Article

Exploring the Factors Shaping Food Recycling Behaviour: A Sustainable Perspective

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Abstract: Food waste is a pressing global issue with significant environmental, social, and economic implications. This paper aims to investigate the recycling of food waste behaviour, focusing on the relationship between social norms, cultural attitudes and public awareness. Malaysia contributes 259.82 kg per person annually to the staggering food wastage of 8.3 million metric tonnes. In this study, a qualitative content analysis research design is used. The study conducts a detailed review of studies on food waste behaviour study explores the variables in the research, categorized as dependent and independent. The dependent variable is recycling food waste behaviour, while the independent variables are public awareness, government policies and regulations, and cultural attitudes. Public awareness significantly influences community behaviour, particularly among youth, highlighting the importance of recycling food waste. Social norms also play a crucial role by embedding recycling as a daily practice. Cultural attitudes affect recycling behaviours through established norms and traditions. The study also examines the Theory of Planned Behaviour (TPB) by Ajzen (1985).

Keywords: Food waste; recycling; sustainable; behaviour ; environment

Introduction

Food waste has emerged as a critical global issue, posing challenges to both environmental sustainability and food security. The squandering of food intended for human consumption has been linked to various problems, including climate change, loss of biodiversity, water scarcity, soil degradation, and hunger (Mganga et al., 2021). Recently, it has also been associated with nutritional losses in diets, further impacting the sustainability of diets and planetary health (Von Massow et al., 2019; Willett et al., 2019). Several strategies have been implemented at various scales and at various points in the supply chain to prevent, minimize and manage food waste (Casonato et al., 2023). Our current study focuses on the effectiveness of such information campaigns.

The Sustainable Development Goals (SDGs) are a collection of 17 global goals set by the United Nations in 2015 to address a wide range of issues, including poverty, inequality, climate change, environmental degradation, and peace and justice. One of these goals, SDG 12, specifically aims to ensure sustainable consumption and production patterns (United Nations Development Programme, 2021). By 2030, the goal is to halve per capita global food waste at both the retail and consumer levels and to minimize food losses throughout production and supply chains, including post-harvest losses. Reducing food waste is essential for maximizing the value of agricultural land and ensuring the sustainable use of natural resources

(United Nations, 2020). This indicator will help countries pinpoint where food is being lost and wasted, providing valuable information for governments, citizens, and the private sector to act and reduce food waste. According to a report on the food waste index (2024), Malaysia contributes 259.82kg per person annually to the staggering food wastage of 8.3 million metric tonnes. This study aims to investigate the root causes, consequences, and potential solutions to this pressing issue.

Moreover, Teresa Kok also highlighted that Malaysia ranked 58th out of 121 countries in the 2022 Global Hunger Index, labelled as 'moderate' (Nizam, 2023). During Ramadan last year, Kuala Lumpur and Negeri Sembilan witnessed an increase in food waste, as reported by Datuk Ahmad Husaini Abdul Rahman, the Chief Executive Officer of the Solid Waste Management and Public Cleaning Corporation (SWCorp) (Leong, 2024). Compared to the previous year, these two states experienced increases of 0.93% and 0.73%, respectively. In Kuala Lumpur alone, a total of 64,125.85 tons of solid waste, including 22,732.61 tons of food waste, was disposed of in 2023. Similarly, Negeri Sembilan recorded 28,044.89 tons of solid waste, with 9,941.91 tons being food waste. Conversely, five states under SWCorp's jurisdiction saw decreases, with Pahang leading at 13.01%, followed by Kedah, Perlis, Johor, and Melaka. On average, 8.159 tons of solid waste were deposited daily across 29 landfills during Ramadan 2023, with 35.45% of it constituting food waste (Leong, 2024).

