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Environmental Justice: The Influence of Environmental Ethics, Environmental Knowledge on Waste Management with Religiosity as a Mediation Variable

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Abstract. *TThis article examine how environmental knowledge, religiosity, environmental ethics, and behavioral influence waste management behavior and realization of environmental justice among batik MSME actors in Indonesia. This research is a field study employing quantitative methods, involving 232 respondents selected through purposive and accidental sampling techniques. The collected data analysed using the PLS-SEM method. This study concluded that environmental knowledge and religiosity are serious challenges in efforts to form environmental justice, MSME actors can feel the impact of their business so they care about industrial waste management, environmental ethics strengthen the commitment of MSME actors to nature conservation programs and prevent environmental damage, internalisation of environmental ethics values which in line with religiosity is more effective in encouraging fair waste management behaviour than just increasing environmental knowledge, and encouragement of waste management is evidence of good interaction between humans and nature.*

Keywords: *Environmental Justice; Environmental Ethics; Environmental Knowledge; Waste Management; Religiosity*

Abstrak. *Artikel ini mengkaji bagaimana pengetahuan dan etika lingkungan, religiositas, dan faktor perilaku mempengaruhi perilaku pengelolaan limbah serta perwujudan keadilan lingkungan di kalangan pelaku UMKM batik di Indonesia. Penelitian ini merupakan studi lapangan dengan pendekatan kuantitatif yang melibatkan 232 responden, yang dipilih melalui teknik purposive dan accidental sampling. Data dianalisis menggunakan metode PLS-SEM. Penelitian menyimpulkan bahwa pengetahuan lingkungan dan religiositas masih menjadi problem dalam membentuk keadilan lingkungan, pelaku UMKM dapat merasakan dampak dari aktivitas usahanya sehingga mendorong kepedulian terhadap pengelolaan limbah industri, etika lingkungan memperkuat komitmen pelaku UMKM terhadap pelestarian dan pencegahan kerusakan lingkungan, internalisasi nilai-nilai etika lingkungan yang selaras dengan religiositas lebih efektif dalam mendorong perilaku pengelolaan limbah yang adil dibandingkan sekadar peningkatan pengetahuan lingkungan, dan dorongan terhadap pengelolaan limbah merupakan bukti adanya interaksi yang baik antara manusia dan alam.*

Kata kunci: *Keadilan Lingkungan; Etika Lingkungan; Pengetahuan Lingkungan; Pengelolaan Limbah; Religiositas*

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Introduction

Research on environmental justice (EJ) studies is part of a religious phenomenon in Indonesia and other countries (Conrad, 2011; Northcott, 2020). Religion can encourage them to adopt more equitable waste management (WM) practices (Gedzi et al., 2022). Neglect of environmental ethics (EE) has an impact on ecosystem injustice. Material factors are still the cause of human actions in treating the environment (Stacey, 2024).

Islam gives humans the responsibility to protect the earth from danger. This responsibility is key to realising environmental justice. Responsibility and justice are at the core of the concept of Islamic economics. The Qur'an (5:64) emphatically states that *"they seek to (cause) destruction on the earth. God does not like those who harm."* Efforts to create environmental justice are increasingly encouraged by various parties: entrepreneurs, the surrounding community, and local and central governments. Environmental pollution control is developed from the time the raw materials arrive to the finished product (Aleksić & Šušteršič, 2020).

Previous research has shown that WM has been poorly researched, resulting in limited available data for decision-making. This exacerbates the lack of WM solutions themselves (Gómez-Román et al., 2020; Mariyam et al., 2022). This waste issue covers various aspects of fibre chemistry, dyeing, degradation mechanisms, and chemical waste generated by the textile industry (Negi, 2025). The increase in waste impact due to economic growth and rising consumption has led to a corresponding rise in waste production (Tsydenova et al., 2018). Textile printing and dyeing, including batik, is one of the industries that is highly relied on for the development of MSMEs in Indonesia. Waste includes not only the problem of objects but also all value processes in the ecosystem (Baran et al., 2024). The textile industry generates a substantial amount of waste annually (Tang, 2023), as seen in Europe (Lanz et al., 2024; Laureti et al., 2024), Ghana (Adu-Boahen et al., 2014), Bangladesh (Sakamoto et al., 2019), and Qatar (Mariyam et al., 2022).

Literature Review

Theories of Planned Behaviour (TPB) and Environmental Justice (EJ)

The study is built on two theories: the Theory of Planned Behaviour (TPB) and the Theory of Environmental Justice (EJ). The Theory of Planned Behaviour (TPB) is the leading theory of intention and behaviour prediction and understanding in the field of WM (Sapawi, Ahmad, & Valeri, 2024; Sheeran et al., 2004). It is based on the idea of information processing and the principle of

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expected value (Sapawi, Ahmad, Valeri, et al., 2024). According to the Theory of Planned Behaviour (TPB), a person's behaviour can be predicted by their behavioural intent, which is determined by three main components: attitudes towards behaviour, subjective norms about behaviour, and perceived control over behaviour. Each of the basic components impacts one's intentions (Sussman & Gifford, 2018). Perceived behavioural control (PBC) is a determinant of intention to act and can increase the probability of behaviour change (Sheeran et al., 2004).

