

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

Spyridon Karytsas^{1*}, Theoni I. Oikonomou¹, Ana Teresa Lima², Ruichang Mao², Davide Aloini³, Pierluigi Zerbino³, María Nuria Sánchez⁴, Helena López Moreno⁴, Oscar Seco Calvo⁴, Ioannis Kostakis⁵, Hans H. Dürr⁶, Husam Sameer⁶, Sofia G. Simoes⁷, Juliana Barbosa⁷, Andrea Genovese⁸, Ram Venkataraman Guru⁸ and Constantine Karytsas¹

¹ Centre for Renewable Energy Sources and Saving, Division of RES Technologies, Geothermal Energy and CO₂ Capture Department, 19th km Marathonos Ave., 19009, Pikermi, Greece

² DTU Sustain, Section for Materials and Durability, Brovej, 2800 Kgs. Lyngby, Denmark

³ University of Pisa, Department of Energy, Systems, Territory, and Construction Engineering, Largo Lucio Lazzarino, 56122, Pisa, Italy

⁴ CIEMAT, Energy Department, Avenida Complutense 40, 28040, Madrid, Spain

⁵ Harokopio University, School of Environment, Geography and Applied Economics, Department of Economics and Sustainable Development, El. Venizelou Ave. 70, 17676, Kallithea, Greece

⁶ Engineering Hydrology and Water Resources Management, Ruhr University Bochum, Universitätsstraße 150, 44801, Bochum, Germany

⁷ LNEG - Laboratório Nacional de Energia e Geologia, Estrada da Portela, Bairro do Zambujal – Alfragide, Apartado 7586, PT 2610-999 Amadora, Portugal

⁸ Sheffield University Management School, Conduit Rd, Sheffield S10 1FL, United Kingdom

* Corresponding author: spkary@cres.gr

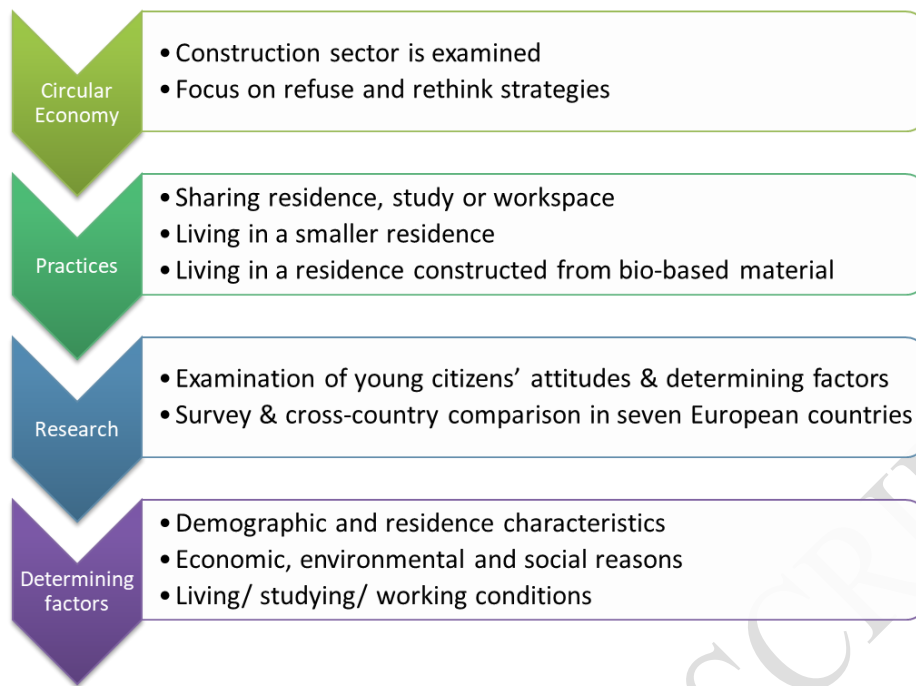
24 **Abstract**

25 The present study focuses on young citizens' attitudes towards high-level circular-economy
26 strategies such as "Rethink" and "Refuse" in the construction sector. In this respect, young citizens'
27 attitudes and determinants of adopting CE practices in construction, including sharing residences,
28 living in smaller or bio-based buildings, and using shared study or workspaces, were examined. A
29 survey was conducted between May 2025 and January 2026 across seven European countries
30 (Denmark, Germany, Greece, Italy, Portugal, Spain, and the UK), including 358 participants aged
31 40 or younger. The survey unveiled interesting attitudes, with a general openness to adopting
32 certain CE practices, such as living in smaller or bio-based constructed homes, and sharing study
33 and workspaces. Economic reasons emerge as the primary motivator for sharing a residence or
34 living in a smaller one, while environmental considerations are particularly influential in decisions
35 related to bio-based materials. In cases of sharing study or work spaces, the provided conditions are
36 perceived as the primary factor. Respondents' attitudes vary, influenced by factors such as income,
37 age, and residential characteristics. Moreover, cross-country analysis revealed variations in
38 willingness to adopt specific CE practices, highlighting the role of national context in shaping CE
39 preferences. The findings highlight the importance of tailored strategies to promote CE adoption,
40 emphasizing awareness of environmental benefits, targeted policies, and the need to address
41 economic barriers.

