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A microeconomic examination of the "Rethink" and "Refuse" Circular Economy practices in the construction sector: Results from a survey focused on youth across seven European countries

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Abstract

The present study focuses on young citizens' attitudes towards high-level circular-economy strategies such as "Rethink" and "Refuse" in the construction sector. In this respect, young citizens' attitudes and determinants of adopting CE practices in construction, including sharing residences, living in smaller or bio-based buildings, and using shared study or workspaces, were examined. A survey was conducted between May 2025 and January 2026 across seven European countries (Denmark, Germany, Greece, Italy, Portugal, Spain, and the UK), including 358 participants aged 40 or younger. The survey unveiled interesting attitudes, with a general openness to adopting certain CE practices, such as living in smaller or bio-based constructed homes, and sharing study and workspaces. Economic reasons emerge as the primary motivator for sharing a residence or living in a smaller one, while environmental considerations are particularly influential in decisions related to bio-based materials. In cases of sharing study or work spaces, the provided conditions are perceived as the primary factor. Respondents' attitudes vary, influenced by factors such as income, age, and residential characteristics. Moreover, cross-country analysis revealed variations in willingness to adopt specific CE practices, highlighting the role of national context in shaping CE preferences. The findings highlight the importance of tailored strategies to promote CE adoption, emphasizing awareness of environmental benefits, targeted policies, and the need to address economic barriers.

Keywords: Strategy, practice, sharing, survey, determinants, demographic, residence, socioeconomic, environmental.

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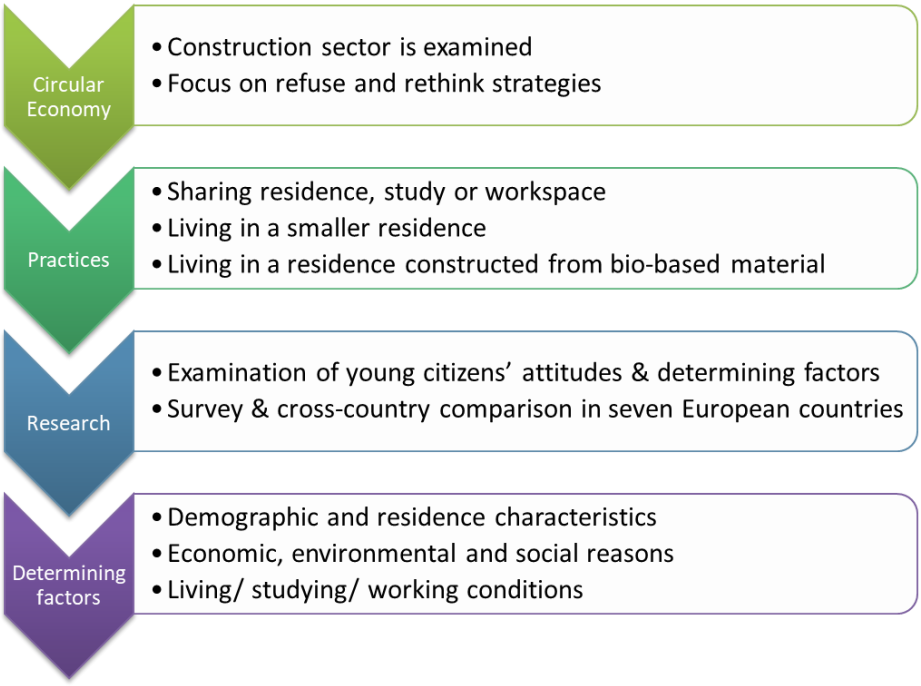
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Graphical abstract



1. Introduction

1.1. *The Circular Economy and the 10R strategies.*

The Circular Economy (CE) is an economic system of closed loops in which raw materials, components, and products retain their quality and value for as long as possible, and systems can be powered by renewable energy sources (Goh *et al.*, 2025). It seeks to limit waste, use resources as efficiently as possible, and appropriately dispose of remaining items (Smol *et al.*, 2015; Koengkan, 2023). By focusing on resource reuse and recycling, waste reduction, and product lifetime management, the CE model differs from the conventional linear "take-make-dispose" path (Chenavaz and Dimitrov, 2024; Gupta *et al.*, 2025a). The CE is increasingly recognized as crucial to sustainable development, as it promotes innovation, minimizes waste, reduces resource consumption, and enhances social and economic well-being. International policies, industrial practices, and the growing consensus on its economic and environmental benefits underscore its significance (Khajuria *et al.*, 2022; Chenavaz and Dimitrov, 2024; Al Halbusi *et al.*, 2025; Barbosa *et al.*, 2025; Goh *et al.*, 2025; Gupta *et al.*, 2025a).

The "10R framework" or "10R strategies" is a systematic collection of hierarchical strategies intended to put CE into practice by minimizing waste and optimizing value retention, where greater circularity and higher value retention are indicated by lower R-numbers (**Table 1**). Three loops can be used to group this hierarchy: a) Short loops (R0–R3): Emphasize more efficient material generation and use; b) Middle long loops (R4–R6): Stress prolonging the life of the product; c) Long loops (R7–R9): Encourage ongoing beneficial use of resources and products (Mani *et al.*, 2025). The research frequently cites these strategies as a comprehensive approach to applying CE across a variety of sectors and industries (Muñoz *et al.*, 2023; Santos *et al.*, 2023; Mani *et al.*, 2025; Ogiemwonyi, 2025; Shahi and Parashar, 2026.

Table 1. The 10R Strategies

R-Level	Strategy	Description
R0	Refuse	Avoid use of products/resources; make redundant
R1	Rethink	Reconsider use/function; innovate business models
R2	Reduce	Minimize material/resource use
R3	Reuse	Use again for the same purpose
R4	Repair	Fix to extend lifespan
R5	Refurbish	Restore to good condition
R6	Remanufacture	Use parts in a new product with the same function
R7	Repurpose	Use for a new purpose
R8	Recycle	Process for material recovery
R9	Recover	Extract energy/materials from waste

Source: Own creation based on: Cheffi et al., 2023; Muñoz et al., 2023; Santos et al., 2023; Mani et al., 2025; Ogiemwonyi, 2025; Shahi and Parashar, 2026

1.2. *Adoption of CE practices*

The effectiveness of CE practices is directly affected by consumer behavior, which plays a crucial role in shaping the flow of goods, resources, and components throughout the CE (Lilley *et al.*, 2019; Kuah and Wang, 2020; Henao-Hincapié *et al.*, 2024). To unlock interactions between waste management and climate change mitigation, consumer attitudes and perceptions regarding CE are essential, as they influence demand for sustainable goods and services (da Silva *et al.*, 2024; Kurniawan *et al.*, 2024). When supported by clear incentives and mechanisms, citizens' adoption of CE practices can lead to better livelihoods, improved conditions, and benefits for future generations (Bhubalan *et al.*, 2022). Besides, a thorough understanding of consumer motivations, barriers, and the societal integration of CE practices should guide policy frameworks and interventions (Chenavaz and Dimitrov, 2024; da Silva and Ramos, 2024; Greene *et al.*, 2024). Integrating citizen feedback and behavior into climate mitigation and CE policy models is critical to developing effective, comprehensive strategies that address real-world requirements and drive systemic change (Lima *et al.*, 2023; Herranz-Pascual *et al.*, 2024). Although adopting CE practices is essential for sustainable consumption, it remains under-studied, and many individuals are unaware of the positive social impact that CE activities can create (da Silva and Ramos, 2024).

