

Review

# Understanding the determinants of households' intention to practise solid waste segregation-at-source: Theoretical framework development

Kai Wah Cheng<sup>1,2,3,\*</sup>, Syuhaily Osman<sup>4</sup>, Zuroni Md Jusoh<sup>4</sup>, Jasmine Leby Lau<sup>4</sup>, Walton Wider<sup>1,3</sup><sup>1</sup> Faculty of Business and Communications, INTI International University, Nilai 71800, Negeri Sembilan, Malaysia<sup>2</sup> Graduate School, Western University, Sangkat Boeng Kork II, Khan Toul Kork, Phnom Penh, Cambodia<sup>3</sup> School of Management, Metharath University, Sam Khok District, Pathum Thani 12160, Thailand<sup>4</sup> Faculty of Human Ecology, Department of Resource Management and Consumer Studies, Universiti Putra Malaysia, UPM Serdang 43400, Selangor, Malaysia\* **Corresponding author:** Kai Wah Cheng, [kaiwah.cheng@newinti.edu.my](mailto:kaiwah.cheng@newinti.edu.my)

## CITATION

Cheng KW, Osman S, Md Jusoh Z, et al. (2024). Understanding the determinants of households' intention to practise solid waste segregation-at-source: Theoretical framework development. *Journal of Infrastructure, Policy and Development*. 8(3): 2906. <https://doi.org/10.24294/jipd.v8i3.2906>

## ARTICLE INFO

Received: 21 September 2023

Accepted: 20 October 2023

Available online: 1 February 2024

## COPYRIGHT



Copyright © 2024 by author(s).

*Journal of Infrastructure, Policy and Development* is published by EnPress Publisher, LLC. This work is licensed under the Creative Commons Attribution (CC BY) license. <https://creativecommons.org/licenses/by/4.0/>

**Abstract:** Purpose: The level of the environment is gradually declining, especially with regard to the serious problem of solid waste. Solid waste segregation-at-source is seen as the most essential approach to helping the natural environment minimize the amount of waste generated before being transferred to waste disposal sites and landfills in many rapidly growing towns and cities in developing countries. However, a number of previous environmental-based research have focused only on the general scope of recycling, sustainable development, and the purchase intention for sustainable food products. This situation has led to useful and relevant information on the research scope of households' intention to segregate solid waste at source, which remains largely unanswered. The aim of this paper is, therefore, to provide a literature review to develop a novel theoretical framework in understanding the determinants of households' intention to practise solid waste segregation-at-source. Theoretical framework: The study provides a detailed explanation of the application of the Theory of Reasoned Action, the Fietkau-Kessel Model, the Focus Theory of Normative Conduct, and the Value-Basis Theory to predict the relationship between attitude, subjective norms, environmental concerns, and environmental knowledge of households on intention to practise solid waste segregation-at-source. Design/methodology/approach: This research is descriptive in nature. Findings: A better understanding of the potential mediator and moderator is needed to contribute to the body of knowledge on the causal relationship between the studied variables. In conclusion, the researchers discuss how the framework can be used to address future research implications as more evidence emerges. Research, practical and social implications: The current study is expected to broaden previous research in order to improve general understanding of attitudes and subjective norms towards the specific research scope of solid waste segregation-at-source.

**Keywords:** theory of reasoned action; Fietkau-Kessel model; focus theory of normative conduct; value-basis theory; intention; solid waste segregation-at-source

## 1. Introduction

Many people are now expressing their increased concern about serious environmental destruction as a result of irresponsible environmental behaviour (Pan et al., 2018). In Malaysia, the lack of solid waste segregation-at-source practises among local households is one of the main factors causing the problem of day-to-day solid waste generation (Economic Planning Unit, 2015). In 2015, the Malaysian ministry of housing and local government launched a phased solid waste segregation-at-source to reduce the amount of solid waste transferred to landfill sites

(SWM Environment, 2023). However, this environmental policy has not yet been implemented nationwide. Because of the climate change crisis and the depletion of natural resources, households should think about themselves and take real steps to manage their household waste to that improves the social welfare, well-being, and quality of life for both current and future generations.

Compared to previous Theory of Reasoned Action literature, research on the attitude and intention of a household to practise solid waste segregation-at-source is rare. The existing literature has explored a variety of general pro-environmental behaviors, including the combination of transport, energy, and food consumption behaviours (Han, 2021), energy-saving behaviours (Uddin et al., 2022) and recycling (Yadav et al., 2022). In the context of this research, attitude refers to negative or positive assessment of the likelihood of separation of solid waste on the basis of its different properties, which in turn are highly capable of generating influence within the population (Baawain et al., 2019). Generally, previous researchers have agreed that attitude is an important predictor of behavioural intention (Mohan and Kinslin, 2022). Unfortunately, it pointed out that although an individual has a favourable attitude towards undertaking recycling behaviour, they have not been able to practise such positive behaviour that can improve the quality of their natural environment (Udawatta et al., 2015). This situation explains why people tend to take longer to break with old traditions and change their current attitudes and practises (Albarracin and Shavitt, 2018). In addition, Trang et al. (2019) pointed out that consumers tend to have a negligible attitude towards sustainable products in developing countries. These varied research findings call for a more in-depth investigation of the current scenario of intention to practise solid waste segregation-at-source between households. Here, this variable refers to a tendency to systematically perform a repeated and typical action of separating unwanted material or matter into different elements according to their recycling potential.

Meanwhile, the subjective norm variable was further divided into two dimensions, namely the descriptive norm and the injunctive norm, through the Focus Theory of Normative Conduct (Cialdini et al., 1990). The descriptive norm also defines the “is-norm” (Eriksson et al., 2015). In contrast to the injunctive norm, Constantino et al. (2022) claimed that the descriptive norm was the actual percentage or frequency of a certain practise within a group. The descriptive norm also reflects the perception that a person holds what other members actually do (Qalati et al., 2022) despite their moral component (Hamann et al., 2015) of aggression in social contexts. This situation, in turn, will motivate other people to intend to comply with common practises (Bissing-Olson et al., 2016). The present research estimates that the motivation to enhance the intention to practise solid waste segregation-at-source should be increased when households see more positive pro-environmental descriptive norms because it gives local households a sense that their actions will have an impact on their daily routine.

Moreover, compared to the descriptive norm, the injunctive norm is relatively more effective (Bissing-Olson et al., 2016) in communication and more stable (Heinicke et al., 2022) in the promotion of pro-environmental behaviour. The effectiveness of the injunctive norm depends on its saliency (Cialdini et al., 1990) and on the extent to which the injunctive norm is in focus and to which it is

consistent (Reinholdsson et al., 2023). So, in the context of this research, the researcher thinks that the focus on injunctive norms may come from a regulatory notification in the form of a written message that encourages a person to have a stronger intention of doing a socially accepted behaviour (Zhang et al., 2022) which is solid waste segregation-at-source.