42

43 **Keywords:** Strategy, practice, sharing, survey, determinants, demographic, residence,
44 socioeconomic, environmental

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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).

63 The "10R framework" or "10R strategies" is a systematic collection of hierarchical strategies
64 intended to put CE into practice by minimizing waste and optimizing value retention, where greater
65 circularity and higher value retention are indicated by lower R-numbers (Table 1). Three loops can
66 be used to group this hierarchy: a) Short loops (R0–R3): Emphasize more efficient material
67 generation and use; b) Middle long loops (R4–R6): Stress prolonging the life of the product; c)
68 Long loops (R7–R9): Encourage ongoing beneficial use of resources and products (Mani et al.,
69 2025). The research frequently cites these strategies as a comprehensive approach to applying CE
70 across a variety of sectors and industries (Muñoz et al., 2023; Santos et al., 2023; Mani et al., 2025;
71 Ogiemwonyi, 2025; Shahi and Parashar, 2026).

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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

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

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77

78 *1.2 Adoption of CE practices*

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

94 In light of the above, the importance of younger citizens adopting CE practices should be
95 emphasized. The younger generation is seen as the future leaders in the shift to a low-carbon
96 economy. They need to adopt sustainable consumption patterns to achieve long-term sustainability
97 goals (Jia and Lin, 2024). Encouraging sustainable habits and building environmental knowledge
98 requires early education (Wardani et al., 2025). Awareness campaigns and educational programs
99 aimed at young people, who are more open to change, are essential to promote a CE mindset and
100 raise accountability and responsibility (Voukkali et al., 2023; Shobande et al., 2024; Zimmermann
101 et al., 2024; Carbonell-Alcocer et al., 2025; Gupta et al., 2025b). To improve the effectiveness of
102 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).

105

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,

129 citizens contribute to circular transitions not only through invited forms of engagement, such as
130 consultations or co-creation activities, but also through voluntary changes in their daily practices,
131 including decisions to reuse, repair, share, maintain, and responsibly manage construction materials
132 and the built environment. Such everyday forms of participation are essential for embedding
133 circular economy principles into social practices and fostering long-term behavioral change (Shove
134 et al., 2012; Chilvers and Kearnes, 2015).

135

136 ***1.4 The 10R strategies in the construction sector – A focus on Refuse and Rethink***

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

144 Refuse and Rethink are foundational CE strategies for promoting sustainability and resource
145 efficiency in the construction sector; they are positioned at the top of the CE strategies' hierarchy
146 because they try to prevent waste creation at the source through value shifts and innovative design,
147 rather than managing waste after it is generated (Ho et al., 2024; Carrico, 2025; Rajaratnam et al.,
148 2025; Swathi and Vidjeapriya, 2025; Torrónategui-Chávez et al., 2026). The Refuse principle has
149 been defined as rejecting a certain product or its function. A broader definition is the eradication of
150 environmentally, economically, or socially damaging patterns in processes or in utilization, leading
151 to more sustainable and circular practices. In the construction sector, this can include rejecting
152 design alternatives that incorporate unnecessary features, such as oversized floor areas or redundant
153 finishes, as well as avoiding the specification of virgin or high-embodied-carbon materials where
154 lower-impact alternatives are available, and material combinations that hinder future disassembly,

155 reuse, repair, or recycling choices (Allwood et al., 2013; Rios et al., 2015; Adams et al., 2019;
156 Çimen, 2023; Ho et al., 2024; Rabaia et al., 2024; Montalbano et al., 2025; Swathi and Vidjeapriya,
157 2025). The Rethink principle goes beyond sharing products between sectors or services. It entails
158 rethinking design, production, operational procedures, dismantling processes, and managerial
159 decisions to facilitate circularity. In building design, this may include merging multiple functions to
160 produce multifunctional or adaptive elements, hence increasing resource efficiency and utility
161 (Çimen, 2023; Ho et al., 2024; Rabaia et al., 2024; Swathi and Vidjeapriya, 2025).

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

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

179 Sharing study spaces, another Rethink strategy example, represents a paradigm shift from
180 ownership-based to access-based consumption, exploiting underutilized assets and slowing resource

181 loops by increasing use intensity and extending product lifetimes (Schwanholz and Leipold, 2020;
182 Curtis, 2021; Mont et al., 2021). Sharing study areas can greatly reduce the need to create new
183 buildings or more rooms, resulting in less environmental impacts connected with construction
184 (Jeleniewicz et al., 2025); additionally, it includes a socio-relational dimension, since it may
185 promote community empowerment, trust, and social cohesiveness, which are essential to resource
186 recirculation and the accomplishment of CE goals (Curtis, 2021; Rodrigues et al., 2021; Tan and
187 Yeoh, 2025).