In light of the above, the importance of younger citizens adopting CE practices should be emphasized. The younger generation is seen as the future leaders in the shift to a low-carbon economy. They need to adopt sustainable consumption patterns to achieve long-term sustainability goals (Jia and Lin, 2024). Encouraging sustainable habits and building environmental knowledge requires early education (Wardani *et al.*, 2025). Awareness campaigns and educational programs aimed at young people, who are more open to change, are essential to promote a CE mindset and raise accountability and responsibility (Voukkali *et al.*, 2023; Shobande *et al.*, 2024; Zimmermann *et al.*, 2024; Carbonell-Alcocer *et al.*, 2025; Gupta *et al.*, 2025b). To improve the effectiveness of these initiatives and ensure that young people are well-informed and motivated to embrace circular behaviors, it is important to tailor communication strategies to age and awareness levels (Carbonell-Alcocer *et al.*, 2025).

1.3. *CE strategies in the construction sector*

The construction sector consumes a significant amount of natural resources, accounting for roughly 40% of global resource use, 40% of global waste, and 33% of global emissions; thus, implementing CE strategies is critical for limiting environmental impacts and advancing resource efficiency (Eikelenboom *et al.*, 2021; Moustafa *et al.*, 2025; Van Opstal *et al.*, 2025). CE strategies in this sector aim to reduce waste and resource degradation by designing buildings with a lifecycle approach, optimizing material use, and incorporating end-of-life considerations (Eikelenboom *et al.*, 2021; Van Gulck and Steeman, 2024; Wang *et al.*, 2024; Firoozi and Firoozi, 2025).

Applying CE strategies in the construction sector can result in considerable reductions in carbon emissions -potentially up to 38% by 2050- by lowering the need for raw material extraction, minimizing waste, and enhancing resource efficiency (Jonsdottir *et al.*, 2025). At the same time, these strategies provide economic benefits by lowering material costs, boosting productivity, and creating new jobs (Akhimien *et al.*, 2021; Moustafa *et al.*, 2025). Social sustainability is also enhanced by offering affordable, healthy housing alternatives, involving communities, and encouraging innovation and entrepreneurship (Akhimien *et al.*, 2021; Van Opstal *et al.*, 2025).

Citizens play an important role in adopting and implementing CE practices in the construction sector. Their acceptance and support of secondary materials, along with their engagement in waste management and resource-efficiency projects, are critical for completing material loops and achieving circularity (Shooshtarian *et al.*, 2021; Ajwani-Ramchandani and Bhattacharya, 2022; Herranz-Pascual *et al.*, 2024; Jonsdottir *et al.*, 2025). Beyond participation in formal or institutionally organized initiatives, recent scholarship emphasizes that participation should also be understood as an emergent and relational process embedded in everyday socio-technical practices and routines (Chilvers and Kearnes, 2015; Chilvers and Kearnes, 2020). From this perspective, citizens contribute to circular transitions not only through invited forms of engagement, such as consultations or co-creation activities, but also through voluntary changes in their daily practices, including decisions to reuse, repair, share, maintain, and responsibly manage construction materials and the built environment. Such everyday forms of participation are essential for embedding circular economy principles into social practices and fostering long-term behavioral change (Shove *et al.*, 2012; Chilvers and Kearnes, 2015).

1.4. *The 10R strategies in the construction sector – A focus on Refuse and Rethink*

The 10 R's framework is becoming increasingly adapted to the construction sector, with definitions suited to construction materials and mapped across the value chain, notably at the manufacturing and end-of-life stages (Sharma *et al.*, 2022; Ding *et al.*, 2023; Ho *et al.*, 2024; Lima *et al.*, 2024; Carrico, 2025; David *et al.*, 2025; Rajaratnam *et al.*, 2025; Swathi and Vidjeapriya, 2025). Most CE initiatives in the built environment have historically focused on lower-order strategies, such as recycle, reuse, and reduce, with less attention given to higher-order strategies, such as Refuse and Rethink (Ho *et al.*, 2024).

Refuse and Rethink are foundational CE strategies for promoting sustainability and resource efficiency in the construction sector; they are positioned at the top of the CE strategies' hierarchy because they try to prevent waste creation at the source through value shifts and innovative design, rather than managing waste after it is generated (Ho *et al.*, 2024; Carrico, 2025; Rajaratnam *et al.*, 2025; Swathi and Vidjeapriya, 2025; Torróntegui-Chávez *et al.*, 2026). The Refuse principle has been defined as rejecting a

certain product or its function. A broader definition is the eradication of environmentally, economically, or socially damaging patterns in processes or in utilization, leading to more sustainable and circular practices. In the construction sector, this can include rejecting design alternatives that incorporate unnecessary features, such as oversized floor areas or redundant finishes, as well as avoiding the specification of virgin or high-embodied-carbon materials where lower-impact alternatives are available, and material combinations that hinder future disassembly, reuse, repair, or recycling choices (Allwood *et al.*, 2013; Rios *et al.*, 2015; Adams *et al.*, 2019; Çimen, 2023; Ho *et al.*, 2024; Rabaia *et al.*, 2024; Montalbano *et al.*, 2025; Swathi and Vidjeapriya, 2025). The Rethink principle goes beyond sharing products between sectors or services. It entails rethinking design, production, operational procedures, dismantling processes, and managerial decisions to facilitate circularity. In building design, this may include merging multiple functions to produce multifunctional or adaptive elements, hence increasing resource efficiency and utility (Çimen, 2023; Ho *et al.*, 2024; Rabaia *et al.*, 2024; Swathi and Vidjeapriya, 2025).

Co-housing, co-living, and shared housing arrangements are cited as examples of Rethink practices, which question traditional ownership systems and promote collective usage of resources, shared spaces, and, in certain cases, collective control (Brown and Vergragt, 2016; Alday-Mondaca and Schiff, 2025; Arceo *et al.*, 2025; Wikander *et al.*, 2025). Sharing a residence with non-family members, such as roommates, co-housing, or co-living arrangements, has become more prevalent in a variety of circumstances, especially among young adults and in reaction to high urban housing costs. This arrangement differs from traditional family-based households and is frequently motivated by economic necessity, companionship, or lifestyle preferences (Mause, 2008; Jeffers *et al.*, 2023; Kotila, 2024).

Sharing office spaces among different stakeholders, such as enabling multiple organizations to use the same office building or repurposing spaces for different functions at different times, are also examples of Rethink practices. This approach is considered an idealized design principle for addressing the need for new office space, as it prioritizes less-impactful options over constructing new buildings. For instance, if existing office spaces are underutilized, the Rethink principle would suggest adjusting work hours or redesigning office layouts to enable co-sharing with another company, rather than building new office facilities, thus achieving both environmental and economic benefits (Çimen, 2023; Jegen *et al.*, 2025).

Sharing study spaces, another Rethink strategy example, represents a paradigm shift from ownership-based to access-based consumption, exploiting underutilized assets and slowing resource loops by increasing use intensity and extending product lifetimes (Schwanholz and Leipold, 2020; Curtis, 2021; Mont *et al.*, 2021). Sharing study areas can greatly reduce the need to create new buildings or more rooms, resulting in less environmental impacts connected with construction (Jeleniewicz *et al.*, 2025); additionally, it includes a socio-relational dimension, since it may promote community empowerment, trust, and social cohesiveness, which are essential to resource recirculation and the accomplishment of CE goals (Curtis, 2021; Rodrigues *et al.*, 2021; Tan and Yeoh, 2025).