Literature Review

1. The Theory of Planned Behaviour: Ajzen's Behavioural Intention (1985)
The Theory of Planned Behaviour (TPB), developed by Ajzen in 1985, is a cognitive framework that suggests an individual's decision to engage in a particular behaviour, such as gambling or ceasing to gamble, can be predicted by their intention to perform that behaviour (Brookes, 2023). "Intentions are believed to reflect the motivational factors that influence behaviour; they indicate how much effort individuals are willing to put in and how determined they are to perform the behaviour. Generally, the stronger the intention to engage in a behaviour, the more likely it is that the behaviour will be carried out" (Ajzen, 1991, p. 181). Predicting and explaining the behaviour of individuals can be done by considering their psychological aspects. Thus, many authors have studied the psychological components that allow us to understand the factors that lead people to have certain behaviours (Pérez & Egea, 2019). In order to analyze the intentions of Malaysian Youth to recycle food waste altruistically for sustainable rural development, we used a theoretical framework based on social psychology models

According to the Theory of Planned Behaviour (TPB), human behaviour is influenced by three types of considerations: beliefs about the expected outcomes of the behaviour (behavioural beliefs), beliefs about the social expectations of others (normative beliefs), and beliefs about the factors that might enable or hinder the performance of the behaviour (control beliefs) (Bosnjak et al., 2020) shown in Figure 1.
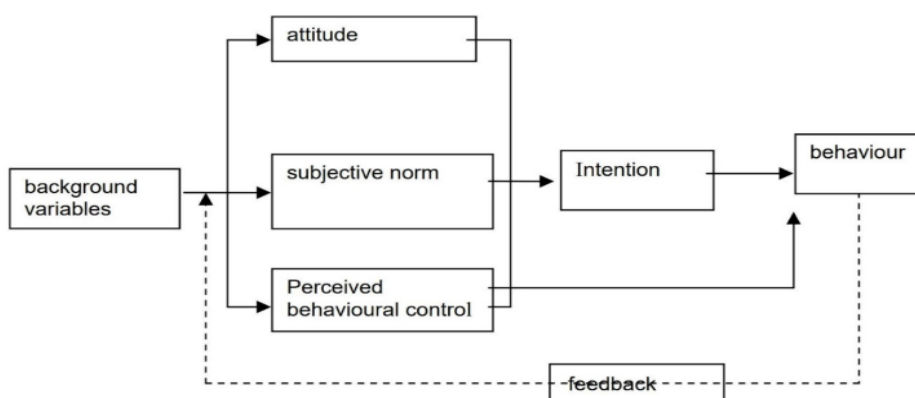

Figure 1. The theory of planned behaviour

As shown in Figure 1, the Theory of Planned Behaviour (TPB) posits that the immediate alternative to a particular behaviour is the intention to perform it. Behavioural intentions indicate the extent to which individuals are willing to try to perform a specific behaviour, such as intending to recycle food waste. The actual behaviour, such as having already been recycled, follows this intention. Additionally, intention is assumed to capture the motivational factors that influence behaviour (Bosnjak et al., 2020). According to TPB, intentions are determined by: (1) attitudes toward the behaviour (the individual's positive or negative evaluation of the behaviour); (2) subjective norms (the perceived social pressure to perform or not perform the behaviour); and (3) perceived behavioural control (the individual's perception of the ease or difficulty of performing the behaviour) (Brookes, 2023).

Therefore, based on Ajzen's Theory of Planned Behaviour (TPB), the likelihood of a person forming an intention to engage in a specific behaviour increases when their attitude toward the behaviour is positive, when they perceive favourable social pressure (subjective norms), and when they feel a high level of control over performing the behaviour (Ajzen, 2011). While TPB is useful in its original specification (Pérez & Egea, 2019) it was put forth that, after the examination of traditional TPB variables, the TPB can accommodate additional predictors if these new constructs significantly account for the variance in intention. Throughout its existence, the initial TPB model has faced criticism for its limited predictive power, primarily due to the insufficient number of variables explaining why individuals engage in certain behaviours (Teo et al., 2016; Rozenkowska, 2023). This has prompted many researchers to revise the original model by incorporating additional variables to the basic one's attitudes, subjective norms, and perceived behavioural control (PBC). These additional variables, such as "past behaviour," "moral norms," "perceived moral obligation," "perception of ease of use," and "capacity to resist," have, in some cases, demonstrated significant explanatory power (Tommasetti et al., 2018).

