

## Article

# Green Home Buying Intention of Malaysian Millennials: An Extension of Theory of Planned Behaviour

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**Abstract:** The empirical study aimed to examine the factors affecting green home buying intention in Malaysia. The study adopted the popular theory of individual decision-making, the theory of planned behaviour, but extended it with a few new variables to get better predictability. Based on the cross-sectional survey method and quota sampling technique, the instrument-like questionnaire was distributed to the potential buyers who had the intention to buy a home. Data were collected from 741 potential buyers who are young Malaysian students. Collected data were analysed using partial least squares (PLS) modelling (SmartPLS 3.0) in order to measure the strength of the independent variable effects on the dependent variable. The results indicate that attitude, perceived behavioural control, subjective norms, perceived value, reasonable pricing and green building knowledge had a positive and significant effect on green home buying intention, with attitude showing the highest effect; the only exception is an environmental concern. This study also validated the theory of planned behaviour (TPB), which provides important insight for the firms involved with the housing development industry for their future business strategy.

**Keywords:** theory of planned behaviour; green home buying intention; Millennials; Malaysia



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## 1. Introduction

Environmental degradation is an issue driven by rapid economic growth. Due to natural disasters, climate change, waste generation, destruction of the ecosystem and air pollution, the world's environment has changed dramatically, which affects people's economic status and their livelihoods. The Malaysian economy is the largest in Southeast Asia; rapid industrial development is resulting in environmental degradation through over-utilization and over-consumption of natural resources. In such a situation, consumers are aware of their environment. To reduce the impact on the environment, consumers can make a decision to choose the right product or move to sustainable consumption [1]. Thus, academicians, government institutions and private regulatory bodies have taken serious consideration of the environmental problem and its adverse impact on human health issues [2,3]. Because the housing sector accounts for approximately 70 percent of all structures and because it is anticipated that annual residential energy consumption would increase by 1.1% between the years 2008 and 2035, it is of utmost importance to promote environmentally friendly housing on a worldwide scale [4,5].

There has been a rise in both interest and demand for eco-friendly dwellings during the past two decades [6]. In response to the global call, Malaysia has embraced the idea of green home design. Although the prospect of development in this sector is high, the growth is still in the early stage in Malaysia [7]. Housing developers feel that the demand for green homes in Malaysia is very minimal. There are very few high-end green buildings in Malaysia [8]. Researchers such as Young et al. [9] stated that although consumers express

their concern towards the environment, it does not transform into green buying behaviour. Other researchers [10,11] have argued that even though consumers express a favourable attitude to green products but it does not mean the consumers buy green products. It is not obvious, as of yet, which factors have a substantial impact on the customer's intention to make a purchase, nor what the connection is between these factors and the consumer's desire to buy green home (GH) products [12]. Given the need to get people to choose more environmentally friendly housing, more research is needed to find out how potential homebuyers feel about sustainability certifications for homes and what makes them want or not want to buy a home with a sustainability certification [12]. These studies have indicated research gaps on the green behaviour of consumers in buying homes.

Currently, most studies on the psychological factors contributing to pro-environmental behaviours have concentrated on relatively low-investment behaviours such as like reducing overall consumption, increasing recycling, or selecting 'green' alternatives in the context of organic food, energy-efficient appliances, and green mobile phones, sustainable lodgings, green banking or finance, green supply chain, hybrid vehicles, and power companies (e.g., [3,11,13–20]). Many studies [4,12,21–27] have investigated the impact of environmental considerations on consumers' choices regarding one of the largest lifetime purchases they will ever make (the purchase of a dwelling). Some academics have investigated the factors that influence people's decisions to buy eco-friendly homes [23,28,29]. There have been previous attempts to anticipate what features and qualities will appeal to buyers and influence their decisions about environmentally friendly homes [24]. However, research on green home-buying in Malaysia is rare. The only study found, given the limitation of the researchers was conducted by Tan et al. [30] on green residential buying intention. The study is limited as they did not use any guiding theory; there are some constructs which, however, proved insignificant against the global norms. Thus, it is important to retest the study in other areas in Malaysia and justify the findings again.

The previous studies on green building (GB) consumption focused on general consumers as the primary population of interest [29,31,32]. To the best of our knowledge, very little study was undertaken on the unique home-buying customer group, with young people's perspectives and values being especially ignored. Zhang et al. [23] conducted their home-buying intention study on the young generation, while Kota et al. [21] explored Generation Z's perceptions of green homes in the USA perspectives. Youth in Malaysia's cohort makes up 43 percent of the total population and they are the main target market for the green movement, and (still under research) specifically attitudes toward environmental issues [33]. On the other hand, young people have a strong desire for housing that meets their needs. Thus, it is likely that they will become possible buyers in the housing industry. To date, however, there has been no study conducted on the topic of GH purchase intent among young consumers in Malaysia.

The theory of planned behaviour, the values-beliefs-norms theory, the technology acceptance model, and the norm activation model are just some of the theories and models that are frequently used to investigate the perceptions, preferences, motivations, and purchase intentions of end-users of sustainable housing [23,25,28,34,35]. In order to analyse the data, this study bases its theoretical decisions on the idea of planned behaviour [36]. Sustainable residential housing often uses TPB [7,37,38]. Green consumer behaviour is complicated and affected by many things, especially when it comes to big-ticket items like houses and cars [12]. Moreover, judging a young mind is harder because there are more things to think about. So, TPB may not be enough to fully explain the use of GH purchase intention as a behaviour that helps the environment [39,40]. Although researchers have confirmed that TPB is one of the important models in behavioural research, many other researchers have included additional constructs such as price [41,42], environmental concern [1,3], perceived value [43,44], and environmental knowledge [1,3]. Moreover, Ajzen [36] suggested that TPB can be extended if a further important variable is identified. This argument allows researchers to add other important constructs to extend the TPB model. Therefore, price, environmental concern, and perceived value are included in this re-

search as additional constructs. Previous research has not adequately defined “knowledge” in the context of GHs or their function in determining purchase intention. Existing studies used environmental knowledge [23,25] as a predictor of green home-buying intention. None of the studies adopted green building knowledge covering the level of knowledge a buyer holds about the factual, conceptual and technical aspects of green homes instead of overall environmental knowledge. Moreover, the dimension of reasonable pricing had not been included in any research to predict green home buying intention so far. Thus, new research is required which will explain GH buying decisions to combine an expanded view of TPB with other components. Therefore, the following research questions are to be answered:

RQ1: What are the predictors of green home buying intention for Millennial consumers?

RQ2: To what extent does the extended TPB validate green home buying in the Malaysian context?

