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Quantitative Research Article

Behavioral Drivers of Food Waste Reduction in Urban Vietnam

Thi Thuy Giang Nguyen[1*] and Gia Hung Nguyen[1]

Abstract

Background/Problem: Rapid urbanization in Vietnam has intensified challenges in household food waste management, contributing to environmental and economic burdens. Understanding behavioral factors influencing waste reduction is essential for effective interventions.
Objective: This study investigates the role of perceived behavioral control (PBC), attitudes, subjective norms and lack of concern within an extended theory of planned behavior (TPB) framework in shaping food waste reduction intentions and behaviors.
Design and Methodology: Data were collected from 425urban households in Ho Chi Minh City through an online survey. Partial least squares structural equation modeling was employed to analyze the relationships between the variables.
Results: The perceived behavioral control emerged as the strongest predictor of food waste reduction behaviors (β = .26, $p < .001$), surpassing the influence of attitudes (β = .15, $p < .001$) and subjective norms (β = .23, $p < .001$). Lack of concern negatively affected PBC (β = -.37, $p < .001$) and waste reduction intentions (β = -.31, $p < .001$), highlighting significant psychological barriers.
Conclusion and Implications: The findings underscore the centrality of PBC in driving sustainable household practices and the critical role of addressing barriers such as lack of concern. This study advances the TPB by contextualizing behavioral drivers in rapidly urbanizing economies. Practical insights for policymakers include enhancing food management skills and integrating behavioral insights into policies to promote effective waste management and broader sustainability goals.

Author Affiliation

[1]Faculty of Commerce, University of Finance - Marketing, Ho Chi Minh City, Vietnam.

*Corresponding author e-mail: nguyengiang@ufm.edu.vn
https://orcid.org/0009-0002-6730-8037

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Food waste is a pressing global issue with significant environmental, economic and social consequences. In 2022, approximately 631 million tons of food waste originated from households, accounting for 60% of the global total and averaging 74 kilograms per person annually. This waste contributes to 8–10% of global greenhouse gas emissions, intensifying the climate crisis (UNEP, 2024). This waste poses economic and environmental challenges, exacerbating resource depletion and greenhouse gas emissions (Damanik et al., 2024; Setiawan et al., 2024). Economically, the global cost of food waste is staggering, amounting to billions of dollars annually, while millions worldwide face food insecurity (Deliberador et al., 2023; Schrank et al., 2023). In Vietnam, rapid urbanization and economic growth have profoundly reshaped food consumption patterns, particularly in urban hubs like Ho Chi Minh city (HCMC). With GDP per capita reaching $4,164 in 2022, rising disposable incomes have fueled increased reliance on convenience foods and pre-cooked products, transforming household food behaviors (Ngan et al., 2024; Tran & Bean, 2023). This shift has been accompanied by substantial food wastage, driven by over-purchasing, poor food management and cultural practices such as preparing large family meals (Adaryani et al., 2024; Bhatti et al., 2023; Schrank et al., 2023; Tahir, 2023). Nationally, Vietnam discards over 8 million tons of edible food annually, valued at $3.9 billion or nearly 2% of GDP (Pham et al., 2021). In

HCMC alone, municipal solid waste generation has surged from 6,000 tons daily in 2010 to 9,200 tons in 2022, with food waste accounting for 50–55% of this total (Nguyen et al., 2024). This dual economic and environmental toll underscores the urgent need for targeted behavioral interventions in urban centers like HCMC.

Although food waste has been extensively studied, research on behavioral drivers in Vietnam remains limited. Most studies focus on intrinsic motivators such as environmental awareness and personal norms, which shape attitudes and moral obligations (Schrank et al., 2023; Setiawan et al., 2024). However, these factors often fail to address practical and situational constraints prevalent in urban environments (Schrank et al., 2023; Setiawan et al., 2024; Viccaro et al., 2023). Recent research highlights perceived behavioral control an individual's perception of their ability to act as a more robust predictor of waste reduction behaviors, especially in contexts of rapid urbanization and infrastructural challenges (Bhatti et al., 2023; Schrank et al., 2023; Zheng et al., 2023). Unlike intrinsic motivators, perceived behavioral control emphasizes practical determinants, such as confidence in managing food waste through tools like meal planning and storage techniques (Borgne et al., 2021).

There is a need to explore how perceived behavioral control interacts with attitudes, subjective norms and barriers such as lack of concern in shaping food waste reduction intentions and behaviors, particularly in convenience-driven urban settings. This study aims to address existing gaps by exploring the behavioral factors that influence household food waste reduction in HCMC. It is based on the theory of planned behavior (TPB) (Ajzen, 1991. The study focuses on the central role of perceived behavioral control while also examining the interplay of attitudes, subjective norms, and lack of concern as influencing factors. Additionally, it provides actionable insights for policymakers and stakeholders. These insights are intended to help design effective interventions tailored to Vietnam's urban context.

