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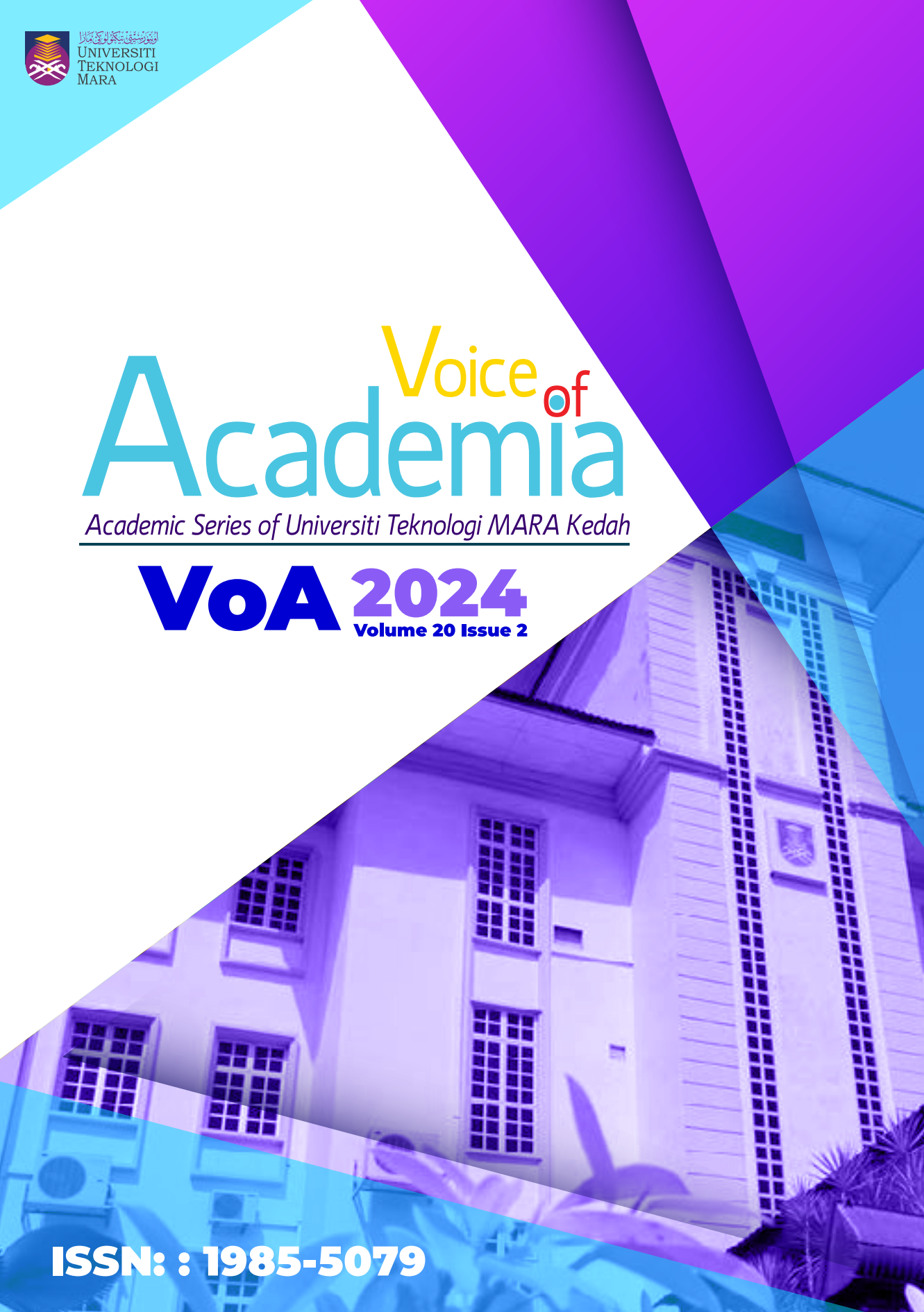

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TABLE of CONTENTS

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SOLVING THE CONUNDRUM OF DOMESTIC WASTE: THE ENABLERS OF WASTE COOKING OIL RECYCLING INTENTION

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ABSTRACT

Waste cooking oil can be reused and repurposed into valuable goods such as biodiesels and household products like soaps and candles. This study was conducted to identify the level of waste cooking oil recycling intention among Malaysian and the enablers of the intention. The enablers are measured based on three aspects, namely attitude towards waste cooking oil recycling, subjective norms, and perceived behavioural control. This study is quantitative, and the data is based on a survey approach. This study employed a combination of cluster and convenience sampling techniques and obtained a valid of 254 respondents. The hypotheses were analysed using multiple regression analysis. The study results showed that the respondent's intention to practice waste cooking oil recycling was moderate. Next, the study has revealed significant and positive relationships between attitude towards waste cooking oil recycling, subjective norms, perceived behavioural control, and waste cooking oil recycling intention. Then, perceived behavioural control has been instituted as the most significant enabler. Thus, individual self-compliance is considered a decisive factor. The theoretical and practical implications and future research suggestions were highlighted in the final section.