Environmental justice (EJ) is an integrative discipline designed to allow research to be conducted to better understand how unfair and disproportionate environmental pollution can be (Mazzucco et al., 2020). Active involvement is carried out starting from enviromental knowledge (EK), identification of factors that inhibit WM, and development of biological-organic and mechanical solutions (Conrad, 2011). EJ aims to ensure a level of protection for all beings (Mazzucco et al., 2020). Responsible behavior results in justice for all parties involved in activities that generate waste. Based on TPB and EJ, we hypothesize that EE and EK factors will significantly influence WM's actions over R as a mediating variable.

The Effect of EE on Religiosity

EE is an extraction of philosophy and ethics that considers the moral obligation that humans have to protect their environment (Sewpershad, 2018). EE is a critical reflection on the norms and morals that humans must implement when making moral choices related to environmental issues (Syihabuddin et al., 2023). Environmental behaviour is related to the presence of religion (Fang et al., 2020).

Hypothesis 1. There is a positive influence of EE on Religiosity

The Effect of EE on WM

Garbage is any consumption that we once valued and now no longer want, once desired and now discarded. Waste is a poignant reminder of the desire to forget about consumable goods (Hird, 2013). In the practice of waste collection, public-spirited recyclers and waste managers have endeavoured to make recycling more convenient, ethical, and humane for a broader audience (Seldman & Huls, 2016). The application of a religion's EE to WM poses a challenge because it requires an understanding of the religion's principles, a basic knowledge of the environment, and a strong commitment to responsible management (Prabnok et al., 2024). Responsibility for WM is a significant challenge at the global level (Mazzucco et al., 2020).

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Hypothesis 2. There is a positive influence of EE on WM

The Effect of EK on Religiosity

EK is one of the most potent predictors of environmentally friendly behaviour. EK is defined as the ability of an individual to identify environmental concepts, signs, and problems of damage, and to search for solutions. Previous research has found that EK correlates with ecologically conscious behaviour (Jayasekara et al., 2024). Having EK means being aware of and taking care of the environment. People are well aware that they need a sustainable environmental ecosystem for their lives (Ramadhan et al., 2024).

Hypothesis 3. There is a positive influence of EK on Religiosity

The Effect of EK on WM

Knowledge is essential for a person to determine behaviour or action. Even in some countries, knowledge about the environment is conveyed through educational levels that aim to foster environmental concern (Desa et al., 2011). However, studies have found that EK does not have a positive effect on pro-environmental behaviour or perceived value (Jayasekara et al., 2024). This suggests that increasing EK can improve people's behaviour, especially in developing countries, and enhance the level of environmental awareness and behaviour (Ali, Ahmed Hussein, El Rouby, Habiba Sherif, Barakat, 2022).

Hypothesis 4. There is a positive influence of EK on WM

The Effect of Religiosity on WM

The dimension of religiosity is closely related to religious behavioural obligations or rituals, for example, in Islam, such as praying five times a day regularly and fasting during Ramadan. Islam has obligated believers to worship (Yin et al., 2019). Worship is not only interpreted as an individual ritual, but also includes an obligation to maintain and defend the universe. The willingness to maintain and prevent environmental damage is a manifestation of man's obedience as God's representative on earth, as described in Q.S. (2:30). A person's level of religiosity will affect his values and, consequently, his way of reasoning about how he acts (Elshaer et al., 2021). Previous research has found a correlation between R and WM (Ayten & Hussain, 2024). An increase in one's level of R is associated with a higher level of environmental sensitivity (Baran et al., 2024).

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Hypothesis 5. There is a positive influence of Religiosity on WM

The Effect of EE on WM through Religiosity

EE is one of the elements that contribute to caring behaviour in WM to avoid damage to the environment. EE establishes a coordinated and balanced relationship between humans and nature. To practice EE, the philosophy and principles of religion can be applied to support environmental philosophy for the betterment of the environment (Sewpershad, 2018). R can have an impact on EE (Syihabuddin et al., 2023), which means that humans will have a more religious environmental management pattern.

Hypothesis 6. There is a positive influence of EE on WM through Religiosity

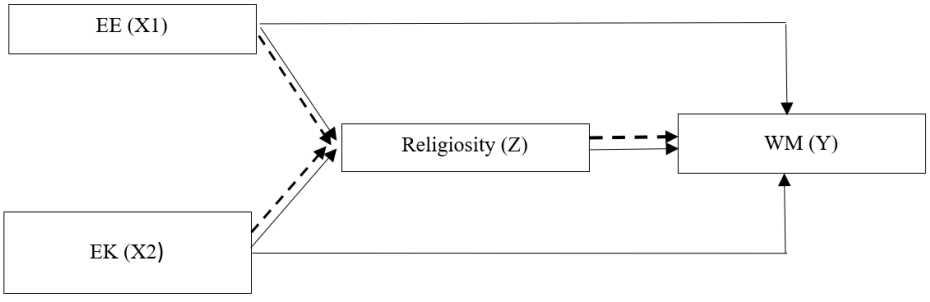
The Effect of EK on WM through Religiosity

A person's behaviour towards the environment is influenced by knowledge of environmental issues and environmental sensitivity (Lestari, 2023). The concept of Islamic knowledge has a peculiarity, namely, that it is transcendental knowledge based on the perception and observation of the senses. Islam emphasises that good knowledge lies in the value of its usefulness for human welfare and the protection of the universe. The Islamic perception of knowledge is value-oriented and informed by ethical and theological issues. This discussion serves as a blueprint for harmony, rather than conflict, between Islam and science (Kamali, 2003).