Literature Review

This section reviews key studies based on the theory of planned behavior (TPB). The TPB explains that three main factors - attitudes, subjective norms, and perceived behavioral control are work together to shape intentions and, eventually, behaviors (Ajzen, 1991). This study expands TPB by adding a new variable, lack of concern, which reflects apathy and disengagement. Lack of concern is treated as separate from attitudes and has a negative impact on both PBC and intentions. Previous research (McCarthy & Liu, 2017; Schrank et al., 2023) shows that lack of concern lowers the importance people place on waste management, hindering sustainable practices. This framework has been widely used in food waste research to explore the psychological and social factors influencing household waste reduction.

At the household level, food waste reduction involves practices and behaviors aimed at minimizing food wastage from purchase through consumption to disposal (Schanes et al., 2018; Viccaro et al., 2023). This concept encompasses a comprehensive approach to managing food resources responsibly to mitigate the adverse effects on the environment, food security, and consumer well-being. Food waste reduction refers to strategies and practices aimed at decreasing the amount of food that is discarded or unused. Effective management of food resources at this level is pivotal for mitigating adverse environmental impacts, ensuring food security, and enhancing consumer well-being (Schanes et al., 2018).

The Theory of Planned Behavior

The theory of planned behavior (TPB), proposed by Ajzen (1991), is a widely used framework for understanding behavioral intentions and actions. The TPB identifies three core variables influencing intentions and behaviors: attitudes, subjective norms and perceived behavioral control. Attitudes reflect cognitive and emotional evaluations of a behavior; subjective norms capture social pressures to act or abstain; and perceived behavioral control represents confidence in one's ability to perform the behavior. Among these, perceived behavioral control is particularly critical in driving food waste reduction, especially in the face of practical barriers like limited storage or time constraints (Adaryani et al., 2024;

Setiawan et al., 2024). Unlike intrinsic motivators such as attitudes or norms, perceived behavioral control emphasizes actionable confidence, enabling individuals to translate intentions into consistent behaviors (Graham-Rowe et al., 2015; Ma et al., 2023). Research links higher perceived behavioral control with proactive actions such as mindful purchasing, meal planning, and proper food storage (Stancu et al., 2016; Zheng et al., 2023).

However, additional factors, such as lack of concern, may undermine the effectiveness of TPB variables (Graham-Rowe et al., 2015; Obuobi et al., 2024). For instance, Graham-Rowe et al. (2014) identified apathy and prioritization of convenience as psychological barriers to food waste reduction. Conversely, positive attitudes, such as beliefs in environmental or economic benefits, strongly encourage waste-reducing behaviors (Deliberador et al., 2023).

To address these gaps, this study extends TPB by introducing lack of concern (LC) as a distinct variable, separate from attitudes. The LC reflects apathy and disengagement toward food waste issues, which negatively affect PBC and behavioral intentions. By incorporating LC, this research aims to provide a more nuanced understanding of the psychological and situational barriers influencing food waste reduction behaviors. This aligns with findings from Ertz et al. (2021) and Russell et al. (2017), which show that a lack of concern undermines perceived control and perpetuates wasteful habits.

Household Food Waste Reduction Intention and Behavior

Household food waste reduction behavior includes proactive actions like meal planning, proper food storage, portion control, and using leftovers, aimed at minimizing waste (Schanes et al., 2018). Successful waste reduction behaviors rely on awareness, food management skills, and consistent habits (Stancu et al., 2016), with factors like shopping habits and cultural norms further influencing these practices (Graham-Rowe et al., 2014).

Household food waste reduction intention represents a household's commitment to reducing waste, shaped by environmental awareness, financial motivations, social norms, and a sense of responsibility (Stefan et al., 2013). These intentions are further strengthened by high self-efficacy, or confidence in managing food resources effectively, and by social influences that encourage sustainable consumption practices (Russell et al., 2017). According to the TPB, behaviors are driven by intentions formed through attitudes, subjective norms and perceived control (Ajzen, 1991). Studies confirm that strong intentions to reduce food waste positively correlate with actual waste reduction behaviors, supported by factors like self-efficacy and routine practices (Barbera et al., 2022). Thus, households with strong intentions to reduce waste are more likely to engage in sustainable behaviors such as mindful shopping, effective storage, and responsible disposal, supporting both waste reduction and broader sustainability goals.

H1: The household food waste reduction intention positively affects household food waste reduction behavior.

