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Disposable Face-Mask Waste Management and Assessment Through Willingness to Pay and SWOT Framework in Post COVID-19 Pandemic

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ABSTRACT

Disposable masks are widely used during the pandemic and post-pandemic as self-protection from COVID-19. Due to this, a mask waste disposal problem has happened throughout the world, impacting the environment through pollution. Disposable waste management using the Willingness to Pay (WTP) system can be a mitigation effort. The study was conducted using an online cross-sectional questionnaire which was analyzed using the Spearman method and the SPSS cross tab descriptive analysis technique. The results of the study found that there is a positive correlation in the community's approval for the management of mask waste with the WTP response, which had a negative impact on the environment. However, it is negatively correlated with the amount of budget issued by the community with WTP. A SWOT (Strength, Weakness, Opportunity, Threat) study was proposed to evaluate the proposed WTP of the waste management system, finding that it is important to educate the public about the negative impacts. Therefore, WTP can be applied in the management of mask waste because it has advantages in waste management on a small to large scale.

1. INTRODUCTION

Health is a vital matter in human life to smoothly carry out activities. Research states that Indonesia is vulnerable to health problems during the COVID-19 pandemic because of its high population vulnerable to transmission virus, so it is important to educate and inform the Indonesian people about maintaining health, especially physical health through education [1]. Education, in this case, can be in the form of exercise, taking vitamins, and wearing masks. Health has become a main topic of discussion worldwide because of the coronavirus disease (COVID-19) pandemic, which occurred in 2019. Health service institutions are in the spotlight in handling the COVID-19 case because there has been a crisis in the quality and safety of health services in several institutions, so it is important to improve the quality of doing better [2]. However, apart from maintaining personal health and improving health services, several factors affect a person's susceptibility to the virus. Old age factor shows the results of being susceptible to COVID-19 infection [3]. In fact, COVID-19 can attack various ages and genders, this greatly affects the psychology of society because of the fear of being exposed to COVID-19 [2-4]. The risk of contracting COVID-19 can cause death, therefore people are vigilant by vaccinating [5-7] and use masks on individuals as a form of self-protection from the virus [8-13].

Masks are one of the important things in the world of health whose use is very intense. The use of masks in health facilities has increased sharply due to the COVID-19 pandemic, this is due to the fact that many COVID-19 patients are being treated and the death rate fluctuates [14, 15]. The fact is that the hospital's preparedness in dealing with the COVID-19 disaster in terms of personal protective equipment facilities for health workers is still lacking, one of the facilities in question is masks [16]. Therefore, the production of disposable masks is increased to meet the demand from health facilities or the community [17-19].

Generally, masks are only used for medical purposes and are now being used massively by the community due to the COVID-19 pandemic. The COVID-19 pandemic period has made masks the main thing among the public that must be used in outdoor and indoor activities as a preventive measure to avoid the virus [20-22], as well as very strict regulations governing the use of community masks [23-25]. Indonesia had a percentage of 82% compliance with use in 2020, this is due to the policy to use masks when mobility is outside [26]. The use of masks is very significant, almost every day during a pandemic, causing high demand and demand for disposable masks. This is in line with the sharp increase in sales of masks during the pandemic as respiratory protection [27]. Disposable medical masks are considered effective in preventing the transmission and spread of the virus [28], because the transmission comes from the mouth and nose.

The use of disposable masks by the world community results in an abundance of mask waste which is very concerning. In the coastal areas of 46 countries around 0.15 - 0.39 million tons of plastic waste including masks ends up in the oceans in a year [29]. Indonesia ranks first in producing plastic waste with a contribution of 17.46% [29]. A significant amount of mask waste is found in waterways, and it can cause water pollution [30, 31]. This is because disposable mask waste contains chemical compounds that can interfere with

polluting the environment [32] so that the existence of marine biota is threatened, even the diversity of plants in the sea is also threatened, and in the end all aspects of the environment are disturbed in balance, meaning that the disposal of mask waste by the community is not disposed of in its place. Another case states that the management of mask waste, apart from being thrown away, is simply burning it [33]. Burning disposable mask waste is not recommended because it causes air pollution and is carcinogenic considering that mask waste is made from plastic. The main ingredient for making masks is polupropylene (PP) which contains petrol compounds commonly found in plastics making it difficult to decompose by soil microorganisms [34-36].