Hypothesis 7. There is a positive influence of EK on WM through Religiosity

The relationship between variables in this study can be understood within the context of the following research design.

Figure 1. Research Design



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Methods

This type of research employs a quantitative approach in field research. The research type uses survey research with questionnaire techniques. The population of this study is batik textile MSMEs. The sampling technique employed in this study is a combination of purposive and accidental sampling techniques. The purposive sampling approach was used to ensure that the respondents of this study contributed to the WM of the batik textile industry.

EE is also an internal resource as it can help a company formulate a value creation strategy (Enbaia et al., 2024). EE acts as an internal resource for a company to create a value-creation strategy to increase sustainable business performance (Ram & Bracci, 2024). The EK dimension includes utilisation, maintenance, and supervision, with indicators of the physical environment, biological environment, and social environment (Bellan, 2008; Gidlow et al., 2010).

Religiosity (R) is defined as "man's belief in God and therefore man is committed to acting in accordance with the principles of his God (Ilter et al., 2017). A person's willingness to adhere to religious rules indicates their level of religiosity (Baran et al., 2024). Waste treatment is attractive to stakeholders who consider resource efficiency and waste recycling (Budjav, 2022; Czekała et al., 2023; Williams et al., 2023).

The instrument used in this study is a questionnaire developed based on the indicators of the independent variable. EE consists of 5 items (Di Paola, 2024). EK, which consists of 5 items (Aby Dujana et al., 2025). Religiosity, which consists of 6 items (Ayten & Hussain, 2024), while the dependent variable, namely WM, consists of 9 items (Maulana & Yuliani, 2023). The research sample consisted of 25 items multiplied by five parameters. The respondents who completed the questionnaire totalled 232. This is in accordance with the provisions for determining the number of samples based on observation data, which is between 100 and 200 (Hair et al., 2014).

This study collects primary data obtained directly from the field through survey techniques. The questionnaire is created in the form of a Google Form and sent to respondents via email and WhatsApp. Literature studies are used to obtain secondary data, including scoring and measurement of alternative answers using the Likert scale, which has five response options.

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Table 1. Likert Scale Score

No	Code	Information	Score
1	SS	Strongly Agree	5
2	S	Agree	4
3	N	Neutral	3
4	TS	Disagree	2
5	STS	Strongly disagree	1

The statistical tools used were descriptive statistics and structural equation modelling to test the influence of EE and EK on WM, with R as the mediating variable. Each factor was analysed using the PLS-SEM method to determine which factors most influenced WM behaviour and vice versa, either directly or indirectly through mediating variables. The reason for using SEM in this study is to test a series of relationships between variable constructions (Suryani et al., 2021).

Results and Discussion

Data Respondents Characteristics

Based on the analysis of Table 2, the following provides an overview of the characteristics of the respondents' profiles involved in this study. The respondents involved were primarily female, comprising 75%, while men accounted for 25%. This shows that women dominate in this study. In terms of education, the majority of respondents have a relatively high educational background, with 66.4% holding a high school diploma or higher. Higher education, such as a Bachelor's degree (S1), was also quite common, accounting for as much as 25.9%, although the number was less than that of respondents with a high school education. Meanwhile, only a small percentage of respondents have a Master's (S2) or Doctoral (S3) degree, 5.6% and 1.7%, respectively.

Regarding the age of the respondents, most were in the young age range, with 54.3% of respondents under 20 years old, followed by 32.8% of respondents between the ages of 21 and 30 years. Older age (over 40 years old) is represented by only a small percentage of respondents, reflecting that the majority of workers in this industry are dominated by the younger generation. In terms of job positions, the majority of respondents work as employees in the textile industry, which accounts for 39.2%, followed by 26.7% who work as sellers of textile products. Meanwhile, 25.9% of respondents are textile business owners, and the rest are suppliers of textile raw materials (8.2%).

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Table 2. Respondents Characteristics

Variable	Frequency	Percentage
Gender		
Male	58	25%
Female	174	75%
Education		
Junior High / Equivalent	1	0.6%
Senior High / Equivalent	154	66.4%
Bachelor (S1)	60	25.9%
Master (S2)	13	5.6%
Doctorate (S3)	4	1.7%
Age		
≤ 20 years	126	54.3%
21-30 years	76	32.8%
31-40 years	18	4.3%
41-50 years	10	0.9%
> 50 years	10	0.9%
Occupation		
Textile Business Employee	91	39.2%
Textile Business Owner	60	25.9%
Textile Raw Material Supplier	19	8.2%
Textile Product Seller	62	26.7%
Business Duration		
< 1 year	151	65.1%
1-5 years	51	22.0%
> 5 years	30	12.9%
Business Type		
Family Business (Hereditary)	79	34.1%
Non-Family Business	153	65.9%

Most of the respondents, namely 69.4%, have a monthly income of less than IDR 2,500,000. This suggests that most respondents come from low-income backgrounds. Only a small percentage of respondents had higher incomes, namely 15.5% with an income between IDR 2,500,001 and IDR 5,000,000, and even fewer had higher incomes than that.