Lack of Concern

Lack of concern refers to the indifference or disengagement household members feel regarding the environmental, economic, and social consequences of food waste. This attitude, marked by disinterest or apathy, often reduces the likelihood of adopting waste-reduction practices like meal planning, mindful purchasing, and portion control (Stancu et al., 2016). Households with low concern may view food waste as a minor issue, influenced by abundant food supply or convenience-driven habits. In the extended TPB framework, lack of concern acts as a barrier that impacts household behavior, intentions, and perceived control over food waste reduction (Obuobi et al., 2024; Setiawan et al., 2024). When household members do not consider food waste a critical issue, they are less likely to see value in adopting waste-reduction practices or believe their actions will make a difference, weakening their motivation to engage in waste-reducing efforts (Graham-Rowe et al., 2015; Schanes et al., 2018; Stefan et al., 2013). Research consistently

shows that low concern diminishes perceived control and responsibility, often leading to wasteful behaviors driven by convenience and short-term preferences (Kennedy et al., 2024; McCarthy & Liu, 2017).

Studies highlight that households with low concern are less likely to prioritize sustainable actions, leading to higher levels of food waste (Obuobi et al., 2024; Schanes et al., 2018; Stefan et al., 2013). For example, households that lack a sense of responsibility for waste often display minimal engagement in waste reduction (Graham-Rowe et al., 2014). Additionally, a low level of concern impacts subjective norms and attitudes, making it challenging for individuals to sustain long-term waste reduction behaviors.

Ultimately, understanding and addressing lack of concern as a barrier is crucial to promoting food waste reduction, as it influences not only waste reduction behaviors but also the intention and perceived control needed to make lasting changes (Graham-Rowe et al., 2014). Based on these insights, the following hypotheses are proposed:

H2: Lack of concern negatively affects household food waste reduction behavior.
H3: Lack of concern negatively affects household food waste reduction intention.
H4: Lack of concern negatively affects perceived behavioral control.

Perceived Behavioral Control

Perceived behavioral control in food waste reduction reflects an individual's confidence in managing food practices to minimize waste. According to Ajzen's (1991), PBC directly influences both intentions and actions; individuals who feel in control over waste management are more likely to commit to waste-reducing intentions and proactive behaviors (Graham-Rowe et al., 2015; Schrank et al., 2023). Key factors enhancing this control include resource availability examines whether individuals have access to practical resources (e.g., storage options or food-sharing networks) that support waste reduction, personal skills includes skills like meal planning, portion control, and proper food storage techniques, which enhance the ability to manage food effectively, and overcoming situational barriers like unplanned meal changes, or reliance on convenience foods, which may hinder waste reduction efforts (Adaryani et al., 2024; Damanik et al., 2024; Setiawan et al., 2024; Tahir, 2023).

High PBC enables individuals to translate intentions into actions, such as mindful purchasing and portion control, while low PBC may hinder action due to barriers like time constraints (Graham-Rowe et al., 2015; Stancu et al., 2016). Additionally, PBC interacts with TPB constructs like attitudes and norms, where awareness of waste's environmental impact can support positive attitudes, yet action depends on perceived control (Graham-Rowe et al., 2015).

Research suggests enhancing PBC through educational tools and resources like meal planning apps can strengthen waste-reducing behaviors (Schrank et al., 2023). Studies by Setiawan et al. (2024) and Tahir (2023) found that integrating PBC with moral norms, as per Norm Activation Theory, fosters intentions by reinforcing both obligation and feasibility in waste management.

Empirical evidence found PBC to be a significant factor influencing food waste reduction intentions among Indonesia's younger generation (Damanik et al., 2024). Thus, PBC is foundational in supporting effective waste reduction, making it crucial for sustaining mindful consumption behaviors. Based on these insights, the following hypotheses are proposed:

H5: Perceived behavioral control positively affects household food waste reduction intention.
H6: Perceived behavioral control positively affects household food waste reduction behavior.

Attitudes toward Household Food Waste Reduction Intention

Attitudes in this study reflect cognitive and emotional evaluations of food waste reduction, including beliefs about its economic benefits and environmental responsibility (Deliberador et al., 2023). While environmental awareness may overlap with attitudes conceptually, they are distinct in this context, as attitudes here encompass broader beliefs beyond environmental considerations (Adaryani et al., 2024;

Tahir, 2023). Positive attitudes toward waste reduction are typically driven by the belief in its benefits, such as resource conservation and cost savings, which, according to the theory of planned behavior, strengthens intentions to engage in waste-reducing behaviors (Ajzen, 1991; Bhatti et al., 2023).

In this research, attitudes are measured through the following sub-dimensions: 1) Environmental beliefs: Reflect perceptions of the environmental benefits of reducing food waste, such as minimizing landfill contributions and conserving natural resources. 2) Economic beliefs: Capture the financial advantages of waste reduction, including cost savings from mindful consumption and efficient food management. 3) Personal responsibility: Assess the sense of moral obligation or responsibility to reduce waste as a reflection of sustainable practices.