In terms of the Value-Basis Theory, environmental concern has been justified in having a significant impact on the prediction of various types of environmentally friendly behaviours (Chen and Hung, 2016; do Paco et al., 2019). It is important to note that the variable of general environmental concern has been used as a mediating variable in other areas of research, including corporate environmental practices (Zhang et al., 2015) and ecological purchase intention (Arisal and Atalar, 2016). Besides the environmental concerns, this current research also applies environmental knowledge as a moderating variable for the study of interrelationships between variables studied by the Fietkau-Kessel Model (Kollmuss and Agyeman, 2002). In the context of this research, environmental knowledge refers to factual information that has a powerful influence on the relationships, concepts or facts related to the ecosystem and its surrounding environment generated by interacting and observing with the non-human and human world. However, to the best of our research knowledge, research using the Value-Basis Theory to investigate the impact of different dimensions of environmental concerns, i.e., egoistic concern (i.e., the extent of environmental degradation towards self-interest), altruistic concern (i.e., the concern about the effects of environmental deterioration that would jeopardize the health and wellbeing of other people on the environment), and biospheric concern (i.e., the concern of all living things in nature due to environmental deterioration) (Stern and Dietz, 1994), has been very rare, limited, and scarce. This situation was reflected in the call for more research on how the understanding of these different dimensions of environmental concern can be strengthened and enhanced among researchers on this specific research scope, i.e., the intention to practise solid waste segregation-at-source. So, in response to Karpudewan (2019) suggestions, the current research takes the first step toward closing the specific literature gap by looking into the relationships between the variables studied.

Thus, this paper aims to provide a literature review on the integration of attitude and subjective norms (descriptive norm and injunctive norm) together with the mediating effect of environmental concerns (egoistic concern, altruistic concern, and biospheric concern) and the moderating effect of environmental knowledge through the application of the Theory of Reasoned Action, the Fietkau-Kessel Model, the Focus Theory of Normative Conduct, and the Value-Basis Theory to predict their intention to practise solid waste segregation-at-source.

## **2. Literature review**

### **2.1. Theory of reasoned action**

Martin Fishbein and Icek Ajzen's Theory of Reasoned Action (Ajzen and Fishbein, 1980) was one of the most extensive and influential research programmes in the history of social psychology. A cursory search of the citation index also reveals thousands of citations for the Theory of Reasoned Action, thus demonstrating

that this research programme has been extremely successful in terms of its influence on the field of psychology (Kumar et al., 2023). There are two assumptions under the Theory of Reasoned Action: 1) people will act rationally when they make a decision to display certain behaviors; and 2) most behaviours are subject to volitional control. A person may, by definition, decide whether to carry out that particular behaviour on their own. The Theory of Reasoned Action hypothesises that the determinant of one's behaviour depends on his or her intention, whether he or she is likely to act in a targeted behaviour. In turn, their intentions will be influenced by attitudes and subjective norms (Mahajan and Gera, 2023).

Briefly, according to the Theory of Reasoned Action, behavioural intention (what one intends to do or not to do) is the most proximal cause of behaviour. In other words, behavioural intention is the most important determinant of behaviour. Behavioural intention, in turn, is determined by attitude (one's assessment of behaviour) and subjective norms (one's assessment of what important others think one should do), either of which may be the most important determinant of any particular behaviour. These two variables are influenced by personal beliefs. Attitude includes assessment of outcomes and behavioural beliefs. The subjectivity norm consists of motivation for compliance and normative beliefs (Ajzen and Fishbein, 1975; Mokhlis et al., 2022).

Both the attitude and subjective norms are estimated to be determined by the summative process. Usually, this is empirically revealed by beta weights obtained from multiple regression analyses, where behavioural intention has regressed to attitude and subjective norms. If the result is a larger attitude than the subjective norms beta weight, the behaviour is considered to be more attitudinal than normative control, but if the reverse is true, the behaviour is considered to be more normative than attitudinal control.

Individual beliefs about social norms and behaviour will influence the formation of attitudes and subjective norms. Increases in attitude and subjective norm may, generally, lead to a stronger desire to engage in the behaviour (Q. A. Nguyen et al., 2018). The Theory of Reasoned Action also explains that attitudes (positive or negative evaluation of performing a behaviour) are determined by behavioural beliefs. In other words, attitudes are determined by the individual's belief in the consequences of their behaviour. An individual will intend to perform a particular behaviour if he or she evaluates it positively. Thus, the attitude is the salient belief of an individual as to whether the outcome of his or her behaviour is positive or negative (Huang, 2023). Meanwhile, the subjective norm is the motivation to comply with normative beliefs. It also acts as an individual's normative belief, which refers to an individual's subjective perception and acceptance of social values and norms in a society.

Xiao (2020) recently argued that, contrary to popular belief, human behaviour is the result of many other correlated factors, not just attitude or motivation. Ajzen and Fishbein (1975) considered that behavioural and normative beliefs can lead someone to achieve the desired outcome, such as social recognition and relaxation. However, if the research develops a model that directly links these motivators to the actual desired behaviour, a few elements or steps, including attitude and subjective norms, may be missed in the decision-making process in order to take action. Because of

this, the power of the Theory of Reasoned Action lies in its ability to include a range of determinants that work together to influence individual behaviour sequentially and linearly.

The application of the Theory of Reasoned Action is well established in the field of pro-environmental behaviour research (Rousta et al., 2016). Pro-environmental behaviour appears to be a complex behaviour that seeks consciously to minimise the negative consequences of one's actions on the built and natural world (Tsaur and Yen, 2023). Pro-environmental behaviour may include personal buying behaviour, travel behaviour, recycling and resource utilisation, and active participation in a pro-environmental organisation (Ribeiro et al., 2023).

The Theory of Reasoned Action allows for the prediction of intention and behaviour (Yang et al., 2023). Its explanatory power can be shared across cultures (Bloemen-Bekx et al., 2023). It was widely used in related sustainability research (du Toit et al., 2017; T. N. Nguyen, Lobo, Greenland, 2017; T. Nguyen et al., 2017). It also provided a theoretical framework for health studies, including slimming and eating behaviours, smoking and alcohol abuse, condom use, and human immunodeficiency viruses (HIV) (Williams, 2023).

Some research has applied the Theory of Reasoned Action to energy (Martins Goncalves and Viegas, 2015), green information technology adoption (Kumar et al., 2023), environmentally friendly energy use (Santos et al., 2023), waste management (Cheng and Osman, 2019), hybrid electric vehicle usage (Alzahrani et al., 2018), and pro-environmental behaviour (T. N. Nguyen, Lobo, Nguyen et al., 2016; T. N. Nguyen, Lobo, Greenland, 2017). For all these reasons, it is appropriate to use the Theory of Reasoned Action to investigate the intention of Selangor citizens to practise solid waste segregation-at-source.