Mask waste is an environmental pollution problem that is a shared responsibility and has become a dynamic that is still looking for a way out during the pandemic and post-pandemic until now. The abundance of waste illustrates the high use of masks. Although masks are used by ordinary people, not medical personnel, masks are still classified as medical waste that requires special handling. Mask waste management is useful for separating mask waste from other waste, disposing of masks in accordance with health SOPs (Standard Operating Procedure), preventing the accumulation of waste in unwanted places.

Previous research proposed a recycling technique for mask waste using ultraviolet radiation disinfectant and autoclaving [37, 38]. This contradicts [39, 40], which finds that disposable medical masks are difficult to recycle because they can potentially contain viruses and bacteria. Other studies propose substituting environmentally friendly mask-making materials, so they are easily degraded by nature. The ingredients for making these eco-masks are Waste Collagen-viscose fish from the canned fish industry into collagen peptides for disposable masks [41]. Conversion of mask waste as building additives for cement by 5% can reduce the amount of waste piles [42]. In addition, the potential for mask waste to become bio-energy through pyrolysis or other techniques is further investigated [43, 44]. Several previous studies are still debating whether the technique of recycling, reusing, and disposal of mask waste harms the environment. However, previous studies have yet to pay attention to aspects of mask waste management independently (individually), in the household, or collectively. The gap in research is regarding how simple ways to carry out mask waste treatment at the basic level in individuals. Individual mask waste is not too much, but the waste of masks for each individual in the household, even in housing complexes or groups, has a significant amount. Mask waste is often mixed with other household waste in organic and inorganic waste.

This study investigates the willingness of the community to give extra pay to reward waste management officers for helping sort mask waste. There has been no previous detailed research on the role of the community in Willingness to Pay (WTP) as an award to waste management officers for the services they have performed and for actively supporting them in operations. This is because there is no SOP for the management of mask waste in terms of sorting, and there are still few institutions and governments that pay special attention to the management of mask waste.

Waste becomes crucial; the waste problem cannot be stopped, but good management can be implemented to overcome the waste problem. Based on this, the management of mask waste to disposal and recycling is important to implement. Therefore, the management of mask waste needs to be taken seriously. The management objective is to prevent the negative impact of mask waste on the environment and humans. One of the efforts to manage mask waste is through WTP. WTP involve the community in contributing to spending some money in the context of appreciating waste management services. WTP can work with synergy from various parties, especially the community, as the main actor in using masks. The results from the WTP are used for waste management operations as well as returns for the services of management officers. Public concern about the environment can influence the WTP's decision to protect the marine ecosystem from plastic waste [45, 46].

The description above indicates that community involvement is very important in managing mask waste, but are people willing to participate in the management of mask waste through the WTP system? This study aims to analyze the factors that influence community involvement in managing mask waste in making decisions on WTP for disposable masks and is strengthened by a SWOT analysis of WTP. This is important because the mitigation of mask waste involves not only the government and related institutions but requires synergy from the community as the main actor in using disposable masks. The findings in this research are that the community's knowledge of how to manage mask waste still feels unusual because generally, what is the center of public attention is household waste in general. Based on health and the environment, the community agrees to participate in WTP in managing mask waste. However, the financial ability responds differently to the amount of the budget spent on mask waste management, and people still want to manage mask waste properly. Therefore, the efficiency of WTP can be considered by the government in policy-making for the management of single-use mask waste.

2. METHOD

This study is intended to evaluate the factors that support the management of mask waste during the pandemic and post-pandemic. The amount of domestic waste is influenced by the standard of living of residents and environmental awareness [47]. The action of personally handling waste is influenced by socio-cultural factors regarding communication, awareness, collaboration, values, and norms, as well as consumer confidence in waste management [48]. Nevertheless, disposal techniques in mask waste, like burning and reclamation, generally produce dangerous chemicals [49]. Furthermore, the study was designed to determine the WTP value for the community's willingness to pay a certain amount of money to manage single-use mask waste by analyzing several factors, which SWOT evaluated. This research is important because the abundance of mask waste impacts the environment. However, the management of mask waste at the community level has yet to be maximized, which is different from mask waste in health facilities where SOP is available.

