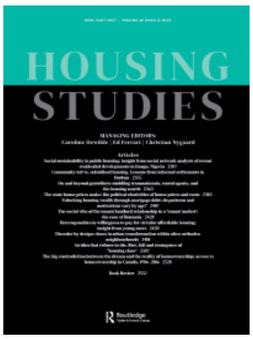

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Heterogeneities in willingness to pay for circular affordable housing: insight from young users

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ABSTRACT

Circular affordable housing (CAH) is crucial to advancing sustainability, but the lack of empirical evidence on users' active attitudes towards circularity limits its applicability. To fill this gap, this study utilizes discrete choice experiments to thoroughly explore young users' preferences and willingness to pay for a circular business model (CBM) in affordable housing by considering Dutch and Taiwanese cultural contexts. The analyses highlight the four key attributes that an acceptable CBM for young users in affordable housing should possess: the incorporation of a certain proportion of reused materials, provision of green facilities, availability of furniture services, and effective energy-saving and waste management. Furthermore, young users are willing to allocate 2.5–5% of their monthly income to support the implementation of CBM, which is beneficial for the adoption of CBM in ongoing affordable housing projects worldwide. The attribute preferences of young users in Taiwan and the Netherlands differ due to varying socio-economic characteristics, sustainability attitudes, and distinct cultural patterns within both societies. Consequently, this paper offers recommendations for governments to expedite the development of CAH.

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KEYWORDS
Circular economy; affordable housing; circular business model; willingness to pay; sustainability attitude

Introduction

Adequate housing is regarded as an inherent and fundamental human right; however, the rise of the housing crisis and high housing prices remain major global problems (Lee *et al.*, 2022). In response to these challenges, governments globally have formulated various housing policies to improve housing adequacy, including affordable housing, which has the following characteristics: projects receive part of the funds or subsidies from governments, mainly for rental purposes; income eligibility requirements; and units for short-term use (Czischke & van Bortel, 2018). Due to socio-economic changes, affordable housing is no longer limited to lower-income households but has also expanded to include middle-income groups (Anacker, 2019),

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especially young adults (Ronald *et al.*, 2023), who have short-term rental accommodation needs. In addition, cities face the challenge of decarbonizing to cope with climate change.

In this context, several governments in developed societies, including the Netherlands and Ireland, have taken a significant step by introducing a circular business model (CBM) into affordable housing projects (Larsen *et al.*, 2022). In this study, these projects are referred to as circular affordable housing (CAH). Specifically, CAH can be defined as an affordable housing project integrated with the applicable CBM, wherein the design, construction, facilities, and services of affordable housing projects adhere to the principles of a circular economy (CE) to maximize resource utilization and minimize adverse environmental impact. Moreover, some developing societies, including Malaysia and Taiwan, have directed their attention towards planning CAH, even though their policy agendas in the CE are still largely in the infancy stages (Wu *et al.*, 2021).

CAH serves as an innovative pilot project for future residential buildings and substantially contributes to a transition for the built environment, which has garnered significant attention worldwide. However, the implementation of a CBM in affordable housing, with its focus on innovative designs, services, and technologies, may result in higher operation and service costs (van Loon & Van Wassenhove, 2020). It is uncertain whether users of affordable housing are willing to pay these costs. Additionally, CBM implementation often overlooks the specific preferences of housing users because housing developers typically provide standardized plans (Chan & Adabre, 2019).

To ensure the success of CAH, it is crucial to understand user preferences and their willingness to pay (WTP) for CBM implementation. While several studies have indicated a growing willingness among residents to pay for specific circular practices in the housing sector, such as household waste management (Nainggolan *et al.*, 2019) and the adoption of renewable energy (Balezentis *et al.*, 2024), a notable research gap remains concerning users' preferences and WTP for the CBM, particularly within the affordable housing sector. Without comprehensive user insights, the implementation of CBM may face substantial challenges, potentially leading to residential dissatisfaction in CAH projects.

To address this knowledge gap, this study aims to understand the actual preferences and WTP of young users to propose a user-centred CBM for affordable housing projects. The focus is on young adults aged 20–30, who represent a substantial demographic for affordable housing (Ronald *et al.*, 2023). The preferences and willingness of this age group can potentially shift future building designs towards circularity in the private housing sector, as they are prospective homebuyers (Kim *et al.*, 2021). Furthermore, exploring variations in user preferences between developed and developing societies can offer valuable insights for a wide range of communities. Accordingly, the Netherlands and Taiwan are selected as the study areas. The main research objectives are (1) establishing CBM attributes specific to affordable housing, (2) identifying the similarities and differences in preferences and WTP for CBM among young people in Taiwan and the Netherlands, and (3) presenting an adaptive CBM proposal for affordable housing plans.

To achieve these objectives, this paper is divided into seven parts. After the introduction, Section 2 reviews the theory of affordable housing, CBM attributes, and the factors influencing young adults' WTP. Subsequently, Sections 3 and 4 introduce the study areas and methodology. The results of the survey and empirical models are presented in Section 5, whereas Section 6 discusses the key findings. The final section presents the conclusions.

Literature review

Theory of affordable housing

Affordable housing, developed from the Keynesian welfare state, such as egalitarianism, managerialism, and income distribution (Friedman & Rosen, 2019), has emerged as pivotal within housing policy and research. Gradually, a scholarly consensus has been reached regarding the interpretation of affordable housing, which typically targets low- and middle-income groups and serves as an intermediary between market and social rents (Anacker, 2019; Czischke & van Bortel, 2018). Since the 1990s, the term 'housing needs' has shifted towards the market-oriented term, 'housing affordability', driven in part by political machinations to align housing policies with neoliberal economic principles (Friedman & Rosen, 2019). Despite the widespread adoption of the term 'affordability', its definition remains nebulous and subjective, fuelling ongoing debates regarding the feasibility and efficacy of affordable housing. In particular, given the increasing emphasis on sustainability, affordable housing frequently serves as a pilot project for introducing sustainable concepts, such as CE. Notably, whether the costs associated with implementing sustainable practices can be borne by the targeted residents without compromising affordability is debatable (Charoenkit & Kumar, 2014). Some researchers argued that investing in the sustainable aspects of affordable housing is necessary, considering the long-term operational benefits and positive externalities, such as health and community benefits (MacAskill *et al.*, 2021). However, research on how the CE concept can be effectively applied to affordable housing while ensuring affordability is limited.

Circular business model in buildings

The CE is a production and consumption model that aims to enhance resource management, and it analyses resource flows in cities, buildings, and communities to identify commercial and innovational opportunities (The European Commission, 2015). According to Pretner *et al.* (2021), circular products designed using the CE concept are generally either made from recycled materials or designed to be durable for resale as second-hand items. Nevertheless, the characterization of circular buildings should not be limited to these two considerations. In fact, a truly circular building are the tangible outcomes resulting of applying a CBM that considers building designs, facilities, and services aligned with CE concept, thus benefiting users (or communities) and the living environment.

The CBM is an innovative business model for creating value through the implementation of CE. It is centred on preserving the economic worth of products beyond

their initial use and leveraging them for new market opportunities where applicable (Linder & Williander, 2017). To facilitate the practical implementation of CBM, the Ellen MacArthur Foundation (2015) proposed the ReSOLVE framework, which consists of six key business actions: (1) *Regenerate*. To restore land and protect ecosystems to maintain and enhance environmental biocapacity; (2) *Share*. To enable the enjoyment of product value without ownership by utilizing resources, tools, knowledge, or infrastructure; (3) *Optimize*. To maximize efficiency or minimize the wastage of resources, components, and materials through technological and biological cycle improvements; (4) *Loop*. To keep resources within closed loops by promoting remanufacturing, recycling, reusing, and repurposing to extract value from waste and return it to the economy; (5) *Virtualize*. To deliver value without physical materialization through virtualization by utilizing digital technologies and analysis; (6) *Exchange*. To reallocate resources to improve or maintain the equal value of products and services.

The ReSOLVE framework is used to navigate social responsibility and circularity in business decisions (Jabbour *et al.*, 2019). Specifically, by adopting this framework, businesses can rethink the level of circularity and identify new market opportunities (Sell *et al.*, 2023). This empowers companies to drive innovation and foster economic resilience, thus making the ReSOLVE framework a practical and crucial guide for businesses integrating circularity through financial, environmental, and social metrics.

CBM attributes for affordable housing

The set of CBM attributes that comprise its structure elucidate how CBM facilitates the transition of housing sectors towards the CE. Leising *et al.* (2018) examined three circular building cases in the Netherlands and summarized nine attributes. They found that utilizing renewable energy, providing shared facilities, enhancing management, and adopting reused materials have been actively included in the building CBM across these cases. Moreover, Ghafoor *et al.* (2023) conducted an integrative literature review on the CBM in the housing sector. They suggested that attributes should be identified based on three vital aspects, namely energy, material, and space, to enhance efficiency, longevity, and sufficiency, thus enabling a CE in housing. These prior studies provide insights into and references for the CBM attributes for buildings based not only on the knowledge body but also on real cases. Therefore, this paper reviewed the studies on these attributes and identified seven applicable attributes in the CBM for affordable housing (see Table 1): the reuse of building materials, green facilities, furniture services, shared social spaces, energy and waste management, facilities management, and monthly service costs.

These CBM attributes were determined by considering that they can influence the users' living qualities and can be measured objectively (Chau *et al.*, 2010). The attributes were subsequently grouped into four dimensions: (1) *Environment*, with a focus on mitigating environmental harm and improving occupant health; (2) *Service*, aimed at enhancing users' quality of life and promoting inclusivity; (3) *Management*, focused on optimizing operational efficiency and extending the lifespan of building assets; and (4) *Cost*, reflecting user affordability and their WTP for attributes in the other dimensions during a housing operation. A detailed account

Table 1. Association of three levels of CBM attributes with the ReSOLVE framework.