188 Reducing building size to household needs, such as opting for a smaller house, is recognized as a
189 sufficiency measure in the sharing economy and is closely tied to CE approaches, namely the
190 Rethink strategy. This strategy decreases material and energy demand, minimizes waste, and
191 lessens the environmental effect of both the manufacturing and use stages of buildings
192 (Shahmohammadi et al., 2024). A desire for a slower, more meaningful life, lower investment costs,
193 and an intentional rejection of the idea of upward social mobility might all be reasons to choose a
194 smaller house, and although these motives are not necessarily explicitly environmental, they align
195 with CE ideals by extending the lifespan of residences and reducing resource use (Wuyts et al.,
196 2019). In some situations, the movement to smaller houses is driven by individuals desiring
197 improved quality of life, financial independence, and reduced consumption, rather than necessity
198 (Evans, 2019; Stratton and Corneal, 2023).

199 Choosing to live in a house built with bio-based materials can be considered a CE practice,
200 particularly when associated with the Refuse strategy, as bio-based alternatives can substitute
201 conventional high-impact construction materials, such as fired clay bricks, gypsum or cement-based
202 panels, Portland cement-based products, and mineral wool or expanded polystyrene insulation.
203 However, simply using bio-based materials does not automatically fulfill all CE criteria, as the
204 success of this approach depends on elements such as the design for disassembly, local sourcing,
205 and the presence of recycling or composting infrastructure (Suttie et al., 2017; Shooshtarian et al.,
206 2021; Ruf et al., 2022; Le et al., 2024; Barbhuiya et al., 2025). The use of such materials is

207 associated with reduced initial production costs and mitigation of environmental impacts, when
208 compared to traditional materials like cement and bricks (Le et al., 2023; Le et al., 2024; Pacheco-
209 Torgal, 2025), and the potential for materials to be reused, recycled, or composted at the end of the
210 building's life (Mahanta et al., 2022; Kayaçetin et al., 2023; Le et al., 2024; Kruczek et al., 2025).

211

212 ***1.5 Factors affecting citizens' adoption of CE practices***

213 *1.5.1 Demographic characteristics*

214 Age plays a significant role in how citizens plan to adopt CE practices in housing. Younger
215 generations are usually more aware and have better attitudes toward these practices. In contrast,
216 middle-aged groups, such as Generation Y, are more likely to turn these attitudes into concrete
217 actions, such as reusing and recycling. However, actual adoption is still low across all age groups.
218 This highlights the need for targeted educational campaigns to connect positive intentions with
219 lasting circular behaviors in the built environment (Hojnik et al., 2023; Sampedro-Beneyto et al.,
220 2024; Zimmermann et al., 2024).

221 Gender is a key factor in adopting CE practices. Studies show that women are more open than men
222 to practices like reuse, recycling, and repair. They are also more willing to pay extra for
223 environmentally friendly products (Sampedro-Beneyto et al., 2024; Zimmermann et al., 2024). This
224 influence goes beyond individual consumers. In professional settings, female managers often play
225 important roles in encouraging circular practices in their organizations (Ali et al., 2022).

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

233 Larger households (in terms of household members) tend to use more resources, like water and
234 energy. However, they are also more likely to adopt practices and equipment that save resources.
235 This is probably due to increased awareness and the chance to save money (Salas-Zapata et al.,
236 2023; da Silva and Ramos, 2024). Moreover, having more employed household members can
237 contribute to certain sustainable behaviors, such as reducing food waste (Lopez et al., 2026).

238 *1.5.2 Residence characteristics*

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

247 The size of a residence influences the willingness to adopt sustainability and energy efficiency
248 practices in different ways. Larger households benefit from economies of scale, which lowers their
249 environmental impact per person. In contrast, medium-sized homes tend to be more driven to
250 pursue energy retrofitting than smaller properties, which face more obstacles (Maghsoudi Nia et al.,
251 2024; Strandell et al., 2026). Moreover, owners of larger, child-free homes are generally more open
252 to space-sufficiency measures such as downsizing. However, the actual adoption rate is low due to
253 concerns about lifestyle changes, comfort, and property values. This situation shows the need for
254 targeted subsidies and awareness campaigns (da Silva and Ramos, 2024; Sula et al., 2025).

255 The ownership status of a residence, especially home ownership, can affect the desire to adopt CE
256 practices. Homeowners are usually more willing to invest personally in household interventions,
257 such as energy efficiency measures, than non-owners (Scott et al., 2014). However, in situations
258 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,

285 and safe environments, encourage greater acceptance and participation (Mies and Gold, 2021;
286 Moustafa et al., 2025). On the other hand, poor living standards, lack of awareness, and unsafe or
287 unfair working conditions can create significant barriers. These issues can widen the gap between
288 intention and actual adoption and worsen social inequalities (da Silva and Ramos, 2024; Van Opstal
289 et al., 2025; Oikonomou et al., 2026).