Reducing building size to household needs, such as opting for a smaller house, is recognized as a sufficiency measure in the sharing economy and is closely tied to CE approaches, namely the Rethink strategy. This strategy decreases material and energy demand, minimizes waste, and lessens the environmental effect of both the manufacturing and use stages of buildings (Shahmohammadi *et al.*, 2024). A desire for a slower, more meaningful life, lower investment costs, and an intentional rejection of the idea of upward social mobility might all be reasons to choose a smaller house, and although these motives are not necessarily explicitly environmental, they align with CE ideals by extending the lifespan of residences and reducing resource use (Wuyts *et al.*, 2019). In some situations, the movement to smaller houses is driven by individuals desiring improved quality of life, financial independence, and reduced consumption, rather than necessity (Evans, 2019; Stratton and Corneal, 2023).

Choosing to live in a house built with bio-based materials can be considered a CE practice, particularly when associated with the Refuse strategy, as bio-based alternatives can substitute conventional high-impact construction materials, such as fired clay bricks, gypsum or cement-based panels, Portland cement-based products, and mineral wool or expanded polystyrene insulation. However, simply using bio-based materials does not automatically fulfill all CE criteria, as the success of this approach depends on elements such as the design for disassembly, local sourcing, and the presence of recycling or composting infrastructure (Suttie *et al.*, 2017; Shooshtarian *et al.*, 2021; Ruf *et al.*, 2022; Le *et al.*, 2024; Barbhuiya *et al.*, 2025). The use of such materials is associated with reduced initial production costs and mitigation of environmental impacts, when compared to traditional materials like cement and bricks (Le *et al.*, 2023; Le *et al.*, 2024; Pacheco-Torgal, 2025), and the potential for materials to be reused, recycled, or composted at the end of the building's life (Mahanta *et al.*, 2022; Kayaçetin *et al.*, 2023; Le *et al.*, 2024; Kruczek *et al.*, 2025).

1.5. *Factors affecting citizens' adoption of CE practices*

1.5.1. Demographic characteristics

Age plays a significant role in how citizens plan to adopt CE practices in housing. Younger generations are usually more aware and have better attitudes toward these practices. In contrast, middle-aged groups, such as Generation Y, are more likely to turn these attitudes into concrete actions, such as reusing and recycling. However, actual adoption is still low across all age groups. This highlights the need for targeted educational campaigns to connect positive intentions with lasting circular behaviors in the built environment (Hojnik *et al.*, 2023; Sampedro-Beneyto *et al.*, 2024; Zimmermann *et al.*, 2024).

Gender is a key factor in adopting CE practices. Studies show that women are more open than men to practices like

reuse, recycling, and repair. They are also more willing to pay extra for environmentally friendly products (Sampedro-Beneyto *et al.*, 2024; Zimmermann *et al.*, 2024). This influence goes beyond individual consumers. In professional settings, female managers often play important roles in encouraging circular practices in their organizations (Ali *et al.*, 2022).

Income level influences citizens' intentions to adopt CE practices. However, its effects are complex and depend on the context. Higher income sometimes enables specific behaviors, like purchasing circular products. In contrast, lower income can motivate participation in other activities, such as recycling for economic gain (Gomes *et al.*, 2022). Importantly, studies show that income alone is not a consistent predictor. Factors like education, awareness, and access to infrastructure often play a more significant role in shaping a person's willingness to engage in circular practices (Anokye *et al.*, 2024).

Larger households (in terms of household members) tend to use more resources, like water and energy. However, they are also more likely to adopt practices and equipment that save resources. This is probably due to increased awareness and the chance to save money (Salas-Zapata *et al.*, 2023; da Silva and Ramos, 2024). Moreover, having more employed household members can contribute to certain sustainable behaviors, such as reducing food waste (Lopez *et al.*, 2026).

1.5.2. Residence characteristics

The type of housing influences people's willingness to adopt CE practices. Residents of single-family houses and bungalows show greater independence and motivation, often driven by economic factors, to install measures such as solar panels. This contrasts with those living in multi-story apartments (Sánchez-Braza and Pablo-Romero, 2014; Zander, 2020; Wu *et al.*, 2023). Apartment residents face more obstacles, and the complexity of group decision-making and issues of cost and benefit sharing can reduce their willingness to adopt these practices. Community leadership or specific policies can help encourage these residents to take action (Ajwani-Ramchandani and Bhattacharya, 2022; Malcolm *et al.*, 2024).

The size of a residence influences the willingness to adopt sustainability and energy efficiency practices in different ways. Larger households benefit from economies of scale, which lowers their environmental impact per person. In contrast, medium-sized homes tend to be more driven to pursue energy retrofitting than smaller properties, which face more obstacles (Maghsoudi Nia *et al.*, 2024; Strandell *et al.*, 2026). Moreover, owners of larger, child-free homes are generally more open to space-sufficiency measures such as downsizing. However, the actual adoption rate is low due to concerns about lifestyle changes, comfort, and property values. This situation shows the need for targeted subsidies and awareness campaigns (da Silva and Ramos, 2024; Sula *et al.*, 2025).

The ownership status of a residence, especially home ownership, can affect the desire to adopt CE practices. Homeowners are usually more willing to invest personally in household interventions, such as energy efficiency measures, than non-owners (Scott *et al.*, 2014). However, in situations where circular models emphasize usage-based services rather than ownership, the impact of ownership status is less significant. In these cases, consumer habits and payment structures become more significant in shaping intentions to adopt these practices (Elzinga *et al.*, 2020).

1.5.3. Socioeconomic, environmental and functional factors

Economic factors play a major role in shaping citizens' intentions to adopt CE practices. Financial constraints are a significant barrier that creates a gap between intention and actual behavior (Maione *et al.*, 2025). On the other hand, economic incentives, like tax breaks, subsidies, and take-back programs that offer discounts, effectively boost participation by making circular practices more financially appealing (Forlin and Scholz, 2020; Karytsas and Theodoropoulou, 2023; Zhang, 2024). Additionally, price sensitivity in developing countries increases demand for affordable recycled products, further encouraging adoption (Dantas *et al.*, 2022).

Environmental factors greatly influence people's intentions to adopt CE practices. Awareness and knowledge about the environment drive individuals to feel that circular actions are personally relevant. This connection fosters greater engagement (Lamprom *et al.*, 2025; Varma *et al.*, 2025). Furthermore, when people see the environmental benefits of circular products, they are more likely to adopt them and perceive fewer risks. Environmental attitudes and beliefs, including perceptions of vulnerability to threats, directly and positively affect the adoption of circular practices (Ali *et al.*, 2022; Zhang *et al.*, 2024).

Social factors such as norms, values, and lifestyle play a significant role in shaping citizens' intentions to adopt CE practices. Social norms, along with the influence of peers, family, and role models, can strongly encourage or discourage participation. This is especially true in collectivist cultures where group dynamics are important (Li *et al.*, 2021; Pei *et al.*, 2026). Additionally, lifestyle choices and social values, such as the growing preference for healthy and sustainable living, reflect broader cultural trends that promote circular behaviors, such as sharing, reuse, and waste reduction (Godinho Filho *et al.*, 2024; Żywiołek *et al.*, 2025).

Improved living conditions, such as healthier environments and better infrastructure, motivate citizens to engage in CE practices. Positive working conditions, including job creation, fair wages, and safe environments, encourage greater acceptance and participation (Mies and Gold, 2021; Moustafa *et al.*, 2025). On the other hand, poor living standards, lack of awareness, and unsafe or unfair working conditions can create significant barriers. These issues can widen the gap between intention and actual adoption and worsen social inequalities (da Silva and Ramos, 2024; Van Opstal *et al.*, 2025; Oikonomou *et al.*, 2026).

