a level of awareness, especially from vendors who generate more waste than visitors. The CVM method, conducted through the waste retribution WTP by vendors, can be used as one solution or form of accountability for the ecosystem balance. There are four stages in the Circular Economy Value Chain (CVM) aimed at implementing CE, namely:

a. Formulating market hypothesis

The market hypothesis begins by informing the traders about the waste problem in the Borobudur Temple area, which is caused by the increasing amount of garbage. Subsequently, the sellers will be explained about the significant benefits of preserving the environment in the Borobudur Temple area.

b. Conducting a bid for WTP

The offer of WTP amount to implement CE to local sellers begins by mentioning the amount of environmental tax or waste collection fee paid through local government regulations, which is IDR 10,000 for the local sellers' fee. The amount stated by local sellers may be lower or higher than the fee amount based on local regulations. Hence, the inquiry was conducted using the open-question method.

c. Averaging amount of WTP

The average WTP can be estimated by dividing the total sum of WTP values by the number of respondents, which is calculated using the average WTP value as follows:

$$EWTP = \frac{\sum_{t=1}^{n} Wi}{n} \tag{1}$$

where, *EWTP* is the estimation of the average WTP amount for the implementation of CE. *Wi* is WTP to I, *n* is the number of local sellers, and *i* is i-th local sellers's WTP.

d. Results WTP

Following the calculation of the mean WTP value, the subsequent stage involves assessing the collective WTP value of the population by applying the established formula:

$$TotalWTP = \sum_{t=1}^{n} WTP_i(\frac{n_i}{N})P \tag{2}$$

where, *TotalWTP* is the aggregate amount of WTP by local sellers for the implementation of a circular economy. WTP_i is WTP local sellers sample-i, n_i is the number of samples ranges from 0 to I, *N* is aggregate sample size, and *P* is aggregate population size.

2.2 OLS regression

The local seller's WTP to implement a circular economy is subject to various influencing factors. These factors were examined through OLS regression analysis utilizing the EVIEWS software. The econometric equation employed in the OLS regression is presented below:

$$lretribution = \alpha + b_1 gender + b_2 age + b_3 maritalstatus + b_4 education + b_5 lincome + b_6 problem + b_7 management + e \tag{3}$$

Factors influencing the WTP include gender, age, marital status, length of education, income, knowledge of waste problems in the Borobudur Temple area, and knowledge of CE application. WTP or willingness to pay in the event of collection of waste retribution. Waste retribution is used to manage the waste generated by sellers and to implement a circular economy in the Borobudur Temple area. This study aims to determine whether gender, age, length of education, marital status, total monthly income, knowledge of CE, and the waste management problem for local sellers in the Borobudur Temple area affect WTP. The research conducted is quantitative research using cross-section data.

2.3 Mosaic display analysis

The influence of factors analyzed using OLS regression is further examined in more depth using Mosaic display. Mosaic display is a graphical representation of a two-way frequency table or contingency table. It is utilized to visualize data from two or more qualitative and quantitative variables. In addition to being used to observe the relationships and quantities between each factor influencing WTP for CE, its level of association is also examined through the Pearson residuals formula:

$$r_{ij} = \frac{(O_{ij} - E_{ij})}{\sqrt{E_{ij}}} \tag{4}$$

Another metric that can be used is the Standardized (adjusted) Pearson residual, which is computed by:

$$r_{ij} = \frac{(O_{IJ} - E_{ij})}{\sqrt{E_{ij}}\,(1 - n_{i+})(1 - n_{+j})} \tag{5}$$

where, r_{ij} is the Pearson residual corresponds to the specific cell located at the intersection of the-i column and-j row, O_{ij} is the value observed for the cell located at the intersection of the-i column and-j row, E_{ij} isThe predicted value for the cell at the-I column and-j row, Pi+ is the sum of the row divided by the total sum, and P+j is the sum of the column divided by the total sum.

3. RESULT AND DISCUSSION

3.1 Overview of research locations

Borobudur Temple is a temple that was built during the Syailendra Dynasty or around the 8th century AD [36]. Borobudur Temple is under the auspices of a state-owned enterprise, namely PT Borobudur Temple area. Therefore, the area is known as the Borobudur Temple area. The astronomical location of the Borobudur Temple area is located at 7° 36′ 28" South Latitude and 110° 12′ 13" East Longitude while its geographical location is in Borobudur Village, Borobudur District, Magelang Regency, Central Java.

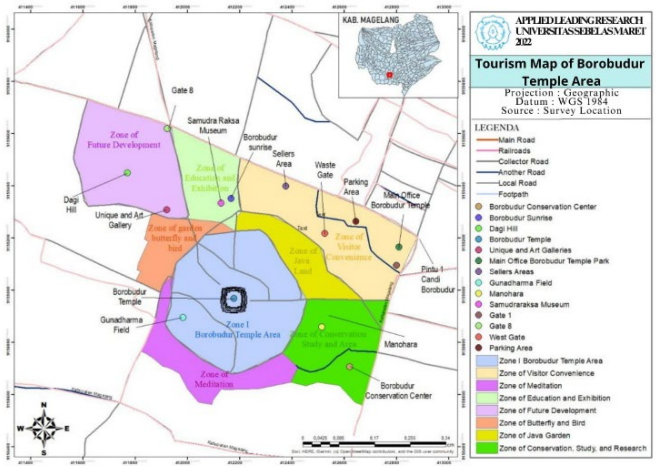

Figure 8. Borobudur Temple area

In Figure 8, it can be seen that the Borobudur Temple area is located in Borobudur Village, with the northern boundary bordering the Progo River, the east bordering Wanurejo Village, the south bordering the Sileng River, and the west bordering Karangrejo Village. Borobudur Temple area has an area of approximately 87 hectares.