Data collection using an online cross-sectional questionnaire with 344 respondents from various backgrounds and ages spread throughout Indonesia. However, due to research limitations, there are only 27 provinces out of a total of 37 provinces in Indonesia. Participants in the study were based on predetermined criteria: at least high school or college students with a minimum age of 15 years to adults aged > 50 years. The research instrument is divided into several sections, namely the general characteristics of the respondents,

perceptions of health and mask waste, the habit of using masks, and the decision-making of WTP. Respondents need 5-10 minutes to complete the questionnaire.

Questionnaire data were used as primary data, which was processed using IBM SPSS 25.0 software (IBM Corporation, Armonk, NY, USA) to test the Spearman correlation with a significant level of 0.05 as the basis for decision-making to determine the correlation of various factors with community approval of WTP. In addition, descriptive analysis is also used to study the characteristics of respondents through a Likert scale which is classified into several variables and described by means and percentages.

3. RESULT

Based on the results (Figure 1), the distribution of respondents' characteristics is in 27 provinces in Indonesia. Most of the respondents were Central Java (47.67%), East Java (10.47%), West Java (9.59%), Jakarta (6.10%), and Jambi (4.07%).

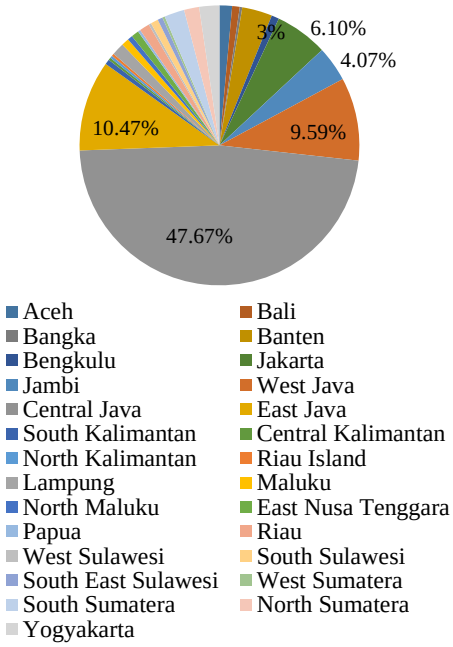

Figure 1. The origin of the respondent's province (the color with no percentage indicates the respondent's participation <3%)

The characteristics of the 344 respondents in the study included gender, age, education, type of work, monthly income, knowledge of the negative impact of masks, waste service management, approval of mask waste management, and nominal willingness to participate in WTP for mask waste management.

The percentage of female sex is 67.2%, which is more dominant than male at 32.8%. General characteristics are dominated by 20-30 years with a percentage of 66% meaning that age is a productive age in activities, thoughts, and work. While most of the respondents' backgrounds are at the tertiary level, both undergraduate/master/doctoral with a percentage of 63.7%, meaning that respondents have a good educational background as a provision for caring for the environment, especially in the management of mask waste. Based on the type of work, it shows that the status of students/students is greater than other jobs, which is 52%, followed by State Civil Apparatus at 17.4% and private employees at 12.5%. The income levels of respondents are very diverse, the 3 highest incomes IDR/month of the respondents are <500,000 more than the others, namely 30.8%, then 2,000,001 – 5,000,000 by 25%, and >5,000,001 by 24.1% (Table 1). Diverse income levels are a factor in the decision to participate in WTP.

Table 1. Characteristics of participating respondents

Characteristic	Categories	N (%)
Sex	Male	113 (32.8%)
	Female	231 (67,2%)
Age	<20	51 (14.8%)
	20-30	227 (66%)
	31-40	55 (16%)
	41-50	6 (1,7%)
	>50	5 (1.5%)
Education	Middle School	7 (2%)
	High School	82 (23.8%)
	Diploma	36 (10.5%)
	Bachelor/Master/Doctor	219 (63.7%)
Occupation	Student	179 (52%)
	Housewife	6 (1.7%)
	Fresh Graduate	31 (9%)
	Entrepreneur	12 (3.5%)
	Private employees	43 (12.5%)
	State Civil Apparatus	60 (17.4%)
	other	13 (3.8%)
Monthly Income (IDR/month)		
	<500,000	106 (30.8%)
	500,001 – 1,000,000	35 (10.2%)
	1,000,001 – 2,000,000	34 (9.9%)
	2,000,001 – 5,000,000	86 (25%)
	>5,000,001	83 (24.1%)