Dimensions		Attributes	Levels	Descriptions	ReSOLVE framework: six business actions						Code
					Regenerate	Share	Optimize	Loop	Virtualize	Exchange	
Environment (Eberhardt *et al.*, 2020)	1	Ratio of reused building materials (Lo, 2017; Rasmussen *et al.*, 2020)	1	0%: The housing is built with no reused building materials.	N/A						1.1
			2	50%: The housing is partly built with reused building materials.	•					•	1.2
			3	100%: The housing is built with a large proportion of reused building materials.	•		•	•			1.3
	2	Green facilities (Fallmann & Emeis, 2020)	1	Not provided	N/A						2.1
			2	General: Small green space (e.g. roof garden) with complex vegetation patterns for gardening. Offering basic outdoor furniture.	•	•					2.2
			3	Suitable: Large green space (e.g. roof garden) with complex vegetation pattern. Offering basic outdoor furniture, gardening tools (rented), and equipment (rented) for residents.	•	•		•		•	2.3
Service (Leising *et al.*, 2018)	3	Furniture services (Leising *et al.*, 2018)	1	Not provided	N/A						3.1
			2	Basic: Basic and fixed furniture is provided.		•					3.2
			3	Advanced: Various furniture is provided, and residents can also choose and rent (online service is provided).		•		•	•	•	3.3
	4	Shared social space (Joensuu *et al.*, 2020; Jussila *et al.*, 2023)	1	Not provided	N/A						4.1
			2	Basic: Provide a few basic shared spaces for residents.		•					4.2
			3	Various: Different types of shared spaces with good space management (e.g. space reservation) are provided for residents.		•	•				4.3

(*Continued*)

Table 1. Continued.

Dimensions		Attributes	Levels	Descriptions	ReSOLVE framework: six business actions						Code
					Regenerate	Share	Optimize	Loop	Virtualize	Exchange	
Management (Joensuu *et al.*, 2020)	5	Energy and waste management (Wang & Geng, 2011)	1	Basic: A general energy system is provided, but no recycling management.	N/A						5.1
			2	Good: Renewable energy systems, such as solar panels and recycling management, are provided.	•					•	5.2
			3	Comfortable: Home automation and renewable energy systems are provided; all waste, including water and food waste, is managed.	•		•		•	•	5.3
	6	Facilities management (Elmualim *et al.*, 2018; Joensuu *et al.*, 2020)	1	On average: Basic services, such as security, are provided.			N/A				6.1
			2	Good: Equipment maintenance and solutions to the living problems of residents are provided.			•				6.2
			3	Excellent: Equipment maintenance and efficient residential management (online services) are provided.			•		•		6.3
Cost (He *et al.*, 2019)	7	Monthly service cost (Government of the Netherlands, 2022; Taiwan Institute of Property Management, 2018)	The Netherlands								
			1	€25			N/A				7
			2	€35							
			3	€45							
			Taiwan								
			1	NT$960 (€28.95)			N/A				7
			2	NT$1120 (€33.78)							
			3	NT$1280 (€38.61)							

Note. The monthly service cost is based on the average monthly rent of a one-bedroom unit. The monthly service cost in Level 1 accounts for 9% of rent (€300) in Taiwan. The monthly service cost in Level 1 accounts for 3% of rent (€750) in the Netherlands.

of how these attributes were employed within the experimental design is provided in the methodology section.

Young adults' willingness to pay

Economic viability is crucial for CBM operation. Current studies have indicated that users' attitudes and their WTP for circular products remain critically understudied (Planing, 2018). WTP reflects the maximum price a consumer can agree to pay for products or services, signifying the true value they place on the product in terms of its utility. Consumers' WTP is often affected by the additional features of the product. Specifically, when consumers prefer these additional features, they tend to believe that the product has relatively higher quality, thus increasing the price they are willing to pay (Pretner *et al.*, 2021). In particular, consumer WTP is highly affected by products with positive environmental attributes and sustainability labels. According to Xia & Zeng (2008), the WTP for sustainable products is often 5–20% more than that for original products.

Previous studies have delved into the WTP for green housing business models, particularly on the preferences of young demographics. For instance, He *et al.* (2019) found that young adults are willing to pay for attributes, such as green space and water-saving systems in green housing. Additionally, Abreu *et al.* (2020) concluded that the younger generation not only has a deeper understanding of energy efficiency but also exhibits a higher willingness to invest in energy renovations for housing than the elderly. Gomes *et al.* (2023) highlighted young individuals' heightened awareness of the added value of green-certified housing, indicating confidence in its quality. However, confidence in circularity in buildings is not widespread, as consumer opinions are divided into two opposing camps. One camp argues that implementing circularity in buildings can significantly reduce natural resource depletion (Nußholz *et al.*, 2020). Conversely, others raise concerns regarding potential contamination risks during recycling or the perception of reduced hygiene associated with, for instance, reused materials (Wallin *et al.*, 2021). Thus far, evidence on how young adults perceive circularity in the affordable housing sector is lacking, underscoring the necessity of this research.

Influential factors for willingness to pay

The perspectives and WTP of users are substantially associated with their socio-economic characteristics and sustainability attitudes.

Socio-economic characteristics

Specific individual characteristics associated with positive WTP for sustainable products have been observed. For instance, females have shown a greater inclination towards such products (Liu *et al.*, 2019), as have individuals with higher levels of education (Golbazi *et al.*, 2020) and higher incomes (Shao *et al.*, 2018). Age is another crucial variable, though its impact is a subject of debate. While Vecchio &

Annunziata (2015) reported an increase in WTP for environmentally friendly products with age, the findings of Bigerna *et al.* (2021) contradict this.

Sustainability attitudes

These attitudes encompass awareness and behaviours related to sustainability, which plays a critical role in consumption decisions (Wang *et al.*, 2022). As defined by Kollmuss & Agyeman (2002), sustainability awareness includes knowledge and perception of sustainability as a concept and the associated issues. Sustainable behaviour pertains to the choices individuals make in their daily lives, which can have direct or indirect implications for the environment (Francis & Sarangi, 2022). In theory, increased sustainability awareness should lead to sustainable behaviours. However, Chaturvedi *et al.* (2022) pointed out that the translation of sustainability awareness into active consumption behaviour does not always occur.

Furthermore, current cross-cultural studies suggest that sustainability attitudes may also be influenced by culture in society as a whole. For instance, in Malaysia, Al Mamun *et al.* (2018) found that lower-income residents tend to have higher environmental concerns and are more willing to pay for eco-friendly products, mainly due to the impact of social norms. Ur Rahman *et al.* (2021) further emphasized that individuals in collectivistic societies tend to make decisions for sustainable consumption, as they prioritize adherence to social norms and seeking social approval. However, Chwialkowska *et al.* (2020) suggested that sustainable consumption is more likely to occur in individualistic societies, as egoistic considerations primarily drive consumers.

Research contexts

The Netherlands and Taiwan were chosen in this paper as illustrative cases of developed and developing societies, respectively, based on the following considerations. They represent distinct cultural contexts, spanning the Western and Eastern spheres, and exhibit differing rates of CE promotion. However, they share similarities in terms of demographic size and relatively high living standards. Moreover, Taiwan's pursuit of affordable housing and promotion of CE practices has been significantly influenced by Western European models, particularly those from the Netherlands (Yu *et al.*, 2023). This influence is evident in many pilot projects across Taiwan, which draw inspiration from Dutch initiatives, thereby introducing the CE principle into affordable housing (Chen *et al.*, 2020). Thus, comparing two societies can offer valuable insights (Chen *et al.*, 2020; Tserng *et al.*, 2021).

Similarities and differences between The Netherlands and Taiwan

The Netherlands supports a population of approximately 17.6 million residents and possesses a high standard of living. This is reflected in its robust economy, with a GDP per capita of €52,074 and a purchasing power parity (PPP) of €59,948 (World Economics, 2022). Meanwhile, Taiwan, with approximately 23.8 million residents, stands out as a developing society with impressive economic development (Kim &

Heo, 2017). Although GDP per capita in Taiwan is lower than in the Netherlands, at €30,964, its PPP is close to that of the Netherlands, at €59,220 (World Economics, 2022). Another similarity between the two is the percentage of young adults (aged 20–30), who comprise 13%–14% of the total population in both societies (Executive Yuan R.O.C. (Taiwan), 2020; Statista, 2023). In both societies, this group is typically highly educated and plays a leading role in technological advancements, cultural movements, and social progress.

In Western societies, such as the Netherlands, independence is highly valued. Young Dutch individuals typically leave home at around 23.6 years and buy their first homes at about 28 years (Bernstein & Struyven, 2022; Kutlák, 2021). Families in the Netherlands tend to be smaller, with fewer households where multiple couples live together (Kalmijn & Saraceno, 2008). In contrast, the maintenance of dense kinship networks is emphasized in Taiwanese societies. Young adults often stay with their parents until around age 33 and buy their first homes at approximately 35 years (Li & Hung, 2019; Lin *et al.*, 2014). Even after marriage, it is common for them to continue living with their parents (Li & Hung, 2019). These norms and cultural differences suggest tendencies towards individualism in the Netherlands and collectivism in Taiwan.

Additionally, despite both societies being in the 'just before acceleration' phase of CE development (Cramer, 2022), their paces of CE promotion differ. The Netherlands initiated its CE policies in 2016 to achieve full circularity by 2050. These policies encompass various sectors and value chains, including manufacturing, food, and education. In contrast, CE policies in Taiwan were formulated in 2018 and are still in their infancy (Wu *et al.*, 2021). Moreover, Taiwan's CE policies focus on transitioning critical industries, such as information technology, the biomedical industry, and manufacturing, rather than encompassing a comprehensive transition.

Affordable housing in Taiwan and The Netherlands

In the Netherlands, the planning and provision of affordable housing are subject to government intervention, with supervision of rent regulations by housing associations. To ensure affordability, the monthly rent for such housing typically falls within the range of €700–€900 to prevent market forces from driving rents to unaffordable levels (Czischke & van Bortel, 2018). Moreover, to be eligible for affordable housing, individuals must have an annual income below €61,148 but above €6390.8 (Government of the Netherlands, 2022). Notably, this income threshold is met by a significant portion of the young Dutch population aged 20–30, given that the average annual income within this age group stands at €24,816 (Statista, 2021).

In Taiwan, the government typically oversees the early phases of affordable housing, which include land allocation, planning, and rent regulation supervision. The rent for housing units is limited to €270–€600 (Construction and Planning Agency of R.O.C. (Taiwan), 2017). Additionally, to qualify for these units, the annual income should be below €23,407 but above €13,080. Similar to the Netherlands, most young adults in Taiwan meet this standard, with an average annual income of €13,956 (Executive Yuan of R.O.C. (Taiwan), 2021).

Methodology

This paper employed a discrete choice experiment (DCE) to explore participant preferences for a CBM of affordable housing.