Methodology

Reviews of the literature are described as mostly qualitative synthesis. About 50 literature reviews published in peer-reviewed, English-speaking journals between 2000 and 2024 are reviewed using content analysis. This review study employs a content analysis research design in a qualitative manner. A content analysis based on a particular pattern of analytical categories established from a typical research approach follows a descriptive review of the body of literature. Hsieh and Shannon (2005) define qualitative content analysis as the subjective interpretation of text data through systematic coding to find themes or patterns. Secondary data from books on food waste behaviour studies, journals, dissertations, proceeding papers, and policy papers were used for the document analysis. The secondary data was subsequently analysed and interpreted using thematic analysis. Denzin (1989) emphasises the importance of balancing description and interpretation when presenting the results of a qualitative content analysis. Text descriptions should be detailed and complete in order to give readers context and background information. Interpretation is crucial to qualitative research, reflecting both theoretical and personal understanding of the subject under study. Patton (2002) defines an engaging and easy-to-read report as one that has enough description to allow the reader to comprehend the basis for an interpretation, as well as enough interpretation to allow the reader to grasp the description. In terms of article selection, this review study considered any English-language, peer-reviewed, primary research paper that contained a full explanation of data on food waste behaviour. Secondary research publications (e.g., literature reviews, comments) were included if they provided an in-depth examination of data food waste behaviour-related research.

The Findings

Recycling food waste is considered a key component of sustainable food waste reduction behaviour, alongside minimizing food waste production and repurposing the leftovers (Attiq et al., 2021). Not only that, but recycling food waste also helps to save wasted food and the resources that can go along with it. It has the power to influence the industrial sector and recycling the food waste will be essential to prevent global warming, protecting future generations' access to resources, promoting equity and cutting expenses for both consumers and business entities (Farkas, 2023).

1. Categories of Recycling Food Waste

The first category of recycling food waste is composting. The most recommended method of recycling food wastes is composting. According to El Haggae et al. (1998), composting is the process of turning organic waste into soil conditioner through the controlled biological breakdown of the materials. Vermicomposting is the term for the organic materials like leftovers, food and leaves dissolve into the soil. In order to create a nutrient-rich compost that can eventually be used in farms or gardens, food scraps must be mixed with other organicmaterials, water must be added and the proper carbon to nitrogen ratio must be preserved. The dirt can be utilized and used for the farms and gardens. Composting has gained popularity as an eco-friendly method of reducing food waste over time (UNEP, 2023).

Next, the second category of recycling food waste is anaerobic digestion, which can be defined as a special technique that breaks down organic compounds in the absence of oxygen using various microbial species. Worldwide, anaerobic digestion has been used extensively in large-scale facilities. Livestock manures, waste waters and solid lignocellulosic waste have all been turned into biogas using a variety of anaerobic digestion approaches (Achinas et al.,2020). Biogas energy can be utilized in the same ways as natural gas to power cooling systems,produce electricity and provide heat. All this renewable natural gas including water, carbon dioxide (CO_2) and hydrogen sulphide can be produced from biogas by purifying it by eliminating low-value or harmless components. This can be compressed and used as vehicle fuel, sold and pumped into the natural gas distribution system or processed further to produce advanced biochemicals and bioproducts, energy products and alternative transportation fuel (US EPA, 2024).

Lastly, food redistribution. Food distribution can be referred to as an initiative taken by providing places for people to donate their unused food or edible food that can be eaten by others. It is the most important tactic used by commercial food enterprises to combat food waste as a component of the larger problem of the food supply chain. Moreover, it also can be referred to as food recovery or food rescue. Instead of the food ending up in a landfill, it might be collected and donated to charitable organizations that feed the underprivileged in the community (Saidatul Akma et al., 2023). This food redistribution is crucial in supporting the second sustainable development goal (SDG) which is zero hunger. By allocating excess food to those in need, food redistribution helps to address food insecurity by increasing food access and lowering hunger (Ayala et al., 2022).