1. Introduction

The issue of solid waste is becoming a national-level problem. According to the former Director of the Institute of Ocean and Earth Sciences, Universiti Malaya, Prof. Dr. Sumiani Yusoff, the estimated generation of solid waste in Malaysia in 2020 was 38,081 tonnes per day, and the figure continues to increase in 2021, with 38,699 tonnes per day. Of that amount, 40% is food waste. On average, the cost of food waste disposal per house is RM210 per month and RM2,600 per year. The most significant problem in this country is that the number of sanitary landfills with pollution control facilities is much smaller than that of non-sanitary landfills (Muhammad Saufi et al., 2021). The Malaysian government has started enforcing the Solid Waste and Public Cleansing Management Act 2007 (Act 672). According to Section 74, Solid Waste and Public Cleansing Management Act, 2007, the public must segregate solid waste. Failure to do so will cause the perpetrator to be fined a maximum of Ringgit Malaysia (RM)1000 if convicted.

Meanwhile, Section 108 (2) (g) states that an individual is responsible for separating solid waste that can be recycled while avoiding dumping waste in the disposal centre (National Solid Waste Management Department, 2023). The National Solid Waste Management Policy (Amendment) 2016 is a strategic improvement step to achieving the status of a developed country and sustainable solid waste management. The policy comprises two goals: 1) to create a solid waste management system that is comprehensive, integrated, cost-effective, sustainable, and accepted by the community, and 2) to implement solid waste management based on a waste management hierarchy that gives priority to waste reduction through reduce, reuse, and recycle (National Solid Waste Management Department, 2023).

Waste is any form of remnant that is not used and is no longer needed. It can be classified into three types: solid waste, liquid, and gas. Waste such as plastic, leftovers, paper, metal, furniture diapers, and cooking oil from home, industry, or commercial activities needs to be disposed of systematically (Nanda & Berruti, 2021). The collection process, transportation, and disposal of waste must be performed according to the procedures determined by gazetted laws and regulations. Improperly managed and disposed waste will affect the balance in the environment, whether to the environment itself or the public. Successful waste management can ensure that environmental sustainability is well-maintained and guaranteed. Efficient waste management is not only subject to the implementation and application of solid waste management but also involves parties comprising organisations, communities, and individuals (Zhao, 2021).

Used cooking oil can be recycled to produce valuable substances such as soap and vehicle fuel to replace petrol and diesel (Foo et al., 2021). Some cafeteria operators and individuals discard used cooking oil into the sink, drain, or on the ground. The practice is detrimental to the environment, where it can cause blocked drains, pollution of rivers and soil, and loss of minerals (Yang et al., 2022). Fat, oil, and grease (FOG) is a term coined for sewage water that does not contain faeces or grey water resulting from cooking activities, such as cooking oil, butter, margarine, sauce, gravy, fried food, cheese, and others (He et al., 2017). This waste is one of the main challenges in Malaysian sewage system management. Separation should be done by putting this waste into separate containers and disposing it correctly. We can emulate the culture of Japanese people who clean up oil residue using fabric or tissue. They separate the leftovers first before disposal. Such practices can help protect the environment and even reduce the burden of treating FOG waste. The operators on the premises must install a proper oil trap or grease interceptor system (He et al., 2017). The Department of Environment highly demands the

installation of oil traps to meet the Environmental Quality Regulations (Scheduled Waste) requirements 2005. Oil traps effectively separate oil from water to reduce oil and grease draining directly into public drains.