290

291 ***1.6 Study rationale and structure***

292 The adoption of CE principles in the construction sector is strongly influenced by socioeconomic
293 and behavioral factors, with stakeholder perceptions and cultural attitudes shaping strategies such as
294 Refuse and Rethink. However, limited awareness, confusion over different CE practices, and deep-
295 seated sociocultural barriers, such as consumer preferences and resistance to change, hinder
296 progress (Ranasinghe et al., 2024; Hasibuan et al., 2025). On top of this, there is a notable gap in
297 the literature regarding young citizens. Their generational attitudes toward Refuse and Rethink
298 strategies are poorly understood, even though these attitudes could drive future circularity (Godinho
299 Filho et al., 2024; Ranasinghe et al., 2024; Zimmermann et al., 2024; Hasibuan et al., 2025).
300 Scholars consistently call for research on how demographic, behavioral, and cultural factors, along
301 with education, influence these attitudes. This information could help design targeted policies,
302 educational campaigns, and industry practices that promote circularity in the building sector
303 (Godinho Filho et al., 2024; Ranasinghe et al., 2024; Zimmermann et al., 2024; Hasibuan et al.,
304 2025; Ramisetty & Sharma, 2025). Furthermore, comparative evidence across European countries
305 remains limited, even though differences in socio-economic conditions, housing systems, cultural
306 norms, and the maturity of circular economy policies may influence citizens' willingness to adopt
307 CE practices (Kirchherr et al., 2017; Camacho-Otero et al., 2018; European Commission, 2020).
308 Hence, there is a clear need to examine the factors shaping young citizens' attitudes toward Refuse
309 and Rethink CE strategies in construction, thereby addressing the significance of this demographic
310 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.

333

334 **2. Materials and methods**

335 To examine young citizens' willingness to adopt the CE practices (as presented in Section 1.6), a
336 survey targeting undergraduate and postgraduate university students from seven European countries

337 [Denmark, Germany, Greece, Italy, Portugal, Spain, and the United Kingdom (UK)] was planned,
338 organized, and executed. The seven countries were selected, as the survey was carried out in the
339 context of the CO2NSTRUCT European project (<https://co2nstruct.dtu.dk/>), whose consortium
340 comprises partners from these countries (Oikonomou et al., 2023). The overall procedure can be
341 outlined in three phases, in particular: a) questionnaire and survey organization; b) data collection;
342 c) data treatment and analysis.

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

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

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

377 The third phase, i.e., data treatment and analysis, comprised data "cleaning", creating a dataset that
378 excluded incomplete responses (i.e., no missing data) and responses from individuals older than 40
379 years. Following, descriptive statistics were performed for all questionnaire variables, including the
380 estimation of frequencies or mean values [as well as Standard Deviation (S.D.) and median]
381 depending on each variable's type. In addition, comparative analyses were conducted to examine
382 potential differences across the seven participating countries. Specifically, Kruskal–Wallis tests
383 were used to identify differences in willingness to adopt the five CE practices, while one-way
384 ANOVA tests were performed to examine differences in the perceived importance of the four
385 motivational factors (economic, environmental, social, and living/studying/working conditions).
386 Subsequently, linear regression models were developed; in each model, each one of the five CE
387 practices under examination (see Section 1.6) was featured as the dependent variable, while
388 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 m² and 100 m² (47%), followed by 101 m² to 150 m² (22%).

