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Research Paper

The Role of Social Acceptance as A Mediator Variable in The Influence of Environmental Awareness on Willingness to Pay for Waste to Energy

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Abstract

This research aims to determine the role of Social Acceptance as a mediator variable on the influence of Environmental Awareness on Willingness to Pay for Waste to Energy. Participants in this research were the general public aged over 16 years. A total of 200 respondents were obtained through convenience sampling techniques. The measuring instruments used in this research are the social acceptance scale (SAS), environmental awareness scale (EAS), and willingness to pay scale (WTPS). The analysis technique used in this research uses the Structural Equation Modeling (SEM) and path analysis tests. The results of this study show that social acceptance of waste to energy cannot play a significant role as a mediator in the relationship between environmental awareness and willingness to pay for waste to energy. Other findings in this research are that environmental awareness has a significant direct effect on social acceptance of waste to energy, environmental awareness directly affects willingness to pay for waste to energy, and social acceptance of waste to energy does not affect willingness to pay for waste to energy. Suggestions for further research could deepen further into what factors can influence the willingness to pay for waste to energy.

Keywords *Environmental Awareness, Social Acceptance, Willingness to Pay, Waste to Energy*

INTRODUCTION

Environmental problems can arise from various sources, one of which arises from human activities that produce a lot of waste. This is supported by data from the National Waste Management Information System (SIPSN) of the Indonesian Ministry of Environment and Forestry, which recorded that waste generation in 2021 reached 30.4 million/year (KLHK, 2020). The managed waste generation reached 64.78%, but there is still unmanaged waste at 35.22%. Waste from households has the largest achievement of 40.9%. Household waste production is a serious environmental problem that needs to be addressed. The Indonesian government is trying to handle the waste generation by converting it into renewable energy. Municipal waste is converted into electrical energy, known as waste-based power plants (PLTSa).

Regulations issued by the government related to PLTSa include Law. No. 30 of 2007 concerning Energy (Energy Law) as a legal umbrella in the development of renewable energy and followed up by government regulations Law No. 79 of 2014 concerning National Energy Policy (KEN) and Regulation of the Minister of Energy and Mineral Resources (ESDM) No. 44 of 2015 concerning the Purchase of Electricity by PT. PLN from Waste-Based Power Plants. In addition, Law No. 18 of 2008 concerning Waste Management is the legal basis for using waste as an energy source. In addition to government regulations, the Presidential Regulation also encourages the development of PLTSa, stated in Law No. 3 of 2016, concerning the Acceleration of the Implementation of National Strategic Projects, which explains the development of energy infrastructure derived from waste in several provinces. In addition to being intended as an alternative energy source, PLTSa is also considered to be one of the strategies for overcoming

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environmental problems caused by waste generation that are still not optimal.

The construction of PLTSa is expected to overcome environmental problems caused by waste. The study results from Qodriyatun (2021) stated that PLTSa is an instant solution to overcome environmental problems for cities with waste production and limited landfill land. In addition, Nurdiansah et al. (2020) also proved that PLTSa can be an alternative to reduce waste volume. The construction of PLTSa also raises many problems; for example, people are worried that it will impact public health and cause environmental damage. Therefore, before continuing the construction of PLTSa, this study will look at the role of public awareness of PLTSa (community awareness of waste to energy) and social acceptance of PLTSa (social acceptance toward waste to energy) as mediator variables on willingness to pay for PLTSa (willingness to pay of waste to energy).

In addition to social acceptance of PLTSa, to encourage willingness to pay for PLTSa, consumer awareness must be created for the environmental aspects of renewable energy so that they are willing to pay more for less environmental impact (Roe et al., 2001). Consumer awareness referred to in this study is community awareness of waste to energy (PLTSa). Consumers can realize change by being aware of waste to energy (PLTSa) through institutions/governments that can make changes; they cannot do it alone. Therefore, community environmental awareness can impact the willingness to pay for renewable energy (Kassarjian, 1971).