Note: N = number of respondents

Characteristics of respondents' attitudes towards waste management (Table 2) are shown in their knowledge of waste management in general, which shows a percentage of 83.4%, meaning that the community is aware of waste management. However, in contrast to knowledge about waste management services, respondents tend to show a negative response of 68.6%, meaning that respondents are not aware of the presence of waste management services. Furthermore, respondents stated that they agreed that 98.5% of mask waste management was held, meaning that the respondents consciously had a high concern for mask waste. However, only 67.2% of respondents are willing to pay for the services of masks waste management. Furthermore, the respondent's willingness to spend the most money (IDR/month) for the contribution of mask waste management is at most decisions <10,000 with a percentage of 64.5% and agrees at least with a value of >50,000. The decision is based on various factors that need to be studied in depth, not only through descriptions. Therefore, it is necessary to test the correlation of various variables where these variables become a factor in deciding to participate in the WTP.

The variables of respondents' knowledge about waste services, approval for mask waste to be managed, and knowledge of the negative impact of waste showed a significant positive correlation with WTP, respectively, $r = 0.140$, $p<0.05$; $r = 0.122$, $p<0.05$, $r = 0.121$, $p<0.05$. While the budget variable for WTP has a strong and significant correlation but is negative, meaning that if the value of the WTP budget is increased, WTP participation will decrease.

Table 2. Respondent's knowledge regarding waste

Characteristic	Categories	N (%)
Knowledge about the negative impact of mask waste	Yes	287 (83.4%)
	No	57 (16.6%)
Know about waste management services?	Yes	108 (31.4%)
	No	236 (68.6%)
Do you agree if an effort is made to manage mask waste?	Yes	339 (98.5%)
	No	5 (1.5%)
Are you willing to pay for services for mask waste management?	Yes	231 (67,2%)
	No	113 (32.8%)
How much money (IDR / month) will you give for the contribution of mask waste management?	0	113 (32.8%)
	1-10,000	109 (31.7%)
	10,001 – 25,000	91 (26.5%)
	25,001 – 50,000	24 (7%)
	>50,000	7 (2%)

Table 3. Correlation of several variables with WTP response to mask waste management

Variables	WTP Response	
	r	p
Gender	-0.104	0.054
Age	-0.034	0.533
Education	-0.032	0.557
Occupation	0.012	0.829
Monthly Income	-0.044	0.415
Knowledge of waste services	0.140	0.009*
Mask management approval	0.122	0.024*
Knowledge of the negative impact of mask waste	0.121	0.025*
Budget for WTP	-0.854	0.00*

Note: * Correlation is significant at the 0.05 level (2-tailed).

Table 4. Recapitulation of the use of masks by the public during the pandemic (2020 – mid 2022) and post-pandemic (after mid 2022)

Characteristic	Categories	N (%)
Are you still wearing **post-pandemic masks**?	Yes	321 (93,3%)
	No	23 (6,7%)
In 1 week, how many disposable masks do you use? – **during the pandemic**	<3 mask	48 (14%)
	3-6 mask	97 (28.2%)
	7-10 mask	126 (36.6%)
	>10 mask	73 (21.2%)
In 1 week, how many disposable masks do you use? – **after** the pandemic (currently)	<3 mask	100 (29.1%)
	3-6 mask	138 (40.1%)
	7-10 mask	86 (25%)
	>10 mask	20 (5.8%)

Note: Post pandemic means that the use of masks is not strictly required

Respondents still use masks even though there is no significant spike in COVID-19 as indicated by the percentage of 93.3%. However, the number of masks used in a week by each individual is less than during the COVID-19 pandemic. Masks used a week during a pandemic are dominated by 7-10 masks with a percentage of 36.6% of respondents compared to post-pandemic of 3-6 masks with a percentage of 40.1%.

Based on Table 5 the community strongly agrees with the 5 statements, namely X1, X2, X4, X6, and X7. In fact, people are aware of the importance of health as a priority in life. The community also strongly agrees that mask waste comes from daily community activities which can accumulate in rivers, ditches, culverts, seas, to reduce environmental quality (air, water, environmental aesthetics). Therefore, the community strongly agrees with the management of mask waste. The level of perception of agreement is shown in statements X5 and X8, namely mask waste including infectious waste that has the potential to contain viruses/bacteria, this can be due to the knowledge of the community as well as different educational and work backgrounds. Furthermore, the level of doubtful perception is shown in statements X3 and X9, namely the problem of mask waste being a priority and trust regarding the institution implementing the waste management program, this can be caused because in general the knowledge in the community about waste is other than mask waste, while the level of trust in waste management can be related to the respondent's experience on the assessment in the surrounding environment.