## **2.2. Fietkau-Kessel model**

As far as the Fietkau-Kessel model is concerned, Hans-Joachim Fietkau and Hans Kessel (Fietkau and Kessel, 1981) are social psychologists who have developed a relatively simple but useful sociology model to illustrate how environmental behaviour can be encouraged and influenced by both psychological factors and sociological factors. As such, this sociological model combines both psychological and sociological factors in order to explain that pro-environmental behaviour can actually be operationalised by five variables: 1) perceived consequences; 2) possibilities to act pro-environmentally; 3) incentives; 4) attitudes; and 5) knowledge that may have an indirect impact on a particular ecological behaviour, by identifying starting points and strategies for the modification of a person's attitudes (Fietkau and Kessel, 1981; Irvine et al., 2017). It is therefore directly relevant to many areas of environmental studies, such as environmental awareness and behaviour (Pirmoradi et al., 2021), climate change (Haefner and Schobin, 2019), human ecological behaviour (Tarfaoui and Zkim, 2015), solid waste segregation-at-source behaviour (Cheng et al., 2019; Cheng et al., 2020), and sustainable mobility behaviour (Tarfaoui and Zkim, 2015).

On top of that, these five variables are independent of each other. The variables within this model can therefore be modified, if necessary (Kollmuss and Agyeman,

2002). Most of the existing models of pro-environmental behaviour have their limitations due to the lack of consideration of institutional, individual, and social structures. There are two assumptions for pro-environmental behaviour models: 1) Humans can use available information in a systematic manner, and 2) human decision-making is rational. These assumptions are consistent with known theories in behavioural science (Khan and Khan, 2022) and cognitive psychology (Anwar et al, 2022), which holds that people, notwithstanding cognitive biases, engage in systematic information processing and decision-making processes.

Although the Fietkau-Kessel model is not an image of reality (Dembkowski and Hanmer-Lloyd, 1994), it includes the most important factors that may affect or alter the behaviour of the individual. The link between environmental attitude and pro-environmental behaviour is also part of environmental psychology. The term “environmental psychology” was developed in the United States in the 1960s. It looks at the range of complex interactions between human beings and the environment. Because of this, environmental psychology needs to be a very broad field with many different branches.

The Fietkau-Kessel model also explains the factors necessary to have a significant impact on pro-environmental behaviour. Within this model, environmental knowledge appears to have an indirect capability to influence pro-environmental behaviour. The knowledge variable has been used in various research on environmental issues. It is also applied to a number of environmentally friendly campaigns aimed at enhancing environmental behaviour or awareness in society. Although the knowledge variable does not have a direct influence on the model, it still appears to be a necessary variable because pro-environmental behaviour is only possible if people know what they can do to protect the earth (Wilson and Williams, 2007).

As a result, there will be fewer opportunities for the public to act in an environmentally friendly manner without environmental knowledge. Knowledge alone does not seem strong enough to encourage consumers to act pro-environmentally. The Fietkau-Kessel Model therefore concluded that knowledge does not have a direct influence because knowledge works as a moderator between attitude and pro-environmental behaviour. This means that a person ‘s environmental knowledge has an effect on how they feel about the environment and, in turn, how they act to help the environment.

### **2.3. Focus theory of normative conduct**

Social psychology has shown that social norms have been an essential source of social influence since the beginning of the discipline, through research by Sherif (1935) on normalization and Asch (1951) on conformity. In most of the literature on social norms, the social norm has generally been understood as shared rules of conduct, which are partly supported by approval and disapproval (Elster, 1989). It is also an unwritten code and an informal understanding that defines what is expected by others and what others expect of themselves (Tennant et al., 2021). The term “norm” has more than one meaning in scientific usage (Cislaghi and Heise, 2020). It may refer to: a) what is done ordinarily or b) what is commonly approved and

disapproved. Cialdini et al. (1990) called the first of these normative types a descriptive norm (the “is” norm) and the second type an injunctive norm (the “ought” norm). They stressed the need to distinguish between these constructs under the Focus Theory of Normative Conduct since each of them refers to a separate source of human motivation (Deutsch and Gerard, 1955; Kaplan and Kaplan, 1989). A descriptive norm motivates a person to act by showing them which behaviour is the most effective and adaptive in a given situation. An injunctive norm motivates a person to act by punishing them or giving them a social reward.

The Focus Theory of Normative Conduct suggests that the norm does not affect behaviour in the same way at all times and in all situations. Indeed, the norm motivates behaviour primarily when it is activated, which is more likely if it is made salient. As a result, people who are contextually focused on normative considerations are most likely to act in a norm-consistent manner. The Focus Theory of Normative Conduct predicts that if one of the two types of norms (descriptive or injunctive) is prominent in the mind of the individual, it will also exert a stronger influence on behaviour.

Previous researchers analysed the impact of the social norm on behaviour in the context of the Focus Theory of Normative Conduct. Cialdini and Trost (1998) make a clear distinction between descriptive and injunctive norms. Descriptive norm refers to the perception of the prevalence of behaviour (what most others do, what’s done), whereas injunctive norm refers to what is commonly approved and disapproved conduct in a particular culture (what ought to be done). Cialdini et al. (1990) say that the descriptive norm is a quick way to make a decision, while the injunctive norm brings up the possibility of social rewards and punishments.

According to the concept of the Focus Theory of Normative Conduct, Cialdini et al. (1990) conducted a social experiment in which the respondents were asked to perform one of three actions: 1) pick up a plastic bag; 2) throw away a plastic bag by the roadside; or 3) pass without picking up any rubbish. At the end of the experiment, the results showed that when a respondent walked by without picking up the trash and no social norm was made clear, the rate of littering was about the same as in both the littered and clean environments (38%).

However, the findings differed greatly when social norms were made salient. As such, when a respondent saw a confederate littering a plastic bag, he or she was most likely to throw their unwanted stuff into a littered environment (30%) compared to a clean environment (11%). Also, when another respondent was seen to pick up a piece of rubbish as an action to deliver an injunctive social norm that people should not litter, the rest of the people were much less likely to throw away their unwanted stuff, regardless of the environmental conditions, either littered (4%) or clean (7%) (Whitburn et al., 2019). So, the current research is based on the idea that people will change their behaviour because they want to be like the ideal social norm.

## **2.4. Value-basis theory**

The harmful consequences of environmentally destructive human behaviour have become more evident, and people around the world have become more

concerned and aware of various environmental issues (Essiz et al., 2023). The Value-Basis Theory is an extension of Schwartz (1977)'s norm-activation model of altruism. It says that people care about certain environmental problems because they know that those problems will hurt something they value or something they value.