In terms of length of employment in the industry, most respondents (65.1%) have only worked in the textile industry for less than 1 year. Meanwhile, 22% of respondents have between 1 and 5 years of work experience, and another 12.9% have worked in the textile industry for more than 5 years. Finally, regarding the type of business where the respondents work, the majority (65.9%) work in businesses that are not family-owned or hereditary. Only 34.1% work in family businesses that are passed down from one generation to the next.

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Description of Research Variables

Statistical descriptive data for each research variable are presented in Table 3 below.

Table 3. Descriptive Statistics of Research Variables

Variable	Theory		Questionnaire Results		
	Range	Mean	Range	Mean	Standard Deviation
Religiosity	6-30	18	18-30	27,4	2,6
EK	5-25	15	14-25	19,7	2,5
Ethical knowledge	5-25	15	15-25	22,7	2,3
WM	9-45	27	27-45	37,6	4,3

Source: data processed, 2025

Table 3 highlights that the theoretical range of the religiosity variable is 6 to 30, and a theoretical value of 18 for the mean. However, the results of the questionnaire are within a range of 18 to 30, with an average of 27.4. A standard deviation value of 2.6 suggests a moderate degree of variation among the respondents, though most respondents have a relatively higher level of religiosity. The theoretical range of the EK variable is between 5 and 25, with an estimated value of 15 for the average. However, the results of the questionnaire showed that the actual range is between 14 and 25, with an average of 19.7. This suggests that the EK of the respondents is slightly better than the theoretically estimated value.

The variation in the results of the questionnaire is also moderate, with a standard deviation of 2.5, which suggests that the majority of the respondents had a certain degree of knowledge about the environment. In the variable of EK, the theoretical range of ethical knowledge is between 5 and 25, with a theoretical average of 15. The results of the questionnaire on this variable were consistent across the theoretical range, between 15 and 25, with an average of 22.7. This suggests that the respondents had better ethical knowledge than expected. The standard deviation for this variable is lower than the others at 2.3, suggesting that there is a higher degree of uniformity among the respondents in terms of their understanding of ethics. The theoretical WM variable is between 9 and 45, with a theoretical average of 27. The results of the questionnaire showed a range of between 27 and 45, with an average of 37.6. This shows that respondents had a better understanding of WM than expected.

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Evaluation of Measurement Models

All variable measurement models in this study use a reflective approach. To test the validity and reliability of this reflective model, the criteria (Hair et al., 2022) were used. *Loading Factor* (LF) is used to describe how well an item reflects/describes variable measurements. *The rule of thumb* used refers to Hair et al. (2022). Meanwhile, according to Chin (1998), a loading factor value of≥ 0.60 is still considered acceptable in the research analysis. Thus, it can be concluded that a *loading factor* above 0.7 is highly recommended, but *a loading factor* of 0.6 can still be tolerated, especially in exploratory studies (Sugiyono, 2013).

The results of the initial test of the tested construct produced the findings as presented in Table 4 below.

Table 4. Preliminary Measurement Model Results

Variable	Code	Indicator	Outer Loading	Result
Waste Management	WasteMngt1	The process of separating solids in wastewater is beneficial for maintaining environmental quality	0,701	Valid
	WasteMngt2	Useful technology in the solids separation process in wastewater treatment plants	0,739	Valid
	WasteMngt3	Oxidation in sewage treatment is beneficial to reduce the impact of water pollution	0,758	Valid
	WasteMngt4	I monitor the level of toxins in the waste before it is disposed of	0,587	Valid
	WasteMngt5	The company's waste treatment includes the process of neutralising hazardous substances	0,752	Valid
	WasteMngt6	The company's waste treatment includes technology to remove hard-to-fix dyes	0,770	Valid
	WasteMngt7	Waste dye removal plays a role in maintaining water ecosystems	0,740	Valid
	WasteMngt8	Wastewater treatment plants help reduce negative impacts on the environment	0,794	Valid
	WasteMngt9	Investment in waste treatment plants contributes to the cost and financial efficiency of MSMEs	0,775	Valid

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Variable	Code	Indicator	Outer Loading	Result
Environmental Ethic	EnvEthics1	I support the conservation program of nature conservation	0,719	Valid
	EnvEthics2	Every industry needs income stability	0,776	Valid
	EnvEthics3	The industry provides for the well-being of its employees	0,798	Valid
	EnvEthics4	I avoid environmentally damaging actions in industrial activities	0,784	Valid
	EnvEthics5	I am committed to protecting the environment	0,795	Valid
Environmental Knowledge	EnvKnow1	Textile industry activities have the potential to damage the environment	0,444	Not Valid
	EnvKnow2	Low-polluting waste is easier to manage and has minimal economic and social impact	0,726	Valid
	EnvKnow3	Efforts to reduce pollution will impact production costs.	0,620	Valid
	EnvKnow4	There are methods of reuse, reduction, and recycling within the industry.	0,639	Valid
	EnvKnow5	There are eco-friendly materials for textiles.	0,703	Valid
Religiosity	Religiosity1	I am anxious if I do not carry out religious commands to protect the environment	0,794	Valid
	Religiosity2	I feel like God is watching my behaviour	0,660	Valid
	Religiosity3	I felt calm after trying to protect the environment as part of religious observance.	0,818	Valid
	Religiosity4	I can distinguish which actions are good or bad for the environment.	0,816	Valid
	Religiosity5	I routinely take care of the environment even though I don't always get material benefits.	0,811	Valid
	Religiosity6	I am aware that making a living must be in a halal way.	0,659	Valid

