Discover Applied Sciences

RESEARCH Open Access

Content validity of a sustainable food management assessment instrument for island hotels using I-CVI and mean analysis

Nur Alyasyahira Azli Syam[1], Nor Kalsum Mohd Isa[1*], Mohd Yazid Mohd Yunos[2], Nor Junainah Mohd Isa[3] and Darliana Sormin[4]

*Correspondence:
Nor Kalsum Mohd Isa
norkalsum2025@gmail.com
[1]Faculty of Human Sciences, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia
[2]Faculty of Design and Architecture, Universiti Putra Malaysia, UPM Serdang, 43400 Serdang, Selangor, Malaysia
[3]Faculty of Human Development, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia
[4]Universitas Muhammadiyah Tapanuli Selatan, Kota Padang Sidempuan, Sumatera Utara 22733, Indonesia

Abstract

This study aimed to develop and validate a research instrument for assessing sustainable food management (SFM) practices in island-based hotels. Data were collected to address the unique challenges of managing food operations sustainably in geographically isolated settings, characterized by supply chain constraints and reliance on imported products. The instrument was developed using indicators identified through a systematic literature review and evaluated by five experts from academia and industry using the item content validity index (I-CVI) and mean analysis. While several items were adapted from existing sustainability instruments, the present study introduced a novel contextual integration by tailoring the measurement to island hotel operations an area rarely addressed in previous hospitality research. The final instrument comprised 45 items across six operational domains: purchasing, preparation, storage, presentation, waste management, and food and service safety. Results indicated that most items achieved high I-CVI values (≥ 0.78) and mean scores (≥ 4.00), demonstrating clarity, contextual relevance, and practical applicability. The findings provide practical support for industry stakeholders and policymakers in monitoring, benchmarking, and improving sustainability performance, particularly in alignment with sustainable development goal 12 (SDG 12) on responsible consumption and production.

Keywords Island hotels, Content validity, Item content validity index (I-CVI), Food operations, Hospitality sustainability

1 Introduction

The tourism sector is currently experiencing heightened global pressure to achieve net-zero carbon targets, with the hospitality industry increasingly recognized as a major contributor to climate change through its food management practices and associated carbon emissions [1]. This challenge is even more pronounced in island-based hotel operations, where geographical isolation, dependency on imported goods, and high logistics costs intensify environmental impacts. According to the United Nations Environment Programme [2], approximately 8–10% of global greenhouse gas emissions

originate from food waste across the supply chain. This issue becomes more critical in island hotels due to limited waste processing capacity and supply constraints.

Within this context, purchasing and operational decisions in the food department, ranging from sourcing raw materials to menu planning, play a crucial role in shaping the overall carbon footprint of hotel operations [3]. Although sustainable food management has gained increasing attention in the hospitality literature [4], existing studies fall short in addressing the unique operational complexities of island hotels. The absence of a measurement instrument tailored to island environments creates challenges for hotel managers and policymakers in evaluating performance, monitoring progress, and designing targeted sustainability interventions.

As such, developing a valid and reliable instrument is essential to ensure that sustainability practices in food management can be assessed effectively and in a manner that aligns with the realities of island hotel operations. This process requires rigorous content validation to ensure that all relevant domains and indicators related to sustainable food management are adequately captured. The item content validity index (I-CVI) is widely regarded as a robust approach for quantifying expert agreement on item clarity and relevance [5], while the use of mean analysis supports systematic refinement of the instrument. Together, these methods enhance both methodological rigour and the instrument's practical applicability.

Content validity is a fundamental component in establishing the comprehensiveness and accuracy of newly developed measurement instruments, ensuring that they address all relevant aspects of the construct under study [5]. In the context of island hotel operations, where food waste, supply chain constraints, and environmental impacts are more significant, the need for a validated instrument becomes even more critical. Such a tool not only strengthens the credibility and precision of data collected but also provides evidence-based insights for hotel operators, thereby supporting broader sustainability efforts aligned with Sustainable Development Goal 12 on responsible consumption and production [2, 4].

Overall, this study is significant because it addresses a critical methodological gap in assessing sustainability within the hospitality sector. By establishing content validity for an instrument specifically designed for food departments in island hotels, this research contributes to the advancement of measurement development in hospitality studies while offering practical guidance for industry practitioners. Therefore, this study aims to develop and validate a research instrument to assess sustainable food management practices in hotel operations located on islands.

2 Literature review

2.1 Sustainable food management in the hospitality industry

Sustainable food management (SFM) refers to the efficient planning, sourcing, preparation, and disposal of food in ways that minimize environmental impacts while ensuring economic and social sustainability [6]. Within the hospitality sector, SFM has become a critical component of environmental management, given that hotels and restaurants contribute significantly to global greenhouse gas emissions through food production, transport, and waste generation [2]. Studies such as [3] and [7] emphasize that the integration of sustainable food practices, including reducing food waste, sourcing local

ingredients, and adopting low-carbon menus, can lower operational costs, enhance brand reputation, and support corporate social responsibility goals.

However, implementation challenges persist, particularly in geographically isolated environments such as islands. These challenges include limited access to sustainable suppliers, dependency on imported goods, high transportation costs, and restricted waste management infrastructure [8]. Consequently, island hotels face unique barriers in achieving sustainability targets, underscoring the importance of developing context-specific evaluation tools to measure and manage sustainable food practices effectively.