Table 5. Indicators of public perception of disposable mask waste

	Respondent's answer					mean value	Perception level
	SD	NA	D	A	SA		
X1	2	1	4	54	283	4.79	SA
X2	2	3	23	138	178	4.42	SA
X3	83	90	44	85	42	2.75	D
X4	4	7	16	94	223	4.53	SA
X5	4	7	65	108	160	4.20	A
X6	3	5	42	121	173	4.33	SA
X7	0	4	8	83	249	4.68	SA
X8	8	26	119	118	73	3.65	A
X9	37	76	94	85	52	3.11	D

Note: SD=strongly disagree, NA= not agree, D=doubtful, A=agree, SA=strongly agree

X1 : Health is a priority in life
X2 : Mask waste comes from people's daily activities
X3 : The problem of mask waste is a priority
X4 : Mask waste can accumulate in rivers, ditches, culverts, the sea
X5 : Mask waste is included as infectious waste
X6 : Mask waste reduces environmental quality (air, water, environmental aesthetics)
X7 : Mask waste management is important to implement
X8 : Mask waste potentially contains viruses/bacteria
X9 : I trust the agency implementing the waste management program
X10 : The management of mask waste is not only the responsibility of the government

Based on Figure 2, the willingness of respondents to manage mask waste was 231 people, while 113 people chose not to participate. The details in the WTP are 1-10,000 IDR (0.64 USD) for 109 people; 10.001 – 25.000 IDR (0.64 - 1.61 USD) for 91 people; 25.001 – 50.000 IDR (1.61 - 3.21 USD) for 24 people; and >50,000 IDR (3.21 USD) for 7 people (Table 6). The highest WTP value is 1-10,000 IDR (0.64 USD) willing to pay for mask waste management. People's decision in WTP value for managing mask waste is based on knowledge of the negative impacts of mask waste. However, research does not show that income is related to the decision to participate in WTP (Table 3).

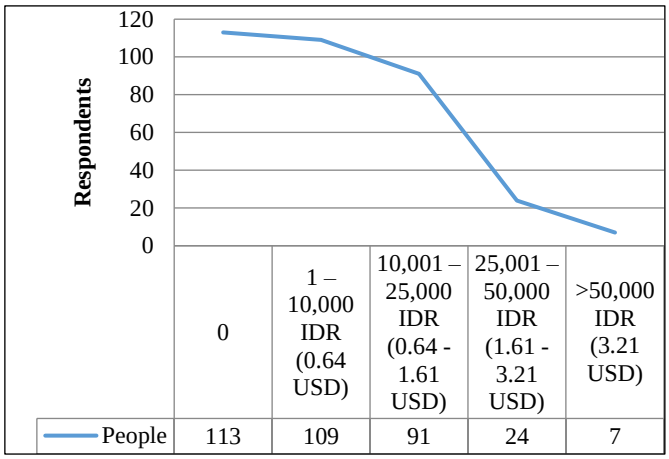

Figure 2. WTP request

Table 6. Estimation of WTP receipts

WTP / month	People	WTP Median / month (IDR)	Estimated receipt / month (IDR)
0	133	0	0
1 – 10,000 IDR (0.64 USD)	109	5,000	545,000
10,001 – 25,000 IDR (0.64 - 1.61 USD)	91	17,501	1,592,591
25,001 – 50,000 IDR (1.61 - 3.21 USD)	24	37,501	900,024
>50,000 IDR (3.21 USD)	7	50,000	350,000
TOTAL			3,387,615

Based on Table 6, the WTP value can be determined. If an area has a population of 231 people participating in WTP mask waste management, the Estimated receipt/month (IDR) is 3,387,615. This estimated value is divided by the number of participants, so a WTP value of IDR 14,665 is obtained.