2. Factors Influence Recyling Food Waste

These factors of public awareness, social norms, and cultural attitudes interact to shape behaviours and practices related to recycling food waste. Understanding and leveraging these influences can help design effective strategies to promote food waste recycling and achieve sustainability goals.

Public Awareness

Awareness-raising aims to inform and educate people about a specific topic or issue to influence their attitudes, behaviours, and beliefs toward achieving a particular goal (TAP Network, 2019). Various strategies, methods, and tools can be employed to spread messages and garner the support needed to shape public opinion. Enhancing awareness and knowledge of food waste management among youths is an ideal starting point for both urban and rural communities to reduce food waste. This is crucial because food waste treatment in Malaysia is still very limited, with practices such as composting or using food waste as animal feed being rare (Izham et al., 2023). Almost all food waste in Malaysia, generated from sources like households, commercial establishments, restaurants, food courts, and supermarkets, is disposed of in landfills. In addition, public awareness encompasses the awareness, attitudes, behaviours, opinions, and activities that define the relationship between the public and scientific knowledge and organizations.

Implementing an awareness strategy to reduce food waste among youths can be highly effective, as evidenced by the successful outcomes seen in various schools, households, and food service operators. This strategy leverages education, engagement, and structured initiatives to foster behavioural changes and install sustainable practices in young people. It is a powerful tool in the fight against food waste. By educating and engaging young people and their communities, we can foster a culture of sustainability and responsible

consumption. According to the Forum Air Malaysia (2020) despite the short timeline of the project, the participating schools, households, and food service operators were able to make substantial reductions in food waste. This shows that awareness-raising and a structured approach to food waste management have the potential to lead to significant changes over a short period of time. The most practical awareness campaigns employ multiple non-personal and personal communication channels to convey diverse types of information (Stöckli et al., 2018). Information can be shared via educational videos, websites, social media platforms like Facebook or TikTok, brochures, workshops, and events to educate the public about food waste and its connection to food sustainability and environmental impacts.

Social Norms
Social norms refer to the accepted behaviours that individuals perceive as standard within their community or social group. In the context of food waste, social norms can significantly influence people's attitudes and actions regarding food consumption and disposal (Zheng et al., 2023). Therefore, the attitudes of partners, friends, and family significantly influenced individuals' behaviours, underscoring the importance of social norms (De Bruin et al., 2019). This means that social norms can influence and change public behaviour towards more sustainable practices. When people see that others around them are engaging insustainable actions, such as recycling, or reducing food waste, they are more likely to adopt these behaviours themselves (White et al., 2019). Social norms serve as a powerful motivator because individuals often look to the behaviour of others to guide their own actions, especially in situations where they are unsure of what is appropriate or effective. Therefore, promoting sustainable behaviours through visible, positive examples within a community can led to broader public adoption of these practices. This can be observed in societies where communal efforts, such as neighbourhood composting programs, are prevalent and where there is a collective commitment to environmental stewardship.

Cultural Attitudes
Culture has been defined since the 19th century as the customary beliefs, social practices, and material characteristics of a racial, religious ("Culture," 2024), or social group. It encompasses the distinctive aspects of daily life that are shared by people within a particular location or era (Tey et al., 2018). Additionally, religion, a crucial part of cultural identity, significantly influences the social behaviours of many people globally (Agarwala et al., 2019). In academic discussions, religion is understood as a comprehensive and multi-faceted concept that encompasses beliefs, rituals, values, and a sense of community. Meanwhile, attitudes are essential in influencing the tendency to perform or avoid specific actions. Moreover, attitudes help predict intentions, which in turn affect actual behaviours (Adel et al., 2022). Many studies have confirmed this link between attitude and intention. For instance, Ajzen (1991) explains this relationship, and Ghani et al. (2013) further stress the importance of attitude in shaping the intention to minimize food waste. The contemporary exertion needs to be delivered all-around coverage to unofficial waste caretaker, low awareness in sorting organic and unorganic waste, as well as to production waste management which is even more difficult Muhammad Abduh (2018)

Cultural attitudes deeply influence how people approach food waste recycling. In cultures that prioritize sustainability and resource conservation, there is a stronger inclination towards recycling food waste. For instance, in many Asian cultures, the practice of using every part of an ingredient is deeply ingrained, reducing food waste and promoting recycling. Additionally, cultural attitudes shaped by religious and ethical beliefs can foster a sense of moral responsibility to recycle food waste. In contrast, in cultures where convenience and abundance are emphasized, there may be less motivation to engage in recycling practices.