The function of the Borobudur Temple, apart from being a place of worship, recreation, and educational facilities, is also to provide employment opportunities for the surrounding community, namely as sellers of regional specialties and foods. Selling activities carried out by sellers are facilitated by the Borobudur Temple manager by providing kiosk rentals for sellers. The facilities provided by the Borobudur Temple area management are functional facilities for sellers because they can increase their income, welfare, and economic level. Sellers occupy an area set aside for selling in the Borobudur Temple area. The large number of tourists who come affects the income of sellers. However, it also has a side effect on the surrounding environment, namely an increase in waste amount. This waste problem still needs to be resolved adequately because the amount of waste by sellers is still disposed of in public landfills, which are far from the seller's locations. This problem can be overcome by implementing a circular economy by reusing goods still suitable for use and recycling, namely the reprocessing of leftover goods or consumable materials. Applying a circular economy, in addition to reducing the amount of waste generation, can also increase the income of kiosk sellers in the area. One of the ways to support the application of CE is through the payment of waste retribution by kiosk sellers. The amount of waste retribution is used to keep waste management advice and infrastructure. In addition to paying waste retribution, increasing the knowledge of kiosk sellers about waste management can also overcome waste problems for kiosk sellers in the Borobudur Temple area. Waste retribution is used to implement a circular economy by carrying out six stages, namely: collecting, separating and processing, packaging, selling, and profit sharing, as seen in Figure 9.

In Figure 9, The first stage is collecting. Kiosk traders collect waste resulting from the kiosk seller's operational activities. The waste that has been collected is then sorted based on it is type, namely organic and inorganic. The next stage is processing. The organic waste that has been collected is then processed into compost through a composting process, and animal feed is processed through a fermentation process.

Figure 9. CE process for kiosk seller's waste

Meanwhile, inorganic waste is processed into handicrafts that have marketable value. The processed waste products are then packaged to be marketed to certain target markets. Proceeds from product sales are shared through profit sharing between waste processing staff and kiosk sellers.

The profit sharing obtained from waste processing can be used as additional income for kiosk traders. The income will affect the environmental value that kiosk merchants are willing to pay through WTP to be further used for the carrying capacity of waste management through six stages (Figure 9).

3.2 Socio-economics characteristics respondents

The application of a circular economy through WTP of waste retribution is also influenced by the socio-economic characteristics of kiosk sellers, as shown in Table 1.

The knowledge of kiosk sellers in the Borobudur Temple area regarding waste management is one of the factors influencing entrepreneurs' WTP of waste retribution as a form of responsibility for the environment, as shown in Table 2. The majority of respondents know about the problems of waste management in the Borobudur Temple area. (88 respondents or 75.2%). Meanwhile, the number of respondents who did not know about the issue was 29 respondents (24.8%). Following are the existing waste problems in the Borobudur Temple area according to the results of interviews with respondents.

Figure 10 shows the results of interviews with respondents, namely kiosk sellers in the Borobudur Temple area, who obtained information that there are several problems with waste management in the Borobudur Temple area. The waste management problem most sellers mentioned is the need for more education on waste management from the Borobudur Temple area sellers. As many as 34% of the kiosk sellers out of 88 who know about waste management problems in the Borobudur Temple area admit that they need more education on sorting and managing the waste they produce. Some of them already know how to manage waste, but they get this knowledge from programs in their home environment. The second most mentioned problem is the small number of trash bins around the Borobudur Temple area seller area. The lack of trash bins around the merchant area causes sellers and visitors who want to shop to have difficulty disposing of their trash, so a lot of rubbish is found in several locations. The trash

bins that have been provided are still trash bins mixed with organic and non-organic waste. The lack of trash bins around the merchant area causes sellers and visitors who want to shop to have difficulty disposing of their trash, so a lot of rubbish is found in several locations. The trash bins that have been provided are still trash bins mixed with organic and non-organic waste. The lack of trash bins around the merchant area causes sellers and visitors who want to shop to have difficulty disposing of their trash, so a lot of rubbish is found in several locations. The trash bins that have been provided are still trash bins mixed with organic and non-organic waste.

The third problem is that stagnant water causes an unpleasant odour in the Borobudur Temple area merchant area. The puddle occurred because there were potholes on several roads in the area. During the rainy season, the hole will be flooded, and a few moments later, it will smell foul. According to research [37], the smell generated from sewers, gutters, or other water bodies is included in environmental pollution, notably water pollution. The next problem is that several merchant areas, especially near the exit area, still have a lot of trash scattered around. Most of the litter scattered around is organic waste in the form of dry leaves, and there are also some droppings of wild geese, as shown in Figure 11B, around the seller's area. Waste problems, of course, disturb visitor's comfort and the environment's cleanliness.

The fifth waste management problem is the location of the waste disposal containers. There are three waste disposal containers in the Borobudur Temple area, two outside the merchant area, and only 1 is near the parking lot at gate 3 of the Borobudur Temple area. The closest container to the seller's location is the one near the parking lot at Gate 3 of the Borobudur Temple area, while the other containers are outside the reach of the seller's area. The location of the containers far from the site has become a complaint for several small entrepreneurs because sellers who have tried to collect waste independently feel that it is too far to dispose of waste in waste containers. The problem is exacerbated if the waste collected separately is organic waste, large in size, and heavy mass, like coconut shell waste from young coconut sellers. The last problem is that the cleaners cannot reach several selling areas in the Borobudur Temple area, especially near the vehicle exit. Therefore, a lot of trash is scattered around the room.

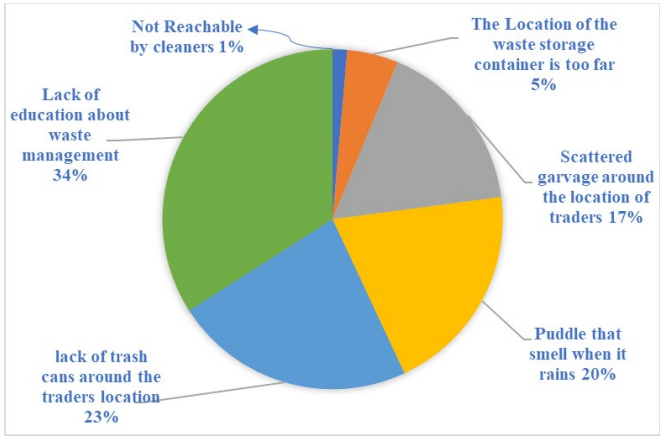

Figure 10. Problems of waste management in the Borobudur Temple area

Figure 11. Various environmental problems in the Borobudur Temple area include a lack of trash bins, waterlogging and wild geese, and waste containers that are far away