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%

412

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

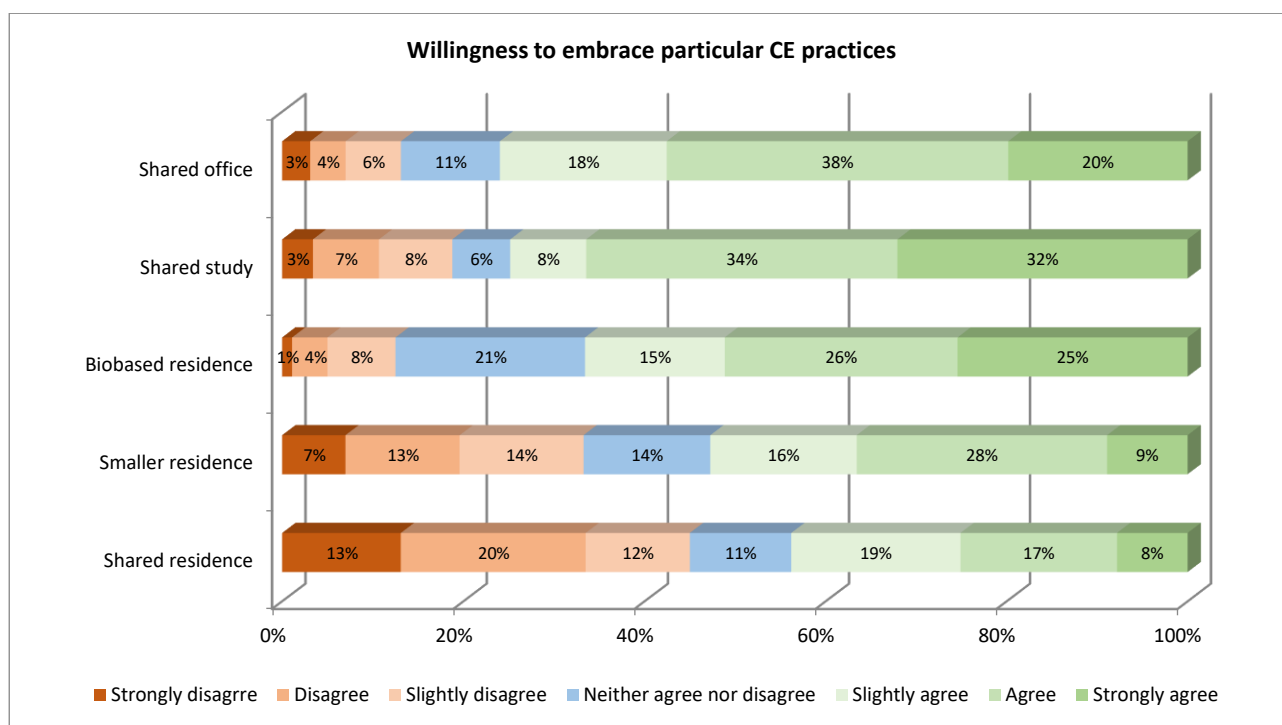
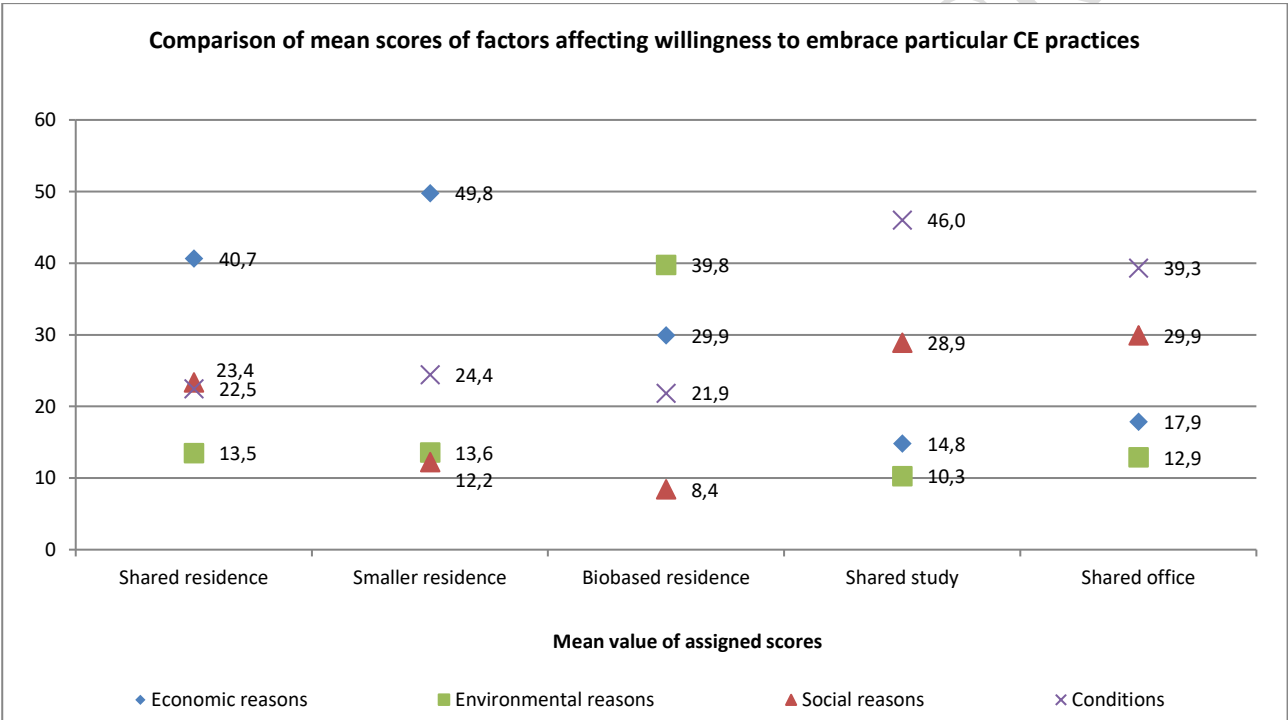


Figure 1. Willingness to embrace particular CE practices

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).

440 The evaluation results differ –in relation to what has been presented above- when referring to the
441 assessment of the factors affecting willingness to study in a shared space and to work in a shared
442 office space. In both cases, conditions [studying in the first case (mean value 46,0) and working in
443 the second (mean value 39,3)] have been evaluated as the most important factor, followed by social
444 reasons, with mean values of 28,9 and 29,9, for willingness to study and work in shared spaces,
445 respectively. In contrast, environmental reasons are considered the least important factor in both
446 cases.
447



448 Figure 2. Comparison of mean scores of factors affecting willingness to embrace particular CE
449 practices
450
451

452 3.2 Cross-country comparative analysis

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

458 The largest number of significant differences was observed for willingness to live in a residence
459 constructed from bio-based materials, suggesting substantial variation in the acceptance of bio-
460 based construction solutions across countries. Denmark consistently reported higher willingness
461 than Greece, Italy, Portugal, Spain, and the UK, while Germany also exhibited higher willingness
462 than Greece and Italy. By contrast, Greece reported significantly lower willingness than Portugal
463 and Spain. These findings suggest that perceptions of bio-based housing solutions are particularly
464 sensitive to national context.