There are several ways to dispose of cooking oil waste. First is by pouring it into a container. The used cooking oil must be cooled down first because it is safer and easier to handle at room temperature. In addition, used cooking oil can also be frozen, and the solidified oil can be discarded in the trash. Third, recycled cooking oil can be transformed into home compost. Waste cooking oil can also be used to remove weeds. For this purpose, the cooking oil can be poured directly on the grass or put in a spray bottle and sprayed on the grass – leading to the rapid extermination of the latter. Moreover, used cooking oil can be sold to recycling companies, such as Alam Flora, indirectly generating additional income. The recycling centres will convert used cooking oil into soap, candles, and even energy that can be reused (Zhao et al., 2021). Despite certain measures being implemented to increase the engagement of communities in recycling programmes, their involvement still needs to be improved due to the differences in recycling practice interests (Izham et al., 2023; Rangga et al., 2023). Awareness of oil waste recycling practices needs to be clearly disseminated despite the wide execution of awareness programmes. De Feo et al. (2020) revealed the requirement for a higher level of knowledge about oil waste recycling, which has limited the recycling of waste cooking oil. Thus, efforts to increase and improve community awareness should be fostered by cultivating recycling habits. This applied culture needs to be practised by all levels of society.

In this study, the enablers of oil waste recycling were measured based on three aspects: attitude towards oil waste recycling, subjective norms, and perceived behavioural control. This study examines the influence of attitudes towards oil waste recycling, subjective norms, and perceived behavioural control on waste cooking oil recycling intention. For instance, Khan et al. (2019) discovered that the influence of family and friends and perceived behavioural control trigger the behaviour of reselling waste products, while awareness and attitude towards waste disposal lead to the reuse of plastic products. Despite vast studies assessing the intention of recycling behaviour (e.g., Noor et al., 2023; Wan et al., 2017; Zhu et al., 2021), the research gap in understanding oil waste recycling, which significantly affects the amount of liquid waste production in Malaysia, still needs to be addressed. Few studies have focused on the context of waste cooking oil, and most of them were inclined towards the issues of plastic waste and solid waste recycling.

Moreover, past studies have yielded inconsistent findings, which need further examination by the current empirical studies. Many empirical studies have discovered the positive influence of attitudes, subjective norms, and perceived behavioural control on recycling intention (e.g., Hameed et al., 2022; Noor et al., 2023; Passafaro et al., 2019). Conversely, Majid et al. (2021) demonstrated that subjective norms and perceived policy effectiveness were insignificant to recycling intention. Hence, this study hopes to deliver vital information to support the government's current policy changes, the technology used, and other relevant factors. In addition, the current study is significant in supporting the government's intention towards a circular economy. The circular economy is an industrial system that is restorative and regenerative with a design that replaces the concept of "end of life" of products with the use of renewable energy, eliminates the use of toxic chemicals, and aims to eliminate waste through the superior design of materials, products, systems, and business models (De Giovanni & Folgiero, 2023). A circular economy comprises three main principles: reducing waste and pollution, continuously using products or materials, and renewing the natural system. It is a resilient, distributive, diverse, and inclusive economic model. The practice of waste recycling promotes the embodiment of an economic concept that combines sustainable development and the implementation of a green economy (Rusch et al., 2023).

2. Literature Review

Recycling is a practical approach to reducing the quantity of waste. The recycling system is presented in Figure 1. The first arrow indicates solid waste separation from the waste stream, e.g., plastic, paper, and glass. The second arrow indicates the solid waste that has been separated while producing new products. Meanwhile, the third arrow shows new products that have been produced and will be marketed to consumers. These three arrows are interconnected and can be described as a repeating system of times. Therefore, the three arrows form a significant system chain for reducing solid waste sent to the garbage disposal site (Minunno et al., 2020). An effective community recycling system is fundamental to encouraging them to practice recycling. Recycling starts at home with the consumer's role in separating recycled goods from their waste streams before being collected and reprocessed to produce a new product (Minunno et al., 2020).

Figure 1. Recycle Label

Recycling bins are a common method utilised to collect recycled goods. Recycled materials are collected according to the type of recycled material, such as plastic, paper, and glass (Coelho et al., 2020). This system can operate through three methods: consumers separating recyclables before collections are made, workers separating goods during the collection, and segregation of recyclables at the facilities (Coelho et al., 2020). However, the method requires a high cost. Another alternative is drop-off centres, established to facilitate the collection of recycled materials. This method allows users or residents to bring their recyclables to the collection centre and store them in appropriate containers (Balwada et al., 2021). Buy-back Centres, which are almost similar to a drop-off centre, are also introduced to collect recyclable materials. These centres' role is to buy recycled materials from consumers. Buying recycled goods from users can increase community participation (Balwada et al., 2021). However, there is no standardised price for recycled goods. Every recycling system introduced is to facilitate the community's recycling activities.