Experimental design

In the DCE, rational individuals rely on the random utility theory (McFadden, 1974) when confronted with choices. The success of DCE depends on an appropriate design, which involves three steps: identifying CBM attributes, defining attribute levels, and determining the number of choice sets and alternatives.

In this study, six CBM attributes in the environment, service, and management dimensions were derived from the literature review. Subsequently, each attribute was expanded into three different levels based on the degree of circularization. The ReSOLVE framework[1] was employed to examine the relationship between attributes at different levels and circularity practices (Rosa *et al.*, 2019). At Level 3, the attributes encompass a wide range of circular actions, representing the highest level of circularization. Level 2, positioned in the middle, includes fewer actions and serves as the threshold. Level 1, the lowest tier, corresponds to general affordable housing with no consideration for circularization. In the cost dimension, the monthly service cost attribute fluctuates according to the rent, which is determined by the size of the dwelling unit. According to Uyttebrouck *et al.* (2020), small-scale housing units, such as one-bedroom units, are preferred by young individuals, primarily due to their lower rental costs. Consequently, the rent discussed in this paper is derived from the average rent of one-bedroom units in affordable housing—approximately €300 in Taiwan and €750 in the Netherlands. Furthermore, the monthly service costs are determined based on the rent of one-bedroom units in affordable housing, constituting 9%–12% of the rent in Taiwan (Taiwan Institute of Property Management, 2018) and 3%–6% in the Netherlands (Benedek *et al.*, 2022). Subsequently, the monthly service costs for Taiwan and the Netherlands are expanded into three levels according to the regulations governing service costs. Table 1 summarizes CBM attributes and respective levels.

With seven attributes and three levels each, the possible combinations of attribute levels are 2187 (3^7) alternatives. Because of the impracticality of offering participants this number of alternatives, this study used SPSS (version 26) software to generate an orthogonal design, which provides a statistically optimal subset of the possible combinations. The final orthogonal design comprised 18 alternatives. These alternatives were then randomly divided into nine choice sets. Each set contained two alternatives, labelled Housing A and Housing B. If participants did not prefer either option, they could choose 'Neither of them.' Figure 1 illustrates the alternatives in the nine choice sets and provides an example of a choice set offered in the questionnaire.

Sampling and questionnaire

To survey preferences and WTP for CBM in affordable housing among young adults, this study recruited participants through Prolific to answer the questionnaire. Prolific,

Choice set		Ratio of reused building materials	Green facilities	Furniture services	Shared social space	Energy and waste management	Facilities management	Monthly service cost
1	#1	100%	Suitable	Basic	Not provided	Basic	On average	€45/ NT$1280
	#2	100%	Not provided	Advanced	Not provided	Good	Good	€35/ NT$1120
2	#3	50%	General	Not provided	Not provided	Comfortable	Good	€45/ NT$1280
	#4	0%	Not provided	Not provided	Not provided	Basic	On average	€25/ NT$960
3	#5	100%	General	Not provided	Basic	Comfortable	On average	€35/ NT$1120
	#6	50%	Suitable	Advanced	Not provided	Comfortable	Excellent	€25/ NT$960
4	#7	0%	General	Advanced	Basic	Basic	Good	€25/ NT$960
	#8	0%	Not provided	Basic	Various	Comfortable	Good	€45/ NT$1280
5	#9	100%	Not provided	Basic	Basic	Comfortable	Excellent	€25/ NT$960
	#10	100%	General	Advanced	Various	Basic	Excellent	€45/ NT$1280
6	#11	0%	Suitable	Not provided	Basic	Good	Excellent	€45/ NT$1280
	#12	50%	Not provided	Not provided	Various	Basic	Excellent	€35/ NT$1120
7	#13	0%	Suitable	Advanced	Various	Comfortable	On average	€35/ NT$1120
	#14	50%	General	Basic	Various	Good	On average	€25/ NT$960
8	#15	100%	Suitable	Not provided	Various	Good	Good	€25/ NT$960
	#16	0%	General	Basic	Not provided	Good	Excellent	€35/ NT$1120
9	#17	50%	Not provided	Advanced	Basic	Good	On average	€45/ NT$1280
	#18	50%	Suitable	Basic	Basic	Basic	Good	€35/ NT$1120

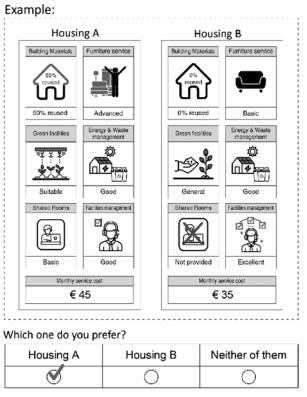

Figure 1. Nine choice sets and an example of a choice set.

an online recruitment platform, was selected for its numerous advantages, including its pre-screening of participants (e.g. age and gender), reasonable recruitment costs, and guarantee that participants are truly interested in the subject.

Before launching the main survey, this study invited 20 individuals aged 20–30 who were studying (or working) in various departments at Dutch and Taiwanese universities to review the questionnaire. Their feedback was instrumental in refining word choice and the wording of the questionnaire to ensure clarity and cultural appropriateness.

The final questionnaire consisted of three parts (see Appendix A). The first part collected socio-demographic information, which included gender, age, educational attainment, and annual income. The second part was designed to assess the level of sustainability awareness and sustainable behaviours among participants. It included between three and five questions, each utilizing a 5-point Likert scale, where 1 represents strongly disagree, and 5 represents strongly agree. The third part consisted of a choice task that included nine complete choice sets. Before the choice task, an attribute explanation and instructions were provided to ensure that all respondents could make informed and conscious decisions.

A stratified sampling method was employed to select respondents through Prolific, targeting Dutch and Taiwanese aged 20–30 residing in the Netherlands and Taiwan. Participants who completed the questionnaire were compensated with 3.5 euros on the Prolific platform. Finally, an 85% response rate produced 631 valid questionnaires, with 312 Dutch and 319 Taiwanese respondents offering complete information.

Empirical models for taste heterogeneity

According to random utility theory, an individual selects alternative i, whose utility is greater than those of all other choices, when faced with a choice set J. The utility U_{ni} that respondent n obtains from alternative i is defined in Equation (1). Attribute X_{ni} is a vector of observed variables associated with alternative i, and its marginal utility coefficient β indicates that each respondent holds the same opinion on the attribute. The alternative specific constant (ASC) captures unobserved sources that affect utility (Train, 2009). If $\mathcal{E}_{ni}$ in Equation (1) is assumed to be independent and

identically distributed, as well as to obey a Type I extreme-value distribution, the respondent's probability of choosing alternative i from J is as indicated in Equation (2) which represents the multinomial logit (MNL) model.

$$U_{ni} = V_{ni} + \mathcal{E}_{ni} = \beta X_{ni} + ASC_i \tag{1}$$

$$P_{ni} = \frac{\exp\left(\beta_n X_{ni}\right)}{\sum_{j=1}^{J} \exp\left(\beta_n X_{nj}\right)} \tag{2}$$

In this research, X_{ni} encompasses seven attributes: reused building materials, green facilities, furniture services, shared social space, energy and waste management, facilities management, and monthly service cost. The MNL model incorporating these seven attributes is further detailed in Equation (3):

$$P_{ni} = \frac{\exp\left(ASC_i + \beta_{1n} \cdot Reused_{ni} + \beta_{2n} \cdot Green_{ni} + \ldots + \beta_{7n} \cdot Cost_{ni}\right)}{\sum_{j=1}^{J} \exp\left(ASC_j + \beta_{1n} \cdot Reused_{nj} + \beta_{2n} \cdot Green_{nj} + \ldots + \beta_{7n} \cdot Cost_{nj}\right)} \tag{3}$$

A maximum likelihood estimate can obtain each attribute's coefficient β, which can be used to calculate the marginal WTP in Equation (4). Marginal WTP for the k attribute is calculated by dividing the estimated coefficient of the k attribute variable by the estimated coefficient of cost attribute p and multiplying it by (−1).

$$WTP_k = -\frac{\beta_k}{\beta_p} \tag{4}$$

Taste heterogeneity, stemming from socio-demographic variations and decision-making processes, significantly impacts respondents' choices in DCE. Thus, this paper introduces the MNL and latent class (LC) models to treat taste heterogeneity. The MNL model is foundational for discrete choice analysis, as it maximizes utility to understand decision-making behaviour. Its estimated coefficients (β) help explain the influence of variables on choice probabilities and their significance. However, the MNL model is limited in capturing underlying diversity due to its independence from irrelevant alternatives (IIA) constraints (Train, 2009).

This study employed the LC model to address this limitation, which offers more flexibility in analyzing preference heterogeneity. According to Greene & Hensher (2003), the LC model utilizes Equations (5)–(7) to estimate the probability of respondent choices and class memberships, thus allowing us to identify the optimal number of classes based on the Akaike information criterion (AIC). The best-fit model can be determined using pseudo-R^2 (Diriye *et al.*, 2022). Equation (5) calculates the probability of individual n choosing alternative i by summing the probabilities of choosing that alternative across all S classes, weighted by the probability of belonging to latent class s. Equation (6), derived from the MNL model, estimates the utility coefficient β_s for the seven attributes and membership probability function.

Recognizing that utility functions may vary among respondents due to differences in socio-demographic profiles, Equation (7) is designed to capture this heterogeneity. It represents respondents in different classes with distinct preferences. A membership function determines the probability that a respondent with a specific profile Z belongs to a latent class s.

$$P_n(i) = \sum_{s=1}^{S} P_n(i \mid s) \cdot M_n(s) \tag{5}$$

$$P_n(i \mid s) = \frac{\exp(ASC_s + \beta'_{1s} \cdot Reused_{ni} + \beta'_{2s} \cdot Green_{ni} + \ldots \beta'_{7s} \cdot Cost_{ni}}{\sum_{i' \in C_n} \exp(ASC_s + \beta'_{1s} \cdot Reused_{ni'} + \beta'_{2s} \cdot Green_{ni'} + \ldots \beta'_{7s} \cdot Cost_{ni'}} \tag{6}$$

$$M_i(s) = \frac{\exp(\gamma'_s Z_i)}{\sum_{s=1}^{S} \exp(\gamma'_s Z_i)} \tag{7}$$

Results

Sample description

The Taiwanese ($N = 319$) and Dutch ($N = 312$) samples are presented in Table 2. The two samples exhibited a gender balance, with slightly more females in Taiwan (50.5%) and the Netherlands (51.6%). Participants were categorized into three age groups to investigate the potential impact of distinct stages of young adulthood and significant life transitions on their preferences. The 20–22 age group signifies the transition from adolescence to adulthood and comprises individuals completing higher education and embarking on their careers or continuing their studies at the university level. The 23–26 age group is characterized by early career development and the establishment of personal independence, with many acquiring initial work experience or pursuing advanced educational degrees, such as a master's degree. The 27–30 age group indicates a phase of greater stability, where individuals are typically more established in their careers and personal lives and often make long-term commitments, including marriage. In Taiwan, 11.9% were aged 20–22, 33.2% were aged 23–26, and 54.9% were aged 27–30, whereas in the Netherlands, 33.7% were aged 20–22, 40.1% were aged 23–26, and 26.2% were aged 27–30, indicating that the Dutch sample was relatively younger than the Taiwanese sample.