1.6. *Study rationale and structure*

The adoption of CE principles in the construction sector is strongly influenced by socioeconomic and behavioral

factors, with stakeholder perceptions and cultural attitudes shaping strategies such as Refuse and Rethink. However, limited awareness, confusion over different CE practices, and deep-seated sociocultural barriers, such as consumer preferences and resistance to change, hinder progress (Ranasinghe *et al.*, 2024; Hasibuan *et al.*, 2025). On top of this, there is a notable gap in the literature regarding young citizens. Their generational attitudes toward Refuse and Rethink strategies are poorly understood, even though these attitudes could drive future circularity (Godinho Filho *et al.*, 2024; Ranasinghe *et al.*, 2024; Zimmermann *et al.*, 2024; Hasibuan *et al.*, 2025). Scholars consistently call for research on how demographic, behavioral, and cultural factors, along with education, influence these attitudes. This information could help design targeted policies, educational campaigns, and industry practices that promote circularity in the building sector (Godinho Filho *et al.*, 2024; Ranasinghe *et al.*, 2024; Zimmermann *et al.*, 2024; Hasibuan *et al.*, 2025; Ramisetty & Sharma, 2025). Furthermore, comparative evidence across European countries remains limited, even though differences in socio-economic conditions, housing systems, cultural norms, and the maturity of circular economy policies may influence citizens' willingness to adopt CE practices (Kirchherr *et al.*, 2017; Camacho-Otero *et al.*, 2018; European Commission, 2020).

Hence, there is a clear need to examine the factors shaping young citizens' attitudes toward Refuse and Rethink CE strategies in construction, thereby addressing the significance of this demographic and the existing gaps in understanding. In this respect, the present study aims to examine young citizens' (thus focusing on university students) willingness to adopt five particular CE practices of the Refuse and Rethink strategies in the construction sector, as well as the demographic and residence characteristics, and socioeconomic and environmental factors that may affect their decisions. The study also compares responses across seven European countries (Denmark, Germany, Greece, Italy, Portugal, Spain, and the UK), which differ in their levels of circular economy implementation, housing systems, and sustainable construction practices, to explore whether national context is associated with differences in attitudes toward the examined CE practices (Akinade *et al.*, 2020; European Environment Agency, 2024). Four of the examined practices are relevant to the Rethink strategy, namely: a) willingness to live in a house/apartment shared with other people (non-family members); b) willingness to live in a smaller house/apartment (in terms of square meters), compared to the permanent residence; c) willingness to study in a shared space (e.g., library, student's residence); d) willingness to work in a shared office space (i.e., share office space with others). The fifth practice is connected to the Refuse strategy and examines the willingness to live in a house/apartment constructed from bio-based materials (e.g., wood).

For this purpose, the present study proceeds as follows: Section 1 provides an introduction to the research, aiming to provide a framework for understanding citizens' adoption of CE practices in the construction sector and the determining factors behind it. Section 2 presents the materials and methods applied for this research, including the questionnaire and survey organization, and data collection and analysis. Section 3 focuses on the study's results, including descriptive statistics, a cross-country comparative analysis, and linear regression models with the five CE practices mentioned above as dependent variables. Finally, Section 4 provides the discussion and Section 5 provides the conclusions of the study.

2. Materials and methods

To examine young citizens' willingness to adopt the CE practices (as presented in Section 1.6), a survey targeting undergraduate and postgraduate university students from seven European countries [Denmark, Germany, Greece, Italy, Portugal, Spain, and the United Kingdom (UK)] was planned, organized, and executed. The seven countries were selected, as the survey was carried out in the context of the CO2NSTRUCT European project (https://co2nstruct.dtu.dk/), whose consortium comprises partners from these countries (Oikonomou *et al.*, 2023). The overall procedure can be outlined in three phases, in particular: a) questionnaire and survey organization; b) data collection; c) data treatment and analysis.

The first phase included the development and validation of the survey questionnaire (see **Appendix I**), which included the following segments: a) Demographic characteristics (country of residence, gender, age, income satisfaction, household size); b) Residence characteristics (residence type, ownership status and size); c) Attitudes towards CE practices in the construction sector [willingness to adopt each CE practice, and perceived importance of factors (economic, environmental, social, living/studying/working conditions) affecting willingness]. Nominal, ordinal, and continuous scales were used for the demographic and residence-related questions. The level of agreement regarding willingness to adopt CE practices was assessed using a 7-point Likert scale ("Strongly disagree" to "Strongly agree"). Moreover, to explore the importance of the four factors (economic, environmental, social, and conditions) for each of the five CE practices, respondents were asked to allocate a total of 100 points among the four factors, based on how important they perceived each one to be. No formal definitions of these factors were provided in the questionnaire. Consequently, their interpretation was left open to respondents, allowing the analysis to capture participants' subjective perceptions of the considerations influencing their willingness to adopt each CE practice. Responses were collected through an online platform; SurveyMonkey was selected given its technical specifications for the questionnaire's question types. The final questionnaire was provided in English and translated into Spanish to ease collection in the specific country.

The second phase included data collection in the seven countries. To collect responses, the questionnaire was disseminated during class sessions or via email to undergraduate and postgraduate students in university departments related to economics, environmental sciences, and engineering. These departments were

purposively selected because they provide greater exposure to sustainability and circular economy concepts and educate future professionals who may influence the adoption of circular practices in the built environment. In addition, they were represented among the collaborating institutions participating in the study, facilitating participant recruitment. The age limit was set at 40 years old, as the aim of this study was to examine younger citizens' perceptions; responses from older students were excluded. This way, 358 fully filled-in responses were collected from early May 2025 to January 2026, from the following departments: a) Sustain and Construct; Technical University of Denmark (Denmark); b) Civil and Environmental Engineering; Ruhr University Bochum (Germany); c) Economic and Sustainable Development; Harokopio University of Athens (Greece); d) Engineering; University of Pisa (Italy); e) Environmental Sciences and Engineering; NOVA School of Science and Technology (Portugal); f) diverse science and engineering departments from the Technical University of Madrid, the Autonomous University of Barcelona, the University of Granada, and the University of Oviedo (Spain); g) Management School; University of Sheffield (the UK).

The third phase, i.e., data treatment and analysis, comprised data "cleaning", creating a dataset that excluded incomplete responses (i.e., no missing data) and responses from individuals older than 40 years. Following, descriptive statistics were performed for all questionnaire variables, including the estimation of frequencies or mean values [as well as Standard Deviation (S.D.) and median] depending on each variable's type. In addition, comparative analyses were conducted to examine potential differences across the seven participating countries. Specifically, Kruskal–Wallis tests were used to identify differences in willingness to adopt the five CE practices, while one-way ANOVA tests were performed to examine differences in the perceived importance of the four motivational factors (economic, environmental, social, and living/studying/working conditions). Subsequently, linear regression models were developed; in each model, each one of the five CE practices under examination (see Section 1.6) was featured as the dependent variable, while independent variables comprised demographic characteristics, residence characteristics, and perceived importance of factors (economic, environmental, social, living/studying/working conditions). The two models, which introduced willingness to study in a shared space and willingness to work in a shared office space as the dependent variables, did not include residence characteristics. Statistical analyses were carried out using SPSS 20 software; Microsoft Excel was used to create the figures presented.

3. Results

3.1. *Descriptive statistics*

The demographic (country of residence, gender, age, income satisfaction and household size) and residence characteristics (residence type, ownership and size) are presented in **Table 2**. Regarding country of residence, there is an overrepresentation of responses from Spain (24%) and an underrepresentation of the UK (5%), while the remaining five countries range from 12 to 17%. Female participants represent 53% of the overall sample, and the mean age is 23,08 years. Respondents were asked about their level of agreement with the statement "My household income meets my everyday needs"; "Agree" and "Strongly Agree" were the most common responses, totaling 57%. Regarding the number of people living in the respondents' permanent residence (including themselves), the mean household size is 3,23 persons. The majority (60%) stated an apartment building as their permanent residence, followed by a detached house (21%) and a semi-detached house (15%). Regarding the ownership status of permanent residences, the majority stated they live in privately owned residences (60%), followed by rented residences (38%). The most common residence size is between 50 m^2 and 100 m^2 (47%), followed by 101 m^2 to 150 m^2 (22%).