3. Conceptual Framework
The conceptual framework is a collection of interconnected goals and basics. The objectives that specify the aims and purposes of the research. The concept of recycling food waste behaviour is a dependent variable of this research. Additionally, the independent variables in this research are public awareness, social norms and cultural attitudes. Figure 2 illustrate the frame.
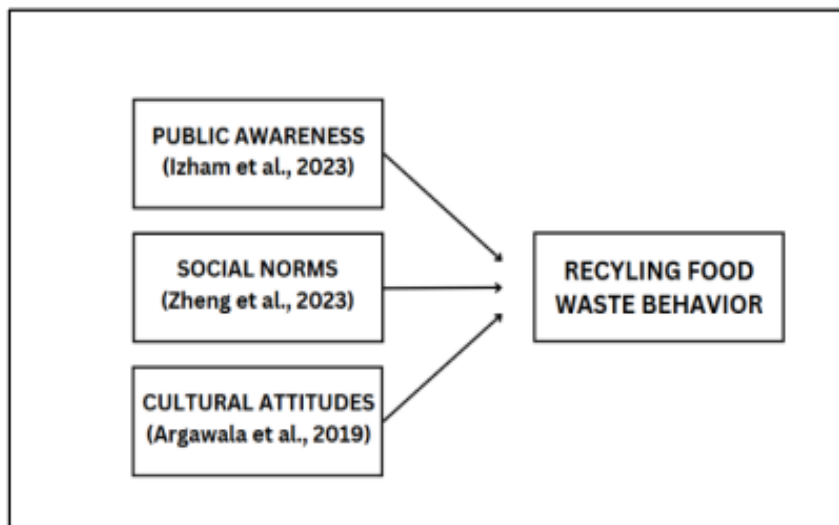
Figure 2. Conceptual framework on factors influencing the recycling food waste behaviour

The Influence of Public Awareness and Recycling Food Waste Behaviour
According to Phooi et al (2022), Malaysians are highly conscious of food waste. Over 70% of Malaysians believe that wasting food is an immoral behaviour that wastes money as well as natural resources like water and farmer planting efforts. However, approximately 0.72% of Malaysians said that they were unaware of the consequences of having food waste. Consumers are less concerned about the environmental effects of food waste, but they are more aware of its economic consequences. This is since most of consumers are considering the expense of food waste rather than any additional effects or even the impact on society. Their great cost consciousness arises from the fact that costs directly affect their budget, yet things are different when it comes to environmental impacts (Jereme et al., 2016).

The greatest step that can be done as the first step for both urban and rural cultures to minimize the volume of food waste produced is by raising awareness and knowledge of food waste management. This is due to the fact that there are currently very few options in treating food waste that is produced in Malaysia which will end up in landfills. The landfills are used to dispose of almost all of the food waste produced from various sources including houses, businesses, supermarkets and even food courts. Therefore, Malaysia has seen a double rise in the waste of unconsumed food alone over the past few years (Izham et al., 2023). Governmental and nonprofit organizations frequently create instructional materials, websites and social media campaigns to inform people about waste reduction. The usefulness of educational programs helps to educate and promote awareness towards food waste among the consumers including the youth (Blessing et al., 2023).