The samples also showed that a considerable portion of young people in both Taiwan and the Netherlands have high education levels. In Taiwan, 76.2% held a bachelor's degree, whereas 15.0% held a master's degree or higher. In the Netherlands, 42.6% held a bachelor's degree, whereas 38.8% held a master's degree or higher. Regarding income, about 90% of individuals met the criteria for affordable housing. In Taiwan, 39.8% fell within the €13,956–€23,407 income range and could be categorized as middle-income, whereas 51.1% were in the lower-middle-income group, between €13,080 and €13,956. In the Netherlands, 22.1% were in the middle-income group (€24,816–€61,148), whereas 72.4% were in the lower-middle-income group, between €6390.8 and €24,816.

Table 2. Results of descriptive statistics.

Taiwan		The Netherlands	
Number of participants (%)		Number of participants (%)	
Socio-demographic profile			
Gender			
Male	158 (49.5%)	Male	151 (48.4%)
Female	161 (50.5%)	Female	161 (51.6%)
Age			
20–22 years	38 (11.9%)	20–22 years	105 (33.7%)
23–26 years	106 (33.2%)	23–26 years	125 (40.1%)
27–30 years	175 (54.9%)	27–30 years	82 (26.3%)
Educational attainment			
High school or lower	28 (8.8%)	High school or lower	58 (18.6%)
Bachelor's	243 (76.2%)	Bachelor's	133 (42.6%)
Post-graduate or above	48 (15.0%)	Post-graduate or above	121 (38.8%)
Annual income			
€13,080–14,280	163 (51.1%)	€6390.8–49,013	226 (72.4%)
€14,281–23,407	127 (39.8%)	€49,014–61,148	69 (22.1%)
More than €23,407	29 (9.1%)	More than €61,148	17 (5.4%)
Sustainable attitude			
	Mean *SD*		Mean *SD*
Statements about sustainability awareness (A)			
A1	3.80 0.653	A1	3.94 0.779
A2	3.65 0.794	A2	3.00 1.047
A3	4.05 0.668	A3	4.04 0.799
Total (A)	3.83 0.550	Total (A)	3.66 0.614
Statements about sustainable behaviour (B)			
B1	4.01 0.624	B1	3.46 1.159
B2	4.00 0.705	B2	3.46 1.004
B3	4.08 0.620	B3	3.41 1.032
B4	4.07 0.589	B4	3.90 0.804
B5	4.18 0.641	B5	3.71 1.069
Total (B)	4.06 0.456	Total B	3.59 0.682

A1. I care about environmental problems and policy.
A2. I know about the circular economy and related policies of the Netherlands/Taiwan.
A3. I believe most houses should be constructed with recycled and eco-friendly materials.
B1. I have switched products/brands for environmental reasons.
B2. I make an effort to buy products made from reused materials.
B3. I support the brands which provide sharing services.
B4. I support activities related to the environment, circularity, or sustainability.
B5. If the government provides affordable housing with circular attributes for young people, I am interested in renting a studio or a house from them.

The Taiwanese and Dutch youth in the sample exhibited positive attitudes towards sustainability. In Taiwan, the mean sustainability awareness score was 3.83 ($SD = 0.55$), and the sustainable behaviour score was 4.06 ($SD = 0.46$). In the Netherlands, the mean sustainability awareness was 3.66 ($SD = 0.61$), and sustainable behaviour score was 3.59 ($SD = 0.68$). One-way ANOVA analysis exhibited significant differences in sustainability attitudes based on socio-demographic factors. In Taiwan, differences in educational attainment resulted in significant differences in sustainable awareness ($p < 0.01$) and sustainable behaviour ($p < 0.01$). In particular, young adults with a bachelor's degrees were concerned with sustainability ($M = 3.9$, $SD = 0.52$) and were willing to support relevant activities ($M = 4.1$, $SD = 0.42$), which is consistent with the work of Golbazi *et al.* (2020). In the Dutch context, gender was highly correlated with sustainable awareness ($p < 0.05$) and behaviour ($p < 0.01$), with young females being more aware of sustainability ($M = 3.7$, $SD = 0.54$) and taking more active environmental actions ($M = 3.7$, $SD = 0.58$) than males. These results corroborate the findings of Liu *et al.* (2019).

Examination of taste heterogeneity

This paper analyzed participants' preferences and taste heterogeneity using the MNL model in NLOGIT 6.0 (see Table 3). The MNL model results revealed both significantly positive and negative coefficients for attributes and levels. Positive and negative coefficients indicate an increase and decrease in the probability of respondents choosing the corresponding alternative, respectively. For example, the coefficient of the cost attribute was significantly negative, indicating that respondents preferred lower service costs[2] in the choice task. While the MNL models effectively captured participants' preferences, they also demonstrated apparent heterogeneity within the samples, with pseudo-R^2 being lower than 0.3 within the Taiwanese and Dutch samples. In particular, the pseudo-R^2 was only 0.09 in Taiwan, which was lower than in the Netherlands (0.2). This suggests that there is substantial variability in preferences that the MNL model alone cannot fully capture. Consequently, the LC model is needed to address taste heterogeneity within the sample.

Additionally, attribute non-attendance (ANA) is a potential issue in taste heterogeneity. ANA can be defined as the assumption that respondents may selectively ignore or disregard certain attributes of the alternatives when making their choices (Eldeeb & Mohamed, 2020). In particular, when ANA is an attribute that holds high importance in choice experiments, significant differences in cognitive efforts, past experiences, or socio-economic demographics among participants could be revealed (Alemu *et al.*, 2013). Therefore, this paper, drawing on the studies by Lancsar *et al.* (2007) and Tait *et al.* (2019), utilized the change values of the partial log-likelihood to assess the importance of each attribute in the choice experiment and subsequently designated the ANA for the Taiwanese and Dutch models. Ultimately, the attribute

Table 3. Estimation results of MNL models for the study areas.

Attribute	Coefficient	Taiwan	The Netherlands
	ASC	6.1549[a]	4.4808[a]
Ratio of reused building materials	$\beta_{1.1}$	−0.5349[a]	−0.5570[a]
	$\beta_{1.2}$	0.0133	0.0121
	$\beta_{1.3}$	0.5216[a]	0.5448[a]
Green facilities	$\beta_{2.1}$	−0.4125[a]	−0.7026[a]
	$\beta_{2.2}$	0.1687[a]	0.3335[a]
	$\beta_{2.3}$	0.2438[a]	0.3692[a]
Furniture services	$\beta_{3.1}$	−0.3826[a]	−0.2390[a]
	$\beta_{3.2}$	0.0919	−0.1850[a]
	$\beta_{3.3}$	0.2907[a]	0.4240[a]
Shared social spaces	$\beta_{4.1}$	0.1784	−0.0566
	$\beta_{4.2}$	−0.2362[a]	−0.1602[b]
	$\beta_{4.3}$	0.0577	0.2168[a]
Energy and waste management	$\beta_{5.1}$	−0.2826[a]	−0.7004[a]
	$\beta_{5.2}$	0.0691	0.2511[a]
	$\beta_{5.3}$	0.2135[a]	0.4493[a]
Facilities management	$\beta_{6.1}$	0.0711	−0.1797[a]
	$\beta_{6.2}$	−0.0357	0.1213[c]
	$\beta_{6.3}$	−0.0353	0.0584
Monthly service cost	β_7	−0.0025[a]	−0.0604[a]
R^2		0.0962	0.2020
Pseudo-R^2		0.0905	0.1969
Log-likelihood		−2000.62	−1893.17
AIC		4029.2	3814.3

Note. [a]$p < 0.01$, [b]$p < 0.05$, [c]$p < 0.1$.

'ratio of reused building materials' in Taiwan's model and 'energy and waste management' in the Netherlands' model were designated as ANAs, as shown in Table 4.

Subsequently, this paper conducted a class analysis and identified two- and three-class models (see Table 5). Despite the pseudo-R^2 of the three-class models being better than that of the two-class models, one class in the three-class models was a statistically non-significant residual (class size < 10%). Such classes are often excluded or disregarded due to their general lack of precise information. However, disregarding them may result in valuable insights from a smaller subset of respondents being overlooked, as they still constitute valid data. Therefore, this paper selected the two-class LC models because they still exhibited a good fit (pseudo-$R^2 > 0.3$) and retained all available data.

Young adults' preferences for attributes in different contexts

Table 6 presents the membership probabilities, attribute preferences, and respondents' characteristics of the two classes in both the Taiwanese and Dutch models. The results revealed a higher probability of assigning each respondent to Class 1 than Class 2 across both societies. This also suggests that a large proportion of Taiwanese

Table 4. Importance rank of CBM attributes in choice experiments.

Taiwan			
Rank	Attributes	Partial effect-change in log-likelihood	The relative effect-% sum of the change in log-likelihood
1	Reused building materials ratio	−11.2	24.1%
2	Furniture services	−10.21	22.0%
3	Green facilities	−8.23	17.7%
4	Energy and waste management	−7.44	16.0%
5	Shared social space	−5.89	12.7%
6	Facilities management	−3.5	7.5%
The Netherlands			
Rank	Attributes	Partial effect-change in log-likelihood	The relative effect-% sum of the change in log-likelihood
1	Energy and waste management	−18.99	37.1%
2	Shared social space	−15.28	29.9%
3	Reused building materials ratio	−7.07	13.8%
4	Green facilities	−4.29	8.4%
5	Furniture services	−4.15	8.1%
6	Facilities management	−1.34	2.7%

Note. This ranking focuses on the attributes within the environment, service, and management dimensions. The cost attribute is not included in this ranking.