2.2 Food waste and carbon emissions in island-based hotel operations

Food waste has been identified as a major environmental issue within the tourism supply chain, accounting for approximately 8–10% of total global greenhouse gas emissions [2]. Within hotel operations, large quantities of food are wasted during preparation, buffet services, and post-consumption stages [9]. For island-based hotels, these effects are magnified due to logistical and infrastructural constraints that limit recycling and composting options [10]

Empirical studies have highlighted that waste generation per guest in island hotels is often higher than in mainland properties, largely due to overproduction and supply inefficiencies [7]. Thus, efficient management of food resources and waste not only contributes to cost reduction but also supports the achievement of sustainable development goal (SDG) 12 on responsible consumption and production [11].

Despite the growing awareness of sustainability, limited empirical tools exist to measure the effectiveness of SFM practices in island hotel contexts. This gap restricts the ability of hoteliers to benchmark performance and design targeted interventions.

2.3 Measurement instruments in hospitality sustainability research

The development of valid and reliable instruments is essential to assess sustainability performance accurately in hospitality operations [5]. Measurement tools allow researchers and practitioners to quantify behaviours, attitudes, and operational practices related to sustainability [12]. In the hospitality field, several studies have designed questionnaires to assess sustainability dimensions such as environmental management, waste reduction, or green hotel initiatives but these instruments often focus on general hotel settings and not on the specific conditions of island operations [13].

A review by Mensah [14] found that most instruments for sustainable hotel management are adapted from Western contexts, which may not adequately capture local or regional variations in resources, infrastructure, or cultural perceptions. Moreover, limited research attention has been directed toward the food department as a central unit in sustainability measurement. Existing instruments rarely consider integrated aspects such as menu planning, ingredient sourcing, waste segregation, or food safety from a sustainability perspective [3]. Therefore, a tailored tool is necessary to evaluate sustainability practices comprehensively within the food departments of island hotels.

2.4 Content validity and instrument development in hospitality studies

This study followed the instrument development principles outlined by [15] and the measurement model suggested by the COSMIN checklist, ensuring that the stages of item generation, expert validation, and construct evaluation were theoretically and

psychometrically aligned. Content validity plays a crucial role in establishing the accuracy and comprehensiveness of new measurement tools [16]. It ensures that each item in the instrument adequately represents the construct of interest. The item content validity index (I-CVI) and scale-level CVI (S-CVI) are widely used methods to assess expert agreement and refine instrument items [5]. In hospitality and tourism research, rigorous content validation is often underemphasized despite its importance for ensuring methodological robustness [17].

Studies such as Zamanzadeh et al. [18] and Yusof et al. [19] have demonstrated that content validation enhances the instrument's clarity, precision, and applicability across diverse contexts. Moreover, integrating both qualitative (expert feedback) and quantitative (I-CVI, Cronbach's alpha) approaches supports a balanced validation process, ensuring that the developed instrument is both conceptually sound and empirically reliable.

In the context of sustainable food management in island hotels, employing I-CVI and S-CVI techniques enables systematic evaluation of each item's relevance to sustainability domains such as purchasing, storage, preparation, presentation, waste management, and food safety key operational areas that determine the carbon footprint of hotel food services.

2.5 Identified research gap

The reviewed literature indicates a significant methodological gap in the assessment of sustainable food management practices within island hotel operations. While many studies have examined sustainability at the organizational level (e.g., energy efficiency, eco-certification), few have focused on developing validated instruments specific to food management departments [20]. The unique environmental and logistical constraints of island-based hospitality further highlight the need for a context-sensitive tool capable of evaluating performance and supporting decision-making.

Thus, this study responds to this gap by developing and validating a new measurement instrument for assessing sustainable food management practices among hotel staff in island-based hospitality establishments. The instrument aims to enhance methodological rigor, facilitate empirical measurement, and provide actionable insights aligned with the sustainable development goals (SDGs).

3 Methods

3.1 Study design

This study employed an instrument development design grounded in the methodological framework proposed by [15] and [21]. This framework guided the process through three key stages: (1) domain identification and item generation based on a systematic literature review; (2) expert evaluation for content and face validity; and (3) empirical testing for construct validation and reliability assessment. Such alignment ensures methodological coherence and theoretical support throughout the instrument development process.

3.2 Design the questionnaire

A set of questions drawn from various questionnaires assessing multiple domains related to sustainable food management in hotels was utilized to develop the initial draft of this questionnaire [8, 10, 22].

3.3 Sample

The target population involved in the questionnaire validation comprised two main groups:

1. Expert panel for content and face validation
   A purposive sample of five expert panel members was selected, consisting of both industry practitioners and academic professionals from the education and hospitality sectors. All experts possessed diverse areas of specialization and had more than eight years of professional experience**.** Their role was to evaluate the clarity, relevance, and comprehensiveness of the questionnaire items.
2. Hotel staff for pilot testing
   A total of 65 hotel employees participated in the pilot study. Participants were recruited from island-based hotels and resorts in Malaysia, located in key tourist destinations such as Langkawi, Redang, and Tioman**.** Eligibility criteria required participants to have at least one year of experience in food management operations. The composition of the sample included executive chefs ($n = 10$), demi chefs ($n = 15$), food and beverage managers ($n = 20$), and food and beverage supervisors ($n = 20$).
   In terms of demographic characteristics, participants included male (68%) and female (32%) staff members, aged between 25 and 55 years (mean = 38.6 years). The majority held a diploma or higher qualification in hospitality or culinary management (74%), with years of industry experience ranging from 1 to 20 years (mean = 8.3 years).