To address the gaps and research questions above, the present study aims to investigate the factors responsible for the prediction of green home buying intentions of Malaysian Millennials empirically. The main novelty of this paper is as follows. Firstly, it provides an extension of the TPB model in the case of eco-homes buying intention, providing both the cognitive and context-specific factors. It introduces a new cognitive construct “green building knowledge” with a new scale customized to the green building context. It also integrates a few other constructs such as environmental concern, perceived value and reasonable price. Secondly, most of the previous studies focused on green home purchasing failed to consider young consumers. The research is conducted using the response of Millennials which will help the academic with a new understanding of a particular segment of the consumer in diffusing green homes. Understanding what people want to buy can help fill in this research gap. Moreover, for green homes to work, it would be important for policymakers to come up with good policy strategies. Thirdly, the study is contextualized in Malaysia where this particular type of study is rare. Hence, the study’s results can offer policymakers and other groups in developing countries some useful examples and lessons learned. Particularly, this will help us to figure out how different types and levels of policies affect the prices, values, and level of awareness of green housing on the market. It will give us a new way to look at how government policies promote green housing and make sure it is of good quality.

The remaining sections of this work are structured as follows. In Section 2, related hypotheses and a research framework are presented. Section 3 then introduces the research methodologies. The results and data analysis are presented in Section 4. In Section 5, we explore the results and explain their practical relevance and consequences. The final portion offers the study’s conclusion and limitations.

## 2. Literature Review and Hypotheses Development

### 2.1. Green Homes

Green building (GB), which saves energy, water, land, and materials while protecting the environment, is an effective way to cut carbon emissions, promote sustainable development, and improve quality of life [45,46]. Darko et al. [6] and Zheng et al. [23] show that “green buildings” (GBs) are buildings that take into account and try to minimize their effects on the natural environment and human health while also boosting their positive effects over a building’s entire life cycle. There are a lot of different GB standards all over the world, and most of them agree that GBs should try to reduce negative effects on the environment, society, and economy [23]. As a branch of GB, green home (GH) meets all of the general requirements of GBs and puts a strong focus on the health, comfort, and safety of residents in the context of a place to live. It is an architectural idea for meeting modern development needs. It does not require a certain type of housing, and it does not make a difference between regions [47]. It is called having a smaller “ecological footprint” because it uses less energy at the beginning and throughout its life, makes less waste or treats some of it, and improves the quality of the indoor environment to make sure people are healthy

and productive at work [48]. Table 1 shows a summary of some empirical research on green home buying intention.

**Table 1.** Empirical research on the intention of buying green homes.

Sources	Research Method/Sample Size/Country	Analysis Tools	Research Model	Significant Factors
[4]	Empirical/ Questionnaire survey/Construction participants/180/China	Logistic regression Model-SPSS	TPB	Environmental awareness, green home comfort, neighbors'/friends' assessment and government incentive
[12]	Empirical/Online survey/residents/330/Australia	SEM (AMOS)	TPB	Perceived behavioural control, green consumer identity, subjective norms, and attitudes
[21]	Empirical/Student Interview/304/ USA	Multinomial logistic regression	Dual-Inheritance Theory and Normative Motivation	Intrinsic, instrumental, non-normative motivation, barriers
[22]	Empirical/Questionnaire survey/208/China	SEM (AMOS)	TPB	Attitude, perceived behavioural control and subjective norms
[23]	Empirical/ Online survey/Young consumers/241/China	SEM (AMOS)	Extended TPB	Subjective norms, attitude, subjective knowledge, environmental concern, governmental initiatives
[24]	Empirical/Online survey/Urban residents/728/China	PLS-SEM	No existing model used	Perceived value, perceived benefits, environmental concern, perceived risk
[25]	Empirical/Face-to-face interview/Resident of Dhaka/319/Bangladesh	SEM (AMOS)	TPB	Environmental knowledge, environmental concern, subjective norms, perceived behavioural control, attitude
[30]	Empirical/Questionnaire survey/304/Malaysia	PLS-SEM	No existing model used	Attitude, moral obligation, environmental concern, perceived value, perceived self-identity, financial risk

Note: PLS = Partial Least Squares; AMOS = Analysis of Moment Structures, TPB = Theory of Planned Behaviour, SEM = Structural Equation Modeling, SPSS = Statistical Package for Social Sciences.

Green building reduces the negative impact of human activities and protects the natural environment. Green building provides safety, comfort, and healthy living to humans. According to Tan [8], one of the main aims for green and sustainable homes is to improve healthy living. Tan [7] stated that houses become 'green' if housing developer uses recycled roof systems, certified energy-efficient appliances, recyclable timber products, recyclable kitchen cabinets, less energy-consuming fluorescent lamps and light-emitting diode lighting systems. Nowadays green products are introduced due to the increasing concern about local and global pollution, overflowing wastes, global warming and diminishing natural reserves [49]. Green consumers are those who are more interested in and aware of environmental problems. In essence, it is important to create awareness and a shared sense of responsibility to the environment, so that everybody enjoys an environmentally sustainable lifestyle. Thus, in this research, we have tried to identify the factors those influence green and sustainable home-buying intention.

The research framework used in this study is shown in Figure 1. There are 13 hypotheses, drawn from eight constructs, namely, attitude towards buying a green and sustainable home, attitude, perceived behavioural control, subjective norm, green building knowledge, environmental concern, perceived value, reasonable price and buying intention for a green home.