Table 1. Socio-economic characteristics of respondents

Socio-Economic Characteristics	Frequency	Proportion (%)	Socio-Economic Characteristics	Frequency	Proportion (%)
Gender			**Education**		
Male	27	30	elementary	49	41.9
Female	90	70	Junior High School	21	19.9
Age			Senior High School	38	32.5
16–23	3	2.6	Bachelors	8	6.9
24–31	5	4.3	>Bachelors	1	0.8
32–39	15	12.8	**Income**		
40–47	41	35	200,000-1,012,500	65	55.5
48–55	25	21.4	1,012,501-2,025,000	20	17.2
56–63	21	17.9	2,025,001-3,037,500	26	22.2
>63	7	6	3,037,501-4,050,000	1	0.8
Marital Status			4,050,001-5,062,500	3	2.6
Married	102	87.2	**Knowledge of Waste Management Problems**		
Non-Married	15	12.8	Yes	88	75.2
Knowledge Regarding the Implementation of CE			No	29	24.8
Yes	68	58.1			
No	49	41.9			

Table 2. Distribution of WTP value of kiosk seller waste retribution in the Borobudur Temple area

WTP (IDR)	Frequency	WTP × Number of Respondents (IDR)
7,500	32	240,000
10,000	30	300,000
12,500	20	250,000
15,000	9	135,000
20,000	20	400,000
30,000	6	180,000
35,000	1	35,000
50,000	1	50,000
Amount	**117**	**1,590,000**

CE is one of the efforts to overcome the waste problem experienced by kiosk sellers in the Borobudur Temple area. According to data from the Health Office of Magelang Regency, the Borobudur Temple area is in the 3rd area, with the most waste contributors in Magelang Regency. Some respondents who are kiosk sellers in the Borobudur Temple area admit that they have even made several attempts to deal with the waste problem independently. These efforts are included in the application of a circular economy. Most kiosk sellers in the Borobudur Temple area already know about the application of CE. This can be seen from the number of respondents who knew, namely as many as 68 people (58.1%), and who did not realize were 49 people (41.9%).

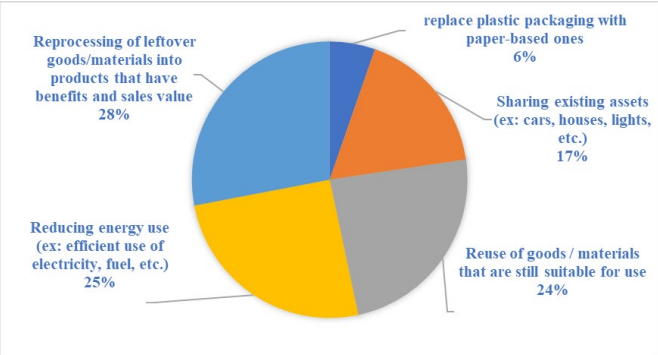

Figure 12. Knowledge of kiosk sellers in the Borobudur Temple area regarding the implementation of CE

Based on Figure 12 above, there are five knowledge points of kiosk sellers in the Borobudur Temple area. The five points are: Reprocessing leftover goods or materials into products with benefits and selling issues, reusing goods or materials that are still suitable for use, replacing plastic packaging with packaging made from paper or environmentally friendly, using existing assets together, and reducing use energy. Nineteen kiosk sellers in the Borobudur Temple area know about reprocessing leftover goods or materials into products with benefits and selling points. Knowledge about reprocessing materials or leftovers is one of the applications of a circular economy, namely reprocessing or recycling. Kiosk sellers who mainly process bits into materials of sale value are food sellers. They process leftover food, such as coconut shells, and then make it into charcoal, and the remaining dried rice is used as livestock feed. The second point, namely the reuse of goods or materials that are still suitable for use, is that as many as 16 kiosk sellers are aware of this implementation. Some of them have also implemented circular economy efforts, namely by reusing plastic packaging for clothes as stuffing for souvenir bags so that the bags look inflated. The third point is to replace plastic packaging with paper or environmentally friendly packaging. Four kiosk sellers know about this implementation. The fourth point is the shared use of existing assets. As many as 11 kiosk sellers are aware of this implementation. Some of them have implemented that by using lights together. The last point is to reduce energy use, namely, as many as 17 kiosk sellers. This is implemented by turning off the lights in the kiosk when not needed and using public transportation from home to the Borobudur Temple area.

3.3 Average of WTP of waste retribution

Kiosk sellers in the Borobudur Temple area are considered beneficiaries of the environmental area of sellers. Therefore, cleanliness and sustainability need to be pursued through the waste retribution WTP approach. The average WTP value of kiosk sellers is obtained from the total WTP value of waste retribution ratio to the total number of kiosk sellers in the Borobudur Temple area. The following is the WTP value of kiosk sellers in the Borobudur Temple area for waste retribution:

Based on Table 3, the results show that the average kiosk seller in the Borobudur Temple AREA is willing to pay retribution for waste of IDR13,590 per month. The waste retribution can be used to implement a circular economy for environmental preservation in the Borobudur Temple area. The average WTP retribution for waste from kiosk sellers for waste management and implementing a circular economy is higher with the local government's stipulations for waste retribution regulations. This indicates that the kiosk sellers in the Borobudur Temple area have an awareness of the importance of protecting the environment.

The WTP curve consists of the accumulated number of individuals who choose a certain WTP amount. The curve relationship describes the amount of WTP with the number of kiosk sellers willing to pay that WTP amount. The following is an illustration of the WTP curve for kiosk seller waste retribution in the Borobudur Temple area.

Figure 13 shows the fluctuations in WTP and that most kiosk sellers in the Borobudur Temple area are willing to pay retribution in the smallest amount. The higher the retribution, the fewer kiosk sellers in the Borobudur Temple area are eager to pay. The estimation uses multiple linear regression to determine the variables affecting the WTP of waste retribution.