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

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

476 The analysis of motivational factors revealed considerably fewer cross-country differences than the
477 willingness measures. For shared and smaller residences, differences were observed only for
478 economic and environmental motivations, whereas social and living-condition motivations
479 remained remarkably consistent across countries. For bio-based residences, however, both
480 environmental and social motivations differed significantly across countries, suggesting that
481 citizens vary not only in their willingness to adopt bio-based housing but also in the motivations
482 underlying these preferences. Likewise, for shared study spaces, only environmental motivations

483 exhibited significant cross-country variation, while no significant differences were identified in the
484 motivational factors associated with shared office spaces.

485

486 **3.3 Regression models**

487 Table 3 presents the results of the linear regression models examining the factors influencing
488 participants' willingness to engage in the five CE practices. The models include demographic and
489 residence variables (the models examining shared study and office do not include the residence
490 variables), as well as specific motivational factors (economic, environmental, social, and
491 living/studying/working conditions) that may affect respondents' preferences. Since respondents
492 allocated 100 points among these four motivational factors, economic reasons were used as the
493 reference category in all models; therefore, the estimated coefficients indicate differences associated
494 with assigning greater relative importance to each motivation compared with economic reasons.

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

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

507 The third model (dependent variable: willingness to live in a residence constructed from bio-based
508 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.

523

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. ^c	n.a. ^c
Residence type (apartment)	-0,022	0,027	-0,062	n.a. ^c	n.a. ^c
Residence size (ordinal)	-0,367***	0,103	-0,167*	n.a. ^c	n.a. ^c

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

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

540 economic, environmental, social, and living/studying/working-condition motivations, significantly
541 shape willingness to adopt specific CE practices. Finally, the cross-country comparison reveals that
542 acceptance of these practices is not uniform across Europe, with the greatest variation observed for
543 bio-based and alternative housing arrangements. These findings suggest that while some drivers of
544 CE adoption are common across countries, national context also plays an important role in shaping
545 citizens' preferences.

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

562 Regarding gender, all models indicate that women are more willing to engage in the proposed CE
563 practices, with statistically significant results for sharing study and office spaces. This finding
564 confirms previous research indicating women's strong acceptance of CE practices (Ali et al., 2022;
565 Sampedro-Beneyto et al., 2024; Zimmermann et al., 2024), possibly due to their greater

566 environmental awareness, community orientation, or openness to collaborative practices. However,
567 the results of this study suggest that gender differences are not uniform across all CE practices, as
568 statistically significant effects were identified specifically for shared study and office spaces.
569 Therefore, gender should be considered as one of several factors influencing CE engagement, rather
570 than as a standalone determinant of participation. Existing sustainability initiatives increasingly
571 recognize the importance of gender-inclusive approaches, including gender-responsive education,
572 capacity-building activities, and the involvement of women in environmental decision-making and
573 community-based sustainability programs (UN Women, 2019; UNFCCC, 2019). Such approaches
574 can contribute to more inclusive CE transitions by ensuring that diverse perspectives and
575 experiences are considered in the design and implementation of CE initiatives. Considering gender
576 differences is therefore important for developing policies that encourage participation across
577 different demographic groups and build on the positive trends observed among women.

578 In terms of age, the study's results show that older participants are less willing to adopt certain
579 construction-related CE practices, particularly shared and smaller residential arrangements. This
580 result aligns with prior research highlighting younger generations' greater preference for CE
581 practices (Hojnik et al., 2023; Sampedro-Beneyto et al., 2024; Zimmermann et al., 2024), possibly
582 due to greater environmental awareness, flexibility, or acceptance of lifestyle changes. Conversely,
583 research on ageing and housing preferences suggests that older adults often show stronger
584 attachment to their existing homes and neighborhoods, with preferences for ageing in place,
585 independence, familiarity, and stability influencing their residential decisions (de Jong et al., 2022;
586 Lebrusán and Gómez, 2022). Therefore, the lower willingness observed among older participants
587 may reflect not only reduced openness to CE-related housing alternatives, but also the importance
588 of maintaining autonomy, privacy, and established social connections. Moreover, residential
589 immobility among older adults should not necessarily be interpreted as a lack of interest in
590 alternative housing solutions, as it may result from either personal choice or constraints related to
591 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

618 preferences for more private space) and the likelihood of living in homes constructed with biobased
619 materials (as larger residences may be less suitable for eco-friendly, biobased materials, which are
620 often used in smaller, more eco-friendly living settings). This result aligns with Shahmohammadi et
621 al. (2024), indicating that smaller residences are strongly associated with greater adoption of CE
622 practices in the building sector. These findings indicate that specific housing ownership structures
623 and residence sizes can function as hurdles to the implementation of CE practices in the building
624 sector. The preference for private space, as well as barriers to renovation or relocation, could hinder
625 efforts to promote CE practices. Measures that take into account residence characteristics include
626 incentives to retrofit existing properties with biobased materials, building regulations favoring (or
627 requiring) eco-friendly materials, and urban planning policies that favor the development of smaller,
628 eco-friendly housing units.