Within the theory of planned behavior, attitudes play a core role, as favorable evaluations of waste reduction strengthen intentions to engage in such behaviors (Ma et al., 2023). Research supports that positive attitudes toward reducing waste encourage proactive behaviors by emphasizing outcomes like financial savings and environmental benefits (Deliberador et al., 2023; Ma et al., 2023; Setiawan et al., 2024). Schrank et al. (2023) further highlight attitudes as key in shaping waste-reduction intentions. Based on these insights, it is hypothesized that:

H7: Attitudes positively affect household food waste reduction intention.

Subjective Norms

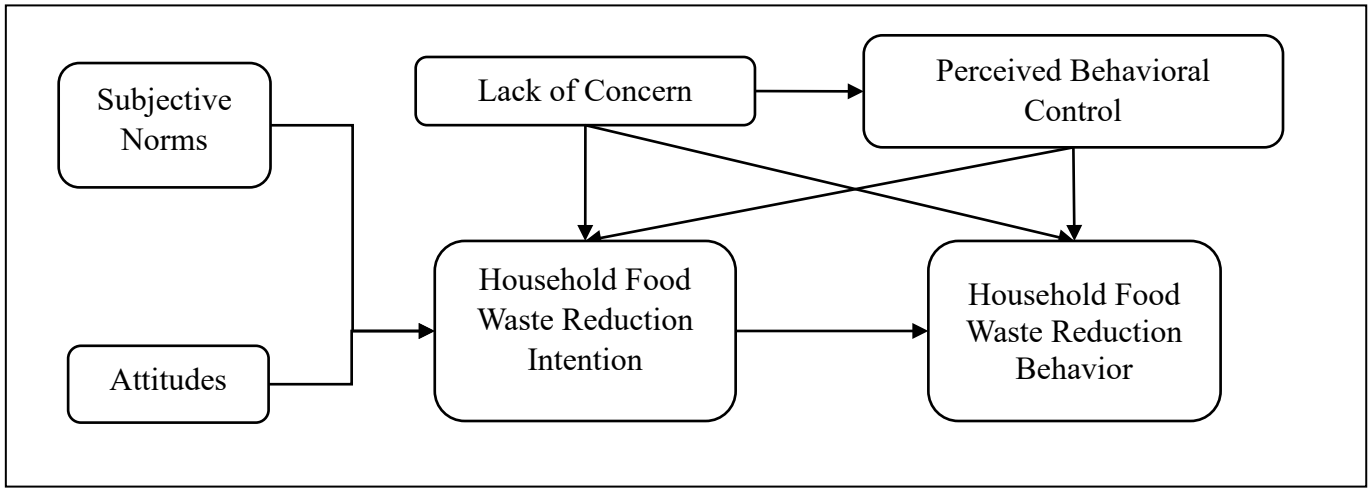
Subjective norms refer to perceived social pressures from family, friends, and the community to engage in food waste reduction behaviors (Ajzen, 1991; Tahir, 2023). In collectivist societies like Vietnam, where social harmony and communal values are prioritized, these norms strongly influence intentions to reduce waste (Adaryani et al., 2024; Damanik et al., 2024). Bhatti et al. (2023) highlights that subjective norms encourage individuals to conform to socially accepted waste reduction practices. This study examines subjective norms through three sub-dimensions: 1) Family expectations: The influence of family members in encouraging waste reduction behavior. 2) Peer influence: The role of social groups and friends in promoting sustainable practices. Community pressure: Societal expectations and cultural norms that reinforce responsible consumption.

Research shows that these dimensions strengthen intentions by aligning individual behaviors with social values, as supported by Schrank et al. (2023) and Ma et al. (2023). Social support and anticipated guilt further motivate sustainable actions, creating a positive feedback loop of behavior (Gunawan et al., 2023; Özkan et al., 2024). This understanding leads to the following hypothesis:

H8: Subjective norms positively affect household food waste reduction intention.

Figure 1

Proposed Conceptual Framework



Method

Data Collection

Ho Chi Minh City (HCMC) is Vietnam's largest urban center with over 9 million residents and was chosen for this study due to its dense population and significant food waste challenges (World Population Review, 2024). Data were collected via an online Google Forms survey over 11 weeks (June to September 2024) using convenience and snowball sampling methods. Convenience sampling targeted initial participants from accessible networks, while snowball sampling expanded reach through participant referrals, enabling the inclusion of diverse respondents across HCMC. This approach ensured a large and diverse dataset while adhering to ethical standards, including informed consent, confidentiality, and voluntary participation (Baltar & Brunet, 2012). Ethical standards were upheld, ensuring informed consent, confidentiality, and voluntary participation.