Although it has been confirmed that a high percentage of the population views environmental problems as a fundamentally critical social problem (Shahid et al., 2023), they still see the potential consequences of environmental degradation as being primarily applicable to distant individuals, non-human nature, or places (Noe and Stolte, 2023). However, human beings are also very likely to differ greatly in their level of concern for the natural environment. Some of them are more likely to make sacrifices to conserve and preserve the environment than others in the same environmental settings. So, this study has assumed that some people see solid waste segregation-at-source as a daily necessity while others see it as a time-consuming or troublesome task.

Furthermore, the Value-Basis Theory has shown that the reasons behind the perception of environmental concerns differ between individuals. The Value-Basis Theory therefore suggests that the degree to which people see themselves as part of the environment (Schultz, 2000; Schultz et al., 2004) and culture (Tian and Liu, 2022) has been shown to influence conservation behaviour and environmental concerns separately. In addition to that, the link between values and environmental concerns is moderated by awareness of the harmful effects of the valued objects. Stern et al. (1995) pointed out that the key elements of this theory are broad value orientations and beliefs about the effect of particular attitude objects on those values. Consequently, the three clusters of environmental concerns are justified in having a direct effect in having a direct effect on the individual, on all people, or on all living things (Schultz and Zelezny, 1999).

Nowadays, more and more people around the world are expressing concern about environmental issues. The Value-Basis Theory therefore suggests that the attitude towards different kinds of environmental issues is the result of more general underlying values and that different value orientations lead to different attitudes. However, Stern and Dietz (1994) argue that an attitude of concern about environmental issues is based on a more general set of values. In other words, the attitude towards environmental issues should incorporate the relationship between individual and environmental concerns, based on the relative importance that a person places on themselves, on other people, or on plants and animals that Stern and Dietz (1994) labelled egoistic, altruistic, and biospheric.

Value-Basis Theory further explains that objects (e.g., plants, animals, other people) are valued by the degree to which they are included in an individual's cognitive self-representation (Schultz, 2000; Schultz and Zelezny, 1999). This explanation fits with what social psychologists have found in other areas (Arunrat et al., 2017).

Egoistic concern is about concern for the self-concerning the environment; altruistic concern specifies concern for other people in relation to the environment; biospheric concern demonstrates concern for the biosphere. One of the Schultz (2000)'s studies provide a shred of strong evidence for the tripartite classification of environmental concerns organized around concern for self, other people, or the

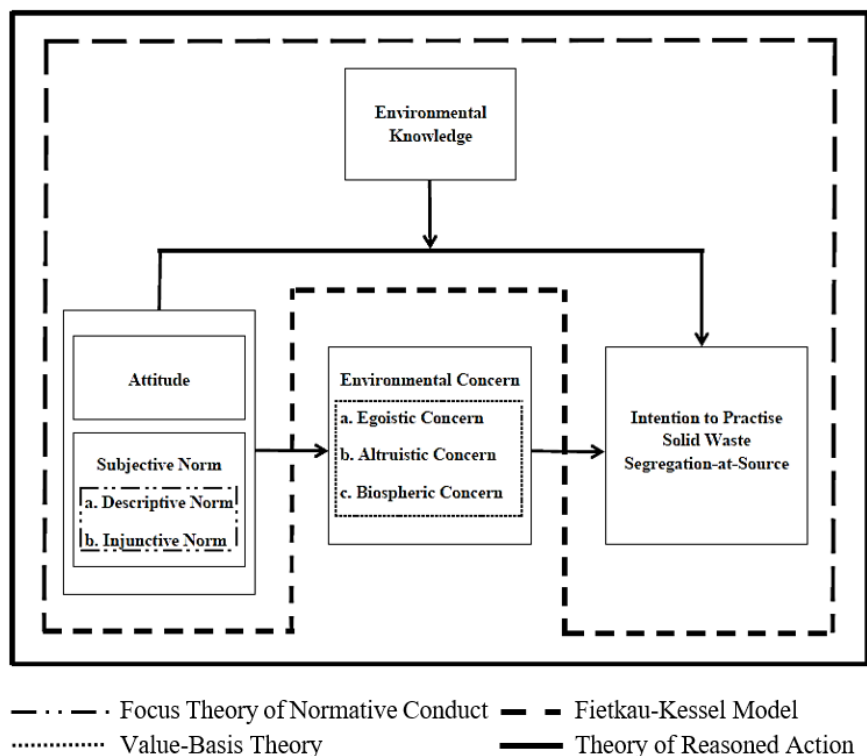


biosphere. As a result, the current research has seen these three aspects of environmental concern as a dynamic idea that affects how people feel, what they remember, and how they see the world based on their own ideas, cultures, and habits.

Most of the findings of past research indicate that there is a positive relationship between the interconnectedness of self and biospheric concern. As a result, perspective-taking and empathetic feelings have been found to correlate positively with biospheric and altruistic environmental concerns. Additionally, experimental perspective-taking has been shown to increase biospheric environmental concerns within an individual. In the end, this research has assumed that the three types of environmental concerns, even though they are based on different things, are related to each other.

### 3. Theoretical framework development

**Figure 1** shows the integration of the Theory of Reasoned Action, Fietkau-Kessel Model, Focus Theory of Normative Conduct, and Value-Basis Theory into the relationships between independent variables (attitude, subjective norm (descriptive norm, injunctive norm)), mediating variable (environmental concern (egoistic concern, altruistic concern, biospheric concern)), moderating variable (environmental knowledge), and dependent variable (intention to practise solid waste segregation-at-source) of the research.



**Figure 1.** The schematic diagram of the incorporation of the theory of reasoned action, the Fietkau-Kessel model, the focus theory of normative conduct, and value-basis theory of research framework.

In terms of academic discussion, with respect to best knowledge, this current research is a preliminary study as it is the first time that the Theory of Reasoned

Action, Fietkau-Kessel Model, Focus Theory of Normative Conduct, and Value-Basis Theory have been merged into a unified framework, particularly in the local context of the intention to practise solid waste segregation-at-source. This situation is due to the previous research majority of either one of the theories used to predict general pro-environmental behaviour. Specifically, existing reading materials for research conducted on the Fietkau-Kessel model in a specific field of research are rare (Mallick et al., 2023). So, the current research has assumed that this is a platform for the researcher to do in-depth literature reviews of the key variables that can be seen from this current conceptual framework.

In this research, the Theory of Reasoned Action was used to investigate the relationships between households' attitudes and subjective norms (descriptive norm and injunctive norm) with the intention to practise solid waste segregation-at-source. Although the Theory of Reasoned Action and its extended Theory of Planned Behavior have been intensively applied to prior research, there is still little literature in the field of intention to practise solid waste segregation-at-source. Research on the Theory of Reasoned Action 's predictability of behaviour change is primarily concerned with Western societies. Up until now, not many research studies in Southeast Asia have directly tested the claims of the Theory of Reasoned Action in any field.

