



*Research article*

## **Determinants of the adoption of tiny houses and their role in alleviating housing shortages in Germany**

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**Abstract:** The lack of affordable housing and the considerable negative environmental impact of the housing sector pose significant challenges for policymakers. Tiny houses have been proposed as a potential solution, but there is still limited understanding of consumer behaviour and attitudes towards such solutions. This study looked at the adoption of tiny houses in Germany by applying the Theory of Planned Behaviour as a theoretical framework to explore demographic and socio-economic factors, motivations, and barriers for living in tiny houses. Data was collected through interviews and an online survey. The results showed a statistically significant positive relationship between intention to live in a tiny house and age, and a significant negative relationship between intention and current accommodation size. Main motivations found in this research were sustainability, cost reduction, freedom, minimalism, mobility, and a sense of community. The main barriers included legal restrictions and a negative perception of minimalism. The lessons learned from this research were: (1) COVID-19 had a negative impact on about 40% of participants, but a statistically significant positive impact on those who were already interested in small houses. (2) Although tiny houses located in cities would be preferable to meet the need for well-connected, high-density housing solutions for young and elderly people and to alleviate the housing shortage, most people seem to be interested in rather rural tiny houses. (3) Minimalism is both a motivator and a barrier to interest in tiny houses, but with a societal shift towards sustainability could become more of a motivator. (4) Interest in tiny homes often builds on financial constraints and limited alternative housing options. (5) The Theory of Planned Behaviour proved to be a sound theoretical framework for this research.

**Keywords:** tiny houses; housing crisis; theory of planned behaviour; COVID-19; German housing situation

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## 1. Introduction

As in many Western countries, living space per inhabitant is steadily increasing in Germany [1,2]. According to Crawford and Stephan [3], this increase has a significant negative impact on the environment, as residential buildings account for approximately 70% of the world's energy demand for construction, while buildings in general were responsible for about 40% of energy-related greenhouse gas (GHG) emissions in 2017, despite improvements in energy efficiency [4]. In addition, Europe is facing a housing crisis, with Germany experiencing a shortage of affordable housing, especially of small apartments in the major cities, and a resulting sharp increase in housing prices [5–8]. Together, these problems with the housing sector lead to an unsustainable situation for society, the environment and the economy, the three pillars of sustainable development [9]. A potential solution to the problem might be tiny houses, which are very small dwellings with a do-it-yourself building potential [9]. This housing trend that originates mainly in the anglophone United States of America, Australia, New Zealand and Canada is now gaining ground in Germany [9]. In 2017 an official definition for tiny houses was enshrined in US law, according to which a tiny house may have a maximum floor area of 37 m<sup>2</sup> [10]. Despite their small living space, tiny houses usually contain all the features of traditional houses, such as a living area, a sleeping area, a cooking area and a bathroom [11,12]. According to a survey conducted in 2017 by Shearer and Burton [9] in Australia, about 20% of tiny houses were permanently sited, 38% were permanent with the possibility of relocation, and 34% were mobile on a trailer.

Tiny houses have the potential to alleviate many social and environmental problems. Not only do tiny houses tend to be more affordable and associated with lower household expenses and thereby present a solution to the tense housing situation, but they also present a lower environmental burden than large houses for various reasons [2,13]. A study conducted in Australia by Crawford and Stephan [3] showed that a tiny house could reduce per capita life cycle GHG emissions by 70% compared to an average Australian home. Tiny houses tend to consume fewer resources and energy during their construction and use, partly through use of natural, reused, or recycled materials [14–16]. This is in contrast to traditionally built houses, which use energy- and CO<sub>2</sub>-intensive materials such as cement [17]. In addition, traditional, larger houses seal more soil than tiny houses with smaller foundations, which harms ecosystem services [18]. Moreover, tiny houses can also facilitate and stimulate a more minimalist lifestyle [15]. However, Hooper et al. [19] noted that to achieve their sustainability potential, the tiny houses need to be carefully designed and executed, using sustainable materials and energy-efficient construction technologies. Although Cohen [20] confirms that the use of materials, energy, water and consumables for tiny houses is usually lower than for regular housing, he argues that they are commonly placed individually and remotely, and therefore do not necessarily have a positive impact on the environment. Therefore, it is not definite whether tiny houses are the ideal solution to sustainability issues, but they at least seem to be an option due to the environmental, social, and economic benefits they offer. Hence, the rise of tiny houses could be good news for sustainable development.

Possibly as a result of the strained housing situation in Germany, interest in alternative housing options is high, with 80% of respondents in a 2019 survey interested in some form of alternative housing, and 13% in tiny houses [21]. Although tiny houses are gaining popularity and are now also widely featured in the media [22,23], there is still a lack of research on the factors that influence interest in tiny houses and ultimately lead to a person building or moving into a tiny house. Several knowledge gaps were identified based on the research on previous studies on tiny houses. Firstly, previous research has focused on the United States of America and other Anglophone countries, whereas research on tiny houses in Europe is very limited. Shearer and Burton [9] assume that Germany is the most active tiny house country in Europe, although no actual data is available.