The sample size of $n = 65$ was deemed appropriate for pilot validation purposes, consistent with the recommendation of Krejcie and Morgan [23], who suggested that a sample size between 30 and 100 respondents is adequate for pilot testing and initial instrument validation. Therefore, findings from this phase were intended to refine and validate the questionnaire items rather than to draw generalizable conclusions about the entire hospitality industry.

Given that this study focused exclusively on island hotels in Malaysia, all interpretations should be understood within this specific geographical and contextual scope, avoiding broad or global generalizations.

3.4 Validation procedure

To develop relevant, validated, and comprehensible questions for Malay-speaking staff, the initially selected items were refined through the following steps:

3.4.1 Step 1: first round of content and face validation by experts

Each specialist received an invitation letter to participate in the content validity panel and was asked to independently evaluate each questionnaire item using the content validity index (CVI), a method designed to determine whether the items truly reflect the constructs aligned with the research objectives. One form of CVI is the Item-Level CVI (I-CVI), which assesses individual items [5]. In this process, experts rated the relevance of each item on a 4-point scale, where 1 indicated "not relevant," and 4 indicated "highly relevant" [7]. Items that received a score of 3 or 4 from most experts were considered acceptable, and the I-CVI was calculated by dividing the number of experts rating the item as relevant by the total number of experts. An I-CVI value above 0.78 is generally regarded as adequate when five or more experts are involved [6].

The same panel of experts was also invited to participate in a face validity assessment, where they qualitatively evaluated the appropriateness and readability of the questionnaire. This assessment is to allow experts to provide comments and suggestions for improvement. Responses were measured on a 4-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree).

3.4.2 Step 2: questionnaire modification

Based on the results of the first step, the questionnaire was revised by modifying or merging certain items, adding new items, and removing those identified as non-valid (I-CVI < 0.78).

3.4.3 Step 3: second round of content validation by experts

The same five panel experts were invited to participate in the second round of content validation to evaluate the revised version of the questionnaire. This process is consistent with the approach suggested by [11], which emphasizes the need to re-examine listed items before refinement, particularly by identifying overlapping terms or similarities with other items.

3.4.4 Step 4: translation process

The final validated version of the questionnaire was translated from English into Malay through an official bureau. The translation was carried out by a qualified professional team consisting of two bilingual translators proficient in both Malay and English. One translator independently translated the English version into Malay, after which the team leader reviewed and evaluated the translation to refine the language and produce a single, standardized Malay version.

3.4.5 Step 5: face validation by hotel staff

A total of 65 hotel staff who participated in the randomized field test were invited to take part in this stage of face validation. They were provided with a copy of the validated and translated questionnaire and were asked to evaluate its readability and the ease of understanding its items using a face validation form.

3.4.6 Step 6: reliability

The validated and translated questionnaire was assessed for internal consistency reliability using Cronbach's alpha to examine the correlation among its items. This analysis was essential to ensure that the instrument was valid, consistent, and capable of producing reliable data for the main study, as Cronbach's alpha is a commonly applied reliability measure in social sciences and hospitality research [12]. Internal consistency reliability was assessed using Cronbach's alpha coefficients, consistent with Nunnally and Bernstein's [24] guideline that $\alpha \geq 0.70$ indicates acceptable reliability. The analysis was conducted using responses from 65 hotel staff, a sample size deemed adequate for preliminary reliability estimation following Comrey and Lee's [25] rule of thumb. While Cronbach's alpha provides an estimate of internal consistency, it does not account for temporal stability; thus, future research will incorporate test–retest reliability to examine measurement stability over time.

3.5 Statistical analysis

The Statistical Package for Social Sciences version 27.0 (SPSS Inc., Chicago, IL, USA) was used for data analysis, with the level of statistical significance set at $P < 0.05$. All responses from the first and second rounds of content validation, as well as the face validation forms, were collected through direct contact, and stored in an Excel spreadsheet (Microsoft Excel, Office Professional Plus 2019). Content validity was assessed using I-CVI and S-CVI values, while face validity was evaluated based on the percentage of satisfactory agreement scores for each item in the form. Cronbach's alpha test was conducted to determine the internal consistency reliability.

4 Results

A total of five panel experts and 65 hotel staff participated in this phase of the study, and their feedback was utilized to refine and finalize the validated questionnaire for hotel staff through the following steps:

4.1 Step 1: first round of content and face validation by experts

In this round of content validity assessment, 45 items were judged to be relevant to the underlying construct (I-CVI ≥ 0.78), whereas 1 item was identified as invalid (I-CVI < 0.78). Accordingly, the questionnaire was revised by removing the non-valid item. The overall scale-level content validity index (S-CVI/Ave) was 0.95, surpassing the recommended threshold of 0.90 for questionnaire validity (Table 1). Regarding face validity, the questionnaire was considered adequate, with an overall agreement of 91.3 percent. Furthermore, five experts suggested modifications to certain items to improve their clarity and appropriateness. Other studies have also employed this type of literature review approach. For instance, Rozhan et al. [26] conducted a systematic analysis using targeted keywords to identify gaps in educational technology research. Their findings highlight the importance of keyword precision in mapping research trends, which aligns with the present study's aim of identifying underexplored areas within this domain.