For example, Arunrat et al. (2017) looked at the climate change adaptation intentions of non-adaptive farmers in Thailand using the Theory of Planned Behaviour—an extended theory of the Theory of Reasoned Action. In addition to that, the Malaysian study carried out by Masud et al. (2016) looked at the impact of attitude, perceived behavioural control, and subjective norms on the climate change “pro-environmental” intentions. Accordingly, this current research has assumed that it is essential to apply the Theory of Reasoned Action as a theoretical foundation to contribute to the body of knowledge by filling the research gap in the context of intention to practise solid waste segregation-at-source.

The influence of subjective norms between the households was further divided into the descriptive norm and the injunctive norm through the Focus Theory of Normative Conduct. Although some research has focused on the influence of subjective norms on the shopping behaviour of organic products (Xu et al., 2022), there is no research to examine the direct influence of the descriptive norm on the intention to practise solid waste segregation-at-source. However, the descriptive norm has been shown to be effective in inducing pro-environmental behaviour, including energy conservation Helferich et al., 2023), littering (Chaudhary et al., 2023), recycling (Dorigoni and Bonini, 2023), transportation behaviour (Kormos et al., 2015), purchase of sustainable grocery products (Demarque et al., 2015), towel reuse in a hotel setting (Reese et al., 2014) and reducing theft (Schneider and van der Linden, 2023). Accordingly, the present research has assumed that this is the first time that the Focus Theory of Normative Conduct has been used to enrich the scarce literature on the intention to practise solid waste segregation-at-source.

Current research has used the Value-Basis Theory to examine the three-dimensional environmental concerns of Selangor households—egoistic concern, altruistic concern, and biospheric concern. However, there is little evidence in support of the Value-Basis Theory to be used to examine the intention to practise

solid waste segregation-at-source. According to the previous Schultz (2000)'s research, there are three clusters of environmental attitudes that represent egoistic, altruistic, and biospheric concerns. Research analyses showed that concerns for self (my health, my future, my lifestyle, me), other people (people in my community, all people, children, my children), and the biosphere (plants, animals, marine life, birds) were loaded by separated but correlated factors. However, the relationships between egoistic, altruistic, and biospheric concerns and other existing environmental attitude measures has yet to be reported.

In conclusion, by realizing scarce academic knowledge and rare research findings in this field of research, the present research has taken the necessary initiative to provide an important insight into the relevant knowledge of the research gap and bridge the context of its literature for future research purposes.

#### **4. Conclusion**

This current research is designed to examine attitudes, subjective norms (descriptive norm and injunctive norm), environmental concerns (egoistic concern, altruistic concern, and biospheric concern), and environmental knowledge on the intention to practise solid waste segregation-at-source. Specifically, the present research will investigate the mediating effect of environmental concerns as well as the moderating effect of environmental knowledge in the relationship between their attitude and subjective norms with the intention to practise solid waste segregation-at-source in the neighbourhood. Therefore, the present research is expected to broaden the previous research to improve the general understanding of the attitude and subjective norms (descriptive norm and injunctive norm) to the specific research scope of the intention to practise solid waste segregation-at-source. In particular, a new configuration finding has become apparent in further exploring the applicability of environmental concerns (egoistic concern, altruistic concern, and biospheric concern) in the mediation test and environmental knowledge in the moderation test within a finite research framework, which, in turn, would create new insights into the interrelationships between the variables studied. This paper also highlights a number of theoretical implications for general interests.

This current research will be designed to look at the application of the integration of the Theory of Reasoned Action, the Fietkau-Kessel Model, the Focus Theory of Normative Conduct, and Value-Basis Theory in order to predict the intention to practise solid waste segregation-at-source. Importantly, no existing research has been carried out to date to investigate this specific theoretical combination, either in the scope of the intention to practise solid waste segregation-at-source. Because there isn't much information about this topic, this research should be able to serve as one of the few preliminary types of research that shows the need to give scholars detailed literature references for future research.

Besides that, current research is proposed to provide remarkable insights into the attitude perspective, the subjective norm with its two sub-parts, namely the descriptive norm and the injunctive norm, the environmental concerns with their three sub-parts, namely egoistic concern, altruistic concern, and biospheric concern, as well as environmental knowledge with the intention to practise solid waste

segregation-at-source. Specifically, this research is predicted to look at the influence of subjective norm dimensions, in particular the descriptive norm and injunctive norm, on the research scope of the intention to practise solid waste segregation-at-source. Indeed, many researchers have previously examined the subjective norm in other similar environmental-related research. However, most of the existing research only generally looked at the subjective norm as a unidimensional variable instead of multidimensional variables. In order to fill the specific gap in literature, this research will further classify the subjective norm into two dimensions (descriptive norm and injunctive norm) by applying the Focus Theory of Normative Conduct to the present scope of research.

This is pioneer research that will explore and fill a gap in the existing field of research by assessing environmental knowledge as a moderating variable between attitude, descriptive norm, injunctive norm, and intention to practise solid waste segregation-at-source. Through the Fietkau-Kessel Model, the present research will be able to provide a platform for closing the current research gap in literature in such a way as to enrich scarce literature in order to advance the body of knowledge of the intention to practise solid waste segregation-at-source, particularly in the context of Southeast Asia, including Malaysia.

Ultimately, the backbone theory used to develop the present research models was based on the Theory of Reasoned Action, Fietkau-Kessel Model, Focus Theory of Normative Conduct, and Value-Basis Theory. The development of full models for the intention to practise solid waste segregation-at-source in this current research was based on theoretical support and demonstrated empirical results in the literature. Given the complexity of global solid waste issues, future research may consider including key variables from other theoretical frameworks to evaluate to what extent the Theory of Reasoned Action, Fietkau-Kessel Model, Focus Theory of Normative Conduct, and Value-Basis Theory versus other theories predict this specific research topic. This initiative may therefore lead researchers to know better that, under what circumstances, not just individual variables, but the theories as a whole can well predict the intention to practise solid waste segregation-at-source.

**Author contributions:** Conceptualization, KWC and SO; methodology, ZMJ; software, WW; validation, JLL; formal analysis, KWC; investigation, KWC; resources, SO; data curation, SO, ZMJ and JLL; writing—original draft preparation, KWC; writing—review and editing, WW; visualization, KWC; supervision, SO, ZMJ, and JLL; project administration, KWC and SO; funding acquisition, KWC. All authors have read and agreed to the published version of the manuscript.

**Acknowledgment:** The authors would like to thank all government agencies, research officers, and any other parties involved in the research. This project was funded under INTI International University Research Seeding Grant Phase 3/2022 (INTI-FBC-02-03-2022).