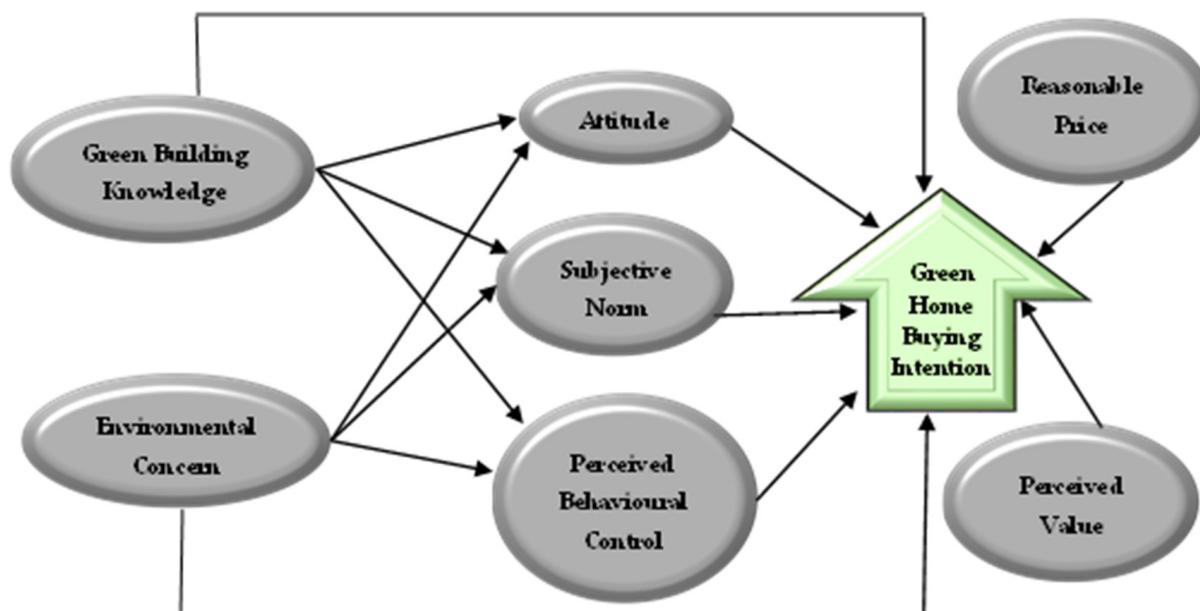


Figure 1. Proposed research framework.

## 2.2. The Component of the Extended TPB Model

Ajzen came up with the TPB model in 1991. The theory of planned behaviour (TPB) [36,50] is an extension of the theory of reasoned action (TRA) [51]. Researchers have used it for the past 20 years and found that it can predict a wide range of intentions and actions. Regardless of strong support by the research for the TPB model, there remains a proportion of unaccounted variance. Adding additional variables with strong theoretical justification would be able to explain unique variance in intention [36].

Young consumers are different from other groups in a number of ways, particularly in Malaysia. Most of them come from families with only one child. Their parents usually help them buy a home, which can greatly improve their ability to make purchases [52]. Furthermore, getting a college degree means that they may care more about the environment. To make sustainable incentive strategies [53], it is important to find out what young consumers' plans are for buying green homes since they are the future consumers and the future of society [54]. These young people are also the ones who may come up with new ideas for the sustainability market, such as green hotel stays [14]. There may be some other specific predictors of intention to achieve a green and sustainable home context. Thus, in this study, some other variables such as perceived value, environmental concern, environmental knowledge and reasonable price are included and extended to the TPB model, as they may affect behavioural intention.

## 2.3. Attitude

Attitude is the appraisal of engaging in a certain behaviour involving the object of the attitude, such as purchasing a product [55]. Attitude refers to the extent to which a person has a positive or negative view or assessment of the behaviour in question. In general, the more favourable an individual's attitude, the stronger their intention to engage in the conduct under discussion. Based on the expectancy-value model, an individual's attitude toward action is defined by the complete set of accessible behavioural beliefs tying the conduct to a variety of outcomes and other characteristics. In light of this, Ajzen [56] asserts that attitude might be regarded as a significant factor in predicting and explaining human behaviour.

Recently, it has been demonstrated that attitude includes perceived consequences, which are related to conduct [57]. Wu et al. [22] argued that mindset is the most significant predictor of the propensity to purchase a green home. Chen and Tung [58] believed that consumers' behavioural intentions would be favourable if their perceived attitude was

positive. According to the studies cited, the psychological mood is transmitted through consumers' ratings. Other research, such as the study by Han and Yoon [59], which focused on ecologically friendly beverage packaging, indicated a favourable link between attitude and behavioural intent. In the context of the green home, it has been observed that consumers' attitudes have a substantial impact on their intentions to behave in certain ways [4,35]. Likewise, Judge et al. [12] and Zahan et al. [25] explored the same in their empirical study on green home-buying intention.

Thus, the following hypothesis needs to be substantiated:

**H1.** *Attitude has a strong and positive association with intention when it comes to the buying of green homes.*

#### 2.4. Subjective Norm (SN)

In the TPB, the idea of "subjective norm" is seen as the second "conceptually independent" factor that affects a person's decision to do or not do something. It refers to "the perceived social influence to do or not do the behaviour" ([36], p. 188). People think of a subjective norm as a social factor made up of normative beliefs [60]. The predictor social factor called "subjective norm" is the perceived social influence to conform to expectations about the behaviour and how this behaviour should affect the person's decision to do it or not [61].

Several studies [62,63] in the field of consumer behaviour and marketing have found that subjective norm is the most important factor in predicting how people will act. In these studies, a positive connection between SN and intention was found. Wu et al. [22] also found that there is a link between SN and the intention to buy a green home. SN is a necessary part of the intention to buy a greenhouse [35], but Zahan et al. [25] found no connection between the two. Zhang et al. [4] and Judge et al. [12] also found a strong link between subjective norms and the intention to buy green housing in China. In this study, a consumer's perception of social pressure is a subjective norm that affects their decision to buy a green and sustainable home. That means the higher the external influence or peer recommendations in favour of environmental protection, the higher the consumers' intention to buy green homes. So, for this situation, we suggest:

**H2.** *There is a significant and positive relationship between subjective norms and intentions to purchase green and sustainable homes.*

#### 2.5. Perceived Behavioural Control (PBC)

PBC is the third and most essential factor influencing intentions (PBC). Ajzen [36] defines PBC as the extent to which an individual feels capable of engaging in the behaviour. It includes two components: how much control a person has over the behaviour and how confident they are in their ability to perform or not perform the activity. It is determined by the individual's perceptions of the influence of both situational and internal elements on the performance of the behaviour. In this research, perceived behavioural control denotes how much control the respondents have even if the purchase appears as slightly expensive or people discourage buying or there are issues in terms of affordability and operating skills for a planned purchase of green buildings.

Studies have demonstrated a favourable and significant association between PBC and recycling [64], waste separation behaviour [65], and the intention to consume green items [1,66]. Wu et al. [22] discovered a favourable connection between PBC and the intention to purchase a green dwelling. Judge et al. [12] and Zahan et al. [25] similarly discovered a substantial relationship between PBC and the intention to purchase a green home; however, Zhang et al. [4] and Tan et al. [30] discovered an insignificant relationship. In light of the preceding, we can conclude that a person's likelihood of purchasing halal food increases in proportion to the degree to which he or she believes he or she has control over

the decision. In this study, PBC is the ability to purchase sustainable and environmentally friendly dwellings. Consequently, the hypothesis is:

**H3.** *PBC and intention to buy green homes are positively linked.*

### 2.6. Environmental Concern (EC)

Crosby et al. define environmental concern as “a strong attitude toward protecting the environment” [67]. Environmental concern is one of the most important cognitive constructs for predicting green products [68]. Research by Yadav and Pathak [69], suggests that a positive outlook on environmentally friendly practices might have a positive impact on the world around us. In an empirical assessment of Indian clients, Jaiswal and Kant [68] revealed that EC was significantly related to attitudes about green products. In addition to this, a number of prior studies incorporated this cognitive component into the TPB paradigm. Combining environmental concern (EC) with an expanded TPB framework, Chen and Tung found that EC had a positive effect on the attitude, subjective norms (SN), and perceived behavioural control (PBC) of guests at eco-friendly hotels [58]. Similar results were also found in the study by Paul et al. [1], which found that EC was favourably associated with sustainable products and TPB characteristics.