Table 5. Criteria for determining the number of classes.

	Taiwan		The Netherlands	
Number of classes	2	3	2	3
R^2	0.3970	0.4078	0.4076	0.4136
Pseudo-R^2	0.3932	0.4032	0.4038	0.4089
Log-likelihood	−1902.01	−1868.00	−1827.49	−1809.05
AIC	3876.0	3824.0	3727.0	3706.1
Class size	Class 1: 77.3% Class 2: 22.7%	Class 1: 62.6% Class 2: 30.4% Class 3: 7.0%	Class 1: 75.3% Class 2: 24.7%	Class 1: 65.5% Class 2: 30.4% Class 3: 4.1%

(77.3%) and Dutch (75.3%) individuals in the sample were more likely to align with the attribute preferences of Class 1. In addition, the attributes designated as ANA held fixed parameters at zero in the analysis and were displayed as 'non-attendance.' The ANA results were observed in Class 2, indicating that respondents belonging to Class 2 tended to ignore these 'non-attendance' attributes during the choice experiment.

This paper revealed that most young Taiwanese and Dutch individuals (Class 1) were significantly attracted to higher-level attributes. Additionally, there was a

Table 6. Estimation results of two-class LC models.

Attribute preferences		Taiwan		The Netherlands	
		Class 1	Class 2	Class 1	Class 2
Attribute	Coefficient	77.3%	22.7%	75.3%	24.7%
	ASC	4.0590[a]	21.7304[a]	4.8314[a]	4.8576[a]
Ratio of reused building materials	$\beta_{1.1}$	−0.6280[a]	Non-attendance	−0.8055[a]	−0.6870[a]
	$\beta_{1.2}$	0.0101		0.2574	−0.1009
	$\beta_{1.3}$	0.6179[a]		0.5481[b]	0.7879[a]
Green facilities	$\beta_{2.1}$	−0.3777[a]	−1.2905[a]	−1.1145[a]	−0.3363[a]
	$\beta_{2.2}$	0.1471[a]	0.7530[a]	0.5779[a]	0.2943[a]
	$\beta_{2.3}$	0.2306[a]	0.5376	0.5366[a]	0.0420
Furniture services	$\beta_{3.1}$	−0.4407[a]	0.1002	−0.1480	−0.3512[b]
	$\beta_{3.2}$	0.0995	0.2455	−0.3151[b]	−0.1296
	$\beta_{3.3}$	0.3412[a]	−0.3458	0.4631[a]	0.4808[a]
Shared social spaces	$\beta_{4.1}$	0.1756	0.4460	−0.1886	0.2169
	$\beta_{4.2}$	−0.1748[b]	−0.7761[c]	−0.0794	−0.1595
	$\beta_{4.3}$	−0.0007	0.3301	0.2680[c]	−0.0574
Energy and waste management	$\beta_{5.1}$	−0.2593[a]	−0.2055	−1.1232[a]	Non-attendance
	$\beta_{5.2}$	0.0820	−0.5587[c]	0.2076[b]	
	$\beta_{5.3}$	0.1773[a]	0.7641[a]	0.9156[a]	
Facilities management	$\beta_{6.1}$	0.0809	−0.7529[b]	−0.2528[c]	−0.2498[b]
	$\beta_{6.2}$	−0.0314	0.4864[c]	0.1750	−0.1256
	$\beta_{6.3}$	−0.0495	0.2665	0.0778	0.3754[b]
Monthly service cost	β_7	−0.0007[b]	−0.0162[a]	−0.0468[a]	−0.1040[a]
R^2		0.3970		0.4076	
Pseudo-R^2		0.3932		0.4038	
Log-likelihood		−1902.01		−1827.49	
Restricted Log-likelihood		−3154.12		−3084.90	
AIC		3876.0		3727.0	

Respondents' characteristics		Taiwan		The Netherlands	
		Class 1	Class 2	Class 1	Class 2
Socio-economic variables	Male	0.3093	Base	−0.1432	Base
	Age 20–22	1.2805[c]		−0.3009	
	Age 23–26	−0.3570		−0.1505	
	Age 27–30	−0.9235[b]		0.4514	
	High school or below	0.5421		0.4187	
	Bachelor's	0.0643		−0.4902[c]	
	Master or above	−0.6064		0.0715	
	Lower-middle income	−9.2028		0.6212[b]	
	Middel income	−9.1395		−0.0870	
	Higher income	18.3723		−0.5342	
Sustainability attitudes	Sustainability awareness	1.0567[b]		0.0108	
	Sustainable behaviour	−0.0627		1.2304[a]	

Note. [a]$p < 0.01$, [b]$p < 0.05$, [c]$p < 0.1$.
With the ANA approach, the attributes designated as ANA held fixed parameters at zero and were displayed as 'Non-attendance'.

considerable overlap in their preferences, which included Level 3 reused building materials, Level 2 and 3 green facilities, Level 3 furniture services, and Level 3 energy and waste management. These findings generally demonstrate a similar preference tendency for specific attributes and levels among young adults, though some attributes, such as shared social spaces and facilities management, exhibit weaker or non-significant effects.

The results also demonstrated a different preference tendency for shared social spaces and facilities management between the two societies. Notably, Dutch Class 1 demonstrated a relatively higher acceptance of higher-level shared social spaces and facilities management compared to Taiwan's Class 1. This difference is attributed to the prevalence of these attributes in Dutch society, resulting in more understanding and experiences among citizens. The results also reveal different preferences for attributes in Class 2 compared to Class 1. In the context of Taiwan, Class 2 exhibited indifference to the adoption of reused building materials in affordable housing but preferences for higher-level facilities management. In the Netherlands, Class 2 exhibited indifference to energy and waste management and disfavoured the adoption of shared social spaces.

Additionally, Table 6 presents the respondents' characteristics for each class and reveals specific socio-economics variables and sustainability attitudes that influenced the preferences. The characteristics of Class 1 are presented, with Class 2 as the reference. Positive and negative coefficients indicate an increase and decrease in the probability that respondents in that class have corresponding characteristics, respectively. Surprisingly Class 1 in the two contexts was influenced by different socio-economic variables and sustainability attitudes despite exhibiting similar preference tendencies for particular attributes.

In Taiwan, the young adults' preferences were significantly influenced by their age and level of awareness regarding sustainability. Younger individuals with a heightened sustainability awareness tended to prefer CAH with higher-level CBM attributes, which supports the argument of Bigerna *et al.* (2021). Additionally, their awareness appeared to be indirectly influenced by their educational background, as suggested by the results of a one-way ANOVA. This influence can be attributed to current policies that have widely introduced CE-related courses in Taiwanese universities aimed at enhancing the knowledge and expertise of future citizens in this field. Interestingly, the results indicate that sustainable behaviour did not significantly impact the preferences of young Taiwanese. These findings reflect the characteristics of a collectivist culture (Ur Rahman *et al.*, 2021), suggesting that most young Taiwanese' choices for circularity are primarily guided by their understanding of sustainability and compliance with CE policies rather than active engagement in sustainability.

Conversely, the preferences of young individuals in the Netherlands were significantly influenced by their income and engagement in sustainable behaviour. Specifically, Class 1 included more individuals with lower-middle incomes and a stronger inclination towards sustainable behaviour. Gender also indirectly affected the behaviour of these young adults, as evidenced by the results of a one-way ANOVA. Importantly, sustainable behaviour held greater significance than socio-demographic factors. This suggests that young participants, especially females (Liu *et al.*, 2019), expressed their

environmental concerns through their behaviour (practical choices), regardless of whether they had a comprehensive understanding of CE concepts. This aligns with a pattern of individualism (Chwialkowska *et al.*, 2020) and reveals that most young Dutch adhere to their beliefs and intuitively practice the same in choice tasks.

WTP of young adults for a preferred CBM

Table 7 displays the estimated marginal WTP for attributes at Level 2 and Level 3. Additionally, the WTP for the monthly service costs in each class was calculated as the sum of the highest marginal WTP values for attributes that exhibited significant preferences within that class. The results reveal that Class 1 in both Taiwan and the Netherlands exhibited a strong WTP for monthly service costs. Remarkably, their total WTP even surpassed the service costs set at Level 3, highlighting the economic viability of a CBM in affordable housing when preferred attributes are prioritized.

In the context of Taiwan, WTP in Class 1 amounted to 19.6% of the rent for a one-bedroom unit, which was 10.6% higher than the standard service costs (9% of the rent) of affordable housing. This study observed that most young Taiwanese individuals were willing to allocate around 5% of their monthly income to support the implementation of a CBM in affordable housing.

Meanwhile, in the Netherlands, WTP in Class 1 represented 7.6% of the rent, which suggests that residents allocated nearly 2.5% of their monthly income to supporting circularity in affordable housing. Surprisingly, this percentage was lower than in the case of Taiwan, which may be attributed to the relatively higher rents in the Netherlands, making young Dutch residents more cautious in their WTP for service costs despite exhibiting active sustainable behaviour. Nevertheless, their WTP remained 4.6% higher than standard service costs (3% of rent) in affordable housing.

However, Class 2 displayed a lower WTP and even exhibited reluctance to pay for attributes and service costs, despite having a preference for these attributes. This is associated with their socio-economic characteristics and sustainability attitudes. The lower WTP in Dutch Class 2 was influenced by their passive sustainable behaviour. Additionally, their income was slightly higher than that of Class 1. This finding suggests young Dutch with higher incomes are more likely to favour ownership over services and pay less attention to recycling or energy reusing.

In Taiwan's Class 2, the situation was even worse, with a WTP under €3, which is unreasonably low for monthly service costs. This can be mainly attributed to their lower sustainable awareness. Moreover, this paper observed that their income was lower than that of Class 1, which may be another factor contributing to unreasonably low WTP. This result suggests that young Taiwanese with lower incomes tend to prioritize survival and reduce spending on sustainability, especially when they have lower awareness of sustainability.

Discussion and recommendations

Along with a growing global interest in affordable housing, public sectors worldwide have developed numerous affordable housing projects incorporating CBM to

Table 7. WTP for CBM attributes and monthly service costs.