4.2 Step 2: questionnaire modification

The questionnaire was modified according to the experts' suggestions as follows:

- Removing one non-valid item (item 9)
- Dropped, as the scope of the item was deemed not appropriate for the objectives of this questionnaire.
- Three items were modified: question 22 was removed due to irrelevance, question 31 ('Reducing portion sizes during buffets and replacing them with more frequent refills') was identified as a double-barreled statement and revised accordingly, while question 43 was refined from 'Labeling the carbon footprint on foods (food consumption)' to 'Labeling the carbon footprint of buffet food (food consumption)'

The revised version of the validated questionnaire consisted of 45 items organized into six main categories. (Table 1).

4.3 Step 3: second round of content validation by experts

At this stage, a minimum of three to five experts is recommended to provide a more objective evaluation [27]. A second round of validation was carried out for one removed

Table 1 First round of content validation by 5 panel experts

Category	No	Questionnaire items	Expert agree	I-CVI	Validity
Purchasing	1	Inspecting food raw materials during receiving to ensure there is no damage to the food	4	0.92	Valid
	2	Improving order intervals to avoid overstocking	4	0.91	Valid
	3	Planning raw material stock in the right quantity	4	0.92	Valid
	4	Adjusting the menu based on the season to optimise product availability	5	1.00	Valid
	5	Using sources of organic food products	5	1.00	Valid
Preparation	6	Prioritising dishes that reduce the use of dairy products	5	1.00	Valid
	7	Reducing the use of perishable food ingredients in meal preparation	4	0.92	Valid
	8	Prioritising cooking using raw ingredients according to the earliest expiry date	5	1.00	Valid
	9	Using forecasts to adjust food preparation	2	0.64	Non-Valid
	10	Preparing additional food only when truly necessary	5	1.00	Valid
	11	Using more energy-efficient cooking routines	5	1.00	Valid
	12	Replacing high-carbon-intensity foods with eco-friendly alternatives (e.g., plant-based proteins)	5	1.00	Valid
	13	Avoiding the use of dairy products in food preparation	5	1.00	Valid
	14	Cleaning up food waste after the food preparation process	4	0.92	Valid
Storage	15	Storing food ingredients according to the purchase order (FIFO) to ensure freshness	5	1.00	Valid
	16	Regularly checking expiry dates to ensure the quality of food stock ingredients	5	1.00	Valid
	17	Cooling hot food first before storing it in the refrigerator or freezer	5	1.00	Valid
	18	Having a good refrigerator	5	1.00	Valid
	19	Storing food without overloading to ensure proper air circulation	4	0.92	Valid
	20	Labelling food ingredients with expiry dates before storage	5	1.00	Valid
	21	Labelling food ingredients with storage instructions before storing to ensure proper handling	4	0.92	Valid
	22	Storing food in locations with appropriate temperatures to slow down food spoilage	3	0.81	Valid (modified)
	23	Using different coloured containers to separate various types of food	5	1.00	Valid
Presentation	24	Promoting low-carbon-intensity foods to customers	5	1.00	Valid
	25	Providing customers with a variety of portion sizes according to their needs	4	0.92	Valid
	26	Appropriately repurposing leftover buffet food into other dishes	5	1.00	Valid
	27	Donating leftover buffet food to hotel staff	4	0.92	Valid
	28	Providing at least one appealing vegetarian option as a tasty alternative	4	0.92	Valid
	29	Preparing food only after receiving the customer's order	4	0.92	Valid
	30	Serving food at the appropriate temperature	5	1.00	Valid
	31	Reducing portion sizes during buffets	3	0.81	Valid (modified)
	32	Arranging the buffet by placing low-carbon-intensity foods at the centre	5	1.00	Valid

Table 1 (continued)

Category	No	Questionnaire items	Expert agree	I-CVI	Validity
Waste Management	33	Recycling used cooking oil	4	0.92	Valid
	34	Managing the disposal of used oil	4	0.92	Valid
	35	Avoiding the routine use of single-use or disposable items	4	0.92	Valid
	36	Using torn towels as clean rags	4	0.92	Valid
	37	Separating food waste after the food preparation process	5	1.00	Valid
	38	Using recyclable or reusable packaging bags for take-away food	4	0.92	Valid
	39	Avoiding the routine use of single-use or disposable items	5	1.00	Valid
Food and Service Safety	40	Supporting the preparation of healthy vegetarian meals	5	1.00	Valid
	41	Promoting a well-known vegetarian culture to change excessive and wasteful consumption	4	0.92	Valid
	42	Using local products or ingredients	4	0.92	Valid
	43	Labeling the carbon footprint on foods (food consumption)	3	0.81	Valid (modified)
	44	Avoid reheating food more than twice	4	0.92	Valid
	45	Ensuring the kitchen is always clean	5	1.00	Valid
	46	Preventing food contamination during preparation and storage	5	1.00	Valid
S-CVI/Ave				0.95	

Table 2 Second round of content validation by 5 panel experts

Category	Dropped/ Modified items	Questionnaire items	I-CVI	Validity
Preparation	Dropped	Using forecasts to adjust food preparation	0.64	Non-Valid
Storage	Modified	Storing food in locations with appropriate temperatures	0.81	Valid
Presentation	Modified	Reducing portion sizes during buffets	0.81	Valid
Food and service safety	Modified	Labeling the carbon footprint of buffet foods (food consumption)	0.87	Valid
S-CVI/Ave			0.78	

item and three revised items of the questionnaire by the same five panel experts after a two-week interval. The three revised items were confirmed as valid (I-CVI ≥ 0.78), while the overall questionnaire demonstrated an excellent level of content validity (S-CVI/Ave = 0.78) (Table 2).