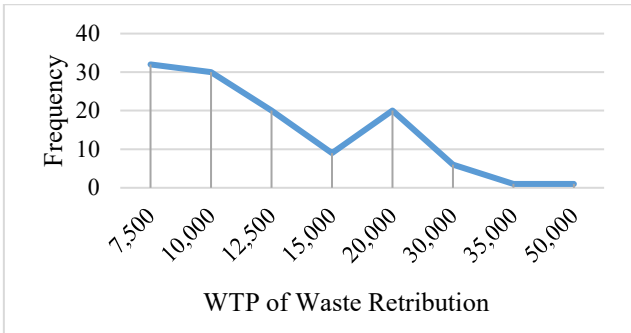

Figure 13. WTP curve for waste retribution kiosk sellers in the Borobudur Temple area

$$lretribution = 2.93 + 0.01gender + 0.004age - 0.06maritalstatus + 0.01education + 0.14lincome - 0.06problem + 0.12management + e \quad (6)$$

Table 3. Regression result

Variable	Coefficient	Std.Error	t-Statistic	Probability	Result
Gender	0.001	0.037	0.249	0.804	Not Significant
Age	0.004	0.002	2.438	0.016	Significant
Marital Status	-0.057	0.006	-1.200	0.233	Not Significant
Education	0.014	0.006	2.287	0,024	Significant
Income	0.140	0.048	2.947	0.004	Significant
Problem	-0.061	0.037	-1.655	0.100	Not Significant
Management	0.121	0.033	3.614	0.0005	Significant

The results of the regression show that the constant coefficient is 2.93. From these results, it can be seen that if the variables are gender, age, marital status, length of education, total monthly income, the knowledge of the local sellers regarding waste problems in the Borobudur Temple area, and the ability of the local sellers regarding the implementation of CE in the Borobudur Temple area are of value zero, then the value of the willingness to pay or the WTP of the local sellers for the waste retribution in the Borobudur Temple area is 2.93%. The regression model in this study based on the regression results in Table 3 indicates that the independent variables that affect the dependent variable are age, length of education, monthly income, and knowledge of local sellers regarding the application of CE in the Borobudur Temple area. Meanwhile, the independent variables that have no effect are gender, marital status, and the knowledge of the local sellers regarding waste problems in the Borobudur Temple area. If the age of the local seller increases by one year, the value of the waste retribution local seller's WTP will increase by 0.004%. In the duration of education variable, the WTP value from the waste retribution increases by 0.01% if the local seller takes one year longer to study. Whereas in the income variable, if the local seller's income increases by 0,14%, the WTP will increase by 0.14%. Finally, suppose the local sellers know that implementing CE will increase the WTP for waste retribution by 0.12%. This explanation can be seen from the probability value of the variable. If the probability value is greater than 0.05, then there is no effect, and vice versa. In that case, these independent variables can explain the 28% WTP of waste retribution variable, while other variables outside the research model explain the remaining 72%. These variables also have a significant simultaneous and overall effect on the dependent variable. The explanation can be seen in Table 3.

Most local sellers in the Borobudur Temple area understand how to manage waste; many have even implemented it. CE is applied in the neighborhood where the local sellers live, not in the selling area or the trade area of the Borobudur Temple area. They hope facilities and infrastructure will be provided to implement a circular economy where they sell or at the Borobudur Temple tourist park seller area.

3.4 Mosaic display analysis

The results of the OLS analysis indicate that several factors affect the WTP value of local sellers for waste retribution in order to implement a circular economy in the Borobudur Temple area, especially in the area of local sellers. Influencing factors are age, length of education, monthly income, and knowledge of local sellers regarding the application of CE in the Borobudur Temple area. The results are then analyzed independently to distribute data between dependent variables through mosaic display analysis.

a. Age with WTP amount of waste retribution for the application of CE

The relationship between age and waste retribution for the application of CE analyzed using OLS regression in Figure 14 showed significant positive results. The results are then further analyzed by mapping variable distribution data on the mosaic display. The results show that local sellers aged more than or equal to 55.5 have a WTP of less than IDR 8750 or USD 0.56. Other results also mention that traders with an age range of 46 – 55.5 years have a WTP of IDR 8750 – IDR 11250 or USD 0.56 – USD 0.72. The data obtained is then reinforced by its Pearson residual level, which ranges from 1.1 – 1.2, which indicates that age is strongly correlated with the size of the trader's WTP. The same results are shown in the research of Nwofoke et al. [38], which shows that someone who is above or more than 45 years of productive age tends to have a decreased level of productivity. This is because their energy and capabilities are not as good as those of the lower productive age, and they also have to compete with ongoing technological updates [39, 40].

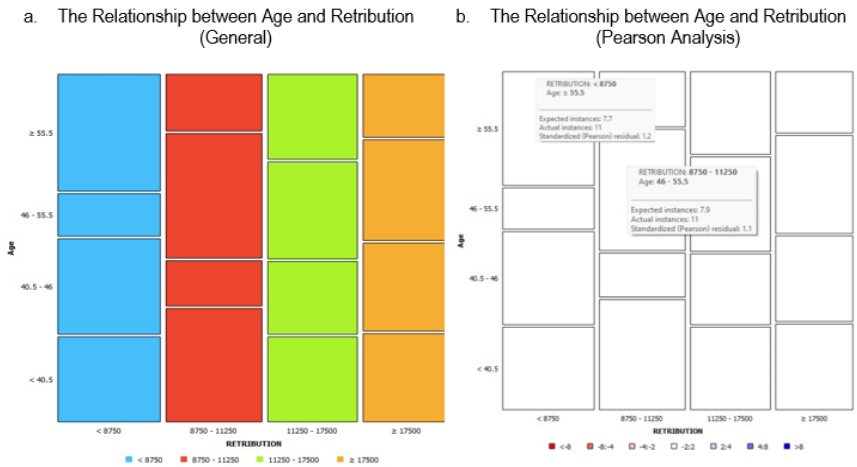

Figure 14. Age with WTP amount of waste retribution for the application of CE

b. Education with WTP amount of waste retribution for the application of CE

The majority of local sellers in the TWC Area have a primary school education level of less than 7.5 years. Research on the influence of education level and environmental responsibility WTP conducted by Fattah et al. [41] said that education level has a significant positive effect on environmental responsibility WTP. This is in accordance with the findings in this study, which indicate that local sellers who have an education level of less than 7.5 years on average have a waste levy WTP for CE applications. The level of education is one of the factors that have a major influence on the level of environmental awareness. People with a high level of education will have a more basic and comprehensive knowledge of environmental problems and awareness [42-44] (Figure 15).