Taiwan								
	Class 1				Class 2			
Attributes	Level 2		Level 3		Level 2		Level 3	
Ratio of reused building materials	€0.44		€26.62	✓	€0.00		€0.00	
Green facilities	€6.34		€9.93	✓	€1.40	✓	€1.00	
Furniture services	€4.29		€14.70	✓	€0.46		€–0.64	
Shared social spaces	€–7.53		€0.03		€–1.44		€0.61	
Energy and waste management	€3.53		€7.64	✓	€–1.04		€1.42	✓
Facilities management	€–1.35		€–2.13		€0.91		€0.50	
Total WTP for monthly service costs			€58.89				€2.82	
Percentage of the rent (€300) for a one-bedroom unit			19.6%				0.2%	
The Netherlands								
	Class 1				Class 2			
Attributes	Level 2		Level 3		Level 2		Level 3	
Ratio of reused building materials	€5.50		€11.71	✓	€–0.97		€7.58	✓
Green facilities	€12.35	✓	€11.47		€2.83	✓	€0.40	
Furniture services	€–6.73		€9.90	✓	€–1.25		€4.62	✓
Shared social spaces	€–1.70		€5.73		€–1.53		€–0.55	
Energy and waste management	€4.44		€19.56	✓	€0.00		€0.00	
Facilities management	€ 3.74		€1.66		€–1.21		€3.61	✓
Total WTP for monthly service costs			€53.52				€18.64	
Percentage of the rent (€750) for a one-bedroom unit			7.6%				2.5%	

Note. ✓ means corresponding to the most significantly preferred levels in each attribute.

promote sustainable living environments. However, long-standing debates persist in housing studies about affordability and the willingness of residents to embrace such sustainable practices. Our empirical findings reveal that the increasing emphasis on sustainability has led to a greater willingness among the majority of young adults to incur higher service costs (4.6%–10.6% higher than standard service costs) to support a CBM in affordable housing. The research findings suggest that most young individuals are willing to allocate 2.5%–5% of their monthly income towards fostering circularity within their residential surroundings. This range reflects a balance between their support for a transition to more circular housing practices and the financial constraints faced by young adults, thus providing a reference for defining the young adults' affordability of CBM in housing. Thus, this study argued that CBM is feasible in affordable housing when appropriate attributes are integrated, which can offer valuable insight into the long-standing debates (Charoenkit & Kumar, 2014).

Furthermore, this study reveals a shared preference trend among young adults in both societies for certain high-level CBM attributes. The preference for advanced green facilities aligns with the study by He *et al.* (2019) on green housing. Specifically, Level 2 and 3 green facilities emerged as a strongly preferred attribute, and the preferences of most young Taiwanese and Dutch individuals were nearly identical. This may be attributed to high-level green facilities that can support psychological restoration and provide spaces for micro-breaks (Williams *et al.*, 2019). Additionally, young adults in both societies also preferred the highest levels of reused building

materials, furniture services, and energy and waste management. This support for attributes related to recycling and reusing may be driven by considerations of environmental benefits and the reduction of natural resource depletion, as noted by Nußholz *et al.* (2020), which aligns with the sustainability values commonly held by young people.

Based on these insights, this paper recommends incorporating these four high-level attributes into CBM for future affordable housing projects, creating a circular living environment that aligns with the preferences of young adults. The practical application of these attributes is outlined below:

- Incorporate a certain proportion of reused materials: Extensively adopting reused materials, such as recycled concrete and glass into structural elements, facades, interiors, and components (Lo, 2017) to minimize environmental impact. These materials can be sourced from sustainable material markets, other demolition sites, or existing buildings.
- Design restorative green facilities: Beyond the traditional notion of green spaces, our study proposes transforming common areas (e.g. rooftops) into multifunctional spaces that maximize green cover while serving as venues for community activities. For example, rooftops could be equipped with rentable gardening equipment to encourage residents to engage in self-sufficient food production (Williams *et al.*, 2019).
- Offer flexible furniture services: By moving away from fixed furniture setups and offering a diverse range of rentable furniture options to create flexibility and personalization in the living spaces (Leising *et al.*, 2018). These services could include delivery, setup, and maintenance to enhance convenience.
- Provide effective energy-saving and waste management: In addition to incorporating renewable energy, grey-water reuse, and waste collection systems, leveraging smart technologies, such as the Internet of Things (Rajesh *et al.*, 2022), can facilitate the efficient management and monitoring of waste and energy circulation in the housing sector.

Besides considering these shared attributes, the CBM should be customized to different societies. For example, in the Netherlands, incorporating shared social spaces into the CBM could garner support from the younger demographic. In Taiwan, however, housing developers should be cautious when determining the quantities and qualities of shared spaces in communal areas to prevent inefficient space allocation. The aforementioned suggestions can serve as a starting point for the Housing White Paper in both societies, guiding housing developers to effectively integrate CBM in the planning of affordable housing.

Despite the identified preferred attributes, introducing all high-level CBM attributes into CAH requires further effort. This study argues the necessity for policy-making within the affordable housing agenda to enhance young adults' awareness and acceptance of less-favoured attributes. The findings also suggest that sustainability attitudes, shaped indirectly by cultural patterns, can influence individual preferences and choices, consistent with previous research (Chwialkowska *et al.*,

2020; Ur Rahman *et al.*, 2021). Consequently, this study proposes the following recommendations for government authorities, tailored to the cultural patterns of Taiwan and the Netherlands, concerning policy direction:

1. For the Netherlands, the adoption of a CBM in affordable housing may be readily embraced by young adults. Essentially, within Dutch culture, effectively responding to most young adults' concerns for the environment is significant for CE promotion. Hence, effectively providing sensitization on the connection between circularity and environmental benefits could encourage society's transition towards CE rather than relying solely on legal mandates (Cutcu *et al.*, 2022). Thus, this paper advocates for governments to enforce information dissemination campaigns elucidating how less-favoured attributes can foster circularization in housing, thereby encouraging citizen support for sustainability.
2. Regarding Taiwan, users' acceptance of CBM in affordable housing tends to be passive, especially for specific attributes (e.g. facilities management). Therefore, despite some awareness of sustainability, this paper recommends the prioritization of legal mandates and subsidy initiatives in housing policies to enhance the acceptance of these less-favoured attributes (Joensuu *et al.*, 2020), rather than focusing on dissemination. Implementing stronger legal measures and subsidies signals a strong commitment from the government, thus fostering a culture of sustainability. Over time, as these practices become more normalized, citizens may transition from passive to active acceptance of these attributes.

While this paper serves as a starting point for circular housing research by examining the preferences and WTP for CBM in affordable housing among young adults, it has limitations that should be addressed in future work. It is suggested that further studies comprehensively investigate users across all age groups and regions, as this paper focuses on young Dutch and Taiwanese individuals aged 20–30. Additionally, the attributes proposed in this work are based on the literature. Hence, this research suggests continuously updating the attributes of CBM in line with the new CE policies, technologies, materials, and innovative services in future research. Despite these limitations, the findings of this study offer valuable insights for other developed and developing societies looking to enhance the implementation of CBM in affordable housing projects.

Conclusions

With the increasing focus on the CE, the implementation of CBM in affordable housing is expected to grow substantially in the coming years. However, challenges related to neglecting user preferences in its plan exist, especially among young users, who constitute a crucial demographic in such housing. Additionally, the emphasis on innovation in CBM may lead to higher operational costs, raising concerns regarding whether users are willing to pay for this model. Ignoring these issues is likely to affect users' satisfaction with future residential rights and interests in CAH.

This research aimed to understand the preferences and WTP of young users aged 20–30 regarding affordable housing and propose a CBM with significant attributes by comparing the Taiwanese and Dutch contexts. This paper identified seven CBM attributes with three levels based on the ReSOLVE framework. Data from 631 valid questionnaires were then collected through a discrete choice experiment, and MNL analysis was applied to explore sample taste heterogeneity. Furthermore, this paper utilized LC models to reveal user preferences, WTP, and influential factors in both societies.

The systematic approach presented in this research can confirm user preferences for circularity while demonstrating economic viability through WTP. This paper identified preferred CBM attributes and levels by comparing the similarities and differences in young adults' preferences across Taiwan and the Netherlands. These findings can serve as a valuable reference for global societies aiming to develop an attractive CBM in CAH. Finally, this paper proposes recommendations for government policy-making in both societies based on the findings to promote the acceptance of all high-level CBM attributes by young adults and achieve a comprehensive circularity in CAH.

Notes

1. ReSOLVE framework. Developed by Ellen MacArthur Foundation, the framework takes the core principles of circularity and applies them to six actions: Regenerate, Share, Optimize, Loop, Virtualize, and Exchange.
2. In this study, the underlying assumption for the marginal utility of cost is linear, not categorical. However, to facilitate participants' comparisons of different costs in the discrete choice experiment, the cost attribute was categorised into levels to simplify interpretation.

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References

Abreu, M. I., de Oliveira, R. A. F. & Lopes, J. (2020) Younger vs. older homeowners in building energy-related renovations: Learning from the Portuguese case, *Energy Reports*, 6, pp. 159–164.

Al Mamun, A., Ali Fazal, S., Ahmad, G., Bin, Yaacob, M. R., Bin. & Mohamad, M. R. (2018) Willingness to pay for environmentally friendly products among low-income households along coastal peninsular Malaysia, *Sustainability*, 10, pp. 1316.

Alemu, M. H., Mørkbak, M. R., Olsen, S. B. & Jensen, C. L. (2013) Attending to the reasons for attribute non-attendance in choice experiments, *Environmental and Resource Economics*, 54, pp. 333–359.

Anacker, K. B. (2019) Introduction: Housing affordability and affordable housing, *International Journal of Housing Policy*, 19, pp. 1–16.

Balezentis, T., Streimikiene, D., Stankuniene, G. & Shobande, O. A. (2024) Willingness to pay for climate change mitigation measures in households: Bundling up renewable energy, energy efficiency, and renovation, *Sustainable Development*, 32, pp. 2385–2402.

Benedek, L. E. P., Mondt, J. C. J., Vissinga, J. & van Zeben, P. J. M. (2022) *Annual Report 2021–2022*, Alphen aan den Rijn.

Bernstein, A. & Struyven, D. (2022) Housing lock: Dutch evidence on the impact of negative home equity on household mobility, *American Economic Journal: Economic Policy*, 14, pp. 1–32.

Bigerna, S., Micheli, S. & Polinori, P. (2021) New generation acceptability towards durability and repairability of products: Circular economy in the era of the 4th industrial revolution, *Technological Forecasting and Social Change*, 165, pp. 120558.