The SWOT analysis presents strengths, weaknesses, opportunities, threats in order to analyze the feasibility of WTP and strategies for broad application, but this analysis is not enough to decide the willingness of the community to contribute to the WTP in the management of masks, therefore there is a need for synergy, education, and a lot of research. which can strengthen the benefits and feedback of WTP.

4. DISCUSSION

The use of masks has proven to be an effective strategy to slow the spread of COVID-19. Even in a critical situation such as a pandemic, it really helps people to socialize with other people because the mindset of each individual believes that masks can protect themselves from viral infections [12]. However, in indigenous communities in rural areas, these preventive measures tend to give a negative response [22].

The paradigm of society is influenced by what has been experienced. The post-pandemic paradigm is the result of a long journey through the COVID-19 pandemic. The post-pandemic community paradigm prioritizes health, increases immunity, and applies a healthy lifestyle in everyday life, including the mindset of using masks. Therefore, it is undeniable that the use of masks after the pandemic is still being used massively every day by the community (Table 4).

The use of disposable masks in the end becomes infectious waste that must be separated from other waste [35]. Infectious waste is a source of disease transmission, therefore the handling of mask waste, especially in health facilities, is very carefully considered. In fact, people who have various backgrounds use masks as a result of the COVID-19 pandemic. The age factor affects preventive behavior in responding to the COVID-19 pandemic, ages 19-55 and over 56 indicate that they tend to be preventive by wearing tight masks [21]. Besides, a higher level of education indicates compliance in the daily use of masks [23]. Age and education, occupation, and even income background have no effect and do not correlate with WTP in waste management. This is in line with research [50] which finds that the level of education is negatively related to the amount of knowledge, attitudes, and practices of a person in his concern for masks. In contrast to the respondent's knowledge of waste services, approval for mask waste to be managed, and knowledge of the negative impact of waste, there is a significant positive correlation. This is because the waste of masks, medical gloves, personal protective equipment during the COVID-19 period is considered hazardous waste because it may be infectious [35]. Therefore, the community tends to agree to carry out waste management, but not for the expenditure of the management budget. The budget variable of community willingness to contribute to WTP shows a significantly strong correlation response (Table 3) but has a negative value, this can be related to public perceptions in estimation of WTP receipts (Table 5) who are still doubtful that the problem of mask waste is a priority and trust in institutions implementing waste management programs.

In fact, waste management is a personal responsibility that produces the waste itself. However, public awareness to manage personal waste is still minimal. Coupled with the regulations and mechanisms of waste management by the government in each region are not in line with an SOP [28]. Therefore, each local government cooperates with the environmental service to carry out personal waste management from each house or complex or regional scope. Coupled with the support of the government or the private sector in the provision of special trash can facilities for masks. The fact is that all elements have not synergized in good waste management, the elements in question are the community as the main actor who produces waste, waste management institutions, waste transport actors from both the government and the private sector, and the government as policy makers. In addition, industry players also have a responsibility for their products that become waste in the community [51].

In the community, mask waste containing high infectious potential is generally not separated and disposed of with other waste, both organic and inorganic, meaning that chemical and biological reactions occur in one place, in fact mask waste is made from PP for plastic. It is known that disposable masks used during the pandemic and post-pandemic are a potential source of microplastic waste that can pollute the environment [40, 52-55]. In contrast to health facilities, the government's focus on medical waste including masks has been implemented by building a service company that manages and transports medical waste from hospitals in accordance with SOPs without polluting the environment.

Research criticizes government policies related to recycled urban green waste that masks are recycled together with other organic materials up to a mask size of 10 mm^2, then returned to the ground with the intention of making it easy to

decompose, but researchers do not agree because the soil will be contaminated with microplastics that are difficult to decompose so that it will have an impact on the environment's future [36]. Therefore, the management of mask waste through WTP aims to manage mask waste with full attention and responsibility. The separation of mask components will be paid more attention because they have different constituent characters. The mask components in question are face masks, ear loops, and nose wires.