Solid waste management that emphasises the concept and practice of Reduce, Reuse, and Recycle (3R) needs to be implemented effectively to ensure that the recycling programme achieves its goals. Solid waste reduction through the application of 3R is the main core of the Solid Waste Management Policy. Reducing refers to searching for methods to reduce solid waste generation. In contrast, reuse includes diversifying the use of materials in maintaining their original form or as an alternative with or without change. The concept of recycling is used to recycle solid waste through physical, chemical, and biological processes. The 3R concept needs to be applied in daily life to reduce pollution while at the same time preserving and conserving the environment. The 3R concept is often applied to plastic, glass, aluminium cans, and paper

materials. However, only a small portion of the community applies the 3R concept to waste cooking oil, as the awareness that cooking oil can be recycled is not well disseminated.
The concept of "Reduce" can be applied by reducing the use of cooking oil or choosing cooking methods that do not use cooking oil, such as boiling, baking, and frying without oil. "Reuse" can be applied by reusing used cooking oil several times or reprocessing cooking oil into other materials, such as candles and soap (Zulwazi et al., 2023). Meanwhile, the concept of "Recycle" can be applied by collecting waste cooking oil that cannot be used again and sending it to a recycling centre. The waste cooking oil sent to the recycling centre will go through several physical, chemical, and biological processes before being processed into other products that could benefit society (Zulwazi et al., 2023). Researchers have found that cooking oil can be processed into bitumen used in road paving works. Additionally, waste cooking oil can be used as a source of biodiesel for vehicle use and power generation (Maotsela et al., 2019). Recycling cooking oil into biodiesel fuel can help reduce the cost of biodiesel production by 60% to 90%, helping to mitigate the dependence on petroleum as fuel (Zhao et al., 2021). Biodiesel produced from used cooking oil is environmentally friendly and does not emit a rancid smell.

Theoretical Framework: The Enablers of Waste Cooking Oil Recycling Intention

The Theory of Planned Behaviour (TPB) by Ajzen (1991) was used as the basis for this study. From the theoretical perspective of social psychology, the TPB is also often used as a model for explaining human behaviour. This theory considers the intention to perform certain behaviours, including attitudes, subjective norms, and perceived behavioural control. According to TPB, attitude is recognised as a positive or negative evaluation by an individual towards a particular behaviour (Ajzen, 1991). It is expressed in the form of expected results for implementing the behaviour. A positive attitude towards implementing oil waste recycling is expected to increase a person's willingness and motivation to support the behaviour (Noor et al., 2023; Zhu et al., 2021). The expected benefit of oil waste recycling, i.e., the individual's upbeat behaviour assessment, is used to measure attitude. It means that individuals with a high expectation of the benefits of oil waste recycling (e.g., income generation or environmental protection) will support the notion. Wan et al. (2017) revealed that experiential attitude (i.e., affective, emotional state towards behaviour), instrumental attitude (i.e., assessment of the behavioural outcome), and subjective norm influenced recycling intention.

Moreover, subjective norms could motivate people with inadequate knowledge of recycling benefits. Aboelmaged (2021) discovered that recycling habits and perceived attitudes significantly predict e-waste recycling intention. Unexpectedly, subjective norms and perceived behavioural control display insignificant effects on the e-waste recycling intention. Subjective norms are normative pressures that arise from the perception that other relevant people want the relevant person to perform certain behaviours (Ajzen, 1991). In other words, subjective norms refer to an individual's perception of whether essential people around them support or discourage their performing the behaviour (Thoo et al., 2022).

Subjective norms refer to interpersonal influences (e.g., peer support, supervisor support, and family support). Important people who are influential references in the environment of individuals include those who can provide social support for the effort to support oil waste recycling (Hameed et al., 2022). Therefore, individuals with high social support will support any pro-social environmental behaviour. For example, Passafaro et al. (2019) revealed that housemates, neighbours, and inhabitants of a city directly affect recycling behaviour and intentions. Meanwhile, a study by Sulaiman et al. (2019) on 375 university students revealed that attitude, subjective norm, perceived behavioural control, past behaviour, perceived moral obligation, knowledge, and inconvenience allegedly affect recycling intention. Regression analysis showed

that past behaviour and subjective norms are significant solid predictors. Likewise, the study by Pei (2019) in the city of Hangzhou, China, discovered that neighbourhood ties and public attachment positively influence waste recycling intentions.