c. Income with WTP amount of waste retribution for the application of CE

Figure 16 shows the results that traders with an average monthly income of IDR 475,000 – IDR 900,000 or USD 30.56 – USD 57.91 have a WTP of less than IDR 8,750 or USD 0.56 while traders who have an income of IDR 900,000 – IDR 2,200,000 or USD 57.91 – USD 141.56 have a WTP of more than the same as IDR 17,500 or equivalent to USD 1.13. This proves that a person's monthly income can affect the amount of WTP on environmental concerns [45-47].

d. Knowledge of CE with WTP amount of waste retribution for the application of CE

Environmental concern is characterized by processing the waste produced into products that can be utilized. One of them is about knowledge of CE. This knowledge is obtained not only from formal education but also knowledge of environmental care and responsibility. Traders who know circular economy-based waste processing have a high WTP of more than IDR 17,500 or USD 1.13 (Figure 17).

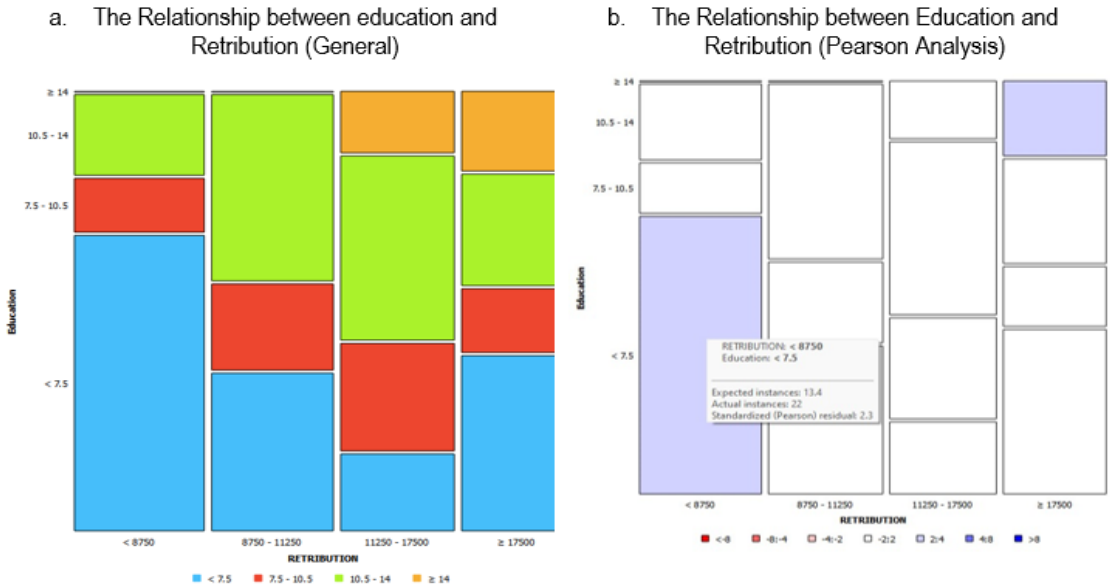

Figure 15. Education with WTP amount of waste retribution for the application of CE