Survey participants were asked about their level of agreement concerning their willingness to embrace particular Rethink (R1) and Refuse (R0) CE practices. As presented in **Figure 1**, the respondents have a negative attitude (45% disagreeing) towards living in a house/apartment that they would share with other people (non-family members). This is the only statement evaluated negatively by respondents, as the majority of the respondents have evaluated positively their willingness to adopt the proposed CE practices: living in a smaller house/apartment, compared to their permanent residence (53% agreeing), living in a house/apartment constructed from bio-based materials (66% agreeing), studying in a shared space (74% agreeing), and working in a shared office space (76% agreeing).

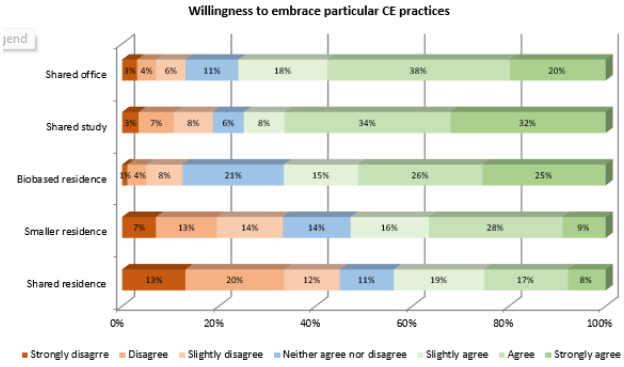


Figure 1. Willingness to embrace particular CE practices.

Participants were asked to evaluate the effects of specific factors (i.e., economic, environmental, and social reasons; and living/studying/working conditions) on their willingness to embrace each of the five aforementioned CE practices. For each CE practice, respondents were asked to allocate 100 points across the four factors based on how significant each factor was to them. For each factor of every CE practice, the mean score of allocated points was calculated, as presented in **Figure 2**. When referring to the factors affecting willingness to live in a house/apartment shared with other people, economic reasons were evaluated as the most important factor (mean score of 40,7, i.e., approx. 40% of the assigned points), while environmental reasons were measured as the least impactful (mean score of 13,5). Concerning the factors

affecting willingness to live in a smaller house/apartment, compared to permanent residence, again economic reasons were evaluated as the most important factor (mean score of 49,8, meaning approx., half of the points available to assign among the four factors); on the contrary, both environmental (mean score of 13,6) and social reasons (mean score of 12,2) score quite low. When examining the factors affecting willingness to live in a house/apartment constructed from bio-based materials, environmental reasons are valued as the most important (mean score of 39,8), while social reasons are the least (mean score of 8,4). The evaluation results differ in relation to what has been presented above- when referring to the assessment of the factors affecting willingness to study in a shared space and to work in a shared office space. In both cases, conditions [studying in the first case (mean value 46,0) and working in the second (mean value 39,3)] have been evaluated as the most important factor, followed by social reasons, with mean values of 28,9 and 29,9, for willingness to study and work in shared spaces, respectively. In contrast, environmental reasons are considered the least important factor in both cases.

Table 2. Demographic and residence characteristics

			Value
Demographic	Country of residence	Denmark	13,4%
		Germany	17,0%
		Greece	11,7%
		Italy	16,8%
		Portugal	11,7%
		Spain	24,3%
		United Kingdom	5,0%
	Gender	Male	44,4%
		Female	53,1%
		Other	2,5%
	Age	Mean	23,08
		S.D.	4,26
		Median	22,0
		Min	18,0
		Max	40,0
	Income satisfaction	Strongly disagree	2,2%
		Disagree	5,3%
		Slightly disagree	5,3%
		Neither agree nor disagree	16,5%
		Slightly agree	13,7%
		Agree	34,6%
		Strongly agree	22,3%
	Household size	Mean	3,23
		S.D.	1,697
		Median	3
		Min	1
		Max	17
Residence	Residence type	Detached	20,9%
		Semi-detached	14,8%
		Apartment	60,1%
		Other	4,2%
	Residence ownership	Self/ family owned	60,1%
		Rented	38,0%
		Other	2,0%
	Residence size	0 - 50 m^2	15,1%
		51 - 100 m^2	46,9%
		101 - 150 m^2	21,8%
		+150 m^2	16,2%

3.2. *Cross-country comparative analysis*

The cross-country analysis indicates that national context is associated with differences in citizens' willingness to adopt several CE practices. However, the extent of these differences varies across the practices examined. Overall, cross-country differences were more pronounced for willingness to adopt the proposed CE practices than for the motivational factors underlying these choices (**Appendix II**).

The largest number of significant differences was observed for willingness to live in a residence constructed from bio-based materials, suggesting substantial variation in the acceptance of bio-based construction solutions across

countries. Denmark consistently reported higher willingness than Greece, Italy, Portugal, Spain, and the UK, while Germany also exhibited higher willingness than Greece and Italy. By contrast, Greece reported significantly lower willingness than Portugal and Spain. These findings suggest that perceptions of bio-based housing solutions are particularly sensitive to national context.

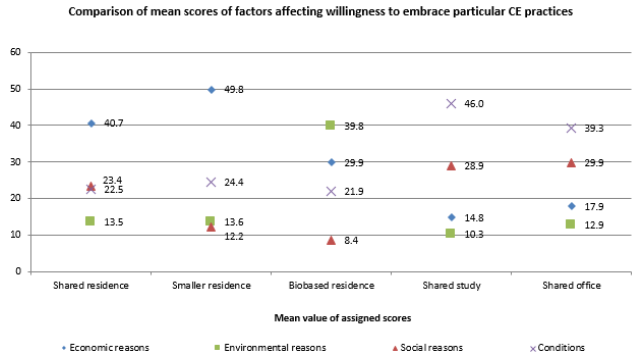


Figure 2. Comparison of mean scores of factors affecting willingness to embrace particular CE practices

Willingness to live in a smaller residence also exhibited considerable cross-country variation. Denmark reported lower willingness than Portugal, whereas Germany reported lower willingness than Portugal and Spain. Italy also showed lower willingness than Portugal and Spain. Similarly, willingness to share a residence differed across countries, with Spain consistently reporting higher willingness than both Germany and Italy.

Regarding shared spaces, cross-country differences were comparatively limited for shared study spaces but somewhat more pronounced for shared office spaces. For shared study spaces, significant differences were identified only between Denmark and Italy and between Italy and Portugal. In contrast, willingness to work in a shared office space differed in several comparisons, with Denmark consistently reporting lower willingness than Germany, Greece, and Italy, while Portugal also reported lower willingness than Greece.

The analysis of motivational factors revealed considerably fewer cross-country differences than the willingness measures. For shared and smaller residences, differences were observed only for economic and environmental motivations, whereas social and living-condition motivations remained remarkably consistent across countries. For bio-based residences, however, both environmental and social motivations differed significantly across countries, suggesting that citizens vary not only in their willingness to adopt bio-based housing but also in the motivations underlying these preferences. Likewise, for shared study spaces, only environmental motivations exhibited significant cross-country variation, while no significant differences were identified in the motivational factors associated with shared office spaces.