Source: Data processed, 2025

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Waste Management

All indicators of the WM variable show a valid outer loading value. Most indicators have values above 0.7, which indicates that the measurement of WM is well done. Indicators such as WasteMngt1 (0.701), WasteMngt2 (0.739), and WasteMngt3 (0.758) indicate that respondents consider the processes of solids separation, the use of technology in waste treatment, and oxidation as beneficial and essential in reducing the impact of water pollution.

However, the one exception is indicator WasteMngt4 (0.587), which is slightly lower than the other indicators but can still be considered valid. This indicator measures the degree to which the level of toxins in waste is monitored before disposal.

Environmental Ethic

For the WM variable, all the indicators have a high outer loading value, which shows that the measurement of the EE is made well. For instance, indicators like EnvEthic1 (0.719), EnvEthic2 (0.776), and EnvEthic3 (0.798) show that the level of consciousness among the respondents on the importance of preserving nature and also ensuring the continuity of the required income in the industry is high. Furthermore, the other indicators, such as EnvEthic4 (0.784) and EnvEthic5 (0.795), also show good validity in the sense that they are efficient in terms of describing a situation where an individual would like to avoid actions that could damage nature.

Environmental Knowledge

In the EK variable, the first indicator (EnvKnow1) with the outer loading value 0.444 is invalid. It means that this statement is less important or is not adequate to describe the EK. However, this loading value is too low to be accepted. The other indicators of this variable are still valid with an outer loading value above 0.6, including EnvKnow2 (0.726), EnvKnow3 (0.620), EnvKnow4 (0.639), and EnvKnow5 (0.703). The respondents know that the waste that is less difficult to pollute the environment is easier to handle. Even though the EnvKnow1 indicator is invalid, EK in the industrial context can be properly described through other indicators.

Religiosity

The indicator loading value for all indicators of the religiosity variable was good outer load. The indicators Religiosity1 (0.794), Religiosity3 (0.818), and

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Religiosity5 (0.811) showed that the respondents strongly perceived that God's supervision was protecting the environment and that they were calm and had a religious responsibility for environmental protection. The indicators have a strong relationship between religiosity and environmental stewardship behaviour. The indicators Religiosity2 (0.660) and Religiosity6 (0.659) have low outer loading values; however, they are still in an acceptable range, and they indicate that the religiosity factor has a role in driving the stewardship behaviour to perform actions for environmental protection.

Table 5. Initial Model Cronbach Alpha and AVE Test Results

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Environmental Ethic	0,835	0,840	0,883	0,601
Environmental Knowledge	0,626	0,653	0,767	0,402
Religiosity	0,857	0,878	0,892	0,583
Waste Management	0,894	0,898	0,914	0,544

Source: Data processed, 2025

Table 5 presents that EE, Religiosity, and WM variables produce excellent results. All of the indicators that measure the three variables have a Cronbach's Alpha value above 0.7, Composite Reliability above 0.7, and Average Variance Extracted (AVE) above 0.5. It means that the constructs are reliable and valid.

The EK variable is the only variable with a reliability and validity problem. A very low value of Alpha, Composite Reliability, and AVE, which are all below 0.7 and 0.5, indicates that indicators within these variables are not strong enough to describe the constructs in question. As such, this variable requires modification so that the measurements are more representative and have validity. Based on the analysis of the previous tables, the indicators that should be considered for deletion to increase the value of the AVE internal reliability measurement are EnvKnow1 and EnvKnow3. The effect of excluding these two variables is described in Table 6 below.

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Table 6. Final Model Outer Loading Results

Variable	Code	Indicator	Outer Loading	Result
WM	WasteMngt1	The process of separating solids in wastewater is beneficial for maintaining environmental quality	0,700	Valid
	WasteMngt2	Useful technology in the solids separation process in wastewater treatment plants	0,739	Valid
	WasteMngt3	Oxidation in sewage treatment is beneficial to reduce the impact of water pollution	0,756	Valid
	WasteMngt4	I monitor the level of toxins in the waste before it is disposed of	0,589	Valid
	WasteMngt5	The company's waste treatment includes the process of neutralising hazardous substances	0,753	Valid
	WasteMngt6	The company's waste treatment includes technology to remove hard-to-fix dyes	0,770	Valid
	WasteMngt7	Waste dye removal plays a role in maintaining water ecosystems	0,739	Valid
	WasteMngt8	Wastewater treatment plants help reduce negative impacts on the environment	0,794	Valid
	WasteMngt9	Investment in waste treatment plants contributes to the cost and financial efficiency of MSMEs	0,775	Valid
WMs	EnvEthic1	I support the conservation program of nature conservation	0,746	Valid
	EnvEthic2	Every industry needs income stability	0,749	Valid
	EnvEthic3	The industry provides for the well-being of its employees	0,771	Valid
	EnvEthic4	I avoid environmentally damaging actions in industrial activities	0,791	Valid
	EnvEthic5	I am committed to protecting the environment	0,821	Valid