Although renewable energy investments are still too expensive, the retail price of energy generated from renewable energy sources is expensive for consumers (Aravena et al., 2012). Consumers may be in a dilemma between the environment and their economic situation. As environmental sensitivity increases, people's attitudes towards the environment change, and they may be willing to pay more. Increasing environmental awareness is one factor that must be considered for sustainable energy supply and growth. Karaoğlan and Durukan (2016) prove that environmental awareness affects the willingness to pay for electricity generated from renewable energy sources. So, it is possible that public awareness of PLTSa can increase the willingness to pay for PLTSa. Many still consider their economic ability to contribute to the PLTSa program. When environmentally conscious consumers are between economic situations and are aware of environmental impacts, they will consider the environmental impacts (Karaoğlan & Durukan, 2016). In addition, they will prefer to behave green in energy consumption and other product groups. In addition, the tendency of people to save energy will increase along with increasing environmental awareness. Based on the results of the explanation, it is necessary to conduct research on the role of environmental awareness and social acceptance as mediator variables on willingness to pay for waste to energy.

LITERATURE REVIEW

Environmental awareness can be defined as an attitude about the environmental consequences of human behaviour. Public support for environmental protection depends on the level of environmental awareness. Although much information exists regarding environmental behaviour, it is unknown which variable or variables appear to be most influential in motivating individuals to take responsible environmental action. According to Dembkowski and Hanmer-Lloyd (1994), Environmental awareness is a multidimensional concept with three main cognitive components that form individual awareness: knowledge, memory, intelligence, and decision-making. Based on several explanations, environmental awareness is a person's attitude when facing environmental problems, which can ultimately increase individual motivation to take responsible environmental actions.

Social acceptance is a crucial issue determining the extensive adoption of green energy technologies. Social acceptance is relevant in adopting innovative renewable energy projects

(Prosperi et al., 2019). Implementing the new energy source policy needs to be supported by social acceptance from the wider community. Waste processing using Waste to Energy also requires social acceptance from most of the community. However, most people have not accepted waste processing in this way because the costs they consider to be relatively high. This is also similar to the research of Aklin et al. (2018), which reveals that social acceptance of solar power is not reduced because of high costs but relative deprivation in rural-urban inequality. It can be seen that using new technology to minimize problems related to processing or new energy sources is still little accepted by the community. Based on this explanation, it can be concluded that social acceptance of waste to energy is the majority of people who tend to agree with the idea of waste management using waste to energy.