Table 3. Results of regression models

	Shared residence	Smaller residence	Biobased residence	Shared study	Shared office
Gender (male)	-0,302	-0,278	-0,099	**-0,339***	**-0,274***
Age (continuous)	**-0,089*****	**-0,051****	0,003	0,016	0,015
Income satisfaction (ordinal)	**0,196*****	**0,138****	**0,185*****	**0,153****	**0,211*****
Household size (continuous)	**0,121***	**0,134****	-0,033	0,013	0,035
Residence ownr. (privately owned)	-0,016	0,156	**-0,477*****	n.a. [e]	n.a. [e]
Residence type (apartment)	-0,022	0,027	-0,062	n.a. [e]	n.a. [e]
Residence size (ordinal)	**-0,367*****	0,103	**-0,167***	n.a. [e]	n.a. [e]
Economic reasons [a]	omitted [d]	omitted [d]	omitted [d]	omitted [d]	omitted [d]
Environmental reasons [a]	0,013	0,003	**0,020*****	**0,020****	**0,025*****
Social reasons [a]	0,007	**-0,016****	-0,001	**0,012****	**0,024*****
Living/ studying/ working conditions [a]	**-0,018*****	**-0,020*****	-0,002	0,007	0,006
Constant	5,557	4,805	4,336	3,442	2,585
R^2	0,113	0,143	0,252	0,042	0,136
Adjusted R^2	0,087	0,118	0,231	0,023	0,119
Durbin-Watson [b]	1,928	1,688	2,030	1,907	2,055
Variance Inflation Factor (VIF) [c]	<1,6	<1,6	<1,6	<1,8	<1,6

*Note: Statistical significance indicated by asterisks: * p < 0,10; ** p < 0,05; *** p < 0,01.*

*[a] In each model, the factor corresponding to each CE practice was included (see **Figure 2**)*

[b] Values ranging between 1,5 and 2,5 indicate no significant first-order autocorrelation

[c] VIF < 5 are typically considered to have low to moderate multicollinearity, indicating no cause for concern

[d] Due to the constant-sum nature of the motivation variables, one category was excluded to avoid perfect multicollinearity. Economic reasons were used as the reference category.

[e] Not applicable

3.3. *Regression models*

Table 3 presents the results of the linear regression models examining the factors influencing participants' willingness to engage in the five CE practices. The models include demographic and residence variables (the models examining shared study and office do not include the residence variables), as well as specific motivational factors (economic, environmental, social, and

living/studying/working conditions) that may affect respondents' preferences. Since respondents allocated 100 points among these four motivational factors, economic reasons were used as the reference category in all models; therefore, the estimated coefficients indicate differences associated with assigning greater relative importance to each motivation compared with economic reasons.

The first model (dependent variable: willingness to share residence) indicates that, at a statistically significant level, respondents of younger age, higher income, living in a household with more occupants, and residing in a smaller dwelling would be more willing to live in a house/apartment that they would share with other people (non-family members). In addition, respondents assigning greater relative importance to living conditions compared with economic reasons are less willing to live in a shared residence.

The second model (dependent variable: willingness to live in a smaller residence) shows that, at a statistically significant level, respondents of younger age, higher income, and living in a household with more occupants would be more willing to live in a smaller house/apartment (in terms of square meters), compared to their permanent residence. Moreover, respondents assigning greater relative importance to social reasons and living conditions compared with economic reasons are less willing to adopt this CE practice.

The third model (dependent variable: willingness to live in a residence constructed from bio-based materials) indicates that, at a statistically significant level, respondents with higher income and those living in smaller non-privately-owned residences are more willing to live in a residence constructed from bio-based materials. Furthermore, compared with economic reasons, assigning greater relative importance to environmental reasons is positively associated with willingness to adopt this CE practice.

The fourth model (dependent variable: willingness to share studying space) finds that, at a statistically significant level, women and respondents with higher income are more willing to study in a shared space (e.g., a library or a students' residence). Moreover, assigning greater relative importance to environmental and social reasons compared with economic reasons is associated with greater willingness to study in a shared space.

The fifth model (dependent variable: willingness to share office space) signifies that, on a statistically significant level, women and respondents with higher income are more willing to work in a shared office space. In addition, respondents assigning greater relative importance to environmental and social reasons than to economic reasons are more willing to work in a shared space.

4. Discussion

The findings provide answers to the study's research objectives. First, the results demonstrate that young citizens are generally receptive to several high-level CE practices in the construction sector, particularly sharing study and workspaces and living in smaller or bio-based residences, although willingness varies across practices. Second, the study identifies the main determinants influencing these preferences, showing that demographic and residential characteristics, together with economic, environmental, social, and living/studying/working-condition motivations, significantly shape willingness to adopt specific CE practices. Finally, the cross-country comparison reveals that acceptance of these practices is not uniform across Europe, with the greatest variation observed for bio-based and alternative housing arrangements. These findings suggest that while some drivers of CE adoption are common across countries, national context also plays an important role in shaping citizens' preferences.

The most consistent result of this study is that higher income satisfaction is positively connected with willingness to engage in construction-related CE practices, with significant effects across all five models. Hence, this indicates that citizens who are more satisfied with their income are more receptive to the proposed practices, i.e., shared, smaller and biobased arrangements. This finding is consistent with previous research indicating that higher income enables positive CE behaviors (Karytsas *et al.*, 2019; Fogarassy *et al.*, 2020; Gomes *et al.*, 2022; Karytsas *et al.*, 2026), in contrast to research suggesting that income alone is not a consistent predictor (Anokye *et al.*, 2024). However, the relationship between economic conditions and willingness to adopt CE practices should be interpreted carefully, particularly for practices such as shared or smaller housing. Lower-income individuals may experience these arrangements not as voluntary circular choices but as necessities resulting from financial constraints. Therefore, higher income satisfaction may reflect not only greater economic capacity to adopt CE practices, but also greater freedom to choose whether and how to engage with such practices. Hence, this finding suggests that economic security and perceived financial capacity may influence openness to CE construction-related practices, highlighting the need for policies that ensure CE solutions remain accessible and desirable across different economic groups, rather than becoming responses to economic hardship alone.

Regarding gender, all models indicate that women are more willing to engage in the proposed CE practices, with statistically significant results for sharing study and office spaces. This finding confirms previous research indicating women's strong acceptance of CE practices (Ali *et al.*, 2022; Sampedro-Beneyto *et al.*, 2024; Zimmermann *et al.*, 2024), possibly due to their greater environmental awareness, community orientation, or openness to collaborative practices. However, the results of this study suggest that gender differences are not uniform across all CE practices, as statistically significant effects were identified specifically for shared study and office spaces. Therefore, gender should be considered as one of several factors influencing CE engagement, rather than as a standalone determinant of participation. Existing sustainability initiatives increasingly recognize the importance of gender-inclusive

approaches, including gender-responsive education, capacity-building activities, and the involvement of women in environmental decision-making and community-based sustainability programs (UN Women, 2019; UNFCCC, 2019). Such approaches can contribute to more inclusive CE transitions by ensuring that diverse perspectives and experiences are considered in the design and implementation of CE initiatives. Considering gender differences is therefore important for developing policies that encourage participation across different demographic groups and build on the positive trends observed among women.