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Variable	Code	Indicator	Outer Loading	Result
EK	EnvKnow2	Low-polluting waste is easier to manage and has minimal economic and social impact	0,696	Valid
	EnvKnow4	There are methods of reuse, reduction, and recycling within the industry.	0,731	Valid
	EnvKnow5	There are eco-friendly materials for textiles.	0,828	Valid
Religiosity	Religiosity1	I am anxious if I do not carry out religious commands to protect the environment	0,795	Valid
	Religiosity2	I feel like God is watching my behaviour	0,671	Valid
	Religiosity3	I felt calm after trying to protect the environment as part of religious observance.	0,826	Valid
	Religiosity4	I felt calm after trying to protect the environment as part of religious observance.	0,805	Valid
	Religiosity5	I routinely take care of the environment even though I do not always get material benefits.	0,794	Valid
	Religiosity6	I am aware that making a living must be halal.	0,680	Valid

Source: Data processed, 2025

Table 7. Cronbach Alpha and AVE Test Results Final Model

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
WMs	0,835	0,835	0,883	0,603
EK	0,615	0,617	0,797	0,568
Religiosity	0,857	0,867	0,893	0,584
WM	0,894	0,898	0,914	0,544

Source: Data processed, 2025

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Table 8. HTMT

	Heterotrait-monotrait ratio (HTMT)
EK <-> WMs	0,575
Religiousity <-> WMs	0,820
Religiousity <-> EK	0,508
WM <-> WMs	0,675
WM <-> EK	0,534
WM <-> Religiousity	0,561

Source: Data processed, 2025

Structural Model Evaluation

The next step is to ensure that the relationships between constructs in the structural model can be empirically justified. The first stage is the collinearity examination, which aims to identify potential problems of multicollinearity between exogenous constructs. The relationship between constructions in structural models can be empirically justified. The first stage is the collinearity examination, which aims to identify potential problems of multicollinearity between exogenous constructs. The results of the VIF test can be seen in Table 9.

Table 9. Inner Variance Inflation Factor (VIF) Test Results

	VIF
EnvironEthic -> Religiosity	1,202
EnvironEthic -> WasteMngt	2,054
EnvironKnowledge -> Religiosity	1,202
EnvironKnowledge -> WasteMngt	1,222
Religiosity -> WasteMngt	1,980

Source: Data processed, 2025

All VIF values given (all below 5) indicate that there were no significant multicollinearity issues between the variables tested. The results of these structural tests are presented in Figure 2 and Table 10.

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Figure 2. Structural test results

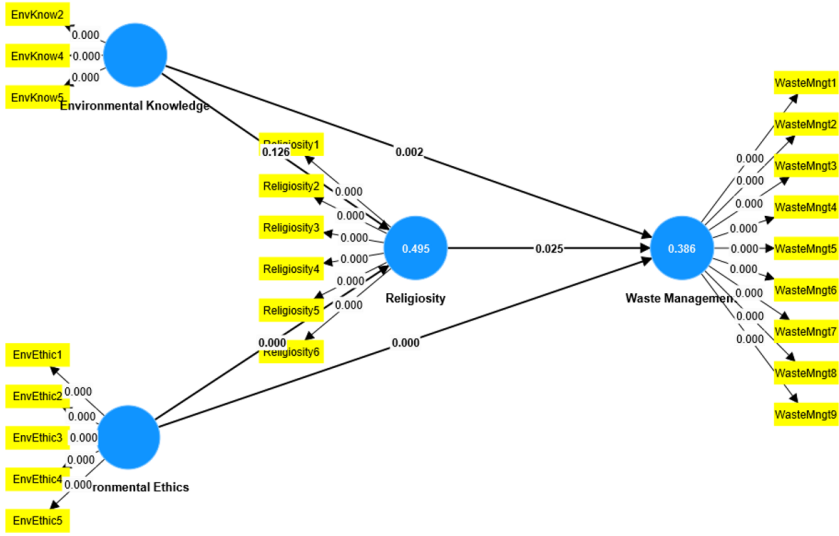

Table 10. Results of Direct Influence Hypothesis Testing

Hypothesis Statement	Path Coefficient	p-value	95% Trust Hose		F Square	Result
			Lower limit	Upper limit		
H1 EnvironEthic -> Religiosity	0,656	0,000	0,560	0,754	0,709	Hypothesis 1 accepted
H2 EnvironEthic -> WasteMngt	0,413	0,000	0,280	0,539	0,135	Hypothesis 2 accepted
H3 EnvironKnowledge -> Religiosity	0,101	0,126	-0,027	0,232	0,017	Hypothesis 3 rejected
H4 EnvironKnowledge -> WasteMngt	0,172	0,002	0,068	0,282	0,039	Hypothesis 4 accepted
H5 Religiosity -> WasteMngt	0,149	0,025	0,020	0,282	0,018	Hypothesis 5 accepted

Source: data processed, 2025

EE have also been shown to have a positive and significant effect on WM (β = 0.413; p-value = 0.000). Hypothesis 2 is accepted. The 95% confidence interval (0.280–0.539) did not include zero, indicating a stable and significant relationship. An f-square value of 0.135 indicates a moderate effect, indicating that WMs have an essential role to play in improving WM practices.