Perceived behavioural control refers to the extent to which individuals believe various factors will either facilitate or hinder their ability to recycle waste (Mohd Noor et al., 2022). These include self-efficacy and expected opportunities to engage in a behaviour (Ajzen, 1991). Self-efficacy refers to the confidence a person feels about performing a specific behaviour, including confidence in overcoming obstacles to achieving that behaviour. In recycling, efficacy can be defined as anticipating the ability to implement recycling initiatives (Bandura, 1986). Therefore, individuals with high self-efficacy will support the implemented oil waste recycling. Ofstad et al. (2017) indicated that perceived behavioural control, personal norms, and social norms are predictive factors for recycling and solid waste separation behaviour. Contextual factors include the recycling facilities, the distance of the recycling centre, and the demographic characteristics of recycling (Geiger et al., 2019). Similarly, Wang et al. (2021) showed that intention and perceived behavioural control significantly impact the practice of recyclable express packaging positively. Convenience, subjective, and moral norms are the utmost factors affecting the usage intention. Wan et al. (2017) highlighted that perceived behavioural control is among the best predictors of recycling than general knowledge, attitudes, and personal norms. The findings by Tang et al. (2023) supported that perceived behaviour control wields the main influences on recycling intention, followed by economic incentive, subjective norm, and self-identity.

Based on the TPB, this study examines the influence of attitudes towards waste cooking oil recycling, subjective norms, and perceived behavioural control towards waste cooking oil recycling intention. TPB is the most detailed and descriptive theory of behaviour, with the fewest variables usually considered and formed by researchers to understand behaviour in many areas, including sociology, psychology, education, and marketing. Hence, the following hypotheses were proposed:

H1 = There is a positive and significant relationship between attitude towards waste cooking oil and waste cooking oil recycling intention.

H2 = There is a positive and significant relationship between subjective norms and waste cooking oil recycling intention.

H3 = There is a positive and significant relationship between perceived behavioural control and waste cooking oil recycling intention.

Transforming Oil Waste into Soap

Soap products from used cooking oil are an economical way of producing valuable materials from waste materials (Maotsela et al., 2019). Soap production is also aimed to instil the love of the environment. The soap, which contains glycerine, helps protect the skin of the hands from becoming dry (Li et al., 2020), besides preventing the skin from peeling. It will ensure that the user's hands are soft despite frequent dishwashing. In addition, it can also speed up the cleaning of oil traces on the cutleries. This product does not contain chemicals that can cause pollution. The use of recycled soap allows easy rinsing of the dishes (Zulwazi et al., 2023). The use of waste cooking oil has sparked the idea of producing soap, and the current study has developed an innovative product known as Soapology (see Figure 2). The three main ingredients needed to develop this product are distilled water, sodium hydroxide, and fragrance. In addition, kaffir lime leaves, tea powder, and lemon grass, which can be used to wash hands, clothes, and dishes,

were mixed. The innovative product, which was based on used cooking oil and free-hazardous chemicals, can be used to wash items such as dishes, sinks, and others.

Figure 2. Soapology

3. Methodology

The study design incorporated a quantitative approach, which involved data collection using a survey. The survey questions were referenced and modified from previous studies (Rakhmawati et al., 2023; Shen et al., 2019). From the sample size formula by Krejcie and Morgan (1970), 384 samples were selected, representing the Malaysian population. Sample selection is also supported by Roscoe (1975), who states that a sample of 30 to 500 people is appropriate in a study. Thus, 400 respondents were selected for this study. A five-option Likert scale was used for the respondents to express the degree of agreement for each submitted item. The sampling technique in this research used a combination of cluster and convenience sampling techniques. The cluster technique was used to group potential respondents who live in Peninsular Malaysia according to their regions (i.e., northern, southern, central, and east coast). In contrast, the sample members in the convenience sampling technique were selected from each existing cluster. Table 1 summarises the items used for this study.

Table 1
Measurement of the Variable

Variable	*Item*	
Attitude towards Waste Cooking Oil Recycling	1)	I think recycling waste cooking oil is essential for the environment
	2)	I think recycling waste cooking oil is a good behaviour
	3)	I think recycling waste cooking oil is wise
	4)	I think recycling waste cooking oil is a beneficial behaviour
	5)	I think recycling waste cooking oil is a very worthy behaviour
Subjective Norms	1)	People important to me support waste cooking oil recycling behaviour
	2)	People important to me think that waste cooking oil recycling is a good activity
	3)	People important to me recycle their waste of cooking oil
	4)	People important to me think that I should perform waste

	cooking oil recycling
Perceived Behavioural Control	1) For me, waste cooking oil recycling is easy. 2) I have the resource, time, and opportunity to perform waste cooking oil recycling. 3) I can perform waste cooking oil as long as I am willing 4) The decision to perform waste cooking oil recycling or not rests solely in my hands
Waste Cooking Oil Recycling Intention	1) I plan to start/continue waste cooking oil recycling 2) I am going to start/continue waste cooking oil recycling 3) I intend to start/continue waste cooking oil recycling 4) I am willing to start/continue waste cooking oil recycling