A total of 425 households participated, selected to represent diverse districts and socioeconomic contexts across HCMC. Eligibility criteria included residency in HCMC for at least one year and primary responsibility for household food management (e.g., meal planning, grocery shopping). Participants included residents from urban districts (e.g., District 1, District 3) and suburban areas (e.g., Cu Chi, Hoc Mon) to reflect varied food waste patterns. Data saturation was achieved after 400 responses, with additional responses enhancing robustness. The research team's credentials include expertise in behavioral studies, survey design, and food waste management.

Instruments

The questionnaire used in this study was developed from validated scales in prior research and was rigorously adapted to the Vietnamese context. It consisted of two main sections: demographic information and scales measuring the study variables.

Translation and validation processes were carried out. A forward-translation and back-translation approach was employed to ensure linguistic and cultural relevance for Vietnamese participants. Two language experts conducted the translations and resolved discrepancies to maintain equivalence with the original scales. Following this, a pilot study with 30 participants was conducted to assess the clarity, readability, and cultural appropriateness of the items. Feedback from participants led to minor revisions to enhance clarity. Reliability and validity were also rigorously evaluated; internal consistency was confirmed with Cronbach's alpha values exceeding .70; while convergent validity was ensured through composite reliability (CR > .70) and average variance extracted (AVE > .50) for all constructs.

The questionnaire for data collection had two sections. The section 1 collected demographic information such as the respondents' age, gender, income, and occupation to provide context for analyzing food waste behaviors.

The section 2 consisted of scales measuring study variables. Respondents rated items on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), designed to capture beliefs, intentions, and behaviors related to food waste reduction. Each construct was measured using rigorously validated scales from prior research, with reliability confirmed in the current sample (n = 425).

To measure attitudes, items were adapted from Deliberador et al. (2023) to assess beliefs about environmental, economic, and personal responsibility aspects of food waste reduction. Perceived behavioral control was adapted from Graham-Rowe et al. (2015) and Stancu et al. (2016). This scale measured confidence in managing food waste effectively, focusing on knowledge, resources, and situational constraints. The subjective norms were adapted from the scale by Schrank et al. (2023), to measure the influence of social expectations and norms on food waste behaviors. The lack of concern scale was adapted from Stancu et al. (2016) and McCarthy and Liu (2017), and assessed apathy and disengagement toward food waste reduction. The measurement of food waste reduction intention (FWI) and behavior (FWB) was adapted from the scales of Stefan et al. (2013) and Graham-Rowe et al. (2014); and measured intentions (FWI) and actions (FWB) related to food waste reduction.

Sample Size and Representation

A total of 425 valid responses were collected, representing approximately .0047% of 9 million residents in HCMC. While non-probability sampling limits generalizability, this sample size is sufficient for partial least squares structural equation modeling (PLS-SEM), which requires a minimum sample size of 10 times the maximum number of paths leading to any construct in the model (Hair et al., 2022).

Results

Demographic Description of Respondents

A study of 425 Vietnamese households in Ho Chi Minh City reveals critical insights for addressing food waste. Women, comprising 62.4% of respondents, play a central role in household food management, emphasizing the importance of targeted initiatives to enhance their knowledge and resources. The age group 35–44, representing 32.7% of participants, demonstrates strong awareness of sustainable practices, making them key influencers in family decisions on food waste reduction.

Notably, 90% of respondents are employed or students, reflecting high engagement and motivation for food waste mitigation. Income analysis shows that 36.7% of households earn 20–30 million VND monthly, suggesting cost-saving strategies may resonate strongly with this group. Additionally, 55.5% of participants have at least secondary education, highlighting the influence of education on attitudes and behaviors toward food waste. Lastly, 39.6% of surveyed households consist of 4–5 members, indicating a need for tailored food management strategies for larger families. These findings underscore the multifaceted factors shaping food waste reduction efforts in the city.

Table 1

Demographic

Demographic	Category	Percentage	Frequency
Gender	Male	37.6	160
	Female	62.4	265
Age (In years)	24 years or less	23.3	99
	25 – 24 years	25.5	108
	35 – 44 years	32.7	139
	45 – 54 years	13.1	56
	55 years or more	5.4	23
Job	Student	25.5	108
	Employed	61.5	262
	Unemployed	3.8	16
	Retired	9.2	39
Monthly Income	< 10 million VND	16.7	71
	10 – less than 20 million VND	26.2	111
	20 – less than 30 million VND	36.7	156
	30 million and more VND	20.4	87
Education	Secondary school	15.6	66
	High School	55.5	236
	Bachelor	17.4	74
	Master or above	11.5	49
Household Size	1 – 3	22.6	96
	4 – 5	39.6	168
	6 – 7	25.6	109
	7 or above	12.2	52

Note. VND = Viet Nam Dong; 1 USD = 25,000 VND.