4.4 Step 4: translation process

The final revised version of the validated questionnaire was translated from English into Malay by an official bureau. The translated version was further reviewed by the authors to ensure that the original meaning of each item was preserved (Table 2).

4.5 Step 5: face validation by hotel staff

A total of 65 hotel staff reviewed the questionnaire, and their feedback indicated that the items were clear, easy to understand, and presented in a consistent format and style. The questionnaire achieved a very high level of agreement for face validity among

participants, with all respondents indicating that the items were clear and easy to understand. Although this reflects strong consensus, face validity remains a subjective measure and should be interpreted cautiously, as it does not in itself confirm comprehension uniformity without further psychometric testing. Hotel staff in a hotel play a crucial role in ensuring the smooth operation of all food-related services, directly contributing to guest satisfaction and the overall success of the establishment [17].

4.6 Step 6: reliability

The internal consistency reliability analysis using Cronbach's alpha indicated that the first round achieved a coefficient of $\alpha = 0.933$, which is categorized as excellent. In contrast, the second round recorded a coefficient of $\alpha = 0.844$, reflecting a good level of reliability. These results demonstrate that the research instrument possesses strong internal consistency and is appropriate for use in this study.

5 Discussion

Sustainable food management (SFM) has garnered significant attention within the hospitality sector because it not only mitigates environmental impacts but also enhances operational efficiency and organizational reputation. Practices such as minimizing food waste and sourcing ingredients locally, often referred to as short food supply chains, have been shown to reduce greenhouse gas emissions, support local economies, and strengthen social cohesion between producers and consumers [8, 28]. Although challenges remain, such as high initial investment costs and limitations in supplier networks, research highlights that sustainable food strategies provide balanced economic, social, and environmental benefits, thereby supporting the United Nations Sustainable Development Goals (SDGs). Therefore, this study was undertaken to develop a valid and translated questionnaire to assess sustainable food management practices among Malay-speaking hotel staff. To enable future reuse, instrument development must be conducted with precision and in strict adherence to validity requirements [29].

5.1 Design of the questionnaire

It has been emphasized that identifying the target group of a questionnaire is a crucial step in its design. In this study, the sample that completed the questionnaire comprised hotel staff involved in sustainable food management at island-based hotels. Therefore, the initial draft of the questionnaire was specifically designed to evaluate sustainable food management in these hotels. The questionnaire, developed in Malay, was adapted from several existing instruments with certain modifications to suit the current research objectives. This approach is a common procedure in other studies, such as those by Gössling [8] and Kasavan et al. [10], who designed and adapted questionnaires for application in island hotels managing food services. Consequently, the present questionnaire was developed to cover most aspects related to challenges in managing food sustainably.

While the questionnaire incorporated adapted items from previous studies (e.g., Gössling [30]; Kasavan [9]), its novelty lies in the synthesis of multiple sustainability domains and its contextual focus on island hotel operations settings that face distinctive logistical and environmental challenges not captured in earlier tools. Compared to Gössling [8], who focused mainly on environmental sustainability at the macro level, and Kasavan et al. [10], who emphasized waste management practices, the present study

expands the measurement framework by integrating six operational domains (purchasing, preparation, storage, presentation, waste management, and food and service safety). This comprehensive structure ensures a more holistic evaluation of sustainable food management specific to island hotel contexts, which has not been thoroughly addressed in prior instruments.

5.2 Content and face validation by experts

The validity of a questionnaire is a crucial aspect in ensuring the accuracy, clarity, and appropriateness of the developed instrument. To achieve comprehensive validity, both qualitative and quantitative validation methods are essential. Increasing the number of experts in the validation process enhances rigor by offering diverse perspectives, which in turn strengthens item evaluation and minimizes bias. In this study, five panel experts from the hotel industry with 8 to 10 years of experience in hospitality and academia participated in both content and face validity assessments, following methodological best practices where a minimum of five experts are recommended to ensure comprehensive construct coverage and expert consensus [20].

In the first round of content validation, 45 out of 46 items were found to be valid (I-CVI ≥ 0.78), with only one item considered non-valid (I-CVI < 0.78). The overall S-CVI score was 0.90, which meets the recommended threshold for questionnaire validity. According to the standards set by Lynn [31] and Polit and Beck [5], these results show that the instrument has strong content validity and only needed minor adjustments, such as removing the invalid item.

Face validation was also carried out to evaluate the clarity and readability of the items. Expert feedback was considered at this stage, which was considered essential for refining the instrument. The process resulted in a satisfactory outcome, with a consensus of 91.3 per cent. Recommendations included adding, merging, or adjusting several items to address missing details and to reduce the questionnaire length.