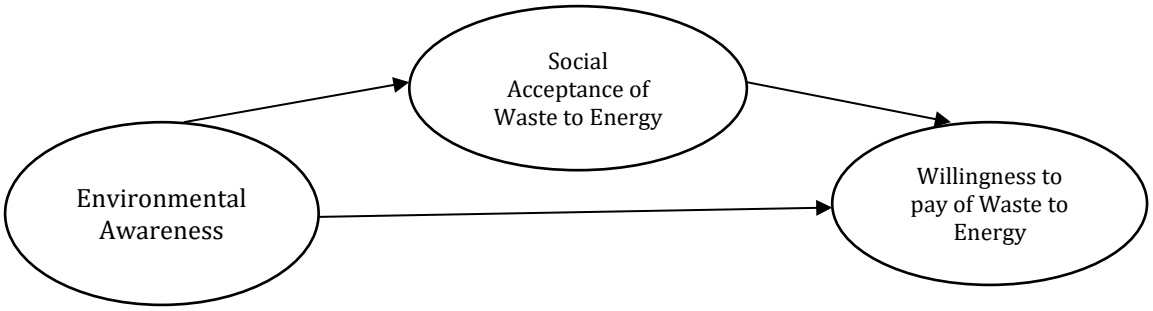

Figure 1. Research Hypothesis

RESEARCH METHOD

This research uses quantitative research type. In this case, Neuman (2007) explains that quantitative research starts from variables to develop research method techniques that produce quantitative data in numbers. Quantitative research that will be carried out generally follows a deductive route, where researchers start from abstract ideas and then specific data collection techniques in the form of measurement procedures to obtain numerical information; the numerical information is a representation of previous abstract ideas (Neuman, 2007). Neuman (2011) explains that the population is a large group in research that has an essential role in the sampling process. In defining a population, researchers must specify the units to be taken as samples and the population's geographic location and temporary boundaries (Neuman, 2011). The target population in this study is the community in the area around waste to energy. Meanwhile, the sample selection criteria must be met for data collection: (1) General public; (2) Aged over 16 years.

Willingness to pay for waste to energy is the maximum price of a good or service, namely waste to energy, where the community around the waste to energy is willing to buy it and is willing to do so voluntarily at a particular time by adapting the measuring instrument from MacKerron et al. (2009) and Bateman et al. (2013) which uses contingent valuation (CV) polytomous choices in determining the size of the offer using the closed-ended question method. It can be seen that carbon offsets can be described based on their characteristics, allowing information to be extracted from respondents, such as the economic value of carbon offsets.

Environmental Awareness is a person's attitude when facing environmental problems, which can ultimately increase individual motivation to take responsible environmental action, compiled by modifying the measuring instrument (Martínez-Borreguero et al., 2020). This measuring instrument uses a 5-point Likert scale consisting of 1: Strongly Disagree, 2: Disagree, 3: Somewhat Agree, 4: Agree, 5: Strongly Agree.

Social Acceptance of Waste to Energy is the majority of the community who tend to agree with the idea of waste management using waste to energy, which is compiled by modifying the measuring instrument from Wüstenhagen et al. (2007), using a 5-point Likert scale consisting of 1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree. The analysis technique in this study is Structural Equation Modeling (SEM) with the help of Jamovi software.

FINDINGS AND DISCUSSION

The research data were analyzed using structural equation modeling (SEM) with Jamovi software. In SEM, there is a confirmatory factor analysis (CFA), overall model fit test, and path analysis test. The following is an explanation of each part of SEM with Jamovi software.