Chan, A. P. C. & Adabre, M. A. (2019) Bridging the gap between sustainable housing and affordable housing: The required critical success criteria (CSC), *Building and Environment*, 151, pp. 112–125.

Charoenkit, S. & Kumar, S. (2014) Environmental sustainability assessment tools for low carbon and climate resilient low-income housing settlements, *Renewable and Sustainable Energy Reviews*, 38, pp. 509–525.

Chaturvedi, P., Kulshreshtha, K. & Tripathi, V. (2022) Investigating the role of celebrity institutional entrepreneur in reducing the attitude-behavior gap in sustainable consumption, *Management of Environmental Quality: An International Journal*, 33, pp. 625–643.

Chau, C. K., Tse, M. S. & Chung, K. Y. (2010) A choice experiment to estimate the effect of green experience on preferences and willingness-to-pay for green building attributes, *Building and Environment*, 45, pp. 2553–2561.

Chen, H. L., Tsai, Y. H., Lyu, C. L. & Duggan, Y. L. (2020) Circular economy in Taiwan-transition roadmap and the food, textile, and construction industries, in: *An Introduction to Circular Economy*, pp. 577–595 (Singapore: Springer).

Chwialkowska, A., Bhatti, W. A. & Glowik, M. (2020) The influence of cultural values on pro-environmental behavior, *Journal of Cleaner Production*, 268, pp. 122305.
Construction and Planning Agency of R.O.C. (Taiwan) (2017) *The Planning of Affordable Housing (Chinese Version)*, Taipei.
Cramer, J. (2022) Effective governance of circular economies: An international comparison, *Journal of Cleaner Production*, 343, pp. 130874.
Cutcu, I., Ozkok, Y. & Golpek, F. (2022) Environment, education, and economy nexus: Evidence from selected EU countries, *Environmental Science and Pollution Research International*, 30, pp. 7474–7497.
Czischke, D. & van Bortel, G. (2018) An exploration of concepts and polices on 'affordable housing' in England, Italy, Poland and The Netherlands, *Journal of Housing and the Built Environment*, 38, pp. 283–303.
Diriye, A. W., Jama, O. M., Diriye, J. W. & Abdi, A. M. (2022) Public preference for sustainable land use policies – Empirical results from multinomial logit model analysis, *Land Use Policy*, 114, pp. 105975.
Eberhardt, L. C. M., Birkved, M. & Birgisdottir, H. (2020) Building design and construction strategies for a circular economy, *Architectural Engineering and Design Management*, 18, pp. 93–113.
Eldeeb, G. & Mohamed, M. (2020) Quantifying preference heterogeneity in transit service desired quality using a latent class choice model, *Transportation Research Part A: Policy and Practice*, 139, pp. 119–133.
Ellen MacArthur Foundation (2015) *Towards a Circular Economy: Business Rationale for an Accelerated Transition*.
Elmualim, A., Mostafa, S., Chileshe, N. & Rameezdeen, R. (2018) Construction and the circular economy: Smart and industrialised prefabrication, in: *Unmaking Waste in Production and Consumption: Towards the Circular Economy*, pp. 323–336 (Bingley: Emerald Group Publishing Limited).
Executive Yuan of R.O.C. (Taiwan) (2021) Earnings Exploration & Information System. Available at https://earnings.dgbas.gov.tw/ (accessed 24 March 2023).
Executive Yuan R.O.C. (Taiwan) (2020) National statistics. Available at https://www.stat.gov.tw/cl.aspx?n=2748 (accessed 1 April 2023).
Fallmann, J. & Emeis, S. (2020) How to bring urban and global climate studies together with urban planning and architecture?, *Developments in the Built Environment*, 4, pp. 100023.
Francis, A. & Sarangi, G. K. (2022) Sustainable consumer behaviour of Indian millennials: Some evidence, *Current Research in Environmental Sustainability*, 4, pp. 100109.
Friedman, R. & Rosen, G. (2019) The face of affordable housing in a neoliberal paradigm, *Urban Studies*, 57, pp. 959–975.
Ghafoor, S., Hosseini, M. R., Kocaturk, T., Weiss, M. & Barnett, M. (2023) The product-service system approach for housing in a circular economy: An integrative literature review, *Journal of Cleaner Production*, 403, pp. 136845.
Golbazi, M., Danaf, A. E. & Aktas, C. B. (2020) Willingness to pay for green buildings: A survey on students' perception in higher education, *Energy and Buildings*, 216, pp. 109956.
Gomes, S., Lopes, J. M. & Nogueira, S. (2023) Willingness to pay more for green products: A critical challenge for gen Z, *Journal of Cleaner Production*, 390, pp. 136092.
Government of the Netherlands (2022) Applying for an affordable housing permit. Available at https://www.government.nl/topics/municipalities/municipalities-tasks/applying-for-an-affordable-housing-permit (accessed 1 April 2023).
Greene, W. H. & Hensher, D. A. (2003) A latent class model for discrete choice analysis: Contrasts with mixed logit, *Transportation Research Part B: Methodological*, 37, pp. 681–698.
He, C., Yu, S., Han, Q. & de Vries, B. (2019) How to attract customers to buy green housing? Their heterogeneous willingness to pay for different attributes, *Journal of Cleaner Production*, 230, pp. 709–719.

Jabbour, C. J. C., Jabbour, A. B. L., de, S., Sarkis, J. & Filho, M. G. (2019) Unlocking the circular economy through new business models based on large-scale data: An integrative framework and research agenda, *Technological Forecasting and Social Change*, 144, pp. 546–552.
Joensuu, T., Edelman, H. & Saari, A. (2020) Circular economy practices in the built environment, *Journal of Cleaner Production*, 276, pp. 124215.
Jussila, J., Franzini, F., Häyrinen, L., Lähtinen, K., Nagy, E., Mark-Herbert, C., Roos, A., Toppinen, A. & Toivonen, R. (2023) Consumer housing choices among residents living in wooden multi-storey buildings, *Housing Studies*, pp. 1–26.
Kalmijn, M. & Saraceno, C. (2008) A comparative perspective on intergenerational support, *European Societies*, 10, pp. 479–508.
Kim, H. & Heo, U. (2017) Comparative analysis of economic development in South Korea and Taiwan: Lessons for other developing countries, *Asian Perspective*, 41(1), pp. 17–41.
Kim, D., Seo, Y. & Freybote, J. (2021) Urbanity, financial crisis and the timing of homebuying decisions by young households, *The Journal of Real Estate Finance and Economics*, 62, pp. 481–507.
Kollmuss, A. & Agyeman, J. (2002) Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior?, *Environmental Education Research*, 8, pp. 239–260.
Kutlák, J. (2021) Individualism and self-reliance of generations Y and Z and their impact on working environment: An empirical study across 5 European countries, *Problems and Perspectives in Management*, 19, pp. 39–52.
Lancsar, E., Louviere, J. & Flynn, T. (2007) Several methods to investigate relative attribute impact in stated preference experiments, *Social Science & Medicine*, 64, pp. 1738–1753.
Larsen, V. G., Tollin, N., Antoniucci, V., Birkved, M., Sattrup, P. A., Holmboe, T. & Marella, G. (2022) Filling the gaps circular transition of affordable housing in Denmark, *IOP Conference Series: Earth and Environmental Science*, 1078, pp. 012078.
Lee, Y., Kemp, P. A. & Reina, V. J. (2022) Drivers of housing (un)affordability in the advanced economies: a review and new evidence, *Housing Studies*, 37, pp. 1739–1752.
Leising, E., Quist, J. & Bocken, N. (2018) Circular economy in the building sector: Three cases and a collaboration tool, *Journal of Cleaner Production*, 176, pp. 976–989.
Li, W. D. & Hung, C. Y. (2019) Parental support and living arrangements among young adults in Taiwan, *Journal of Housing and the Built Environment*, 34, pp. 219–233.
Lin, Y. J., Chang, C. O. & Chen, C. L. (2014) Why homebuyers have a high housing affordability problem: Quantile regression analysis, *Habitat International*, 43, pp. 41–47.
Linder, M. & Williander, M. (2017) Circular business model innovation: Inherent uncertainties, *Business Strategy and the Environment*, 26, pp. 182–196.
Liu, Y., Sun, X., Sun, T., Shi, X. (). & J., Liu. (2019) Promoting green residential buildings by increasing homebuyers' willingness to pay: Evidence from Sino-Singapore Tianjin eco-city in China, *Journal of Cleaner Production*, 238, pp. 117884.
Lo, C. L. (2017) Environmental benefits of renewable building materials: A case study in Taiwan, *Energy and Buildings*, 140, pp. 236–244.
MacAskill, S., Stewart, R. A., Roca, E., Liu, B. & Sahin, O. (2021) Green building, split-incentives and affordable rental housing policy, *Housing Studies*, 36, pp. 23–45.
McFadden, D. (1974) Conditional logit analysis of qualitative choice behavior, in: *Frontiers in Econometrics*, pp. 105–142 (New York: Academic Press).
Nainggolan, D., Pedersen, A. B., Smed, S., Zemo, K. H., Hasler, B. & Termansen, M. (2019) Consumers in a circular economy: Economic analysis of household waste sorting behaviour, *Ecological Economics*, 166, pp. 106402.
Nußholz, J. L. K., Rasmussen, F. N., Whalen, K. & Plepys, A. (2020) Material reuse in buildings: Implications of a circular business model for sustainable value creation, *Journal of Cleaner Production*, 245, pp. 118546.
Planing, P. (2018) Towards a circular economy – How business model innovation will help to make the shift, *International Journal of Business and Globalisation*, 20, pp. 71–83.

Pretner, G., Darnall, N., Testa, F. & Iraldo, F. (2021) Are consumers willing to pay for circular products? The role of recycled and second-hand attributes, messaging, and third-party certification, *Resources, Conservation and Recycling*, 175, pp. 105888.

Rajesh, P., Shajin, F. H. & Kannayeram, G. (2022) A novel intelligent technique for energy management in smart home using internet of things, *Applied Soft Computing*, 128, pp. 109442.

Rasmussen, F. N., Birkved, M. & Birgisdóttir, H. (2020) Low-carbon design strategies for new residential buildings–Lessons from architectural practice, *Architectural Engineering and Design Management*, 16, pp. 374–390.