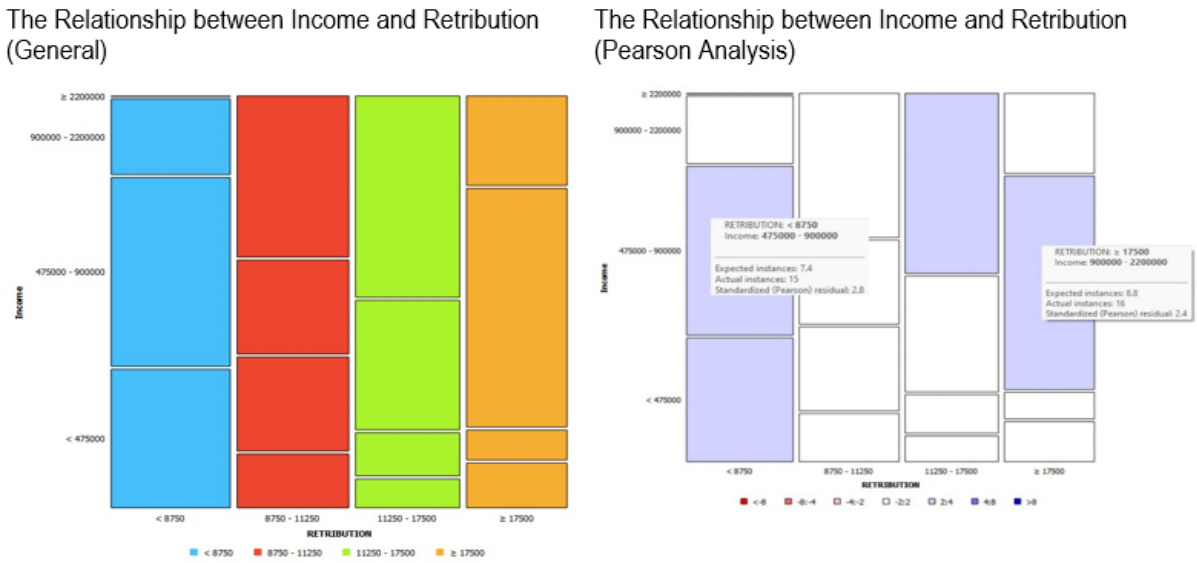

Figure 16. Income with WTP amount of waste retribution for the application of CE

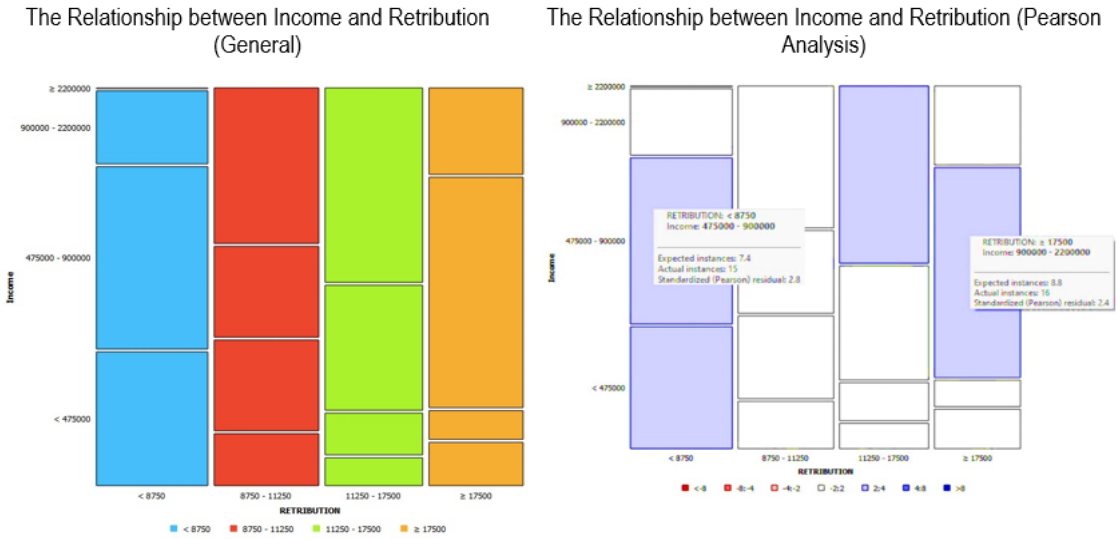

Figure 17. Income with WTP amount of waste retribution for the application of CE

4. CONCLUSIONS

The application of a circular economy can be used as an effort to maintain environmental heritage, especially environmental problems caused by waste. Heritage areas are often used as business opportunities for local traders, but the side effect is an increase in the amount of waste. Thus, environmental awareness, especially from traders, can be increased through the payment of waste retribution for the implementation of a circular economy in the Prambanan Temple heritage area. This study aims to analyze the WTP of local sellers against waste retribution in the Borobudur Temple area. In addition, it also investigates the influence of gender, age, length of education, marital status, income, knowledge of local sellers regarding waste problems in the Borobudur Temple area, and knowledge of local sellers regarding the application of CE in the Borobudur Temple area to WTP sellers kiosk for waste retribution. The result of the CVM that analyzed the average WTP value for local sellers for waste retribution in the Borobudur Temple area is IDR13,590 monthly. This value is higher than the value set by the local government for local sellers' waste payments, which is only IDR.10,000. This shows that local sellers in the Borobudur Temple area have a level of environmental awareness.

Waste retribution can be used to maintain cleanliness, preserve the environment, and promote the implementation of the regional circular economy of the Borobudur Temple tourism area. The independent variable that influences the WTP variable for local sellers for waste retribution in the area Borobudur Temple area is the variables of age, length of education, income in a month, and knowledge of local sellers regarding the application of CE in the area Borobudur Temple area. This study also shows results that have no effect between the independent variables and the dependent variable, namely gender, marital status, and knowledge of local sellers on waste problems in the area. Borobudur Temple area.

Based on the results of the analysis mentioned, there needs to be a retribution rate for local sellers in the Borobudur Temple area. The retribution rate is used to maintain cleanliness, promote environmental preservation efforts, and implement a circular economy in the Borobudur Temple area. Apart from that, quality cleaning services are also needed, especially in the Borobudur Temple area merchant area. Improving the quality of cleanliness can be done by adding waste containers, especially in the area for local sellers in the Borobudur Temple area, increasing the number of cleaning staff, especially in the area for local sellers close to vehicle exits, increasing the number of trash cans in the area for local sellers in the Borobudur Temple area, and provide separate trash bins for organic and inorganic waste. Application of CE in the Borobudur Temple area is carried out by educating local sellers about waste management, providing a place to process organic waste into compost, and providing a waste bank to manage and process inorganic waste so that it can be reused because has a sale value.

REFERENCES

[1] Handoyo, E., Saadah, I.G. (2023). The contribution of social capital to waste management for street vendors in Semarang city, Indonesia. Komunitas, 15(1): 53-66. https://doi.org/10.15294/komunitas.v15i1.38530

[2] Kaza., S., Yao, L., Bhada-Tata, P., Woerden, V. (2018). What a Waste 2.0. World Bank Group.

[3] Huang, Y., Shafiee, M., Charnley, F., Encinas-Oropesa, A. (2022). Designing a framework for materials flow by integrating circular economy principles with end-of-life management strategies. Sustainability, 14(7): 4244. https://doi.org/10.3390/su14074244

[4] Rudan, E. (2023). Circular economy of cultural heritage—Possibility to create a new tourism product through adaptive reuse. Journal of Risk and Financial Management, 16(3): 196. https://doi.org/10.3390/jrfm16030196

[5] Istimal, I., Muhyidin, A. (2023). Pengelolaan Sampah sebagai pengembangan pariwisata berkelanjutan di kampung ekowisata. Jurnal Pemberdayaan Masyarakat Indonesia (JPMI), 5(1): 61-69.