Reliability and Convergent Validity

To ensure measurement reliability and validity, internal consistency and convergent validity of constructs were evaluated using SmartPLS. Table 2 shows that all constructs exceeded the composite reliability (CR) threshold of 0.7, indicating strong internal consistency (Hair et al., 2022). The CR values for food waste reduction behavior (FWB) and intention (FWI) were 0.87 and 0.89, respectively, confirming robust reliability. Convergent validity was also supported, with average variance extracted (AVE) values above 0.5, such as 0.57 for FWB, indicating high variance explained by the constructs.

To enhance model fit, one indicator each from subjective norms (SN), attitudes (AT), perceived behavioral control (PBC) and FWI were removed due to low factor loadings (<0.5), which improved reliability and coherence. Table 3 confirms discriminant validity using the Fornell-Larcker criterion, with each construct's AVE square root exceeding its correlations with other constructs, verifying their distinctiveness.

Table 2

Reliability and Convergent Validity

		Outer loadings	Cronbach 's Alpha	CR	AVE
FWB was adapted from Stancu et al. (2016); Graham-Rowe et al. (2014)			.81	.87	.57
FWB1	I plan meals in advance to reduce food waste in my household.	.75			
FWB2	I practice portion control to avoid unnecessary food waste.	.74			
FWB3	I store food properly to extend its freshness and reduce waste.	.71			
FWB4	I use leftovers creatively to minimize food waste in my household.	.78			
FWB5	I shop mindfully, buying only what is necessary to avoid waste.	.78			
FWI was adapted from Stefan et al. (2013); Russell et al. (2017)			.81	.89	.72
FWI1	I intend to make conscious efforts to reduce food waste in my household.	.86			
FWI2	I feel committed to reducing the amount of food my household wastes	.82			
FWI3	I aim to reduce food waste as a key goal in my household	.87			
LC was adapted from Stancu et al. (2016); McCarthy & Liu (2017)			.85	.90	.69
LC1	I don't feel that food waste is an important issue in my life	.86			
LC2	I am not particularly worried about how much food my household wastes.	.80			
LC3	I prioritize convenience over worrying about food waste	.82			
LC4	I rarely think about the effects of food waste when making household decisions.	.84			
PBC was adapted from Graham-Rowe et al. (2015) and Stancu et al. (2016)			.73	.84	.64
PBC1	I feel capable of managing my household's food waste effectively.	.78			
PBC2	I have the necessary resources (e.g., storage options, planning tools) to reduce food waste	.79			
PBC3	I can adjust my food purchases and usage even if my plans change unexpectedly.	.84			
Attitudes was adapted from Deliberador et al. (2023)			.70	.83	.63
AT1	I believe reducing food waste is beneficial for the environment	.86			
AT2	I think reducing food waste can help save money in my household.	.75			
AT3	I feel that minimizing food waste is an important responsibility	.77			
Subjective norms was adapted from Schrank et al. (2023)			.72	.82	.54
SN1	My family and friends think I should reduce the amount of food my household wastes.	.73			
SN2	People important to me encourage me to adopt waste-reducing behaviors.	.74			
SN3	I feel social pressure to minimize food waste in my household	.71			
SN4	People in my social circle value and expect reduced food waste.	.75			

Note. FWB = household food waste reduction behavior, FWI = household food waste reduction intention, LC = lack of concern, PBC = perceived behavioral control, AT = attitudes, SN = subjective norms.

Table 3
Discriminant Validity

Construct	AT	FWB	FWI	LC	PBC	SN
AT	.79					
FWB	.25	.75				
FWI	.33	.54	.85			
LC	-.19	-.42	-.49	.83		
PBC	.30	.46	.43	-.37	.80	
SN	.29	.34	.46	-.38	.40	.73

Note. Bolded diagonal values represent the square root of AVE, indicating discriminant validity. FWB = household food waste reduction behavior, FWI = household food waste reduction intention, LC = lack of concern, PBC = perceived behavioral control, AT = attitudes, SN = subjective norms.

Model Fit Analysis

As shown in Table 4, the structural model's fit was assessed using several established criteria (Hair et al., 2022). The standardized root mean square residual (SRMR) was 0.07, below the 0.08 threshold, indicating excellent fit (Hair et al., 2022). Additionally, the unweighted least squares discrepancy (d_ULS) and Geodesic discrepancy (d_G) were 1.26 and 0.40, respectively, supporting the model's alignment with the data. The normed fit index (NFI) was 0.72, reflecting a robust fit (values near 1.0 indicate better fit). Together, these metrics confirm the proposed model's predictive accuracy and ability to effectively capture the complexities of household food waste reduction behaviors.