In terms of age, the study's results show that older participants are less willing to adopt certain construction-related CE practices, particularly shared and smaller residential arrangements. This result aligns with prior research highlighting younger generations' greater preference for CE practices (Hojnik *et al.*, 2023; Sampedro-Beneyto *et al.*, 2024; Zimmermann *et al.*, 2024), possibly due to greater environmental awareness, flexibility, or acceptance of lifestyle changes. Conversely, research on ageing and housing preferences suggests that older adults often show stronger attachment to their existing homes and neighborhoods, with preferences for ageing in place, independence, familiarity, and stability influencing their residential decisions (de Jong *et al.*, 2022; Lebrusán and Gómez, 2022). Therefore, the lower willingness observed among older participants may reflect not only reduced openness to CE-related housing alternatives, but also the importance of maintaining autonomy, privacy, and established social connections. Moreover, residential immobility among older adults should not necessarily be interpreted as a lack of interest in alternative housing solutions, as it may result from either personal choice or constraints related to available housing options, affordability, and perceived suitability of alternatives (de Jong *et al.*, 2022). Relevant policies could include engagement strategies addressing the specific concerns and motivations of older populations (e.g. improved quality of life, cost savings, or health and safety benefits), incentives (e.g. financial subsidies, awareness campaigns, pilot programs) for older residents to adopt smaller or shared living arrangements progressively, and the development of age-friendly CE housing solutions that combine resource efficiency with the needs of older adults regarding accessibility, safety, comfort, and privacy (Choi, 2022; Ma *et al.*, 2022).

A larger household size (i.e., the number of household members) is positively associated with the willingness to share a residence or live in a smaller one. This indicates that respondents from larger households may be more comfortable with shared or smaller living arrangements. This is consistent with previous studies, which indicate the positive role of household size in the adoption of environmental or energy-efficient practices (Lam, 2006; Fielding *et al.*, 2010; Al-Mayahi *et al.*, 2019). This could be in response to the practical benefits of resource sharing, cost savings, or interactions within larger households that encourage collaborative decision-making. In addition, larger households often use more resources, making shared solutions more appealing and possibly more effective for reducing environmental footprints. Corresponding policies could include programs and incentives that are particularly appealing to larger families or households (such as affordable, accessible, and well-designed co-housing or community-based living structures), increased awareness of relevant benefits such as cost savings, resource efficiency, and community gains, and policies, such as zoning laws and regulations on housing, that promote shared housing projects in urban areas with high household densities.

Residence-related characteristics present varied effects. Owning a house/apartment is negatively associated with willingness to live in a residence constructed from biobased materials, likely due to the perceived inconvenience or costs associated with moving or renovating. This result is consistent with the findings of Davis *et al.* (2025) and Ferriz-Papi (2025), who found that individual ownership often conflicts with the effective implementation of CE strategies. Moreover, larger residences are negatively associated with both the willingness to share a residence (perhaps due to preferences for more private space) and the likelihood of living in homes constructed with biobased materials (as larger residences may be less suitable for eco-friendly, biobased materials, which are often used in smaller, more eco-friendly living settings). This result aligns with Shahmohammadi *et al.* (2024), indicating that smaller residences are strongly associated with greater adoption of CE practices in the building sector. These findings indicate that specific housing ownership structures and residence sizes can function as hurdles to the implementation of CE practices in the building sector. The preference for private space, as well as barriers to renovation or relocation, could hinder efforts to promote CE practices. Measures that take into account residence characteristics include incentives to retrofit existing properties with biobased materials, building regulations favoring (or requiring) eco-friendly materials, and urban planning policies that favor the development of smaller, eco-friendly housing units.

Economic reasons seem to be the most important factor when considering sharing or living in a smaller residence. Conversely, for practices like living in bio-based residences, environmental concerns take priority. At the same time, social and practical considerations (such as working or studying conditions) are key drivers of sharing study and work spaces. These results align with previous findings, highlighting that motivations for adopting CE practices are context-dependent, involving a complex interplay of economic, environmental, social, and functional factors (Forlin and Scholz, 2020; Mies and Gold, 2021; Karytsas, 2022; Ali *et al.*, 2022; Godinho Filho *et al.*, 2024; Zhang, 2024; Zhang *et al.*, 2024; Moustafa *et al.*, 2025; Żywiołek *et al.*, 2025). Thus, effective CE promotion should tailor strategies to these differing priorities for each practice, including financial incentives, environmental awareness campaigns, improvement of social aspects and working/studying conditions in shared spaces (e.g., community-focused structures emphasizing comfort and convenience), and

integrated policies addressing economic, environmental, and social factors simultaneously.

The cross-country analysis highlights the importance of national context in shaping willingness to engage in CE practices in the construction sector. Although CE strategies are promoted through European and national policy frameworks, their acceptance may vary across countries depending on socio-economic conditions, housing systems, cultural preferences, and previous exposure to sustainable practices (Kirchherr *et al.*, 2017; Camacho-Otero *et al.*, 2018). The most notable differences were observed for bio-based residences and alternative housing arrangements, such as smaller and shared residences, suggesting that citizens' perceptions of these practices may depend not only on environmental awareness but also on factors such as affordability, familiarity, perceived comfort, and the suitability of these practices to existing lifestyles (Herranz-Pascual *et al.*, 2024; Jonsdottir *et al.*, 2025). Therefore, CE policies should consider local contexts and address country-specific barriers and opportunities rather than applying uniform approaches. However, these findings should be interpreted cautiously due to differences in country sample sizes and the characteristics of the surveyed population.

In light of the above, the present study has specific limitations. There is no equal representation of the seven countries, which constitutes the main limitation of this analysis (as shown in **Table 2**, Spain is overrepresented, and the UK is underrepresented). Moreover, the sample is not representative of the broader population, either geographically or in terms of demographic and residential characteristics. In addition, the sample was drawn exclusively from university departments related to economics, environmental sciences, and engineering. Although this purposive sampling strategy enabled the study to target students with greater exposure to sustainability and circular economy concepts, as well as future professionals likely to influence the adoption of circular practices in the built environment, it may also have introduced sampling bias, as these students are likely to possess higher levels of awareness and more favorable attitudes toward CE than the general student population. Consequently, the findings may overestimate the acceptance of CE practices and should not be generalized to all university students or the broader population. Furthermore, the four motivational factors (economic, environmental, social, and living/studying/working conditions) were intentionally not defined in the questionnaire. As a result, respondents may have interpreted these concepts differently based on their own perceptions and experiences, introducing variability in how the motivational dimensions were understood and evaluated. Another limitation of the study is that it considers only demographic and residence characteristics, as well as economic, environmental, social, and functional factors. Hence, potential determinants such as knowledge, prior engagement in CE practices, and additional behavioral, social, and psychological factors are not included in the analysis. Therefore, future research should aim to obtain a more representative sample across countries, academic disciplines, and demographic groups, while accounting for additional determinants. Nevertheless, the present study provides valuable insights that can inform future research and help identify potential areas of interest on topics that have not been previously examined in the scientific literature.

5. Conclusions

This study focused on young people's views on high-level circular economy initiatives, such as "Rethink" and "Refuse," in the construction sector. The study investigated young people's attitudes and the factors that influence their adoption of specific CE practices in the construction sector, such as living in smaller or bio-based dwellings, sharing a residence, and using common study or workspaces. In this respect, a survey of 358 people aged 40 or younger was conducted between May 2025 and January 2026 across seven European countries: Denmark, Germany, Greece, Italy, Portugal, Spain, and the United Kingdom. The survey revealed interesting attitudes, including a general willingness to adopt certain CE practices, such as sharing study and workspaces and living in smaller or bio-based-designed dwellings. Economic factors are identified as the main drivers of the willingness to share a residence or opt for a smaller living space, whereas environmental concerns play a significant role in decisions about bio-based materials. When it comes to sharing study or workspaces, the conditions provided are seen as the most influential factor, followed by social factors. Additionally, attitudes toward adopting CE practices are influenced by demographic characteristics (income, age, gender, and household size) and residential characteristics (residence ownership status and size). The cross-country analysis further revealed that willingness to engage in CE practices differs across national contexts, with the most notable variations observed for bio-based residences and alternative housing arrangements, such as smaller and shared residences. These findings suggest that cultural, socio-economic, and housing-related factors may influence citizens' perceptions of CE practices, although the results should be interpreted with caution given the unequal representation of countries and the characteristics of the sample. The findings underscore the necessity of customized strategies -adapted to different demographics- to encourage CE adoption, focusing on the provision of financial incentives, awareness campaigns, policies stimulating engagement, support of community-led schemes, design of alternative living arrangements, appropriate urban zoning laws and building regulations, and improvement of social aspects and working/studying conditions in shared spaces.