In contrast to the previous relationship, the test results showed that EK had no significant effect on religiosity (β = 0.101; p-value = 0.126). Hypothesis 3 is rejected. The 95% confidence interval is in the range of -0.027 to 0.232 which passes zero, so the direct influence hypothesis is not supported. An f-square value of 0.017 indicates a very small effect, suggesting that increased EK is not necessarily followed by increased religiosity.

The test results showed that EK had a positive and significant effect on WM (β = 0.172; p-value = 0.002). Hypothesis 4 is accepted. The 95% confidence interval (0.068–0.282) is entirely in the positive direction, confirming the stability of the relationship. The f-square value of 0.039 falls into the category of minor effects, which means that although significant, its contribution to WM is relatively limited.

Religiosity was shown to have a positive and significant effect on WM (β = 0.149; p-value = 0.025). Hypothesis 5 is accepted. The 95% confidence interval (0.020–0.282) did not cross zero, so this relationship was declared significant. An f-square value of 0.018 indicates a small effect, indicating that religiosity has a direct, though not dominant, contribution in driving WM behavior.

Overall, EE is the most dominant factor, both in improving religiosity and WM. EK directly plays a role in improving WM, but it does not have a significant effect on religiosity. Nevertheless, religiosity plays a supporting factor that directly drives WM practices, albeit with relatively little influence.

Table 11. Indirect Influence Hypothesis Test Results

Hypothesis Statement	Path Coefficient	p-value	95% Trust interval		Upsilon V	Result
			Batas bawah	Batas atas		
H6 EnvironEthic -> Religiosity -> WasteMngt	0,098	0,029	0,013	0,188	0,0096	Hypothesis 6 accepted
H7 EnvironKnowledge -> Religiosity -> WasteMngt	0,015	0,238	-0,004	0,046	0,0002	Hypothesis 7 rejected

Source: data processed, 2025

Based on Table 11 on testing the indirect influence hypothesis, it appears that EE has a positive and significant effect on WM through religiosity (β = 0.098; p-value = 0.029). Hypothesis 6 is accepted. The 95% confidence interval was in the range of 0.013 to 0.188 and did not pass the zero value, so the mediation effect was declared

significant. This indicates that religiosity can be a mediator variable that channels the influence of WMs on WM. The Upsilon V value of 0.0096 indicates that the strength of the mediation effect is very small, although it is statistically significant. Thus, religiosity plays a role as a *complementary mediator*, where WMs still have a direct influence, as well as being strengthened through religiosity. These findings are consistent with previous research (Fang et al., 2020)

EK has no significant effect on WM through religiosity (β = 0,015; p-value = 0,238). Hypothesis 7 is rejected. The 95% confidence interval is in the range of -0.004 to 0.046, which passes the zero value, so the mediation effect is not empirically supported. An Upsilon V value of 0.0002 indicates a very weak and practically meaningless mediation effect. These findings suggest that religiosity is not able to bridge the relationship between EK and WM. Overall, the test results showed that religiosity plays a mediator on the relationship between EE and WM, albeit with relatively small effect power. In contrast, religiosity does not mediate the relationship between EK and WM.

Table 12. Simultaneous Hypothesis Testing Results

	R-square	R-square adjusted
Religiosity	0,495	0,491
WasteMngt	0,386	0,378

Sumber: data diolah, 2025

Based on Table 12, the results of simultaneous hypothesis testing it shows that these two independent variables have a substantial contribution in shaping the religiosity of respondents. For WM as a dependent variable The *R-square* value of 0.386 indicates that 38.6% of WM variations can be explained simultaneously by EE, EK, and religiosity. The *R-square adjusted* value of 0.378 confirms that the model's explanatory ability remains consistent after adjustments. This shows that the combination of these three variables together has a moderate ability to explain WM practices.

Analysis and Discussion

The results of hypothesis 1 test showed that EE had a positive and significant effect on religiosity (β = 0.656; p-value = 0.000). Hypothesis 1 is accepted. Based on the test results, it can be understood that EE functions as a tool that provides insight to MSME actors to understand environmental problems caused by businesses. As adherents of Islam, EE are important so that humans can be wise when dealing

with the surrounding nature. In Islamic economic studies, ethics is a morality that regulates the procedures of behaving towards fellow humans, fellow creatures, and the universe. The Qur'an has stated emphatically in Surah Al-A'raf (7:56): "*And do not do any damage to the earth after repairs have been made to it. And pray to Him with fear and hope. Indeed, Allah's mercy is very near to those who do good deeds"*.

The trilogy relationship in Islamic economics consists of Iman, Islam, and Ihsan. EE's positive influence on religiosity illustrates that a person's Islam grows from his beliefs, resulting in an awareness that, in doing business, he must still care about the environment. Acts of kindness by balancing the economy and the environment, social interactions such as being friendly, fair, helping others, protecting the environment, processing waste, are good deeds that Allah will reward.