Concern for the environment is the subject of numerous research studies on product selection, such as green purchase behaviour [70], electric vehicle usage intention [71], and organic food [72]. Karatu and Mat [73] and Suki [74] assert that if a person is environmentally conscious, they will have favourable sentiments toward environmentally friendly products. The research of Davis [75] identified a modest or negligible link between EC and behaviour. Consequently, based on the findings of Davis’s study, the current study aims to investigate further the relationship between EC and buyers’ propensity to purchase green homes.

It was discovered that environmental concern strongly influences consumers’ attitudes towards green products and their purchasing intentions [1]. Environmentally conscious consumers with favourable opinions toward GH showed high level GH purchasing intentions [4]. Tan et al. [30] showed that environmental concern was significantly related to green home buying intention. Zahan et al. [25] explored whether environmental concern affects significantly attitude and PBC in the case of green buying intention, finding no relationship with behavioural intention in the context of Bangladesh. Hence, consumers’ elevated concern for environmental degradation and its impact on mankind foster consumers’ favourable attitude, endorsement, and self-control in decision-making and GH buying intentions. The following hypotheses are proposed:

**H4.** *EC has a favourable relationship with attitude.*

**H5.** *EC is correlated positively with SN.*

**H6.** *The relationship between EC and PBC is positive.*

**H7.** *EC is positively associated with the intention to purchase green homes.*

### 2.7. Green Building Knowledge (GBK)

In consumer research, it is acknowledged that knowledge influences all phases of the decision-making process [16]. In particular, knowledge is an important and relevant construct that influences how consumers collect and organize data, how much information is employed in decision-making, and how consumers assess products and services. Green building knowledge in the present study indicates the know-how of green building in terms of three domains of knowledge such as factual, conceptual and procedural knowledge [76]. The factual information about the eco-home design relates to building codes, wind turbines, recycled content materials, dual-flush toilets, rainwater harvesting, water-saving landscape

features/plumbing fixtures, furniture made out of salvaged materials, etc., whereas conceptual knowledge indicates how to maintain indoor air quality, size and window locations, ecological impacts, etc. [76]. The procedural knowledge of green building features abilities such as picking eco-friendly furniture, and knowledge of monitoring cooling systems or solar panels or using water-saving building fixtures [76].

Researchers have argued that environmental knowledge has a significant impact on environmental issues [77]. Scholars [11] indicated that consumers' green product buying intention is influenced by environmental knowledge. Other researchers highlighted that consumers who have environmental knowledge will have a more positive attitude towards green products, further influencing their purchase intention [11]. Consumer choice is influenced by subjective awareness which in turn inspired them to act on the knowledge they have [78]. The researcher argued that people know something when others expect them to know about environmental issues [79]. Scholars [4,25] remarked that information also increases the idea that one is in control of a certain situation, hence enhancing perceived behavioural control.

**H8.** *GBK is positively linked to attitude.*

**H9.** *GBK is significantly linked to SN.*

**H10.** *GBK is significantly linked to PBC.*

**H11.** *GBK is significantly linked to green home purchase intention.*

### 2.8. Perceived Value (PV)

Perceived value (PV) is a key factor in deciding whether or not to buy something [80]. In the green home context, perceived value refers to additional environmental benefits that are ensured or environmental functionality supporting new values or environmental performance meeting the consumer expectation for using green homes. Numerous prior studies have demonstrated that perceived value is a distinguishing factor that affects purchasing intentions [81–83]. Chen and Chang [83] revealed that in the setting of an eco-friendly purchase, green perceived value positively influences green purchasing intentions. Moreover, Chen et al. [84] emphasized that perceived value is the primary determinant of purchase intent for hydrogen-electric vehicles. The research by Zhao and Chen [24] found that PV is significantly related to green home buying intention and Tan et al. [30] observed the same result from the perspective of Malaysia. Liu et al. [85] suggested that there is a link between the ecological value of a person's attitude toward staying in a green hotel and their sense of control over their behaviour, which makes them want to stay in a green hotel. Salehzadeh and Pool [86], Ahmed and Zhang [87], and Wei et al. [88] found that there is a strong link between green perceived value and the intention to buy green online. In the Value-Attitude-Behaviour Model, the authors suggested that perceived value influences purchasing intent via attitude [89]. When consumers find proper environmental value addition in buying green homes compared to traditional homes, they intend to buy them. Thus, the following hypothesis developed is:

**H12.** *PV has a positive relationship with green home buying intention.*

### 2.9. Reasonable Price (RP)

Price is an essential factor before the purchase of any product. It is more relevant for sustainable homes as consumers frequently remark that the price of eco-friendly products is higher than that of conventional products [90]. We know that using green fixtures, furniture, designs or maintaining self-sustaining energy and water system may entail extra costs. In this context, a reasonable price is not indicating a cheaper price but points out the

price against the benefits (value) sought. It stresses whether the price of green homes is reasonable or not to the consumers on these grounds.

According to the Massachusetts Department of Environmental Protection [91], customers are extremely price-sensitive despite their general environmental concerns. Customers are reluctant to pay greater prices as a result [92]. Simmons [93] stated that ecologically concerned consumers may be willing to cut consumption levels of traditional products. Studies have demonstrated that pricing has a substantial effect on green purchasing intentions [94]. Lee et al. [95] commented that if a producer offers a reasonable price for a green product, buyers with a positive attitude toward environmental protection will have a strong intent to acquire green items. Although the price of sustainable homes is considerable, it may be claimed that buyers who care about the environment will purchase them if they can relate price to added value. This resulted in the subsequent hypothesis:

**H13.** *There is a correlation between RP and consumer intent to purchase green homes.*

### 3. Research Design

As stated previously, the primary aim of this study is to discover the factors affecting Millennials' intention to purchase green homes in Malaysia. To meet the aims of the study, an empirical survey was conducted. In the sections that follow, several methodological concerns pertaining to sample and technique, variable measurement, and assessing the reliability and validity of the factors are discussed.