**Conflict of interest:** The authors declare no conflict of interest.

## References

- Ajzen I, Fishbein M (1975). A Bayesian analysis of attribution processes. *Psychological Bulletin* 82(2): 261–277. doi: 10.1037/h0076477
- Ajzen I, Fishbein M (1980). *Understanding Attitudes and Predicting Social Behavior*. Pearson.
- Albarracin D, Shavitt S (2018). Attitudes and attitude change. *Annual Review of Psychology* 69(1): 299–327. doi: 10.1146/annurev-psych-122216-011911
- Alzahrani K, Hall-Phillips A, Zeng AZ (2018). Applying the theory of reasoned action to understanding consumers' intention to adopt hybrid electric vehicles in Saudi Arabia. *Transportation* 46(1): 199–215. doi: 10.1007/s11116-017-9801-3
- Anwar MR, Oganda FP, Santoso NPL, Fabio M (2022). Artificial Intelligence that Exists in the Human Mind. *International Transactions on Artificial Intelligence* 1(1): 28–42. doi: 10.33050/italic.v1i1.87
- Arisal I, Atalar T (2016). The exploring relationships between environmental concern, collectivism and ecological purchase intention. *Procedia-Social and Behavioral Sciences* 235: 514–521. doi: 10.1016/j.sbspro.2016.11.063
- Arunrat N, Wang C, Pumijumng N, et al. (2017). Farmers' intention and decision to adapt to climate change: A case study in the Yom and Nan basins, Phichit province of Thailand. *Journal of Cleaner Production* 143: 672–685. doi: 10.1016/j.jclepro.2016.12.058
- Asch MJ (1951). Nondirective teaching in psychology: An experimental study. *Psychological Monographs: General and Applied* 65(4): 1–24. doi: 10.1037/h0093595
- Baawain MS, Mamun AA, Omidvarborna H, et al. (2019). Residents' concerns and attitudes towards municipal solid waste management: Opportunities for improved management. *International Journal of Environment and Waste Management* 24(1): 93. doi: 10.1504/ijewm.2019.100663
- Bissing-Olson MJ, Fielding KS, Iyer A (2016). Experiences of pride, not guilt, predict pro-environmental behavior when pro-environmental descriptive norms are more positive. *Journal of Environmental Psychology* 45: 145–153. doi: 10.1016/j.jenvp.2016.01.001
- Bloemen-Bekx M, Lambrechts F, Van Gils A (2023). An exploration of the role of intuitive forms of planning in the succession process: the explanatory power of effectuation theory. *Journal of Family Business Management* 13(2): 486–502. doi: 10.1108/jfbm-07-2021-0066
- Chaudhary AH, Polonsky MJ, McClaren N (2023). Social norms and littering—The role of personal responsibility and place attachment at a Pakistani beach. *Global Environmental Change* 82: 102725. doi: 10.1016/j.gloenvcha.2023.102725
- Chen SC, Hung CW (2016). Elucidating the factors influencing the acceptance of green products: An extension of theory of planned behavior. *Technological Forecasting and Social Change* 112: 155–163. doi: 10.1016/j.techfore.2016.08.022
- Cheng KW, Osman S (2019). The role of environmental education in waste segregation-at-source behaviour among households in Putrajaya. *Malaysian Journal of Consumer and Family Economics* 22: 114–136.
- Cheng KW, Osman S, Jusoh ZM, Lau JL (2019). Instrument development on measuring Malaysian households' intention to practise solid waste segregation-at-source. *International Journal of Engineering and Advanced Technology* 8(5c): 1390–1400. doi: 10.35940/ijeat.e1198.0585c19
- Cheng KW, Osman S, Jusoh ZM, Lau JL (2020). The determinants of intention to practise solid waste segregation-at-source among Selangor households. *Malaysian Journal of Consumer and Family Economics* 25(S1): 67–90.
- Cialdini RB, Reno RR, Kallgren CA (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology* 58(6): 1015–1026. doi: 10.1037/0022-3514.58.6.1015
- Cialdini RB, Trost MR (1998). Social influence: Social norms, conformity and compliance. In: Cialdini RB, Fiske ST, Lindzey G (editors). *The Handbook of Social Psychology*. McGraw-Hill.
- Cislaghi B, Heise L (2020). Gender norms and social norms: differences, similarities and why they matter in prevention science. *Sociology of Health & Illness* 42(2): 407–422. doi: 10.1111/1467-9566.13008
- Constantino SM, Sparkman G, Kraft-Todd GT, et al. (2022). Scaling up change: A critical review and practical guide to harnessing social norms for climate action. *Psychological Science in the Public Interest* 23(2): 50–97. doi: 10.1177/15291006221105279
- Demarque C, Charalambides L, Hilton DJ, Waroquier L (2015). Nudging sustainable consumption: The use of descriptive norms to promote a minority behavior in a realistic online shopping environment. *Journal of Environmental Psychology* 43: 166–174. doi: 10.1016/j.jenvp.2015.06.008