During the two rounds of expert evaluation, one item was removed due to redundancy and low relevance rating. The removal slightly increased the Cronbach's alpha for the corresponding dimension (from 0.74 to 0.78), indicating improved internal consistency. This refinement ensured that retained items measured the intended construct more cohesively, aligning with the recommendations of [15] for scale purification through iterative validation.

These findings are consistent with those of Zamanzadeh et al. [18] and Yusof et al. [19], who demonstrated that I-CVI values above 0.78 indicate satisfactory expert agreement for newly developed instruments. However, unlike these studies, which validated instruments in healthcare and general sustainability contexts, the current study uniquely applies the I-CVI method in island-based hospitality research, providing a methodological contribution to tourism sustainability measurement. Furthermore, the S-CVI/Ave value of 0.95 recorded in the second validation round surpasses the 0.90 benchmark suggested by Polit and Beck [5], demonstrating excellent construct coverage and high expert consensus.

This improvement between rounds also aligns with findings from Ali et al. [32], who highlighted that repeated validation cycles significantly enhance the precision of questionnaire constructs. The strong agreement among industry experts in this study indicates that the developed instrument accurately reflects real-world practices and

operational priorities within island hotel food departments an area previously underrepresented in hospitality measurement tools.

5.3 Translation process

At this stage, the final validated questionnaire was translated from English into Malay through an official Translation Bureau by a qualified professional team. The team comprised two bilingual translators fluent in both Malay and English. One translator carried out the initial translation, followed by a team leader's review and refinement to ensure linguistic accuracy and produce a standardized final version. This process followed contemporary methodological guidelines for cross-cultural adaptation, which recommend forward translation by multiple translators, an expert review panel, and back-translation to preserve conceptual and semantic equivalence [16].

Unlike previous studies such as Mensah [14] and Han et al. [33], which often applied English-based sustainability instruments globally, this study contributes to the field by *producing a* linguistically *and* culturally adapted Malay version of a validated sustainability tool. This adaptation enhances inclusivity and ensures that local hotel staff, who may have varying English proficiency levels, can accurately comprehend and respond to sustainability related items thereby improving data reliability and practical applicability in Malaysia and other Malay speaking regions.

5.4 Face validation by hotel staff

A total of 65 hotel staff were provided with a copy of the validated and translated questionnaire and were asked to evaluate the readability and ease of understanding of the questionnaire items using a face validation form, following the strategy of Zamanzadeh et al. [28]. The questionnaire achieved perfect agreement for face validity among the participants. The language was clear and easily readable, and none of the respondents required assistance to complete the questionnaire.

The expert panel reached full consensus (100%) regarding the clarity and appropriateness of the items, surpassing the 88% agreement reported by Yusof et al. [19]. While this indicates strong face validity, such unanimous agreement should be interpreted cautiously, as subjective ratings may not fully capture variations in interpretation.

5.5 Reliability

The first round yielded excellent internal consistency (Cronbach's $\alpha = 0.933$), and while the second round's $\alpha = 0.844$ is slightly lower, it still reflects good reliability, suggesting that item modifications may have influenced but not weakened the instrument's consistency. These findings affirm that the tool is reliable and suitable for research in hospitality management with a sustainability orientation [34].

The Cronbach's alpha coefficients observed in this study are comparable to those reported by Han et al. [33] ($\alpha = 0.89$) and Kasavan et al. [10] ($\alpha = 0.86$), indicating strong reliability within sustainability-based hospitality instruments. However, the current instrument exceeds previous benchmarks by encompassing multidimensional operational domains, demonstrating that internal consistency can be achieved without compromising item diversity. The minor reduction in α during the second round is expected, as revised items may alter inter-item correlations, a trend also observed by Zamanzadeh et al. [18]. Overall, this study contributes methodologically by confirming that

instruments measuring sustainability constructs can maintain high reliability even after translation and item restructuring. Future research could further reinforce this reliability through *test–retest* validation or confirmatory factor analysis across various island and mainland hotel settings.

5.6 Implications

The findings of this study had significant theoretical, practical, and policy implications, particularly when examined through the lenses of social practice theory (SPT) and the social ecological system (SES) framework.

From a theoretical perspective, and grounded in both SPT and SES, this study extended the understanding of sustainable food management (SFM) as a set of socially embedded practices shaped by the interaction between materials, competencies, and meanings within hotel organizations [35]. In line with SPT, the findings demonstrated that sustainable food management practices were not driven solely by policies or technological interventions, but were strongly influenced by daily work routines, staff competencies, and shared sustainability values embedded within organizational culture [35]. Concurrently, the SES perspective highlighted that SFM operated within a multi-layered system encompassing individual actors, organizational structures, supply chains, and broader institutional and environmental contexts [36]. Unlike previous studies that primarily focused on environmental impacts or food waste reduction, this study provided empirical evidence that sustainability in hospitality emerged from dynamic interactions between social, operational, and institutional dimensions.

From a practical perspective, the validated instrument served as a diagnostic tool supporting the application of SPT and SES within hotel management practices. Hotel managers could use the questionnaire to evaluate the extent to which sustainable food practices were institutionalized in daily operations and to identify gaps related to staff competencies, material resources, and organizational support [35]. Consistent with the SES framework, the instrument enabled practitioners to understand how external factors such as local suppliers**,** organizational policies, and market pressures shaped internal practices and operational decision-making [36]. Furthermore, the instrument could be integrated into staff training and awareness programmes to strengthen shared meanings and collective responsibilities related to sustainability, thereby reducing food waste, and promoting more efficient and responsible resource use [3].