[6] Maes, T., Preston-Whyte, F., Lavelle, S., Gomiero, A., Booth, A.M., Belzunce-Segarra, M.J., Bellas, J., Brooks, S., Bakir, A., Devriese, L.I., Pham, C.K., De Witte, B. (2023). A recipe for plastic: Expert insights on plastic additives in the marine environment. Marine Pollution

Bulletin, 196: 115633. https://doi.org/10.1016/j.marpolbul.2023.115633
[7] Barbu, C., Price-Kreitz, R. (2018). Implementation of irrigation policy in the decentralized government: A case study of West Java, Indonesia. Journal of Environmental Management and Tourism Biannually, III(2): 56-72.
[8] Kazmi, R., Chakraborty, M. (2023). Identification of parameters and indicators for implementing circularity in the construction industry. Journal of Engineering and Applied Science, 70(1): 1-27. https://doi.org/10.1186/s44147-023-00251-3
[9] Gregson, N., Forman, P.J. (2021). England's municipal waste regime: Challenges and prospects. The Geographical Journal, 187(3): 214-226. https://doi.org/10.1111/geoj.12386
[10] Rimantho, D., Suyitno, B.M., Pratomo, V.A., Haryanto, G., Prasidha, I., Puspita, N. (2023). Circular economy: Barriers and strategy to reduce and manage solid waste in the rural area at Jepara District, Indonesia. International Journal of Sustainable Development & Planning, 18(4): 1045-1055. https://doi.org/10.18280/ijsdp.180407
[11] Lotti, L., Barile, L., Manfredi, G. (2023). Improving recycling sorting behaviour with human eye nudges. Scientific Reports, 13(1): 10127. https://doi.org/10.1038/s41598-023-37019-x
[12] Muzanni, A., Lestari, F., Chalid, M., Wardani, W.K., Satyawardhani, S.A., Kristanto, G.A., Zulys, A. (2022). Multi-sectoral partnership for waste management evaluation and awards recognition in higher education. International Journal of Sustainable Development and Planning, 17(4): 1205-1213. https://doi.org/10.18280/ijsdp.170419
[13] Markiewicz-Keszycka, M., Carter, A., O'Brien, D., Henchion, M., Mooney, S., Hynds, P. (2023). Pro-environmental diversification of pasture-based dairy and beef production in Ireland, the United Kingdom and New Zealand: A scoping review of impacts and challenges. Renewable Agriculture and Food Systems, 38: e5. https://doi.org/10.1017/S1742170522000382
[14] Sunandar, A.P., Chahyani, R.Q.C., Farhana, F.Z. (2020). ECOBRICK as the utilization of plastic in biology laboratory and foodcourt Yogyakarta State University. Jurnal Pengabdian Masyarakat MIPA dan Pendidikan MIPA, 4(1): 113-121. http://doi.org/10.21831/jpmmp.v4i2.37501
[15] Widiyasari, R., Zulfitria, Z., Fakhirah, S. (2021). Pemanfaatan sampah plastik dengan metode ecobrick sebagai upaya mengurangi limbah plastik. In Prosiding Seminar Nasional Pengabdian Masyarakat LPPM UMJ, Universitas Muhammadiyah Jakarta, pp. 1-10.
[16] Yusiyaka, R.A., Yanti, A.D. (2021). Ecobrick: Smart and practicalsolution for plastic waste management. Learning Community: Jurnal Pendidikan Luar Sekolah, 5(2): 68-74. https://doi.org/10.19184/jlc.v5i2.30819
[17] 17 Purwanti, N.D. (2014). Pengaruh jumlah kunjungan wisatawan terhadap pendapatan asli daerah kabupaten mojokerto tahun 2006-2013. Jurnal Pendidikan Ekonomi (JUPE), 2(3): 1-12.
[18] Suchek, N., Franco, M. (2023). Inter-organisational cooperation oriented towards sustainability involving SMEs: A systematic literature review. Journal of the Knowledge Economy, 1-21. https://doi.org/10.1007/s13132-023-01196-x
[19] Islam, M.A. (2013). Peran brand borobudur dalam pariwisata dan world heritage. Dewa Ruci. Jurnal Pengkajian dan Penciptaan Seni, 8(3): 377-392. https://doi.org/10.33153/dewaruci.v8i3.1129
[20] Butarbutar, R., Soemarno, S. (2013). Environmental effects of ecotourism in Indonesia. Journal of Indonesian Tourism and Development Studies, 1(3): 97-107. https://doi.org/10.21776/ub.jitode.2013.001.03.01
[21] Agarwal, R., Chaudhary, M., Singh, J. (2015). Waste management initiatives in India for human well being. European Scientific Journal, 7881: 1857-7881.
[22] Herdiansah, A.G. (2021). Overcoming the waste problem in mountain tourism sites in West Java. Dharmakarya: Jurnal Aplikasi Ipteks Untuk Masyarakat, 10(4): 357-362. https://doi.org/10.24198/dharmakarya.v10i4.35767
[23] Ermawati, E.A., Amalia, F.R., Mukti, M. (2019). Analisis strategi pengelolaan sampah di tiga lokasi wisata kabupaten banyuwangi. Journal of Tourism and Creativity, 2(1): 25. https://doi.org/10.19184/jtc.v2i1.13838
[24] Suarinastuti, I.A., Mahagangga, I.G.A.O. (2016). Pengelolaan sampah di daya tarik wisata wanara wana/monkey forest, desa padangtegal, ubud. Jurnal Destinasi Pariwisata, 4(2): 25-29.
[25] Obeidat, B., Hamadneh, A. (2022). Agritourism-A sustainable approach to the development of rural settlements in Jordan: Al-baqura village as a case study. International Journal of Sustainable Development & Planning, 17(2): 669-676. https://doi.org/10.18280/ijsdp.170232
[26] Apdohan, J.R.D., Lopez, S.O., Seronay, R.A. (2021). Willingness to pay towards the conservation of ecotourism resources at Agusan marsh wildlife sanctuary, Agusan del Sur, Philippines. International Journal of Conservation Science, 12(3): 1163-1170.
[27] Wubalem, A., Woldeamanuel, T., Nigussie, Z. (2023). Economic valuation of lake Tana: A recreational use value estimation through the travel cost method. Sustainability, 15(8): 6468. https://doi.org/10.3390/su15086468
[28] Damanik, D. (2019). Willingness to pay (WTP) pengunjung museum simalungun di kota pematangsiantar. Ikraith-Ekonomika, 2(3): 9-16.
[29] Marozzo, V., Costa, A., Crupi, A., Abbate, T. (2023). Decoding Asian consumers' willingness to pay for organic food product: A configurational-based approach. European Journal of Innovation Management, 26(7): 353-384. https://doi.org/10.1108/EJIM-10-2022-0591
[30] Díez-Gutiérrez, M., Babri, S. (2022). Tourists' perceptions of economic instruments as sustainable policies in protected areas: The case of Geiranger fjord in Norway. Journal of Outdoor Recreation and Tourism, 39: 100526. https://doi.org/10.1016/j.jort.2022.100526
[31] Ruri, R., Julaeni, R. (2017). Factors affecting the delay first birth in rural Indonesia: An analysis of the 2012 idhs. Jurnal Kependudukan Indonesia, 12(1): 1-12. http://doi.org/10.14203/jki.v12i1.274
[32] Yudanegara, A., Sinaga, O., Roespinoedji, D. (2021). Analysis of availability to pay WTP (willingness to pay) in efforts to develop "cipanas" hot water tourism West Java, Indonesia. Review of International Geographical Education Online, 11(6): 563-574. https://doi.org/10.48047/rigeo.11.06.70