Analysis of R^2 and Q^2 Values

Table 5 presents the R^2 and Q^2 values for PBC, FWB and FWI with the R^2 values indicate how well the model explains the variance in each construct, while the Q^2 values reflect the model's predictive relevance. Both constructs show moderate predictive power, suggesting that the model can reasonably forecast food waste reduction behaviors and intentions, though there is room for improvement by refining variables.

Hypothesis Testing Results

The hypothesis testing results in Table 6 demonstrate that all proposed hypotheses are supported, indicating significant relationships between the study variables, including household food waste reduction intentions, behaviors, and key constructs such as lack of concern, perceived behavioral control, attitudes, and subjective norms, with *p*-values below .005 across all paths.

Table 4
Model Fit

	Saturated Model	Estimated Model
SRMR	.07	.09
d_ULS	1.26	1.87
d_G	.40	.42
Chi-Square	1359.38	1371.43
NFI	.72	.72

Note. SRMR = standardized root mean square residual, d_ULS = unweighted least squares discrepancy, d_G = geodesic discrepancy, NFI = normed fit index.

Table 5
Analysis of R^2 and Q^2 Values

Construct	R^2 Value	Explanation of Variance	Q^2 Value	Predictive Relevance
FWB	.38	The model accounts for 37.5% of the variance in food waste reduction behaviors, identifying significant influencing factors while indicating potential for improvement by refining variables.	.21	The model demonstrates moderate predictive relevance, reasonably forecasting food waste behaviors and supporting targeted interventions.
FWI	.38	The model explains 38.4% of the variance in FWI, with room for enhancement through additional psychological or contextual factors.	.27	The model's moderate predictive relevance effectively forecasts food waste reduction intentions, providing a basis for intervention strategies.
PBC	.14	The model shows low predictive relevance, suggesting unmodeled factors influence PBC and need further exploration.	.08	The model's low predictive relevance suggests unmodeled factors affect PBC, requiring further research to integrate them.

Note. FWB = household food waste reduction behavior, FWI = household food waste reduction intention, PBC = perceived behavioral control.

Table 6
Hypothesis Testing

	Hypothesis	β	*t*-Statistics	*p*-Values	Results
H1	FWI → FWB	.36	7.74	.00	Supported
H2	LC → FWB	-.14	3.01	.00	Supported
H3	LC → FWI	-.31	6.74	.00	Supported
H4	LC → PBC	-.37	8.60	.00	Supported
H5	PBC → FWB	.26	6.08	.00	Supported
H6	PBC → FWI	.18	3.84	.00	Supported
H7	AT → FWI	.15	3.91	.00	Supported
H8	SN → FWI	.23	4.51	.00	Supported

Note. FWB = household food waste reduction behavior, FWI = household food waste reduction intention, LC = lack of concern, PBC = perceived behavioral control, AT = attitudes, SN = subjective norms. * $p < .005$.

Discussion and Conclusion

Discussion of Main Results

This study examined the factors influencing food waste reduction intentions (FWI) and behaviors (FWB) in urban Vietnamese households, using the extended TPB framework (Ajzen, 1991). Among the TPB variables, PBC emerges as the most influential driver of FWI and FWB (H5: β = .26, $p < .005$). The PBC reflects practical factors such as access to resources, knowledge, and overcoming situational constraints, which are critical in urbanizing economies like Vietnam. Enhancing PBC through tools, skills, and infrastructure can help bridge the gap between intentions and actions (Damanik et al., 2024; Adaryani et al., 2024). The results show that PBC outweighs personal norms and environmental awareness, underscoring the need for practical tools and skills to enable effective waste management in convenience-driven cities like Ho Chi Minh City and Hanoi (Damanik et al., 2024; Setiawan et al., 2024).

Environmental awareness and norms are significant drivers of food waste reduction in developed economies. Evidence from the United Kingdom (Graham-Rowe et al., 2015), Italy (Viccaro et al., 2023),

France (Borgne et al., 2021), and Australia (McCarthy & Liu, 2017) highlights the importance of these intrinsic motivators. These findings underscore the role of culturally ingrained sustainability values in fostering waste-reduction behaviors across developed contexts. In Vietnam, PBC predominates, suggesting interventions should prioritize practical support over solely promoting environmental awareness (Pham et al., 2021).

Attitudes (AT) positively influence food waste reduction intentions (FWI) (H7: $\beta = .15$, $p < .001$), as beliefs about economic savings and environmental benefits motivate individuals to take necessary action. However, lack of concern (LC) negatively affects both FWI (H3: $\beta = -.31$, $p < .001$) and food waste reduction behaviors (FWB) (H2: $\beta = -.14$, $p < .001$). LC also undermines perceived behavioral control (PBC) (H4: $\beta = -.37$, $p < .005$), indicating that apathy and disengagement diminish individuals' confidence in managing food waste effectively (Damanik et al., 2024; Obuobi et al., 2024).