The data analyses in this research include testing the (1) preliminary requirements and (2) research hypothesis. A reliability test was performed first to confirm whether an instrument used to obtain information can be trusted as a data collection tool. The Cronbach alpha value of > 0.80 is perfect, acceptable, and reliable (Gliner & Morgan, 2000). The normality test was performed to ensure that the data collected was distributed normally. One of the popular methods for testing normal distribution is to determine skewness and kurtosis. Kline (2005) suggests that a kurtosis value of ± 1 is excellent for most psychometric uses, and ± 2 is usually sufficient. This study used a deviation value of ± 2. Kline (2005) suggests that the kurtosis range value is ± 10 for normal data. Each variable and all linear combinations of variables must be normal as a pre-condition of the analysis assumption. Hypothesis testing was completed using simple correlation and regression analysis for each independent variable against the dependent variable. From the theoretical basis, the hypothesis can be proposed as follows: H0: ρ value = 0, and Ha: p-value < 0.05. The hypothesis indicates that H0 represents no significant influence of the attitude towards waste cooking oil recycling, subjective norms, and perceived behavioural control towards waste cooking oil recycling intention. Meanwhile, Ha indicates a significant influence of the attitude towards waste cooking oil recycling, subjective norms, and perceived behavioural control towards waste cooking oil recycling intention.

4. Results

A total of 254 respondents answered and returned the distributed questionnaire. Of the 254 respondents that were analyzed, 112 or 44.1 percent were respondents men, while the rest were female respondents (n=142, 55.9%). Almost half of the respondents were 21–30 years old, with 166 respondents (65.4%). There are 42 respondents (16.5%) who are living in Northern Region, 89 (35%) in Southern Region, 100 (39.4%) in Central Region, and 23 (9.1%) in East Coast. In terms of occupation, most respondents were students (n=106, 41.7%), followed by private employees (n=76, 29.9%), civil servants (n=43,16.9%), freelancers (n=26, 10.2%), and others (n=3,1.3%). Finally, most respondents were single (n=138, 54.3%).

Table 2
Profile of Respondents

Variables		*Frequencies*	*Percentage*
Gender			
	Male	112	44.1
	Female	142	55.9
Age			
	21–30	166	65.4
	31–40	85	33.5
	41–50	3	1.1
	≥51	0	0
Region			
	Northern Region	42	16.5
	Southern Region	89	35
	Central Region	100	39.4
	East Coast	23	9.1
Occupation			
	Student	106	41.7
	Civil servant	43	16.9
	Private employees	76	29.9
	Retiree	0	0
	Freelancer	26	10.2
	Others	3	1.3
Marital Status			
	Not married	138	54.3
	Married	110	43.3
	Widower	6	

Based on Table 3, the reliability results show the Cronbach alpha values for attitude towards waste cooking oil recycling (0.850), subjective norms (0.811), perceived behavioural control (0.897), and waste cooking oil recycling intention (0.829) were above 0.80. These indicate that the variable instruments were reliable. The normality results found that all Skewness (≤±2) and Kurtosis (≤±10) values for the variables were in a normal distribution (see Table 3).

Table 3
Normality & Reliability Results

Variables	*Mean*	*SD*	*Skewness*	*Kurtosis*	*Cronbach's Alpha*
Attitude towards Waste Cooking Oil Recycling	3.15	0.81	0.124	-1.014	0.850
Subjective Norms	3.25	0.92	-0.741	1.210	0.811
Perceived Behavioural Control	3.43	0.87	-0.546	1.137	0.897
Waste Cooking Oil Recycling Intention	3.41	0.93	0.178	-0.028	0.829

In interpreting the level of items, the range of mean between 1.00 – 2.50 is considered a low level, 2.51 – 3.50 is a medium level, and 3.51 – 5.00 is considered a high level. Table 4 shows the respondent's intention to practice waste cooking oil recycling at a moderate level with a mean value of 2.76 to 3.08. A moderate level means that the behaviour is practiced occasionally.