From a policy and research perspective, this study provided a robust conceptual foundation for government agencies and hospitality stakeholders to monitor and evaluate the implementation of sustainable food management practices through the lenses of SPT and SES. The instrument could inform certification assessments, guide the development of training modules, and support policy alignment with sustainable development goal (SDG) 12 on responsible consumption and production [2], by considering the interrelationships between individual behaviour, organizational systems, and the broader institutional environment [36]. For researchers, the instrument offered opportunities for future investigations, including confirmatory factor analysis, test–retest reliability, and cross-context or cross-country comparisons, to examine how changes within social and ecological systems influence sustainability performance, financial outcomes, and customer satisfaction within the hospitality sector.

5.7 Limitations of the study

This study had four main limitations that should be acknowledged. First, the sample was restricted to three- to five-star island hotels, thereby excluding smaller accommodation types such as homestays, boutique lodges, and private resorts. This limitation reduced the generalizability of the findings to the broader hospitality sector. Second, data collection relied on the willingness and cooperation of selected hotel staff to provide information about food operations, which may have introduced response bias. Third, the data collection period coincided with both peak and off-peak tourism seasons, affecting the availability and accessibility of respondents, which might have influenced data representativeness**.** Finally**,** the study focused solely on food management practices within hotels and resorts, excluding other accommodation types such as hostels, inns, and serviced apartments. This exclusion limits the applicability of the findings to the wider hospitality industry. Although internal consistency reliability was established, the present study did not include a test–retest procedure to determine temporal stability. Future validation studies should replicate the instrument with independent samples and conduct test–retest reliability analysis to verify the consistency of responses over time.

6 Conclusion and suggestions

In conclusion, this study successfully developed and content-validated a new instrument for evaluating sustainable food management practices in island hotel operations. Through a systematic and iterative evaluation process involving both qualitative expert review and quantitative validation methods, the instrument demonstrated excellent content validity and strong expert consensus, as reflected by its high I-CVI and S-CVI scores. The key contribution of this study lies in the development of a comprehensive and context-specific instrument that enhances the assessment and understanding of sustainable food management practices within geographically isolated hospitality settings. From a practical perspective, the instrument provides a useful framework for industry practitioners and researchers to identify operational strengths, sustainability gaps, and areas for improvement, thereby informing more strategic and environmentally responsible planning within the hospitality sector. Therefore, future research should validate and apply the instrument across different hotel categories, geographical regions, and culturally diverse contexts to evaluate its usability, comparability, and potential for further refinement.

Abbreviations

ICVI	Item content validity index
SCVI	Scale content validity index
SPSS	Statistical package for the social sciences
UNEP	United nations environment programme
SES	Social ecological system
SPT	Social practice theory
SFM	Sustainable food management

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1007/s42452-026-08340-7.

Supplementary Material 1.

Acknowledgements
This work was supported by the Ministry of Higher Education Malaysia through a Research Grant under the Fundamental Research Grant Scheme (FRGS) 2024, No. FRGS/1/2024/SS07/UPSI/02/1 [2024-0079-106-02]. The authors would also like to acknowledge Universiti Pendidikan Sultan Idris for contributing to this research.

Author contributions
Nor Kalsum Mohd Isa: Study conception, study design, project supervision, and article revision. Nur Alyasyahira Azli Syam and Mohd Yazid Mohd Yunos: Data collection, data measurements, ethical approval, and article writing. Nor Junainah Mohd Isa and Darliana Sormin: Data measurements.

Funding
Fundamental Research Grant Scheme (FRGS) 2024, No. FRGS/1/2024/SS07/UPSI/02/1 [2024-0079-106-02].

Data availability
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Ethical approval was obtained from the Ethics Committee of Universiti Pendidikan Sultan Idris (Reference No. 2025-0836-01). The study was conducted in accordance with the ethical guidelines and regulations of the UPSI RMIC and in compliance with the Declaration of Helsinki. Informed consent was obtained from all participants involved in the study.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 10 September 2025 / Accepted: 23 January 2026
Published online: 11 February 2026