Not only that, utilizing social media also helps in raising awareness from the public on recycling food waste problems. Publicizing environmental challenges and stressing the need of lowering carbon footprints through media coverage of climate-change, in particular, can establish societal norms that support and encourage eco-friendly behaviour and attract people to purchase sustainable goods and services (Teoh et al., 2021). This shows that the influence of public awareness helps increase the recycling of food waste behaviour towards all generations. A high level of awareness regarding policies and initiatives is necessary, understanding their determinants and benefits is undoubtedly valuable, as it alone may not be sufficient to induce significant changes in society's recycling habits (Izyan Farhana Zulkarnain et al., 2023)

The Influence of Social Norms and Recycling Food Waste Behaviour
Social norms are typically unwritten and indirect rules that represent how members of a group or society should act in a particular scenario or culture when they are introduced to it. While there are similarities among many forms or norms, such as group behavioural patterns or "group-level evaluations of behaviour", unwritten social norms in a new environment or culture are distinct in a number of ways (Zhang et al., 2023). Consumers are impacted by social norms in their substance as well as how they are presented, and how a presentation is

presented can have a favourable or negative impact on how well they understand and follow social standards (Zheng et al., 2023).

Social norms, which include the activation component of portion control inspiration, generally function as a self-disciplinary alert. This encourages consumers to develop an inspiration for portion control, which in turn encourages intentions to decrease consumption and decrease ordering quantities and food waste. On the other hand, social norms and information framing work together, consumers will be intrinsically motivated to control their portions in order to minimize food waste (Zheng et al., 2023).

The descriptive norms and the injunctive norms were found to be strongly and positively correlated with environmental concern. To put it simply, consumers with high environmental norms exhibit environmental concerns like avoiding waste and using less energy (Apolonio & Lacaza, 2022). Raising awareness and understanding among families through educational efforts that capitalize on social norms and emphasize the financial and environmental benefits of decreasing food waste is essential to promote food waste recycling.

Increased public participation in food waste management can also be achieved through offering incentives and easily accessible recycling facilities (Kelly, 2020).

The Influence of Cultural Attitudes and Recycling Food Waste Behaviour
The literature on food waste has identified several established factors that motivate people to reduce it, such as recycling leftover foods. Among these motivations, religiosity has attracted the interest of researchers (Elhoushy & Jang, 2020). Religiosity is a fundamental aspect of social behaviour, directly and indirectly influencing both consumers and society (Elshaer et al., 2021). Tylor (1871) broadly defines culture as "the complex whole which includes knowledge, beliefs, art, law, morals, customs, and all other abilities and habits acquired by humans as members of society". On the other hand, other authors emphasized that also food waste generating patterns are shaped by cultural beliefs and habits (Aschemann- Witzel et al., 2015; Pelau et al., 2020; Phasha et al., 2020)

Among cultural factors, religiosity is seen as significantly influencing individuals' intentions to reduce food waste (Nemeth et al., 2019). Since religion is a global phenomenon, studying it in different countries can help us understand how religiosity influences people's behaviour regarding food waste and reveal any differences among religious communities. For instance, research has examined the effects of religiosity and religious practices like Ramadan on food waste in Qatar and Egypt. Specifically, (Elshaer et al., 2021) discovered that religious beliefs indirectly influence people's intentions to reduce food waste by acting as a mediator between various factors such as the strength of religious beliefs and food-related practices and restrictions. Additionally, even though religiosity impacts individuals' attitudes and behaviours, the extent of this influence depends on how deeply the person feels their religious sentiments. So, people belonging to a community may comply with religious practices, doctrines or values from religious beliefs with different degrees of intensity.

Furthermore, the element of cultural identities explored in this work is the role of media. Media has an influence on individuals' food purchasing and eating habits and as a consequence, on the generation of household food waste (Monteiro et al., 2013). According to research findings, cultural factors have a significant impact on the food waste-related behaviour of Turkish consumers (Secer et al., 2023).

Conclusion
This study explores the variables in the research, categorized as dependent and independent. The dependent variable is recycling food waste behaviour, while the independent variables are public awareness, government policies and regulations, and cultural attitudes. Public awareness significantly influences community behaviour, particularly among youth, highlighting the importance of recycling food waste. Social norms also play a crucial role by embedding recycling as a daily practice. Cultural attitudes affect recycling behaviours through established norms and traditions. The study also examines the Theory of Planned Behaviour (TPB) by Ajzen (1985), which explains behaviour through behavioural intentions influenced by attitudes, subjective norms, and perceived behavioural control.

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