Table 4
Level of Waste Cooking Oil Recycling Intention

Items	N	Mean	SD	Level
1) I plan to start/continue oil waste recycling	254	3.08	0.94	Medium
2) I am going to start/continue oil waste recycling	254	3.05	0.93	Medium
3) I intend to start/continue oil waste recycling	254	2.76	0.95	Medium
4) I am willing to start/continue oil waste recycling	254	2.83	0.98	Medium

Note: 1.00-2.50, low; 2.51-3.50, medium; 3.51-5.00, high.

Table 5 shows the results of the Pearson Correlation test. Findings show a significant and positive relationship between attitude towards waste cooking oil recycling and waste cooking oil recycling intention (r=0.255, p=0.000). Findings also show a significant positive relationship between subjective norms and waste cooking oil recycling intention (r=0.276, p=0.000). Finally, a significant and positive relationship exists between perceived behavioural control and waste cooking oil recycling intention (r=0.341, p=0.000). Therefore H1, H2, and H3 were supported.

Table 5
Pearson Correlation Results

		Waste Cooking Oil Recycling Intention
Attitude towards Waste Cooking Oil Recycling	Pearson Correlation	0.255**
	Sig. (1-tailed)	0.000
	N	254
Subjective Norms	Pearson Correlation	0.276**
	Sig. (1-tailed)	0.000
	N	254
Perceived Behavioural Control	Pearson Correlation	0.341**
	Sig. (1-tailed)	0.000
	N	254

The contribution of the independent variable of attitude towards waste cooking oil recycling, subjective norms, and perceived behavioural control to the dependent variable of waste cooking oil recycling intention was analysed using multiple linear regression. Table 6 displays a summary of the contribution model. It was found that the coefficient of determination or R square obtained is 0.480, meaning the independent variables' ability to explain the dependent variable's variance is 48.0%. In interpreting the results, beta value (β) weights are the credits given to each independent variable to create the predicted score on the dependent variable. From Table 6, the highest beta value score is for perceived behavioural control (β=0.340, p=0.001), which indicates that the increase of waste cooking oil recycling intention is associated with increased perceived behavioural control per unit when other predictors are held constant. The variance inflation factor (VIF) and tolerance are closely related statistics for diagnosing collinearity in

multiple regression. Multicollinearity is a situation that shows a strong correlation or relationship between two or more independent variables in a multiple regression model. If the value of Tolerance < 0.1 and VIF > 10, these can indicate the presence of multicollinearity. Based on Table 6, the data were free from multicollinearity issues.

Table 6
Regression Results

Variables	*Beta (β)*	*Sig. (p)*	*Tolerance*	*VIF*
Attitude towards Waste Cooking Oil Recycling	0.176	0.347	0.626	2.176
Subjective Norms	0.247	0.002	0.565	3.765
Perceived Behavioural Control	0.340	0.001	0.511	2.489
R^2	0.480			
Adjusted R^2	0.431			
F Change	15.981			
Sig.	0.000			

5. Discussion

Recycling practices help reduce the amount of waste produced. Recycling materials such as paper, plastic, and glass will lead to a reduced amount of waste in landfills (Izham et al., 2023). The reduced amount of waste produced means reduced pollution and a cleaner and healthier environment (Rangga et al., 2023). Interestingly, recycling practices also create job opportunities. This study was conducted to identify the level of waste cooking oil recycling intention among Malaysians and the influence of attitudes towards waste cooking oil recycling, subjective norms, and perceived behavioural control on waste cooking oil recycling intention. Theoretically, this study has contributed to the current literature by imparting new insights into the enablers of waste cooking oil recycling intention. Although many researchers have examined the intention of recycling behaviour, the gap in understanding oil waste recycling that significantly affects waste management strategies and adoption still exists. This study is significant since it helps determine the current level of waste recycling intention of Malaysians. The Malaysian government seeks to increase the recycling rate of household waste to 40% under the Twelfth Malaysia Plan (12MP). Hence, the recent data could help monitor the current progress of the government's waste recycling programme.

The findings of this study revealed that the majority of Malaysian waste cooking oil recycling is at a moderate level, indicating that the behaviour is practised occasionally. Statistics from the Malaysian Department of National Solid Waste Management in 2021 found that the country only recorded a recycling rate of 31.52%, while most developed countries recorded at least 60% (Bernama, 2021). Thus, from the current situation and findings, the government's target of achieving a 40% recycling rate by 2025 is going to be a challenge. Nevertheless, the country's target could be achieved with progressive steps and commitment from all parties. Good environmental knowledge and positive practices and attitudes of Malaysians towards waste management will support the government's efforts in implementing punishment such as fines and penalties (Aboelmaged, 2021; Noor et al., 2023; Zhu et al., 2021).