[33] Ismowati, M., Avianto, B.N., Sulaiman, A., Aisi, A.L. R., Firmansyah, V.Z. (2022). Edukasi Pariwisata dan Aksi Sisir Pantai Dari Sampah Wisata Dalam Upaya Meningkatkan Partisipasi Masyarakat di Kawasan Super Prioritas Nasional (KSPN) Labuan Bajo, Kabupaten Manggarai Barat. Jurnal Komunitas: Jurnal Pengabdian Kepada Masyarakat, 5(1): 12-21. https://doi.org/10.31334/jks.v5i1.2288

[34] Aulia, D.C., Situmorang, H.K., Prasetya, A.F.H., Fadilla, A., Nisa, A.S., Khoirunnisa, A., Farhan, D., Nindya, D.N., Purwantari, H., Jasmin, I.O.D., Akbar, J.A., Novi Mesrina Cicionta BR Ginting, Lubis, R.F., Pangestiara, Z. (2021). Peningkatan pengetahuan dan kesadaran masyarakat tentang pengelolaan sampah dengan pesan jepapah. Jurnal Pengabdian Kesehatan Masyarakat (Pengmaskesmas), 1(1): 62-70. https://doi.org/10.31849/pengmaskesmas.v1i1/5516

[35] Mulki, S., Ormsby, A.A. (2022). Breaking green ceilings: Podcasting for environmental and social change. Journal of Environmental Studies and Sciences, 12(1): 18-27. https://doi.org/10.1007/s13412-021-00723-z

[36] Kementerian PPN/Bappenas. (2020). Perkembangan ekonomi Indonesia dan dunia. Triwulan III Tahun 2020. https://perpustakaan.bappenas.go.id/e-library/file_upload/koleksi/migrasi-data-publikasi/file/Policy_Paper/Laporan_Perkembangan_Ekonomi_Indonesia_dan_Dunia_Triwulan_III_2020.pdf.

[37] Wararatna, M., Subekti, R. (2022). Efektivitas dinas lingkungan hidup dalam mengelola sampah sebagai upaya perlindungan terhadap lingkungan. Jurnal Komunikasi Hukum (JKH), 8(2): 221-229. https://doi.org/10.23887/jkh.v8i2.48856

[38] Nwofoke, C., Onyenekwe, S.C., Agbo, F.U. (2017). Willingness to pay (WTP) for an improved environmental quality in Ebonyi State, Nigeria. Journal of Environmental Protection, 8(2): 131-140. https://doi.org/10.4236/jep.2017.82011

[39] Aprilyanti, S. (2017). Pengaruh usia dan masa kerja terhadap produktivitas kerja (Studi kasus: PT. Oasis Water International Cabang Palembang). Jurnal Sistem dan Manajemen Industri, 1(2): 68-72. https://doi.org/10.30656/jsmi.v1i2.413

[40] Hao, Q., Xu, S., Liao, Y., Qiao, D., Shi, H., Xu, T. (2023). Determinants of residents' willingness to pay for water quality improvements in Haikou, China: Application of CVM and ISM approaches. Water, 15(7): 1305. https://doi.org/10.3390/w15071305

[41] Fattah, M.A., Rimi, R.A., Morshed, S.R. (2022). Knowledge, behavior, and drivers of residents' willingness to pay for a sustainable solid waste collection and management system in Mymensingh City, Bangladesh. Journal of Material Cycles and Waste Management, 24(4): 1551-1564. https://doi.org/10.1007/s10163-022-01422-9

[42] Panwanitdumrong, K., Chen, C.L. (2022). Are tourists willing to pay for a marine litter-free coastal attraction to achieve tourism sustainability? Case study of Libong Island, Thailand. Sustainability, 14(8): 4808. https://doi.org/10.3390/su14084808

[43] Geng, J., Yang, N., Zhang, W., Yang, L. (2023). Public willingness to pay for green lifestyle in China: A contingent valuation method based on integrated model. International Journal of Environmental Research and Public Health, 20(3): 2185. https://doi.org/10.3390/ijerph20032185

[44] Girma, H., Geremew, A., Alemayehu, M., Mulatu, G., Gebrehiwot, M., Defloor, B. (2022). Urban households' willingness to pay to improve municipal solid waste collection services and associated factors: A double-bounded contingent valuation study in Harar city, Ethiopia. Environmental Health Insights, 16: 11786302221134937. https://doi.org/10.1177/11786302221134937

[45] Shang, J., Xie, Y., Guo, L., Fan, J., Liu, H. (2023). Evaluation of the nonmarket value of livestock and poultry feces returning to farmland utilization using CVM in Heilongjiang, China. International Journal of Agricultural and Biological Engineering, 16(2): 48-56. https://doi.org/10.25165/j.ijabe.20231602.7588

[46] Pham, T.T., Lam, T.P.M., Le Dang, H., Pham, N.T. (2023). Consumers' willingness to pay an environmental fee for e-waste recycling in Vietnam: Integrating the theory of planned behaviour and the norm activation model. Journal of Material Cycles and Waste Management, 25(5): 2900-2914. https://doi.org/10.1007/s10163-023-01723-7

[47] Ray, M., Ryngnga, P.K., Chetia, P. (2023). Willingness to pay and its determinants for improved solid waste management: A case study. International Journal of Environment and Waste Management, 31(1): 119-134. https://doi.org/10.1504/IJEWM.2023.10054819