#### 3.1. Sample and Procedure

This study's data was collected using the primary data gathering method of a consumer survey delivered to highly educated individuals enrolled in at least one public university. The rationale for choosing university students is that the complexity of the green context is difficult for minors and illiterate persons to understand [96]. Other researchers also highlighted that less educated people find it difficult to understand the topic compared to those with higher education [97]. Thus, the ideal sample for this study consisted of adults aged over 18 years as we focused on Millennial people. In this study, a quota sampling technique was used and respondents chosen for this study were at least studying at the university level.

Before conducting the final survey, five academics from a Malaysian institution were interviewed in depth in order to pick the most important questions to include in the questionnaire. 800 respondents were contacted, but only 741 responses were deemed suitable for data analysis. The majority of rejected questionnaires were incomplete, with respondents failing to answer questions about the factors of interest. The majority of responders were female on average (59.92 percent). Chinese make up the second-highest proportion of contributors (after Malay, at 55.87 percent) with 34.95 percent.

#### 3.2. Measures and Common Method Bias

All items used to measure variables in the present investigation were derived from previously validated instruments except the green building knowledge (Appendix A). The constructs of attitude, perceived behavioural control, and the behavioural intention was measured using scales developed by Alam and Sayuti [98] and Alam et al. [99]. The scales were updated to accommodate the buying of a green and sustainable home. Vermier and Verbeke's [100] subjective norm was chosen for our study. The concept of perceived value was taken from Rizwan et al. [101]. Items for a reasonable price were incorporated and changed from Masukujjaman et al. [102], Cole [76] and Maichum et al. [2]. The questionnaire included items measuring subjective norms (two), perceived behavioural control (three), attitude (five), perceived value (five), reasonable price (four), environmental concern (four), green building knowledge (three), and purchasing intention (three items). All questions employed a six-point Likert scale: 1 for "strongly disagree", 2 for "disagree", 3 for "slightly disagree", 4 for "somewhat agree", 5 for "agree", and 6 for "strongly agree".

Based on the suggested guidelines by [103] in this research, common method bias was tested by utilizing exploratory factor analysis. Kaiser–Meyer–Olkin (KMO) standard was adopted to evaluate the sampling adequacy for factor analysis. The analysis findings demonstrated that all values in the matrix’s diagonal were above 0.5, while the KMO value was at 0.811. Moreover, the Kaiser–Guttman standard and the screen test were applied to distinguish the number of existing variables. The evaluation demonstrated that eight factors have more principal eigenvalues than one, which accounted for 68.331% of the variance. In contrast, the primary factor represented 27.2% of the variance in the factors. As per the factor analysis, more than one single factor showed up, and most of the variance was not represented by one general factor.

### 3.3. Data Analysis Methods

This research employed Partial Least Squares (PLS) path modelling, also known as Partial Least Squares Structural Equation Modeling (PLS-SEM), to evaluate the hypothetical model. According to Ringle et al. [104], the PLS path modelling approach to investigating causal linkages in route models is a broad model implicitly assessed by multiple indicators. Both principal components factor analysis and PLS utilize a component-based methodology (Compeau et al. [105]). PLS has been utilized in marketing, strategic management, and management system research. Aibinu and Al-Lawati [106] used PLS-SEM for modeling the willingness of construction organizations to participate in e-bidding. Afzal et al. [107] conducted an empirical study on the factors of organizational flexibility in the construction industry. PLS analysis has also been used in a variety of other research on entrepreneurship [108]. Other HRM practices research [109] identified PLS as a significant analysis technique. However, the green home purchasing intention study is still in its infancy.

SmartPLS3.0 statistical software was utilized to compute the PLS route model discussed in this study, as suggested by Ringle et al. [110]. PLS model criteria ((i) evaluation of construct validity and (ii) evaluation of the path model) were calculated using a two-states analysis technique.

## 4. Analysis of Outcomes

### 4.1. Assessment of Construct Validity and Discriminant Validity

To evaluate internal consistency, construct validity was evaluated. Using composite reliability scores (CR), Cronbach’s alpha, and the average variance extracted (AVE) test, the construct validity of measured constructs was determined. The results of convergent and discriminant validity assessments are displayed in Table 2. Fornell and Larcker [111] propose that every structure’s AVE should be greater than 0.5. All average variance extracted (AVE) values were more than 0.5, indicating that all constructs fulfilled the acceptable criteria for convergent validity [111,112]. In addition, the values of AVE in the diagonal for all constructs were greater than the squared correlation with other constructs off-diagonal, indicating that all constructs matched the criteria for discriminant validity [111].

**Table 2.** Correlation of latent variables and square roots of AVE.

Variable	ATT	EC	GBK	BI	PBC	PV	RP	SN	CR	AVE	Alpha
ATT	<b>0.842</b>								0.924	0.709	0.898
EC	0.686	<b>0.908</b>							0.934	0.825	0.894
GBK	0.658	0.590	<b>0.845</b>						0.881	0.715	0.796
BI	0.745	0.621	0.775	<b>0.853</b>					0.914	0.729	0.875
PBC	0.628	0.512	0.704	0.701	<b>0.890</b>				0.919	0.792	0.868
PV	0.745	0.658	0.756	0.842	0.654	<b>0.836</b>			0.921	0.700	0.892
RP	0.663	0.596	0.655	0.685	0.652	0.681	<b>0.866</b>		0.923	0.750	0.888
SN	0.320	0.322	0.314	0.411	0.367	0.331	0.304	<b>0.943</b>	0.942	0.890	0.877

Notes: In the table bold elements show the square root of AVE). ATT = Attitude, BI = Behavioural Intention, EC = Environmental concern, GBK = Green Building knowledge, PBC = Perceived Behavioural Control, PV = Perceived Value, SN = Subjective Norm, RP = Reasonable Price.

#### 4.2. Reliability

In internal consistency measurement, reliability is the most frequently employed psychometric measurement for evaluating survey instruments and scales [113]. Composite reliability ratings (CR) and Cronbach's alpha are the most prevalent methods for assessing reliability. CR value can range from 0 to 1. According to Akter et al. [114], the composite dependability value must be greater than 0.7 for a model to be considered reliable. Alternatively, Nunnally stated that a minimum alpha of 0.6 suffices for the early phases of the study, and if the value exceeds 0.7, the data is regarded as highly acceptable [115]. The above discussion can be summed up by noting that the cutoff values for CR and Chronbach alpha are 0.7 and 0.7, respectively, for adequate construct validity. Table 1 demonstrates that the CR and Chronbach alpha values exceeded the corresponding cutoff values of 0.70 and 0.70. With evidence of sufficient reliability and convergent validity, the construct is therefore deemed good.