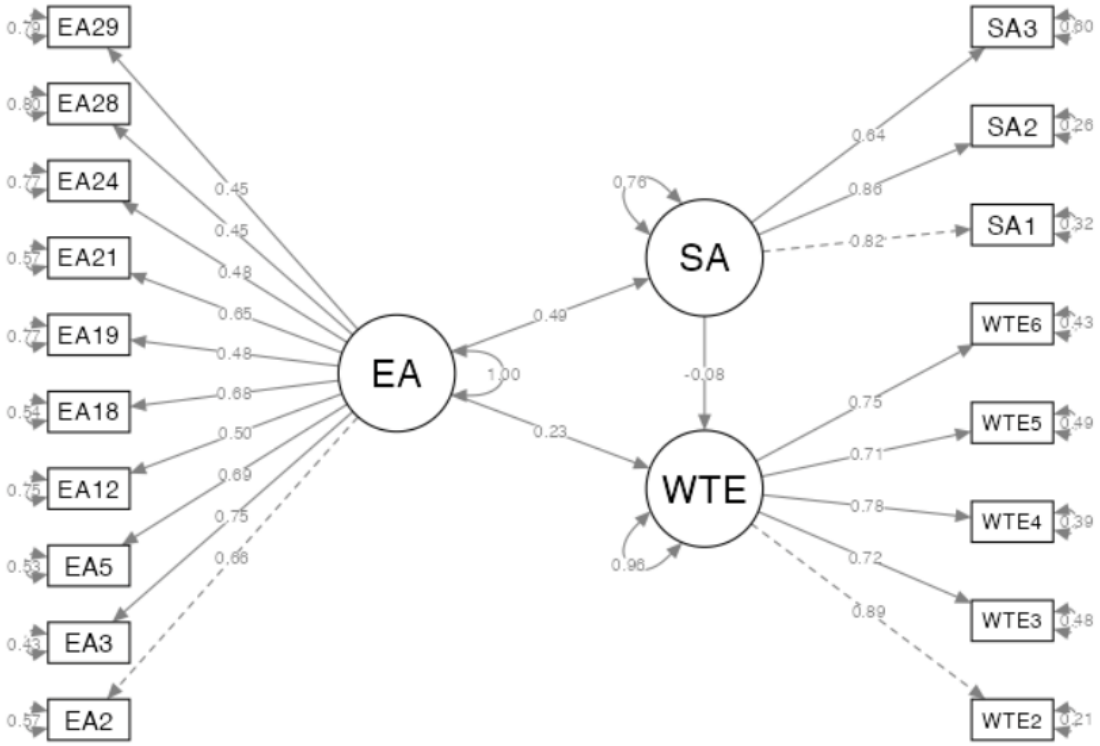

Figure 2. Results of Structural Equation Modeling Analysis

The following is a summary of the confirmatory factor analysis before item drop in this study:

Table 1. Confirmatory Factor Analysis

Variables	Indicator Code	Standardized Loading Factor (SLF) ≥ 0.30	Standard Error	Information	Construct Reliability	
					CR	AVE
Willingness to pay waste to energy	WTE2	0.89	0.21	Valid	0.88	0.60
	WTE3	0.72	0.48	Valid		
	WTE4	0.78	0.39	Valid		
	WTE5	0.71	0.49	Valid		
	WTE6	0.75	0.43	Valid		

Variables	Indicator Code	Standardized Loading Factor (SLF) ≥ 0.30	Standard Error	Information	Construct Reliability	
					CR	AVE
Environmental Awareness	EA2	0.66	0.57	Valid	0.84	0.35
	EA3	0.75	0.43	Valid		
	EA5	0.69	0.53	Valid		
	EA12	0.50	0.75	Valid		
	EA18	0.68	0.54	Valid		
	EA19	0.48	0.77	Valid		
	EA21	0.65	0.57	Valid		
	EA24	0.48	0.77	Valid		
	EA28	0.45	0.80	Valid		
	EA29	0.45	0.79	Valid		
Social Acceptance of Waste to Energy	SA1	0.82	0.32	Valid	0.82	0.61
	SA2	0.86	0.26	Valid		
	SA3	0.64	0.60	Valid		

The reliability of all constructs is stated to be good, with construct reliability (CR) ≥ 0.70, including good reliability and an AVE value < 0.50, indicating adequate convergence (Hair Jr. et al., 2010). Even though the AVE value is smaller than 0.5, Fornell and Larcker (1981) state that if the AVE value is less than 0.5 but the CR value is more significant than 0.6, it is still acceptable. It can be concluded that all instruments/measuring tools used in this study are valid and reliable.

Analyzing the fit of data with the overall model in the LISREL program is called Goodness of Fit (GOF). This test aims to evaluate whether the resulting model is fit or not. The overall model fit analysis can be seen from the results of statistical data processing as follows:

Table 2. Overall Model Goodness of Fit Test

GOF Size	Match Rate Target	Estimation Results	Match Level
Chi-Square	Small value p > 0.05	χ^2= 132 (p = 0.0)	Not good
RMSEA	Included in the good category or *good fit* and 90% *confidence* interval of RMSEA	0.117	Good (*good fit*)
NFI	$NFI \geq 0{,}9$	0.920	Good (*good fit*)
NNFI	NNFI ≥ 0.9	0.930	Good (*good fit*)
RFI	RFI ≥ 0.9	0.908	Good (*good fit*)
IFI	IFI ≥ 0.9	0.940	Good (*good fit*)
CFI	CFI ≥ 0.9	0.939	Good (*good fit*)
PNFI	Ranges between 0 and 1	0.794	Good (*good fit*)