Ronald, R., Schijf, P. & Donovan, K. (2023) The institutionalization of shared rental housing and commercial co-living, *Housing Studies*, 39, pp. 2300–2324.

Rosa, P., Sassanelli, C. & Terzi, S. (2019) Towards circular business models: A systematic literature review on classification frameworks and archetypes, *Journal of Cleaner Production*, 236, pp. 117696.

Sell, L. G., Tedesco, M., Simioni, F. J., Sehnem, S., Soares, J. F. & Coelho Junior, L. M. (2023) Circular economy practices using the ReSOLVE framework: An assessment by sector and scale in the Brazilian planted tree industry, *Journal of Cleaner Production*, 433, pp. 139780.

Shao, S., Tian, Z. & Fan, M. (2018) Do the rich have stronger willingness to pay for environmental protection? New evidence from a survey in China, *World Development*, 105, pp. 83–94.

Statista (2021) Netherlands: Average annual salary by age. Available at https://www.statista.com/statistics/538406/average-annual-salary-in-the-netherlands-by-age/ (accessed 24 March 2023).

Statista (2023) Netherlands: Population, by age and gender. Available at https://www.statista.com/statistics/755052/population-of-the-netherlands-by-age-and-gender/ (accessed 28 October 2023).

Tait, P., Saunders, C., Dalziel, P., Rutherford, P., Driver, T. & Guenther, M. (2019) Estimating wine consumer preferences for sustainability attributes: A discrete choice experiment of Californian Sauvignon Blanc purchasers, *Journal of Cleaner Production*, 233, pp. 412–420.

Taiwan Institute of Property Management (2018) *Manual for the Planning, Design, Construction, and Operation Management of Taiwan Public Housing*, Taipei, Taiwan.

The European Commission (2015) *Circular Economy Action Plan*. Available at https://ec.europa.eu/environment/strategy/circular-economy-action-plan_e

Train, K. E. (2009) *Discrete Choice Methods with Simulation* (Cambridge: Cambridge University Press).

Tserng, H. P., Chou, C. M. & Chang, Y. T. (2021) The key strategies to implement circular economy in building projects—A case study of Taiwan, *Sustainability*, 13, pp. 754.

Ur Rahman, S., Chwialkowska, A., Hussain, N., Akbar Bhatti, W., Luomala, H., Hussain Nhussain, N., Waheed Akbar, B., Rugnl, Luomala Harriluomala, H. & Ur Rahman, S. (2021) Cross-cultural perspective on sustainable consumption: Implications for consumer motivations and promotion, *Environment, Development and Sustainability*, 25, pp. 997–1016.

Uyttebrouck, C., van Bueren, E. & Teller, J. (2020) Shared housing for students and young professionals: Evolution of a market in need of regulation, *Journal of Housing and the Built Environment*, 35, pp. 1017–1035.

van Loon, P. & Van Wassenhove, L. N. (2020) Transition to the circular economy: The story of four case companies, *International Journal of Production Research*, 58, pp. 3415–3422.

Vecchio, R. & Annunziata, A. (2015) Willingness-to-pay for sustainability-labelled chocolate: An experimental auction approach, *Journal of Cleaner Production*, 86, pp. 335–342.

Wallin, J., Knutsson, J. & Karpouzoglou, T. (2021) A multi-criteria analysis of building level graywater reuse for personal hygiene, *Resources, Conservation & Recycling Advances*, 12, pp. 200054.

Wang, Q. J., Dalsgard, J. & Giacalone, D. (2022) Shopping for a sustainable future: Two case studies on consumer perception of organic cotton and wine, *Food Quality and Preference*, 96, pp. 104405.

Wang, X. & Geng, Y. (2011) Municipal solid waste management in Dalian: Practices and challenges, *Frontiers of Environmental Science & Engineering*, 6, pp. 540–548.

Williams, K. J. H., Lee, K. E., Sargent, L., Johnson, K. A., Rayner, J., Farrell, C., Miller, R. E. & Williams, N. S. G. (2019) Appraising the psychological benefits of green roofs for city residents and workers, *Urban Forestry & Urban Greening*, 44, pp. 126399.

World Economics (2022) World Economics. Available at https://www.worldeconomics.com/ (accessed 24 March 2023).

Wu, C. Y., Hu, M. C. & Ni, F. C. (2021) Supporting a circular economy: Insights from Taiwan's plastic waste sector and lessons for developing countries, *Sustainable Production and Consumption*, 26, pp. 228–238.

Xia, W. & Zeng, Y. (2008) Consumer's willingness to pay for organic food in the perspective of meta-analysis, in: *International Conference on Applied Economics*, Greece, SSRN.

Yu, H. C., Lin, T. H. & Dąbrowski, M. (2023) Beyond conditionality: Community placemaking in Taiwanese social housing management, *Planning Practice & Research*, 38, pp. 43–61.

Appendix

Appendix A. Questionnaire

Part 1—Background	
Q1.	Gender: □ Male □ Female: _____
Q2.	Age: □ 20–22 years □ 23–26 years □ 27–30 years
Q3.	Highest education level: □ High school or lower □ Bachelor's degree □ Graduate degree or above
Q4-1.	Annual income (for Dutch): □ €6390.8–49,013 □ €49,014–61,148 □ More than €61,148
Q4-2.	Annual income (for Taiwanese): □ €13,080–14,280 □ €14,281–23,407 □ More than €23,407

Part 2—Sustainable attitude						
To what extent do you agree or disagree with each of the following statements?		1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 strongly agree
Please select one answer *per row*						
Statements about sustainability awareness (A)						
A1.	I care about environmental problems and policy.					
A2.	I know about the circular economy and related policies of the Netherlands/ Taiwan.					
A3.	I believe most houses should be constructed with recycled and eco-friendly materials.					
Statements about sustainable behaviour (B)						
B1.	I have switched products/ brands for environmental reasons.					
B2.	I make an effort to buy products made from reused materials.					
B3.	I support the brands which provide sharing services.					
B4.	I support activities related to the environment, circularity, or sustainability.					
B5.	If the government provides affordable housing with circular attributes for young people, I am interested in renting a studio or a house from them.					

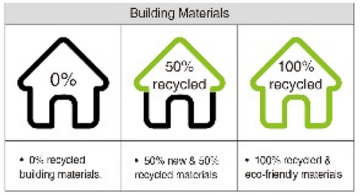
(*Continued*)

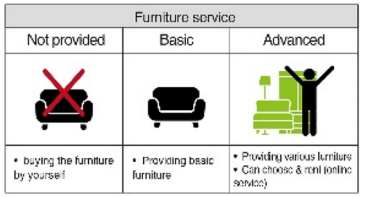
Appendix A. Continued.

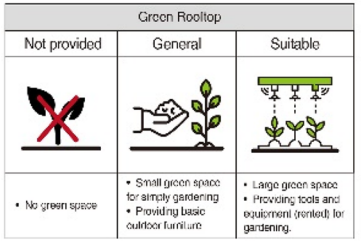
Part 3—Preference and willingness to pay for circular affordable housing

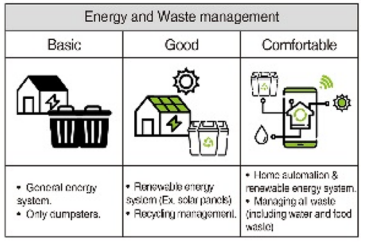
Instructions.

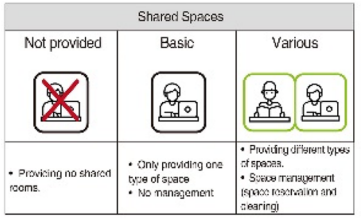
You will be presented with a series of choice sets, each containing two different combinations of design, facilities, and services in affordable housing. Please carefully review each pair of alternatives and select the option that best aligns with your preferences. If neither option meets your preferences, you may choose 'Neither of them.' Below is the explanation for each icon and an example.

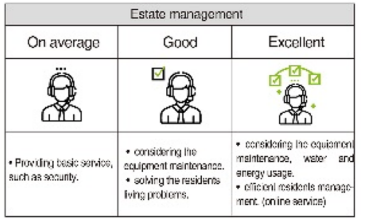


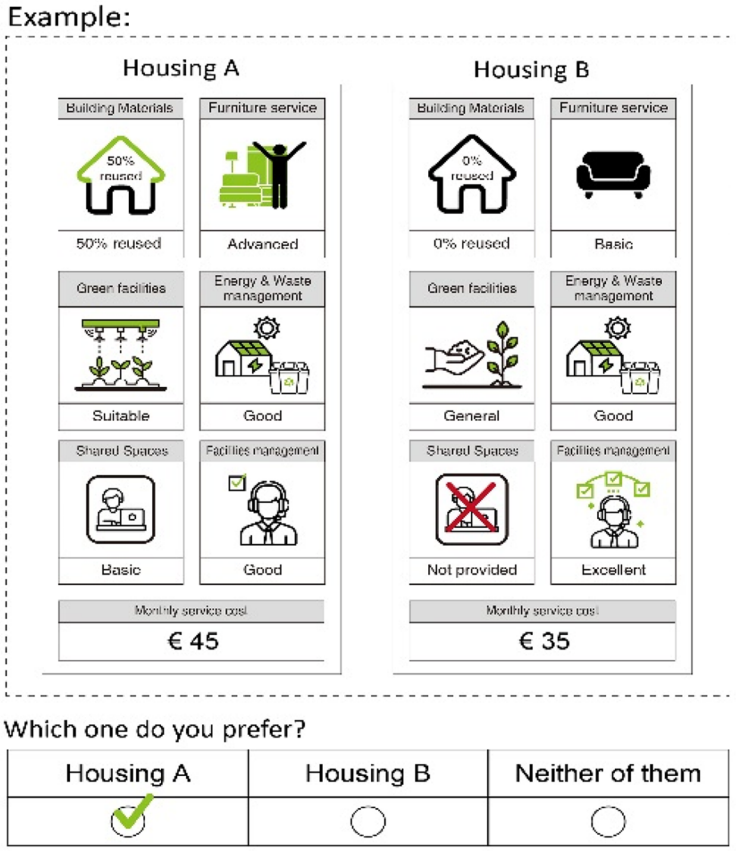












(*Continued*)

Appendix A. Continued.

Part 3—Preference and willingness to pay for circular affordable housing

Choice set #1.

Which one do you prefer:
□ Housing A □ Housing B □ Neither of them