629 Economic reasons seem to be the most important factor when considering sharing or living in a
630 smaller residence. Conversely, for practices like living in bio-based residences, environmental
631 concerns take priority. At the same time, social and practical considerations (such as working or
632 studying conditions) are key drivers of sharing study and work spaces. These results align with
633 previous findings, highlighting that motivations for adopting CE practices are context-dependent,
634 involving a complex interplay of economic, environmental, social, and functional factors (Forlin
635 and Scholz, 2020; Mies and Gold, 2021; Karytsas, 2022; Ali et al., 2022; Godinho Filho et al.,
636 2024; Zhang, 2024; Zhang et al., 2024; Moustafa et al., 2025; Żywiołek et al., 2025). Thus,
637 effective CE promotion should tailor strategies to these differing priorities for each practice,
638 including financial incentives, environmental awareness campaigns, improvement of social aspects
639 and working/studying conditions in shared spaces (e.g., community-focused structures emphasizing
640 comfort and convenience), and integrated policies addressing economic, environmental, and social
641 factors simultaneously.

642 The cross-country analysis highlights the importance of national context in shaping willingness to
643 engage in CE practices in the construction sector. Although CE strategies are promoted through

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

655 In light of the above, the present study has specific limitations. There is no equal representation of
656 the seven countries, which constitutes the main limitation of this analysis (as shown in Table 2,
657 Spain is overrepresented, and the UK is underrepresented). Moreover, the sample is not
658 representative of the broader population, either geographically or in terms of demographic and
659 residential characteristics. In addition, the sample was drawn exclusively from university
660 departments related to economics, environmental sciences, and engineering. Although this
661 purposive sampling strategy enabled the study to target students with greater exposure to
662 sustainability and circular economy concepts, as well as future professionals likely to influence the
663 adoption of circular practices in the built environment, it may also have introduced sampling bias,
664 as these students are likely to possess higher levels of awareness and more favorable attitudes
665 toward CE than the general student population. Consequently, the findings may overestimate the
666 acceptance of CE practices and should not be generalized to all university students or the broader
667 population. Furthermore, the four motivational factors (economic, environmental, social, and
668 living/studying/working conditions) were intentionally not defined in the questionnaire. As a result,
669 respondents may have interpreted these concepts differently based on their own perceptions and

670 experiences, introducing variability in how the motivational dimensions were understood and
671 evaluated. Another limitation of the study is that it considers only demographic and residence
672 characteristics, as well as economic, environmental, social, and functional factors. Hence, potential
673 determinants such as knowledge, prior engagement in CE practices, and additional behavioral,
674 social, and psychological factors are not included in the analysis. Therefore, future research should
675 aim to obtain a more representative sample across countries, academic disciplines, and demographic
676 groups, while accounting for additional determinants. Nevertheless, the present study provides
677 valuable insights that can inform future research and help identify potential areas of interest on
678 topics that have not been previously examined in the scientific literature.

679

680 **5. Conclusions**

681 This study focused on young people's views on high-level circular economy initiatives, such as
682 "Rethink" and "Refuse," in the construction sector. The study investigated young people's attitudes
683 and the factors that influence their adoption of specific CE practices in the construction sector, such
684 as living in smaller or bio-based dwellings, sharing a residence, and using common study or
685 workspaces. In this respect, a survey of 358 people aged 40 or younger was conducted between
686 May 2025 and January 2026 across seven European countries: Denmark, Germany, Greece, Italy,
687 Portugal, Spain, and the United Kingdom. The survey revealed interesting attitudes, including a
688 general willingness to adopt certain CE practices, such as sharing study and workspaces and living
689 in smaller or bio-based-designed dwellings. Economic factors are identified as the main drivers of
690 the willingness to share a residence or opt for a smaller living space, whereas environmental
691 concerns play a significant role in decisions about bio-based materials. When it comes to sharing
692 study or workspaces, the conditions provided are seen as the most influential factor, followed by
693 social factors. Additionally, attitudes toward adopting CE practices are influenced by demographic
694 characteristics (income, age, gender, and household size) and residential characteristics (residence
695 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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1101

1102 **Appendix I**

1103 **Questionnaire: Circular economy in the building sector - residents' attitudes**

1104 **Page #1**

1105 In this survey, we ask you to give your opinion about the Circular Economy practices in the
1106 building sector. There are no correct or incorrect answers, only your own opinion.

1107 Filling in the questionnaire takes less than 5 minutes.

1108 Your answers in this survey will remain completely anonymous. By answering it, you consent that
1109 your responses can be used in a relevant research.

1110 **Page #2**

1111 1. In which country do you live in?

- 1112 • Denmark
- 1113 • Germany
- 1114 • Greece
- 1115 • Italy
- 1116 • Portugal
- 1117 • Spain
- 1118 • United Kingdom

1119

1120 2. Which is your University?

1121

1122 3. Which is your Department?

1123

1124 **Page #3**

1125 4. "After my studies, I would be willing to live in a house/apartment that I would share with other
1126 people (non-family members)"

1127 Please indicate the extent to which you agree or disagree with this statement.

- 1128 • Strongly disagree
- 1129 • Disagree
- 1130 • Slightly disagree
- 1131 • Neither agree nor disagree
- 1132 • Slightly agree
- 1133 • Agree
- 1134 • Strongly agree

1135

1136 5. How much would the following factors affect your willingness to live in a house/apartment that
1137 you would share with other people (non-family members)?