The findings of this study show positive relationships between attitudes towards waste cooking oil recycling, subjective norms, perceived behavioural control, and waste cooking oil recycling intention. Previous studies supported these findings (e.g., Aboelmaged, 2021; Hameed et al., 2022; Mohd Noor et al., 2022; Sulaiman et al., 2019), and perceived behavioural control has been instituted as the most potent enabler. Empirical studies by Mohd Noor et al. (2022), Ofstad et al. (2017), Tang et al. (2023), and Wang et al. (2021) have highlighted the role of perceived behavioural control in influencing intention to perform recycling. Perceived behavioural control also has been highlighted by Azjen (1991) to directly influence behaviour. As an implication, more exhibitions, pitching and innovation competitions, and awareness programmes that promote the recycling culture must be mainstreamed to set an example so that more people are more aware of the recycling practice. Incentives such as prizes, medals, and others can be a catalyst for this noble cause. Extensive media coverage through various platforms is essential to strengthening the movement of recycling and solid waste separation and the 3R culture at various levels of society. Distribution of information to communities, predominantly residential areas and restaurant traders, is necessary to increase the level of awareness and educate them to take the right actions to manage used oil. The generation of side income through the practice of recycling is a good form of incentive to encourage sustainable practice in the community. The campaign also needs to be in dormitory dining halls, schools, and cafeterias of various education levels. Other strategies are benchmarking into some best practice countries in implementing recycling practices. In Sweden, more than 30 power plants in the country burn non-recyclable waste to generate electricity. In Japan, the community is responsible for sorting, treating, and segregating their household waste, which is governed under a strict and scheduled collection calendar. Meanwhile, in Switzerland, garbage bags are sold at a higher price, while recycling is free of charge.

Simultaneously, schools must raise awareness and encourage the younger generation to practice recycling. Schools could organise awareness campaigns such as talks and exhibitions about recycling for students. Establishing the environmental club is also a good initiative to help this effort. For example, the club can organise a competition to collect or create recyclable items. As a result, Malaysians will be exposed to the practice of recycling. Another recommendation is that the government enact a policy on recycling waste cooking oil. In Taiwan, waste cooking oil produced by households and institutions can be collected by local environmental protection bureaus or sanitation teams, which are legally obliged to manage it. In addition, the waste cooking oil produced by restaurants, snack bars, vendors, and night markets is collected by municipal collection teams. Effective in 2015, all waste cooking oil collectors must carry waste cooking oil permits (Tsai, 2019). Local authorities also should increase the number of recycling bins and centres. The cooperation of the government and various parties is essential in making recycling successful (Knickmeyer, 2020).

6. Conclusion

Recycling is the process of turning waste materials into new materials and objects. This alternative to conventional waste disposal can help lower greenhouse gas emission effects. Recycling can prevent the waste of potentially useful materials and reduce the use of fresh raw materials, thus reducing energy consumption and pollution (Rangga et al., 2023). The study found that most respondents have positive and moderate perceptions of waste cooking oil recycling. This shows that the respondents are aware of the importance of recycling. Moreover, the study found that attitude towards waste cooking oil recycling, subjective norms, and perceived behavioural control influence waste cooking oil recycling intention. In response to the research, the researchers put forward some recommendations to concerned parties and stakeholders. The

limitations of the study are practically unavoidable. Among the limitations are from the aspect of the target respondents. This study limits its scope to Malaysians in Peninsular Malaysia. Future studies should be widened by increasing the sample size and sample area. Furthermore, this study used a questionnaire to collect data, which needed some improvement. Among the areas for improvement is the possibility of non-transparency due to respondent bias in answering each question. Future studies are encouraged to adopt multiple data collection methods to reduce bias, ensuring more accurate results.

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Authors Contributions

Muhamad Aiman, M., Muhammad Alif Haiqal, A., Ilhamd, S., & Nurul Hidayana, M. N. conceived and planned the research. Muhamad Aiman, M., Muhammad Alif Haiqal, A., & Ilhamd, S. contributed to interpreting the results. Nurul Hidayana, M. N. took the lead in writing the manuscript. All authors provided critical feedback and helped shape the research, analysis, and manuscript.

Conflict of Interest

We certify that the article is the Authors' and Co-Authors' original work. The article has yet to receive prior publication and is not under consideration for publication elsewhere. This research/manuscript has not been submitted for publication, nor has it been published in whole or in part elsewhere. We testify that all Authors have contributed significantly to the work, validity, and legitimacy of the data and its interpretation for submission to Voice of Academia.

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