The table from the discussion presented previously shows that only 1 of the 8 GOF measurements shows poor fit, so it can be concluded that the model's overall fit is good (good fit). The following is a path analysis of this study. In hypothesis 1 with the path between environmental awareness and social acceptance of waste to energy, the results obtained were β = 0.4866, SE = 0.0831, t = 7.353, p <0.05, so that environmental awareness has a significant direct effect on social acceptance of waste to energy (H0 is rejected). Furthermore, in H2, it was found that β = 0.2335, SE = 0.11293, t = 2.804, p <0.05, so it is proven that environmental awareness directly affects willingness to pay for waste to energy. In hypothesis 3, the results obtained were β = -0.0775, SE = 0.0933, t = -0.897, p> 0.05, so it is proven that there is no direct effect between social acceptance of waste to energy and willingness to pay for waste to energy. Then, hypothesis 4 cannot be proven because, in the path of hypothesis 3, there is no evidence of a direct effect between social acceptance of waste to energy and willingness to pay for the waste to energy. Therefore, this study cannot prove that social acceptance of waste to energy can play a significant role in the relationship between environmental awareness and willingness to pay for waste to energy.

Other research results that state that environmental awareness has a direct effect on willingness to pay for waste to energy are in line with research that states that to encourage willingness to pay for PLTSa, consumer awareness (environmental awareness) must be created for the environmental aspects of renewable energy so that they are willing to pay more for less environmental impact (Roe et al., 2001). Consumers can realize change by being aware of PLTSa through institutions/governments that can make changes; they cannot do it alone. Therefore, public environmental awareness can impact the willingness to pay for renewable energy (Kassarjian, 1971). Besides that, Karaoğlan and Durukan (2016) prove that environmental awareness affects the willingness to pay for electricity generated from renewable energy sources. So, it is possible that public awareness of PLTSa can increase the willingness to pay for PLTSa.

The results of the following study were that social acceptance of waste to energy did not influence willingness to pay for waste to energy. This is not in line with the research of Kraeusel and Möst (2012), which proves that social acceptance is a significant factor in increasing willingness to pay for waste to energy. This indicates that for someone willing to contribute to environmental activities, one of which is energy waste, it does not mean that the person must accept the activity. The community is willing to contribute, but it does not necessarily accept its presence, which does cause new problems, such as piles of garbage or noise that may disturb their environment. Then, the results of the study which stated that social acceptance of waste to energy could not play a significant role as a mediator in the relationship between environmental awareness and willingness to pay for the waste to energy can occur because the results of the social acceptance of waste to energy path test on willingness to pay for the waste to energy do not have a significant effect so that social acceptance of waste to energy cannot be used as a mediator between environmental awareness and willingness to pay for the waste to energy. This is not in line with several previous studies which stated that people who accept waste to energy will contribute more willingly to pay to improve the environment (Hou et al., 2019).

CONCLUSIONS

This study used respondents from the community who live around the waste to energy process, either around the waste collection point that will enter the waste to energy process, or the waste to energy itself. The study's results on the first hypothesis show that Environmental awareness has a direct and significant effect on social acceptance of waste to energy. This aligns with previous research on community concern for waste to energy which can influence and even reduce the community's choice to protest against the waste to energy program (Ren et al., 2016).

In other words, the study states that increasing public awareness of waste to energy can

also increase public acceptance of waste to energy. The results of this study can provide information to the government, both local governments and the Ministry of Environment and Forestry, that the process of waste to energy can produce problems that may arise due to piles of waste that will be converted into energy or the sound produced during the process. Of course, the problems that will arise can make people who live around the waste to energy management reject its presence. Therefore, based on these results, both local governments and the Ministry of Environment and Forestry need to hold activities that aim to increase public awareness of the environment so that people can accept the presence of waste to energy.

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