#### 4.3. Normality and Multicollinearity

First, the assumptions of multivariate normal distribution, error independence, and variance equality were examined. This study has a relatively high sample size (393 respondents); therefore, the Central Limit Theorem could be implemented and there is no doubt regarding the normality of the data. In this work, a single method was employed to assess the existence of multicollinearity among independent variables. This method required the determination of the Variance Inflation Factor (VIF) [116]. As indicated by the main effect regression models with variance inflation factors (VIF range: 1.356–3.241), multicollinearity was not a concern with this data set, as it is much below 10. In this study, the measures chosen for evaluating independent variables do not reach levels indicative of multicollinearity.

#### 4.4. Coefficient of Determination

Researchers such as Santosa et al. [117] recommended that the model must be evaluated by determining the coefficient of determination ( $R^2$ ) of the dependent variable in order to test its explanatory power. Falk and Miller [118] argue that the R-squared of an endogenous variable should be 0.10. Other researchers have also proposed that the R-squared of an endogenous variable might be considered large when its value is 0.26, moderate when it is 0.13, and weak when it is 0.02 [119]. The value of  $R^2$  of all endogenous values was determined to be in excess of the conditions in the PLS analysis proposed by Falk and Miller [118], as shown in Table 3. The model's  $R^2$  is greater than the threshold value; hence, the model's performance is quite excellent.

**Table 3.** Coefficient of determination ( $R^2$ ).

Endogenous Variables	$R^2$
Behavioural Intention	0.454
Attitude	0.294
Perceived Behavioural Control	0.302
Subjective Norm	0.281

#### 4.5. Path Analysis

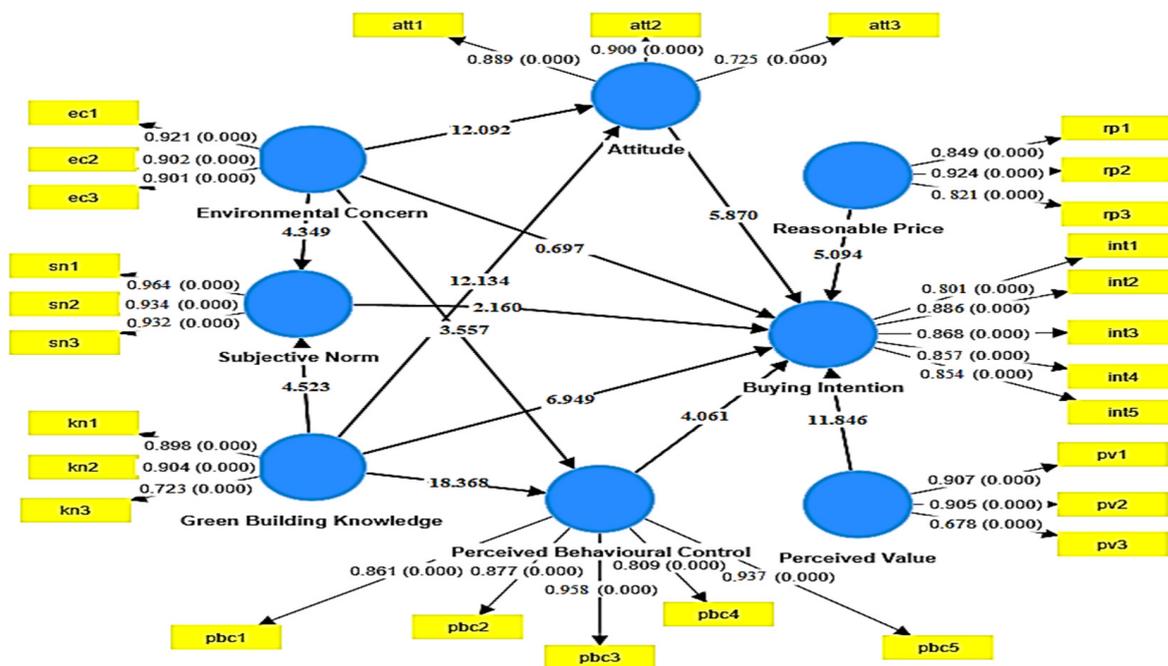
In this study, the TPB model was assessed independently before the whole model was tested. The key conclusions of this study concern the applicability of TPB in a developing nation like Malaysia. Results indicate that antecedents comprising attitude, subjective standards, and PBC have a substantial influence on the intention to purchase a green and sustainable home, as shown in Table 4. Therefore, the results of this study are congruent with those of earlier research [120,121].

**Table 4.** Results of the TPB model.

Hypotheses	Path Coefficients ( $\beta$ )	t-Value	p-Value
Attitude → Intention	0.451	15.616 **	0.001
Subjective Norm → Intention	0.090	3.702 **	0.001
Perceived Behavioural Control → Intention	0.385	13.102 **	0.001

Note: \*\* Significant at 0.001.

Figure 2 shows the path analysis results of the structural model. The path coefficients of the PLS structural model validate the correlations between constructs that are assumed theoretically [122]; individual path coefficients quantify the strength of the causal connection between two constructs. They can be understood as standardized beta coefficients of ordinary least square regressions. Table 5 summarizes the hypothesis testing results.



**Figure 2.** Structural model.

**Table 5.** Results of hypothesis testing.

Hypotheses	t-Value	p-Value	Comment
H1: ATT → BI	5.870 **	0.001	Significant
H2: SN → BI	2.160 *	0.031	Significant
H3: PBC → BI	4.061 **	0.001	Significant
H4: EC → ATT	12.092 **	0.001	Significant
H5: EC → SN	4.349 **	0.001	Significant
H6: EC → PBC	3.557 **	0.010	Significant
H7: EC → BI	0.697	0.485	Not Significant
H8: GBK → ATT	12.134 **	0.001	Significant
H9: GBK → SN	4.523 **	0.001	Significant
H10: GBK → PBC	18.368 **	0.001	Significant
H11: GBK → BI	6.949 **	0.001	Significant
H12: PV → BI	11.846 **	0.001	Significant
H13: RP → BI	5.094 **	0.001	Significant

\* Significant at 0.05, \*\* Significant at 0.001.

## 5. Discussion

When green building knowledge was added to the TPB model, it explained 46% of the differences in intentions. Attitudes, PBC, PV, concern for the environment, and a reasonable price were all good predictors of buying intentions. It was found that perceived value was the greatest predictor of whether or not someone would buy sustainable housing. Purchase intentions were also significantly predicted by environmental concern, subjective norms and green building knowledge. This supports the model which we found to be a good fit with the proposed extensions.