Table 7. SWOT analysis of WTP in the management of disposable masks

	(S) ***Strengths*****:** Implementing integrated mask waste management; The budget issued by the community can be adjusted; The environment is healthier from pollution	**(W)** ***Weaknesses*****:** Community awareness still low; differences in financial conditions between communities
(O) ***Opportunities*** Increased public awareness on the importance of health; The concept of WTP has not been found on a small scale in the community	**SO** Public education to care about mask waste; Conduct a study on the community's contribution to WTP	**WO** Construction, investment, and management of mask waste management; WTP can be used as a small-scale concept in the management of mask waste in rural areas
(T) ***Threats*****:** WTP in society can compete with professional waste management companies	**ST** Optimizing the quality of mask waste management and management to increase trust	**WT** Utilize social media, internet, and local government to invite WTP

Based on the SWOT analysis (Table 7), there is a need for massive health education held by professionals [11] the education is intended as an effort to be aware of health from an early age. The public needs to be educated about the disposal of masks at home to minimize the number of masks that are disposed of incorrectly [55]. The level of community self-help is the key in a government activity, so it is important to provide economic and non-economic incentives as a form of appreciation for the good of the community [56]. In addition, waste management figures, transporters, collectors from one place to another require energy and effort. Another finding shows that all waste management figures are the most vulnerable to the risk of pollution, medical waste is proven to have a high risk, but they do not use personal and protective equipment (PPE) [53].

It is important to pay attention to the construction of a centralized waste management site and the provision of a local waste management site [54]. However, the development of a good mask waste management system requires a large budget because of the complex management chain from the consumer to the final management site, not to mention other types of waste. At least the government spends 20 to 50% of the city budget to maximize waste management [35]. With this investment, the government also invests in the right infrastructure to maintain health and the environment, especially aquatic ecosystems [29].

The study results show that people's mask waste management behavior still needs improvement. However, there is a desire to manage mask waste because they are aware of the negative impact of mask waste which can threaten the environment and health. In addition, the factors related to the decision to participate in WTP were respondents' knowledge of waste services, approval for mask waste to be managed, and knowledge of the negative impacts of waste, showing a significant positive correlation to WTP and a negative correlation to the amount of budget spent on WTP. Thus, the ability and willingness of people to take the initiative to manage mask waste depend on the attitude of each individual. The practical implications of managing mask waste through WTP:

1. There is a need to change attitudes and instill environmental and health values in people; this can be through the lowest level, such as the family, home environment through complex groups, or empowering women in the house to pay attention to the mask waste used by their family. In line with previous research, by actively participating in waste management activities, women can influence the community and grow as social capital in society [57].
2. Capacity building and human resources in waste management agencies, including heads, managers, and waste management operators, to sort mask waste. In the case of a small hotel, it depends on their environmental attitudes and whether operators can implement effective waste management procedures [58] in the human resource and facilities. Optimizing waste collection facilities, such as landfill 3R (reduce, reuse, recycle) and waste banks, and providing incentives to recycling managers to maintain or improve waste management [59] potentially. By providing incentives through WTP to waste management operators, people with high activity or low willingness to recycle mask waste independently will greatly assist in managing medical waste.
3. Government policy from regional to central level under one command to manage waste, including household mask waste, by segregating mask waste through the WTP concept to be further managed by waste management operators so as not to mix with other waste. In this case, everyone is responsible for their mask waste to help facilitate the transportation of garbage. However, the waste management operator will assist it in handling it.

In Malaysia, more than 80% of waste is still disposed of in various landfills, despite improvements to legislation and regulations relating to waste management [60]. On the other hand, cost-effective landfill diversion while decreasing GHGs must consider waste to energy, separation of waste mixed, and variances to the collection. GHG mitigation costs for mixed effluents range from 30 to 900 $/MTCO2e at maximal diversion [61]. Therefore, there needs to be synergy from many parties to supervise each other, remind, and realize that personal and environmental health is very important for handling waste mask.

5. CONCLUSIONS

The study provides a significant positive correlation to the

factors of knowledge regarding waste services, approval of mask waste management, knowledge of negative impacts, as well as negative but significant correlation to the budget contribution in WTP of mask waste management. People are not familiar with the specific management of mask waste as medical waste, so some people have a hesitant perspective to make mask waste management a priority. Efforts to evaluate WTP through SWOT analysis show the advantages of WTP, namely waste can be handled properly without polluting the environment; Weaknesses, namely regarding the different financial conditions of the community; Opportunity, namely WTP at the community level, can be developed; and Threat, namely competition for WTP at the community level with government/private companies that handles waste in health facilities. However, from various SWOT points of view, solutions can be drawn in order to support WTP in the management of disposable mask waste at the community level.

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