- Dembkowski S, Hanmer-Lloyd S (1994). The environmental value-attitude-system model: A framework to guide the understanding of environmentally-conscious consumer behaviour. *Journal of Marketing Management* 10(7): 593–603. doi: 10.1080/0267257x.1994.9964307
- Deutsch M, Gerard HB (1955). A study of normative and informational social influences upon individual judgment. *The Journal of Abnormal and Social Psychology* 51(3): 629–636. doi: 10.1037/h0046408
- do Paco A, Shiel C, Alves H (2019). A new model for testing green consumer behaviour. *Journal of Cleaner Production* 207: 998–1006. doi: 10.1016/j.jclepro.2018.10.105
- Dorigoni A, Bonini N (2023). Water bottles or tap water? A descriptive-social-norm based intervention to increase a pro-environmental behavior in a restaurant. *Journal of Environmental Psychology* 86: 101971. doi: 10.1016/j.jenvp.2023.101971
- du Toit J, Wagner C, Fletcher L (2017). Socio-spatial factors affecting household recycling in townhouses in Pretoria, South Africa. *Sustainability* 9(11): 2033. doi: 10.3390/su9112033
- Economic Planning Unit (2015). Eleventh Malaysia Plan, 2016–2020: Anchoring Growth on People. Malaysian Prime Minister's Department.
- Elster J (1989). *The Cement of Society: A Survey of Social Order*. Cambridge University Press.
- Eriksson K, Strimling P, Coultas JC (2015). Bidirectional associations between descriptive and injunctive norms. *Organizational Behavior and Human Decision Processes* 129: 59–69. doi: 10.1016/j.obhdp.2014.09.011
- Essiz O, Yurteri S, Mandrik C, Senyuz A (2023). Exploring the Value-Action gap in green consumption: Roles of risk aversion, subjective knowledge, and gender differences. *Journal of Global Marketing* 36(1): 67–92. doi: 10.1080/08911762.2022.2116376
- Fietkau HJ, Kessel H (1981). *Environmental Learning: Possibilities for Changing Environmental Awareness; Model Experiences (German)*. Koenigstein, Hain.
- Haefner G, Schobin J (2019). A new climate externalities food knowledge test validated by item response theory and behavioural data prediction. *PsyEcology* 14(3): 297–337. doi: 10.1080/21711976.2023.2239046
- Hamann KRS, Reese G, Seewald D, Loeschinger DC (2015). Affixing the theory of normative conduct (to your mailbox): Injunctive and descriptive norms as predictors of anti-ads sticker use. *Journal of Environmental Psychology* 44: 1–9. doi: 10.1016/j.jenvp.2015.08.003
- Han H (2021). Consumer behavior and environmental sustainability in tourism and hospitality: A review of theories, concepts, and latest research. *Journal of Sustainable Tourism* 29(7): 1021–1042. doi: 10.1080/09669582.2021.1903019
- Heinicke F, König-Kersting C, Schmidt R (2022). Injunctive vs. descriptive social norms and reference group dependence. *Journal of Economic Behavior and Organization* 195:199–218. doi: 10.1016/j.jebo.2022.01.008
- Helferich M, Thøgersen J, Bergquist M (2023). Direct and mediated impacts of social norms on pro-environmental behavior. *Global Environmental Change* 80: 102680. doi: 10.1016/j.gloenvcha.2023.102680
- Huang HL (2023). Challenges for contactless online food delivery services during the COVID-19 pandemic in Taiwan: Moderating effects of perceived government response. *Evaluation and Program Planning* 97: 102249. doi: 10.1016/j.evalprogplan.2023.102249
- Irvine PJ, Kravitz B, Lawrence MG, et al. (2017). Towards a comprehensive climate impacts assessment of solar geoengineering. *Earth's Future* 5(1): 93–106. doi: 10.1002/2016ef000389
- Kaplan R, Kaplan S (1989). *The Experience of Nature: A Psychological Perspective*. Cambridge University Press.
- Karpudewan M (2019). The relationships between values, belief, personal norms, and climate conserving behaviors of Malaysian primary school students. *Journal of Cleaner Production* 237: 117748. doi: 10.1016/j.jclepro.2019.117748
- Khan AN, Khan NA (2022). The nexuses between transformational leadership and employee green organisational citizenship behaviour: Role of environmental attitude and green dedication. *Business Strategy and the Environment* 31(3): 921–933. doi: 10.1002/bse.2926
- Kollmuss A, Agyeman J (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research* 8(3): 239–260. doi: 10.1080/13504620220145401
- Kormos C, Gifford R, Brown E (2015). The influence of descriptive social norm information on sustainable transportation behavior: A field experiment. *Environment and Behavior* 47(5): 479–501. doi: 10.1177/0013916513520416
- Kumar S, Gupta K, Kumar A, et al. (2023). Applying the theory of reasoned action to examine consumers' attitude and willingness to purchase organic foods. *International Journal of Consumer Studies* 47(1): 118–135. doi: 10.1111/ijcs.12812

- Mahajan S, Gera R (2023). Determinant factors influencing green purchase intention of millennials in Delhi/NCR and green consumer needs. *International Journal of Public Sector Performance Management* 12(3): 402–422. doi: 10.1504/ijpspm.2023.133586
- Mallick D, Tsang EPK, Lee JCK, Cheang CC (2023). Marine environmental knowledge and attitudes among university students in Hong Kong: An application of the ocean literacy framework. *International Journal of Environmental Research and Public Health* 20(6): 4785. doi: 10.3390/ijerph20064785
- Martins Gonçalves H, Viegas A (2015). Explaining consumer use of renewable energy: Determinants and gender and age moderator effects. *Journal of Global Scholars of Marketing Science* 25(3): 198–215. doi: 10.1080/21639159.2015.1041780
- Masud MM, Al-Amin AQ, Junsheng H, et al. (2016). Climate change issue and theory of planned behaviour: Relationship by empirical evidence. *Journal of Cleaner Production* 113: 613–623. doi: 10.1016/j.jclepro.2015.11.080
- SWM Environment (2023). Separation At Source (SAS). Available online: <https://kitarecycle.com/separation-at-source/> (accessed on 30 July 2023).
- Mohan R, Kinslin D (2022). The theory of planned behaviour and examining consumer purchase behaviours of energy-efficient lighting products. *International Journal of Professional Business Review* 7(2): e0422. doi: 10.26668/businessreview/2022.v7i2.422
- Mokhlis S, Nik Hussin NS, Nizam NZ, et al. (2022). Predicting Malaysian university students' intent to pursue retailing career: Applicability of theory of planned behavior. *International Journal of Professional Business Review* 7(1): e0277. doi: 10.26668/businessreview/2022.v7i1.277
- Nguyen QA, Hens L, MacAlister C, et al. (2018). Theory of reasoned action as a framework for communicating climate risk: A case study of schoolchildren in the Mekong Delta in Vietnam. *Sustainability* 10(6): 2019. doi: 10.3390/su10062019
- Nguyen T, Nguyen H, Lobo A, Dao T (2017). Encouraging Vietnamese household recycling behavior: Insights and implications. *Sustainability* 9(2): 179. doi: 10.3390/su9020179
- Nguyen TN, Lobo A, Greenland S (2017). The influence of Vietnamese consumers' altruistic values on their purchase of energy efficient appliances. *Asia Pacific Journal of Marketing and Logistics* 29(4): 759–777. doi: 10.1108/apjml-08-2016-0151
- Nguyen TN, Lobo A, Nguyen HL, et al. (2016). Determinants influencing conservation behaviour: Perceptions of Vietnamese consumers. *Journal of Consumer Behaviour* 15(6): 560–570. doi: 10.1002/cb.1594
- Noe EE, Stolte O (2023). Dwelling in the city: A qualitative exploration of the human-nature relationship in three types of urban greenspace. *Landscape and Urban Planning* 230: 104633. doi: 10.1016/j.landurbplan.2022.104633
- Pan SL, Chou J, Morrison A, et al. (2018). Will the future be greener? The environmental behavioral intentions of university tourism students. *Sustainability* 10(3): 634. doi: 10.3390/su10030634
- Pirmoradi AH, Rostami F, Papzan AH (2021). A critical review of sustainable pro-environmental behavior theories. *International Journal of Agricultural Management and Development* 11(1): 117–135. doi: 10.22004/ag.econ.335150
- Qalati SA, Qureshi NA, Ostic D, Sulaiman MABA (2022). An extension of the theory of planned behavior to understand factors influencing Pakistani households' energy-saving intentions and behavior: A mediated—Moderated model. *Energy Efficiency* 15(6): 40. doi: 10.1007/s12053-022-10050-z
- Reese G, Loew K, Steffgen G (2014). A towel less: Social norms enhance pro-environmental behavior in hotels. *The Journal of Social Psychology* 154(2): 97–100. doi: 10.1080/00224545.2013.855623
- Reinholdsson T, Hedesström M, Ejelöv E, et al. (2023). Nudging green food: The effects of a hedonic cue, menu position, a warm-glow cue, and a descriptive norm. *Journal of Consumer Behaviour* 22(3): 557–568. doi: 10.1002/cb.2129
- Ribeiro MA, Seyfi S, Elhoushy S, et al. (2023). Determinants of generation Z pro-environmental travel behaviour: The moderating role of green consumption values. *Journal of Sustainable Tourism*. doi: 10.1080/09669582.2023.2230389
- Rousta K, Bolton K, Dahlén L (2016). A procedure to transform recycling behavior for source separation of household waste. *Recycling* 1(1): 147–165. doi: 10.3390/recycling1010147
- Santos JAC, Fernández-Gámez MÁ, Guevara-Plaza A, et al. (2023). The sustainable transformation of business events: Sociodemographic variables as determinants of attitudes towards sustainable academic conferences. *International Journal of Event and Festival Management* 14(1): 1–22. doi: 10.1108/ijefm-05-2022-0041
- Schneider CR, van der Linden S (2023). Social norms as a powerful lever for motivating pro-climate actions. *One Earth* 6(4): 346–351. doi: 10.1016/j.oneear.2023.03.014
- Schultz PW (2000). Empathising with nature: The effects of perspective taken on concerns for environmental issues. *Journal of Social Issues* 56(3): 391–406. doi: 10.1111/0022-4537.00174