### 5.1. Predictors of Green Home Buying Intention

The results of the PLS-SEM show that attitude is a good predictor of behavioural intention (t-value 5.870, significant at  $p < 0.001$ ) (H1). This finding is in line with the study of Han and Yoon [59], who found the same thing in a different setting. Other studies [4,12,22,25,30] also agree with the results of the present study but contend that attitude is the most important predictor of the intention to buy a green home. In line with Chan and Hsu's [63] study, this analysis revealed that SN was related to intention in a way that was both positive and significant (H2). The result of the PLS analysis (t-value 2.160, significant  $p$ -value  $< 0.031$ ) shows that subjective norms are the most important factor in deciding how someone will behave. Other studies in different fields such as marketing, covering variables such as online buying intention [123], halal food purchasing intention [98], organic food purchasing intention [62], and green product purchasing intention [63], have also confirmed the results of this study. A positive link was found between SN and intention in these studies. This is what some other researchers [4,12,22] have found to be true about people's plans to buy green homes. However, the current result goes against what certain studies [25,35] found, which was that there was no link between them.

Consistent with the literature, our study indicated that there is a positive correlation between PBC and the intent to purchase a green home (t-value = 4.061,  $p < 0.001$ ) (H3). The findings in the present study are also confirmed by studies in different areas such as recycling [64], waste separation behaviour [65], and green product consumption intention [1,66]. Studies [12,22,25] on their green residence buying intention accentuated the same results. However, Zhang et al. [4] and Tan et al. [30] found no relationships. In accordance with the findings of studies [86,89], the current study discovered that perceived value positively and significantly (t-value = 11.846,  $p = 0.001$ ) affects the intention to purchase a green home (H12). In addition, the conclusion is corroborated by studies [24,30], which indicate that PV is one of the most influential elements of purchasing intent.

The findings also show that EC is not a significant predictor of the intention to purchase a green home (t-value 0.697,  $p < 0.485$ ) (H7). This was unexpected because previous research has repeatedly demonstrated that the environment has a large and favourable effect on purchasing intent [25,74]. The PLS-SEM results also reveal that knowledge about green homes has a positive relationship with green home buying intentions (H11), and that this relationship is significant (t-value = 6.949,  $p$ -value = 0.001). This is in accordance with the previous results of Zhang et al. [4]; and Zahan et al. [25]. Hence, proper knowledge of green building leads to a consumer's positive buying intention. The intention to buy a green home is also linked to a reasonable price (H13). The results of the PLS path coefficient analysis (t-value = 5.094,  $p$ -value = 0.001) mean that there is a positive and significant link between a reasonable price and the intention to buy a green and sustainable home. This research backs up the earlier findings that a reasonable price has a positive and significant effect on the likelihood of buying [124,125]. The price of a green home now shows how consumers feel about buying a green and sustainable home. Manufacturers who make green and sustainable homes at a fair price may be able to sell more of them.

### 5.2. Environmental Concern and Its Impact on TPB Constructs

According to the present study's PLS path coefficient findings, environmental concern has a positive and statistically significant link with attitude, SN, and PBC (H4, 5 and 6). The association between EC and attitude is significant:  $t$ -value 12.092 with significant  $p$ -value = 0.001,  $t$ -value 4.349 with significant  $p$ -value = 0.001, and  $t$ -value 3.557 with significant  $p$ -value = 0.01. The findings are consistent with earlier research [4,25,30]. This indicates that the higher the environmental concern in the consumer's mind, the higher the tendency to have a favourable opinion, peer influence and behavioural control of buying GH.

### 5.3. Green Building Knowledge and Its Impact on TPB Constructs

The greater the green building knowledge, the more positive the attitude (H8). The results of the PLS analysis ( $t$ -value = 12.134 and  $p$ -value = 0.001) indicate a positive and statistically significant association between knowledge and attitude. This study confirms the earlier findings that green building-related knowledge has a favourable and significant influence on attitudes toward green home purchasing [58]. The research results show that environmental knowledge has a significant influence on perceived behavioural control and subjective norms ( $t$ -value = 18.368,  $p$ -value = 0.001, and  $t$ -value = 4.523,  $p$ -value = 0.001, respectively) (H9 and 10). This result endorses the previous result of Zhang et al. [4]; and Zahan et al. [25]. It implies that the greater the knowledge about green building, the greater the individual's self-control over their decisions in this regard and the more likely the external influence on the decision making.

## 6. Implication of the Study

The findings of this study have various implications that may help in developing comprehensive strategies for green and sustainable home-buying intentions. This could help increase consumers' buying intention for green homes and ultimately positively impact the environment within Malaysia

The study contributes significantly to theoretical development. First, the study extended the popular and contemporary theory of planned individual behaviour. It successfully integrates new constructs (cognitive) in the model such as green building knowledge. The green building knowledge construct includes three domains of knowledge, namely, factual, conceptual and procedural (skill) knowledge, which has been missing in the green home buying literature and empirical testing. The scales generated here may be replicated by future researchers. We explored environmental concern as a cognitive variable that influences residents' perception of GHs. In eco-innovation adoption studies, environmental concern is one of the most studied personality factors. We discovered that these two psychological characteristics have distinct effects on inhabitants' views and intentions to acquire GHs. This research provides insight into the effects of psychological factors on the intention to purchase GH. The study also adds context-specific factors, i.e., values and reasonable prices. Second, studies on green home buying intention from Malaysian Millennials' perspectives are rare. Targeting this consumer group means that the present results will certainly improve the literature depth in this arena. Third, in terms of new results, we did not find any link between expressed environmental concern and buying intention of green homes for Millennials. This supplies a challenge for new studies to counter or validate such findings in the future, leading to a deepening of the literature in this area.

The outcome of this study has important managerial implications. Our study found a significant relationship between green building knowledge and purchase intention. It is necessary to popularize the knowledge pertaining to eco-homes, their designs, and their purchase because the green home is a newer form of housing. This knowledge includes the features of the green home as well as issues demanding attention in the selection and purchase. The knowledge can increase positive attitudes of the individual, and their ability to exert behavioural control. Thus, it is important for green home businesses to use a

subject-specific environmental message to communicate with potential buyers through different media. The concerned marketing team of this sector should emphasize this with vigour. They can arrange displays in various public places, in Television Commercials (TVC), industry symposiums and elsewhere. Likewise, the methods described above should be put into practice by embracing more focused ways of approaching different types of customers. For example, marketing to women might focus on the alteration of their attitudes, while marketing to men might focus on the improvement of their perceived behavioural control. This study also suggests targeting customers based on their generations. Social media boosting based on the Millennial target group could also bring good results. Fourth, perceived value, attitude, and subjective norms were found to be significant factors in choosing green homes. Enhancing the reputation of eco-friendly homes, such as receiving high praise from consumers' family and friends, receiving extensive and supportive remarks from the media, and receiving moderate guidance from policies, can improve consumers' attitudes toward buying behaviour and subjective norms, and thus impact buyers to buy green residences, which is important for increasing the buying intention of customers for eco-friendly residences. Government, entrepreneurs, the private sector and marketers should develop programmes that will show the value for money when buying a green home. The complementary actions may also include quality assurance. The maintenance of the building code of conduct in green home construction is not only necessary but also requires publicity to improve the positive perceptions linked to branding. Again, the target-based promotional matters should relate to quality assurance.