1138 You have a total of 100 points to allocate among these factors based on how significant you believe
1139 each factor is to you.

Economic reasons

Environmental reasons

Social reasons

Living conditions

1140

1141 **Page #4**

1142 6. "After my studies, I would be willing to live in a smaller house/apartment (in terms of square
1143 meters), compared to my permanent residence"

1144 Please indicate the extent to which you agree or disagree with this statement.

- 1145 • Strongly disagree
- 1146 • Disagree
- 1147 • Slightly disagree
- 1148 • Neither agree nor disagree
- 1149 • Slightly agree
- 1150 • Agree
- 1151 • Strongly agree

1152

1153 7. How much would the following factors affect your willingness to live in a smaller
 1154 house/apartment (in terms of square meters), compared to your permanent residence?

1155 You have a total of 100 points to allocate among these factors based on how significant you believe
 1156 each factor is to you.

Economic reasons

Environmental reasons

Social reasons

Living conditions

1157

1158 **Page #5**

1159 8. "After my studies, I would be willing to live in a house/apartment constructed from bio-based
 1160 materials (e.g. wood)"

1161 Please indicate the extent to which you agree or disagree with this statement.

- 1162 • Strongly disagree
- 1163 • Disagree
- 1164 • Slightly disagree
- 1165 • Neither agree nor disagree
- 1166 • Slightly agree

- 1167 • Agree
- 1168 • Strongly agree

1169

1170 9. How much would the following factors affect your willingness to live in a house/apartment
1171 constructed from bio-based materials?

1172 You have a total of 100 points to allocate among these factors based on how significant you believe
1173 each factor is to you.

Economic reasons

Environmental reasons

Social reasons

Living conditions

1174

1175 **Page #6**

1176 10. "I would be willing to study in a shared space (e.g., library, student's residence)"

1177 Please indicate the extent to which you agree or disagree with this statement.

- 1178 • Strongly disagree
- 1179 • Disagree
- 1180 • Slightly disagree
- 1181 • Neither agree nor disagree
- 1182 • Slightly agree
- 1183 • Agree
- 1184 • Strongly agree

1185

1186 11. How much would the following factors affect your willingness to study in a shared space (e.g.,
1187 library, student's residence)?

1188 You have a total of 100 points to allocate among these factors based on how significant you believe
1189 each factor is to you.

Economic reasons

Environmental reasons

Social reasons

Studying conditions

1190

1191 **Page #7**

1192 12. "I would be willing to work in a shared office space (i.e., share your office space with others)"

1193 Please indicate the extent to which you agree or disagree with this statement.

- 1194 • Strongly disagree
- 1195 • Disagree
- 1196 • Slightly disagree
- 1197 • Neither agree nor disagree
- 1198 • Slightly agree
- 1199 • Agree
- 1200 • Strongly agree

1201

1202 13. How much would the following factors affect your willingness to work in a shared office space
1203 (i.e., share your office space with others)?

1204 You have a total of 100 points to allocate among these factors based on how significant you believe
1205 each factor is to you.

Economic reasons

Environmental reasons

Social reasons

Working conditions

1206

1207 **Page #8**

1208 14. What is your gender?

- 1209 • Male
- 1210 • Female
- 1211 • Other/ I don't want to share

1212

1213 15. What is your age? Please specify in years.

1214

1215 16. "My household income meets my everyday needs"

1216 Please indicate the extent to which you agree or disagree with this statement.

- 1217 • Strongly disagree
- 1218 • Disagree
- 1219 • Slightly disagree
- 1220 • Neither agree nor disagree
- 1221 • Slightly agree
- 1222 • Agree
- 1223 • Strongly agree

1224

1225 17. What is the type of your permanent residence?

- 1226 • Detached house
- 1227 • Semi-detached house
- 1228 • Apartment building
- 1229 • Other (please specify)

1230

1231 18. What is the ownership status of your permanent residence?

1232 • Family owned

1233 • Rented

1234 • Other (please specify)

1235

1236 19. What is the size of your permanent residence?

1237 • 0 - 50 square meters

1238 • 51 - 100 square meters

1239 • 101 - 150 square meters

1240 • +150 square meters

1241

1242 20. How many persons (adults and children) live in your permanent residence (including yourself)?

1243

1244 **Page #9**

1245 Thank you for your participation!

1246

			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 difference s
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
red	Willingness to	Kruskal-			-													-						2

	embrace	Wallis			65,33												82,02							
	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	

1249 Note: Differences in willingness to embrace CE practices between countries were assessed using the Kruskal–Wallis test with pairwise post hoc
1250 comparisons, while differences in the importance assigned to economic, environmental, social, and living/studying/working conditions were assessed
1251 using one-way ANOVA with post hoc pairwise comparisons. Reported values represent pairwise differences calculated as the first country minus the
1252 second country (Country1 – Country2). For ANOVA, values indicate mean differences; for Kruskal–Wallis, values indicate mean rank differences.
1253 Positive values indicate higher scores (or mean ranks) for the first country, whereas negative values indicate higher scores (or mean ranks) for the
1254 second country. Only statistically significant pairwise differences ($p < 0.05$) are reported.