EE has also been shown to have a positive and significant effect on WM (β = 0.413; p-value = 0.000). Hypothesis 2 is accepted. The support of MSME actors also shows the correlation between ethics and WM that they carry out, such as monitoring the level of toxins in the waste before it is disposed of; separating solids in wastewater and removing dyes before the waste is disposed of using technology; and making wastewater treatment plants help reduce negative impacts on the environment. These findings are consistent with previous research (Hird, 2013).

EE correlates with the psychology of MSME actors who feel anxious when they do not carry out religious orders to protect the environment and feel calm after trying to protect the environment as part of religious obedience. This fact illustrates how the Islamic economy was spiritually awakened. The more attention to the environment, the stronger one's faith will be. It tries to rethink the relationship between processes, products, marketing strategies, and the vision of Islam carried out by believers (Mukherjee, 2014). The balance of a Muslim's life lies in the harmonization of the value of human relations with Allah (*hablu min Allah*), human relations with humans (*hablu min an-nas),* and human relations with nature (*hablu min al-'alam).*

In contrast to the previous relationship, the test results showed that EK had no significant effect on religiosity (β = 0.101; p-value = 0.126). Hypothesis 3 is rejected. These findings require serious attention from academics. EK is the ability to identify various environmental indicators, concepts, and patterns of behavior (Zeng et al., 2023). From the hypothesis test 3, it appears that the process of forming new EK has reached the cognitive level, and has not yet reached the level of affection and psychomotor of business actors. The EK possessed has not reached the process of cultivation or habituation.

Theoretically, religiosity has 4 dimensions, namely belief, belonging, behaving, and bonding. The four dimensions include cognitive (belief), social (community),

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practical (worship/ritual), and emotional (personal relationship with God) (Herzog et al., 2020). The findings of hypothesis 3 illustrate that respondents' knowledge has not fully contributed to the level of religiosity. EK does not guarantee the emergence of a sense of responsibility for the environment as a real action. These findings contradict previous research (Aby Dujana et al., 2025; Mayse, 2024; Sapawi, Ahmad, & Valeri, 2024).

Knowledge about the environment can be understood as a form of knowledge of the rules of guarding. This is clearly shown in many verses of the Qur'an. In Surah al-A'raf (7:56), for example, Allah says: "*And do not do any harm to the earth after it has been created. Pray to Him with fear and hope. Indeed, Allah's mercy is very near to those who do good deeds*"**.** Such knowledge is at the level of faith or belief (justification), at the command of God. The quality of the respondents' religious beliefs is still formal-legal but has not reached the substantial-emotional level of the religion itself. EK, which is a usefulness or axiology shown in tangible actions such as processing waste or preventing further environmental damage. Philosophically, knowledge is also subject to Islamic economic rationality, which is based on the meaning of piety at the root of the term Islam itself (Sapawi, Ahmad, Valeri, et al., 2024).

The test results showed that EK had a positive and significant effect on WM (β = 0.172; p-value = 0.002). Hypothesis 4 is accepted. From the results of this hypothesis test 4, it appears that EK contributes to WM behavior so that respondents dare to make sacrifices by trying treatment methods such as reuse, reduction, or recycling of waste and using environmentally friendly materials. This finding is quite encouraging, while in other countries, there are still many limitations to managing waste (Ezeah & Roberts, 2012; Li et al., 2021). These findings contradict previous research (Jayasekara et al., 2024).

Religiosity was shown to have a positive and significant effect on WM (β = 0.149; p-value = 0.025). Hypothesis 5 is accepted. These findings are in accordance with the research that has been carried out (Ayten & Hussain, 2024; Baran et al., 2024; Elhoushy & Jang, 2021; Sapawi, Ahmad, Valeri, et al., 2024; Tsendsuren et al., 2021).

The results of this analysis confirm that religion influences behavior, which supports the theory of planned behavior. In addition, the test results show that EE has a positive and significant effect on WM through religiosity (β = 0,098; p-value = 0,029). Hypothesis 6 is accepted. This finding is in accordance with previous research. Testing hypotheses 5 and 6 proves that, from the perspective of perceived behavioral control (PBC), the belief that there is an opportunity strengthens the perception of MSME actors to carry out WM. PBC confirms that EK has an

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effect on waste recycling behavior (Ali, Ahmed Hussein, El Rouby, Habiba Sherif, Barakat, 2022). There was a significant positive relationship between behavior control and waste prevention behavior (Corsini et al., 2018). EJ theory highlights how behavioral and impact imbalances shape opportunities and constraints for WM. The test results showed that EK had no significant effect on WM through religiosity ($\beta = 0.015$; p-value = 0.238). Hypothesis 7 is rejected. These findings contradict similar research (Fang et al., 2020). It is suspected that EK and weak religiosity are important factors in the weak acceptance of WM.

Conclusion

Overall, the results of the simultaneous testing showed that the research model had a clear force that was strong enough for religiosity and adequate for WM. Thus, the variables EE, EK, and religiosity are simultaneously relevant in explaining behaviors and attitudes related to religiosity and WM in the context of EJ. This fact is very beneficial for the growth of the Islamic economy in Indonesia. The findings of this hypothesis test are a critique of the sociology of knowledge, which is built from 3 stages, namely cognition, influence, and psychomotor; it needs to be transcendently connected to Allah so that it can encourage the act of protecting the environment fairly as a form of worship. The waste management requires economic, sociological, and spiritual ethics considerations.

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