In addition, the present study has policy consequences. Reasonable pricing is found to be significant in our result. This emphasises the need to ensure a fair market pricing policy, through the housing authority in Malaysia. The consumer associations that work for the consumers' rights should also be more active, including in the case of any mishaps that may have occurred. We would like to bring to the attention of policymakers the fact that instrumental motivations, which in the context of this study include the provision of tax incentives, did not appear to be valued nearly as high as other types of motivation (intrinsic and non-normative), by the Millennial potential homebuyers. As a result, policymakers should reconsider how they encourage the development of a built environment in light of the generation of consumers who appear to be influenced more by internal and non-normative factors. Lastly, our data reveal that cognitive processes play crucial roles in determining how residents view green buildings. Concern for the environment positively affects people's attitude, subjective norms, and perceived behavioural control. Thus, it is vital for governments and companies to start public relations efforts to underline the gravity of the current environmental challenges, with a focus on the pollution caused by the construction and operation of conventional housing.

## 7. Conclusions, Limitations and Future Research Directions

The objective of the study was to diagnose the factors affecting green and sustainable home-buying intention in Malaysia with the proposed extension of TPB. Attitude, perceived behavioural control and subjective norm had a high positive and significant effect on green and sustainable home buying intention with attitude showing the highest effect, followed by PBC and finally SN. Compared to subjective norms, the variable "attitude" shows a stronger influence, so marketers might try to attract Malaysian consumers towards green homes using advertising commercials, as this could help in affecting consumers' green home buying intention. Environmental concern had no evident significant influence on green home buying intention, but may in fact be widespread among Millennials. It showed an indirect relationship via the three TPB. Environmental knowledge and perceived value are the two constructs that had a strong relationship with green and sustainable home-buying intentions.

Even though the study accomplished its major aims, the results should be viewed with caution because they are based on a single data collection process (cross-sectional survey). Thus, respondents may gain knowledge as time progresses, which may affect how their

reported thinking is put to use. This paves the way for even more in-depth studies, such as longitudinal studies, which may produce more precise data that more accurately represents the development of eco-friendly behaviours over time. Moreover, the model measured behavioural intention instead of actual behaviour. The study could have been stepped up to a willingness to pay so that the reader could understand the barrier of adoption in more detail. Hence, there is scope for advanced study in the future. The intention-behaviour gap in making a green decision in the housing sector may also be better addressed in future research if the moderating or mediating variables are more fully accounted for. Variables such as facilitating conditions and perceived risk should be tested in future research. In conclusion, the current research was only conducted with participants from the Millennial generation who live in Malaysia; as a result, any attempts to extrapolate the findings to other cultures and environments should be performed with extreme caution. Future research could come up with a multi-group analysis or comparative study by generations within Malaysia or the region.

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## Appendix A Survey Questionnaire

	Strongly Disagree						Strongly Agree
1. Attitude							
Green homes will help to save the environment because it uses environmentally friendly materials and processes	1	2	3	4	5	6	
Buying a green home that has Green Building Index (GBI) ratings or similar international ratings is favourable	1	2	3	4	5	6	
Living in a green home would be good for me because these homes improve our quality of living	1	2	3	4	5	6	
2. Subjective Norm							
My family think that I should purchase a green home rather than a normal home	1	2	3	4	5	6	
My close friends think that I should buy a green home	1	2	3	4	5	6	
People who influence my behaviour think that I should purchase a green home.	1	2	3	4	5	6	

	<b>Strongly Disagree</b>					<b>Strongly Agree</b>
<b>3. Perceived behavioural control</b>						
I am confident that I would purchase a green home even if it is slightly more expensive	1	2	3	4	5	6
I am confident that I would purchase a green home even if the other person advises me the opposite	1	2	3	4	5	6
I am sure I would be able to make difference to use PV solar energy	1	2	3	4	5	6
Buying a green home is entirely within my control	1	2	3	4	5	6
I have the resources, and ability to purchase green homes.	1	2	3	4	5	6
<b>4. Reasonable Price</b>						
I would buy a green home if the price is reasonable.	1	2	3	4	5	6
The price of green homes is normally higher than that of conventional homes.	1	2	3	4	5	6
It is easy to justify the price and benefits of green homes.	1	2	3	4	5	6
<b>5. Environmental Concerns</b>						
I prefer to check the Green Building Index (GBI) or other green ratings and certifications on the homes before purchase.	1	2	3	4	5	6
I want to have a deeper insight into the inputs, processes and impacts of the green home on the environment before the purchase.	1	2	3	4	5	6
I would prefer to gain substantial information on green homes before purchasing.	1	2	3	4	5	6
<b>6. Green Building Knowledge</b>						
I know factual information about eco-home design (e.g., building codes, wind turbines, recycled content materials, and dual-flush toilets etc.).	1	2	3	4	5	6
I have the conceptual knowledge of green building design (e.g., how to maintain indoor air quality, size and window locations, ecological impacts etc.)	1	2	3	4	5	6
I have procedural knowledge of green building operations (e.g., picking eco-friendly furniture, monitoring cooling systems or solar panels or using water-saving building fixtures).	1	2	3	4	5	6
<b>7. Perceived Value</b>						
Green home's environmental functions provide very good value for me	1	2	3	4	5	6
Green home's environmental performance meets my expectations	1	2	3	4	5	6

	Strongly Disagree					Strongly Agree	
Buying a green home has more environmental benefits than other conventional homes	1	2	3	4	5	6	
8. Purchase Intention							
I am planning to buy a green home in future	1	2	3	4	5	6	
I will try to purchase a green and sustainable home in future	1	2	3	4	5	6	
I will make an effort to purchase a green and sustainable home in future	1	2	3	4	5	6	
I intend to purchase green homes next time because of their positive environmental contribution	1	2	3	4	5	6	
I will consider switching to a green home for ecological reasons	1	2	3	4	5	6	

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