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Appendix I

Questionnaire: Circular economy in the building sector - residents' attitudes

Page #1

In this survey, we ask you to give your opinion about the Circular Economy practices in the building sector. There are no correct or incorrect answers, only your own opinion.

Filling in the questionnaire takes less than 5 minutes.

Your answers in this survey will remain completely anonymous. By answering it, you consent that your responses can be used in a relevant research.

Page #2

1. In which country do you live in?

- Denmark
- Germany
- Greece
- Italy
- Portugal
- Spain
- United Kingdom

2. Which is your University?

3. Which is your Department?

Page #3

4. "After my studies, I would be willing to live in a house/apartment that I would share with other people (non-family members)"

Please indicate the extent to which you agree or disagree with this statement.

- Strongly disagree
- Disagree
- Slightly disagree
- Neither agree nor disagree
- Slightly agree
- Agree
- Strongly agree

5. How much would the following factors affect your willingness to live in a house/apartment that you would share with other people (non-family members)?

You have a total of 100 points to allocate among these factors based on how significant you believe each factor is to you.

Economic reasons
Environmental reasons
Social reasons
Living conditions

Page #4

6. "After my studies, I would be willing to live in a smaller house/apartment (in terms of square meters), compared to my permanent residence"

Please indicate the extent to which you agree or disagree with this statement.

- Strongly disagree
- Disagree
- Slightly disagree
- Neither agree nor disagree
- Slightly agree
- Agree
- Strongly agree

7. How much would the following factors affect your willingness to live in a smaller house/apartment (in terms of square meters), compared to your permanent residence?

You have a total of 100 points to allocate among these factors based on how significant you believe each factor is to you.

Economic reasons
Environmental reasons
Social reasons
Living conditions

Page #5

8. "After my studies, I would be willing to live in a house/apartment constructed from bio-based materials (e.g. wood)"

Please indicate the extent to which you agree or disagree with this statement.

- Strongly disagree
- Disagree
- Slightly disagree
- Neither agree nor disagree
- Slightly agree
- Agree
- Strongly agree

9. How much would the following factors affect your willingness to live in a house/apartment constructed from bio-based materials?

You have a total of 100 points to allocate among these factors based on how significant you believe each factor is to you.

Economic reasons
Environmental reasons
Social reasons
Living conditions

Page #6

10. "I would be willing to study in a shared space (e.g., library, student's residence)"

Please indicate the extent to which you agree or disagree with this statement.

- Strongly disagree
- Disagree
- Slightly disagree
- Neither agree nor disagree
- Slightly agree
- Agree
- Strongly agree

11. How much would the following factors affect your willingness to study in a shared space (e.g., library, student's residence)?

You have a total of 100 points to allocate among these factors based on how significant you believe each factor is to you.

Economic reasons
Environmental reasons
Social reasons
Studying conditions

Page #7

12. "I would be willing to work in a shared office space (i.e., share your office space with others)"

Please indicate the extent to which you agree or disagree with this statement.

- Strongly disagree
- Disagree
- Slightly disagree
- Neither agree nor disagree
- Slightly agree
- Agree
- Strongly agree

13. How much would the following factors affect your willingness to work in a shared office space (i.e., share your office space with others)?

You have a total of 100 points to allocate among these factors based on how significant you believe each factor is to you.

Economic reasons
Environmental reasons
Social reasons
Working conditions

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14. What is your gender?

- Male
- Female
- Other/ I don't want to share

15. What is your age? Please specify in years.

16. "My household income meets my everyday needs"

Please indicate the extent to which you agree or disagree with this statement.

- Strongly disagree
- Disagree
- Slightly disagree
- Neither agree nor disagree
- Slightly agree
- Agree
- Strongly agree

17. What is the type of your permanent residence?

- Detached house
- Semi-detached house
- Apartment building
- Other (please specify)

18. What is the ownership status of your permanent residence?

- Family owned
- Rented
- Other (please specify)

19. What is the size of your permanent residence?

- 0 - 50 square meters
- 51 - 100 square meters
- 101 - 150 square meters
- +150 square meters

20. How many persons (adults and children) live in your permanent residence (including yourself)?

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Thank you for your participation!

Appendix II

Country-comparison results

			DK/DE	DK/GR	DK/IT	DK/PT	DK/ES	DK/UK	DE/GR	DE/IT	DE/PT	DE/ES	DE/UK	GR/IT	GR/PT	GR/ES	GR/UK	IT/PT	IT/ES	IT/UK	PT/ES	PT/UK	ES/UK	Total differences
Shared residence	Willingness to embrace	Kruskal-Wallis										-63,24							-95,27					2
	Economic reasons	ANOVA					-16,37					-16,90							-12,66					3
	Environmental reasons	ANOVA					10,05			7,85		11,32				7,19								4
	Social reasons	ANOVA																						0
	Living conditions	ANOVA																						0
Smaller residence	Willingness to embrace	Kruskal-Wallis				-96,69					-96,92	-53,51						-95,72	-52,31					5
	Economic reasons	ANOVA					-14,69			-14,91	-19,19	-19,57												4
	Environmental reasons	ANOVA		9,15	13,03	11,84	16,08			9,61		12,65												6
	Social reasons	ANOVA																						0
	Living conditions	ANOVA																						0
Biobased residence	Willingness to embrace	Kruskal-Wallis		152,45	133,70	85,20	84,95	110,42	101,30	82,55					-67,25	-67,50								9
	Economic reasons	ANOVA																						0
	Environmental reasons	ANOVA		22,34	15,48	16,27	17,01																	4
	Social reasons	ANOVA	-5,19	-8,61	-8,18		-5,28																	4
	Living conditions	ANOVA																						0

Shared study	Willingness to embrace	Kruskal-Wallis			-65,33													-82,02						2
	Economic reasons	ANOVA																						0
	Environmental reasons	ANOVA						-12,93					-9,91			8,67				-11,06		-11,15	-15,41	6
	Social reasons	ANOVA																						0
	Studying conditions	ANOVA																						0
Shared office	Willingness to embrace	Kruskal-Wallis	-70,88	-88,12	-67,75						-66,99				-84,24			-63,87						6
	Economic reasons	ANOVA																						0
	Environmental reasons	ANOVA																						0
	Social reasons	ANOVA																						0
	Working conditions	ANOVA																						0
		Total differences	2	5	6	4	7	2	1	4	3	6	1	0	2	3	0	3	3	1	0	1	1	

Note: Differences in willingness to embrace CE practices between countries were assessed using the Kruskal–Wallis test with pairwise post hoc comparisons, while differences in the importance assigned to economic, environmental, social, and living/studying/working conditions were assessed using one-way ANOVA with post hoc pairwise comparisons. Reported values represent pairwise differences calculated as the first country minus the second country (Country1 − Country2). For ANOVA, values indicate mean differences; for Kruskal–Wallis, values indicate mean rank differences. Positive values indicate higher scores (or mean ranks) for the first country, whereas negative values indicate higher scores (or mean ranks) for the second country. Only statistically significant pairwise differences ($p < 0.05$) are reported.