Raising awareness about the economic and environmental consequences of food waste could help mitigate LC, improve PBC and strengthen intentions. While positive attitudes affirm the TPB and align with findings from Obuobi et al. (2024) and Schrank et al. (2023), apathy linked to LC may undermine the effectiveness of these intentions, particularly when PBC is weak. Campaigns emphasizing the benefits of reducing food waste, such as cost savings and environmental protection, could foster more favorable attitudes and counteract LC.

Lack of concern and attitudes represent distinct drivers of food waste behaviors. Lack of concern reflects apathy and a lack of awareness, often leading individuals to prioritize convenience over responsibility. In contrast, attitudes drive intention by highlighting economic and environmental benefits. However, households with positive attitudes but high levels of lack of concern may struggle to translate intentions into behaviors, as apathy hinders their ability to act. Addressing both lack of concern and PBC is critical for bridging the gap between intention and behavior (Setiawan et al., 2024).

Subjective norms significantly influence FWI (H8: $\beta = .23$, $p < .005$), reflecting Vietnam's collectivist culture. Social pressures, including family expectations and community values, play a key role in shaping behavior (Setiawan et al., 2024; Damanik et al., 2024, Schrank et al., 2023; Ma et al., 2023). However, norms around food consumption, such as large meals or food gifting, often contribute to waste. Interventions emphasizing community pride and sustainable practices may strengthen SN's positive effects.

This study is grounded in TPB by introducing lack of concern as a distinct variable, highlighting psychological and situational barriers to sustainable behavior. While attitudes foster positive intentions, lack of concern identifies critical obstacles. In Vietnam's urbanizing context, PBC is particularly crucial, surpassing attitudes and subjective norms in influence. Practical measures like meal-planning tools, composting infrastructure, and food-sharing initiatives can enhance PBC and address behavioral gaps (Adaryani et al., 2024; Schrank et al., 2023; Zheng et al., 2023). By incorporating cultural norms, the extended TPB framework provides actionable insights for promoting sustainable consumption while respecting tradition.

Limitations

This study provides valuable insights but has limitations. The data focuses on urban households in Ho Chi Minh City, which may not reflect the experiences of rural or less urbanized areas in Vietnam, where food access, storage, and cultural attitudes toward waste can differ. Future research should include rural and semi-urban samples to capture food waste behaviors across diverse settings, allowing for comparative analysis between urban and rural households.

Additionally, snowball sampling limits generalizability due to the influence of respondents' social circles and localized practices. However, it was chosen for its efficiency and ethical access to a diverse sample. Future studies using probability-based sampling are recommended to improve representativeness and explore broader socio-cultural factors in food waste behaviors.

Implications for Behavioral Science

This study is grounded in TPB by demonstrating the central role of PBC in driving food waste reduction intentions and behaviors, especially in urbanizing contexts like Vietnam. The findings offer key implications:

Empowering individuals with tools and resources, such as meal-planning apps, storage guidance and composting infrastructure can strengthen PBC, bridging the gap between intention and behavior. Policymakers should address urban constraints, including limited space and reliance on convenience foods, to enable sustainable practices (Schrank et al., 2023; Setiawan et al., 2024).

As a distinct barrier, LC negatively impacts PBC and intentions. Awareness campaigns emphasizing the financial and environmental benefits of waste reduction can mitigate apathy. Media, influencers, and community-driven programs should promote waste reduction as a desirable and responsible practice.

In Vietnam's collectivist culture, family and community expectations strongly influence behavior (Ma et al., 2023; Nguyen, 2022). Campaigns that align waste reduction with social values, family pride, and community reputation can amplify subjective norms' impact (Nguyen, 2022). Engaging local leaders and organizing community events can further embed waste-conscious habits.

Urban planning policies should prioritize accessible composting, food-sharing networks, and community kitchens to support household waste reduction. Collaborative efforts among policymakers, businesses, and communities can foster shared responsibility for sustainability (Damanik et al., 2024; Setiawan et al., 2024).

Conclusion

This study highlights the critical role of PBC in driving food waste reduction in urban Vietnamese households, emphasizing the need for practical interventions tailored to urban challenges. By extending the TPB to include LC as a distinct barrier, the findings provide new insights into the psychological and situational factors influencing sustainable behaviors. Practical tools, awareness campaigns, and community-driven initiatives that address LC and enhance PBC can effectively bridge the gap between intention and action. These results offer a framework for developing culturally relevant strategies to promote sustainable consumption in rapidly urbanizing economies.

Declarations

Conflict of Interest: The authors declare no conflicts of interest.
Ethical Approval Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Human Research Ethics Committee of University of Finance - Marketing, Ho Chi Minh City, Vietnam (3219/QĐ-ĐHTCM, dated 29/11/2023).

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