- Schultz PW, Shriver C, Tabanico JJ, Khazian AM (2004). Implicit connections with nature. *Journal of Environmental Psychology* 24(1): 31–42. doi: 10.1016/S0272-4944(03)00022-7
- Schultz PW, Zelezny L (1999). Values as predictors of environmental attitudes: Evidence for consistency across 14 countries. *Journal of Environmental Psychology* 19(3): 255–265. doi: 10.1006/jevp.1999.0129
- Schwartz SH (1977). Normative influences on altruism. *Advances in Experimental Social Psychology* 10(1): 221–279. doi: 10.1016/S0065-2601(08)60358-5
- Shahid MS, Hossain M, Shahid S, Anwar T (2023). Frugal innovation as a source of sustainable entrepreneurship to tackle social and environmental challenges. *Journal of Cleaner Production* 406: 137050. doi: 10.1016/j.jclepro.2023.137050
- Sherif M (1935). An experimental study of stereotypes. *The Journal of Abnormal and Social Psychology* 29(4): 371–375. doi: 10.1037/h0060783
- Stern PC, Dietz T (1994). The value basis of environmental concern. *Journal of Social Issues* 50(3): 65–84. doi: 10.1111/j.1540-4560.1994.tb02420.x
- Stern PC, Kalof L, Dietz T, Guagnano GA (1995). Values, beliefs, and pro-environmental action: Attitude formation toward emergent attitude objects. *Journal of Applied Social Psychology* 25(18): 1611–1636. doi: 10.1111/j.1559-1816.1995.tb02636.x
- Tarfaoui D, Zkim S (2015). Moroccan human ecological behavior: Grounded theory approach. *Academic Research International* 6(5): 9–20.
- Tennant C, Neels C, Parkhurst G, et al. (2021). Code, culture, and concrete: Self-driving vehicles and the rules of the road. *Frontiers in Sustainable Cities* 3: 710478. doi: 10.3389/frsc.2021.710478
- Tian H, Liu X (2022). Pro-environmental behavior research: Theoretical progress and future directions. *International Journal of Environmental Research and Public Health* 19(11): 6721. doi: 10.3390/ijerph19116721
- Trang HLT, Lee JS, Han H (2019). How do green attributes elicit pro-environmental behaviours in guests? The case of green hotels in Vietnam. *Journal of Travel and Tourism Marketing* 36(1): 14–28. doi: 10.1080/10548408.2018.1486782
- Tsaur SH, Yen HH (2023). Leisure crafting and pro-environmental behavior: the potential mediating role of engagement. *Leisure Sciences*. doi: 10.1080/01490400.2023.2253232
- Udawatta N, Zuo J, Chiveralls K, Zillante G (2015). Attitudinal and behavioural approaches to improving waste management on construction projects in Australia: Benefits and limitations. *International Journal of Construction Management* 15(2): 137–147. doi: 10.1080/15623599.2015.1033815
- Uddin MN, Chi HL, Wei HH, et al. (2022). Influence of interior layouts on occupant energy-saving behaviour in buildings: An integrated approach using agent-based modelling, system dynamics and building information modelling. *Renewable and Sustainable Energy Reviews* 161: 112382. doi: 10.1016/j.rser.2022.112382
- Whitburn J, Linklater W, Abrahamse W (2019). Meta-analysis of human connection to nature and pro-environmental behavior. *Conservation Biology* 34(1): 180–193. doi: 10.1111/cobi.13381
- Williams DM (2023). A meta-theoretical framework for organizing and integrating theory and research on motivation for health-related behavior. *Frontiers in Psychology* 14: 1130813. doi: 10.3389/fpsyg.2023.1130813
- Wilson CDH, Williams ID (2007). Kerbside collection: A case study from the north-west of England. *Resources, Conservation and Recycling* 52(2): 381–394. doi: 10.1016/j.resconrec.2007.02.006
- Xiao M (2020). Factors influencing eSports viewership: An approach based on the theory of reasoned action. *Communication and Sport* 8(1): 92–122. doi: 10.1177/2167479518819482
- Xu Y, Du J, Khan MAS, et al. (2022). Effects of subjective norms and environmental mechanism on green purchase behavior: An extended model of theory of planned behavior. *Frontiers in Environmental Science* 10: 779629. doi: 10.3389/fenvs.2022.779629
- Yadav SS, Kar SK, Rai PK (2022). Why do consumers buy recycled shoes? An amalgamation of the theory of reasoned action and the theory of planned behaviour. *Frontiers in Environmental Science* 10: 1007959. doi: 10.3389/fenvs.2022.1007959
- Yang CC, Yang SY, Chang YC (2023). Predicting older adults' mobile payment adoption: An extended TAM model. *International Journal of Environmental Research and Public Health* 20(2): 1391. doi: 10.3390/ijerph20021391
- Zhang B, Wang Z, Lai K hung (2015). Mediating effect of managers' environmental concern: Bridge between external pressures and firms' practices of energy conservation in China. *Journal of Environmental Psychology* 43: 203–215. doi: 10.1016/j.jenvp.2015.07.002



Zhang J, Cherian J, Abbas Sandhu Y, et al. (2022). Presumption of green electronic appliances purchase intention: The mediating role of personal moral norms. *Sustainability* 14(8): 4572. doi: 10.3390/su14084572