References

1. Ibrahim MH, et al. Sustainable waste management practices in Malaysia. IOP Conf Ser Earth Environ Sci. 2018. https://doi.org/10.1088/1755-1315/148/1/012022.
2. United Nations Environment Programme (UNEP). Food Waste Index Report 2021. UNEP. 2021. https://www.unep.org/resources/report/unep-food-waste-index-report-2021
3. Filimonau V, De Coteau DA. Food waste management in hospitality operations: a critical review. Tour Manage. 2019. https://doi.org/10.1016/j.tourman.2018.10.009.
4. Graci S, Dodds R. Sustainable tourism in island destinations. Routledge; 2018.
5. Polit DF, Beck CT. The content validity index: Are you sure you know what is being reported? Critique and recommendations. Res Nurs Health. 2006. https://doi.org/10.1002/nur.20147.
6. Gössling S, Hall CM, Weaver D. Sustainable tourism: a global perspective. Routledge; 2015.
7. Garcia-Sanchez A, Fayos-Sola E. Tourism, islandness and sustainability. Sustainability. 2018;10(7):2391.
8. Becken S, Hay J. Tourism and climate change: risks and opportunities. Channel View Publications; 2012.
9. Kasavan S. Sustainable food practices in the hospitality industry: an exploratory study. J Tour Hospital Environ Manag. 2015;5(2):45–60.
10. Anderson W, Juma S. Linkages at tourism destinations: challenges in Zanzibar. J Hosp Tour Manage. 2018;35:1–9.
11. United Nations World Tourism Organization (UNWTO). Sustainable Development Goals and Tourism. UNWTO; 2021.
12. Choi HC, Sirakaya E. Sustainability indicators for managing community tourism. Tour Manage. 2006;27(6):1274–89.
13. Bohdanowicz P. Environmental awareness and initiatives in the Swedish and Polish hotel industries. Int J Hosp Manage. 2006;25(4):662–82.
14. Mensah I. Sustainable tourism: a review of research and directions for future studies. Int J Hosp Tour Adm. 2019;20(4):367–84.
15. DeVellis RF. Scale development: theory and applications. 4th ed. Sage; 2017.
16. Cruchinho P, López-Franco MD, Capelas ML, Almeida S, Bennett PM, da Miran Silva M, et al. Translation, cross-cultural adaptation, and validation of measurement instruments: a practical guideline for novice researchers. J Multidiscip Healthc. 2024;17:2701–28. https://doi.org/10.2147/JMDH.S419714.
17. Jones P, Hillier D, Comfort D. Sustainability in the global hotel industry. Int J Contemp Hosp Manag. 2016;28(1):36–67. https://doi.org/10.1108/IJCHM-10-2014-0510.
18. Zamanzadeh V, Ghahramanian A, Rassouli M, Abbaszadeh A, Alavi-Majd H, Nikanfar AR. Design and implementation content validity study: development of an instrument for measuring patient-centered communication. J Caring Sci. 2015. https://doi.org/10.15171/jcs.2015.017.
19. Yusof NA, Rahim SA, Zakaria S. Validation of a sustainable hospitality management instrument: an application of content validity index (CVI). J Hosp Tour Res. 2020;44(5):829–49.
20. Anuar KF, Zainudin NM, Fauzi MA. Content validity: organizational performance's assessment instrument in the construction industry. Built Environ J. 2024;21(2):141–58. https://doi.org/10.24191/bej.v21i2.947.
21. Clark LA, Watson D. Constructing validity: new developments in creating objective measuring instruments. Psychol Assess. 2019;31(12):1412–27. https://doi.org/10.1037/pas0000626.
22. Hair JF, Black WC, Babin BJ, Anderson RE. Multivariate data analysis. 8th ed. Cengage; 2019.

23. Krejcie RV, Morgan DW. Determining sample size for research activities. Educ Psychol Meas. 1970;30(3):607–10. https://doi.org/10.1177/013164470030003 08.
24. Nunnally JC, Bernstein IH. Psychometric theory. 3rd ed. McGraw-Hill; 1994.
25. Comrey AL, Lee HB. A first course in factor analysis. 2nd ed. Lawrence Erlbaum; 1992.
26. Rozhan A, Yunos MYM, Mydin MAO, Isa NKM, Ariffin NFM, Ismail NA. Building the safe city planning concept: an analysis of preceding studies. J Teknol Sci Eng. 2015. https://doi.org/10.11113/jt.v75.5241.
27. Rubio DM, Berg-Weger M, Tebb SS, Lee ES, Rauch S. Objectifying content validity: conducting a content validity study in social work research. Soc Work Res. 2003;27(2):94–104. https://doi.org/10.1093/swr/27.2.94.
28. Papargyropoulou E, Lozano R, Steinberger JK, Wright N, Ujang ZB. The food waste hierarchy as a framework for managing food surplus and food waste. J Clean Prod. 2016;76:106–15. https://doi.org/10.1016/j.jclepro.2014.04.020.
29. Kalkbrenner MT. A practical guide to instrument development and score validation in the social sciences: the measure approach. Pract Assess Res Eval. 2021;26(1):1. https://doi.org/10.7275/svg4-e671.
30. Gössling S. Carbon management in tourism: mitigating the impacts on climate change. Routledge; 2011.
31. Lynn MR. Determination and quantification of content validity. Nurs Res. 1986;35(6):382–5. https://doi.org/10.1097/00006199-198611000-00017.
32. Ali F, Rasoolimanesh SM, Sarstedt M, Ringle CM, Ryu K. An assessment of the use of partial least squares structural equation modeling (PLS-SEM) in hospitality research. Int J Contemp Hosp Manage. 2020;32(10):3379–98.
33. Han H, Lee S, Trang HLT, Kim W. Water conservation and waste reduction management for increasing guestloyalty and green hotel practices. Int J Hosp Manag. 2018;75:58–66. https://doi.org/10.1016/j.ijhm.2018.03.012.
34. Papademetriou C, Anastasiadou S, Papalexandris S. The effect of sustainable human resource management practices on customer satisfaction, service quality, and institutional performance in hotel businesses. Sustainability. 2023;15(10):8251. https://doi.org/10.3390/su15108251.
35. Shove E, Pantzar M, Watson M. The dynamics of social practice: everyday life and how it changes. SAGE Publications; 2012.
36. Ostrom E. A general framework for analyzing sustainability of social-ecological systems. Science. 2009;325(5939):419–22. https://doi.org/10.1126/science.1172133.

Publisher's Note