Quantitative research on demographic and socio-economic characteristics of people interested in tiny houses is very limited, not just for Europe. Boeckermann et al. [11] collected quantitative data in the United States to run a logistic regression on the relationship between different motivations and tiny house satisfaction and therefore providing some data on the demographic and socio-economic variables, but only for a small, non-representative sample. Mangold and Zschau [24] also presented some data for these variables, collected through 30 interviews focusing on the motivations of tiny house living in the United States. There appears to be no research on the relationship between these variables and interest in tiny house living. In addition, knowledge is also rather limited for the motivations and barriers for tiny house living, which is central to why people do or do not intend to live in a tiny house. Research on the barriers and challenges to tiny house living is even less extensive as on motivations. Moreover, the current COVID-19 pandemic may impact interest in tiny houses, which needs to be examined thoroughly as there is no research on this yet. It should be interesting for industry and policy makers to see whether the pandemic hampers or even increases people's interest in tiny houses and for what reasons. Therefore, the research question that will be answered in this paper is:

How could an understanding of consumer behaviour and attitudes enhance the adoption of tiny houses, and how could this enhancement contribute to alleviating housing shortages in Germany?

We start with reviewing and discussing previous literature on tiny houses. Subsequently, the theoretical background will be described in detail. Section 3 provides insights in the methodology used in order to identify the motivations and barriers for the adoption of tiny houses in Germany. In section 4 the intention to live in a tiny house will be elaborated and analysed. Section 5 will conclude this paper by answering the above-mentioned research questions and discuss the policy implications.

## **2. Literature review**

### *2.1. Tiny house literature*

Previous studies cover a range of issues related to tiny houses, such as the motivations and barriers to living in one and their impact on society and the environment. Reasons to “go tiny” are manifold, but a strong desire for freedom and mobility, minimising possessions and leading a simpler and more sustainable life seem central for many people [9,11,16]. A sense of community and cost reductions were also often found to be essential motivators [9,11,16,24]. Other motivators seem to be, although, to a lesser extent, an interest in design [11,16], curiosity or new experiences [24,25], and the motivation resulting from the will to overcome institutional limitations [25], or from actually overcoming it [11] was mentioned. Shearer [26] and Shearer and Burton [9] also identified the

dislike of renting and apartments, retirement, illness, owning your own home, and even the need for more family space as motivations, although not among the most highly ranked. Only the two studies by Shearer and Burton [9] and Boeckermann et al. [11] collected quantitative data and could therefore rank the motivations of tiny house residents. Both found that reducing costs is the most important motivator among tiny house dwellers, followed by a simpler life or environmental sustainability and increased freedom in third place [9,11]. However, just the research by Böllert [27] and Jebbink [25] focused on motivations in the German context, which needs further validation through a more representative sample and quantitative analysis. Part of their findings aligns with those of other scholars focusing on Anglophone countries, such as the motivations of freedom, community, reducing costs, and simple living [25,27]. Jebbink [25] also mentions curiosity, building something oneself, and acquiring new skills as the most important motivations, while Böllert [27] adds feedback or support from the social environment and living closer to nature.

Research on the barriers and challenges to tiny house living is not as extensive as on motivations. Legal barriers, such as building and registration requirements, housing regulations or finding a permanent parking spot, seem to be the most important but differ from country to country [16,27,28]. In Germany, these legal barriers include regulations from road traffic law and building law, while the latter depends from state to state [29]. If the tiny house is mobile, it must be approved by the TÜV (Technical Inspection Association) and have a maximum external size of  $2.55 \times 12 \times 4$  m [29]. If the tiny house is used as the primary residence, a building permit is required, which presupposes building land, and the development plan contains further conditions for the form of the house [29]. Also, financing, building costs and the cost of land are perceived as a problem [16,27,28], as well as negative comments by others and lack of parental support [16,27]. Lack of knowledge, space and privacy was also reported by Shearer [26]. In the German context, bad weather conditions were another challenge for building a tiny house [27]. There does not seem to be any quantitative research on the importance of the barriers.

In general, homeownership in Germany is not as popular as in other advanced economies, with only 44% of households owning their dwelling, primarily due to a large social housing sector and unfavourable tax policies [30]. Also, in Germany, the acquisition of residential property takes place later than in the UK, only around the time of starting a family [31]. This suggests that getting onto the housing ladder quickly (buying a small house first and then increasingly larger houses as more money becomes available), which is vital in the UK, does not seem to be an issue for Germany [32]. Therefore, the housing ladder, which could be considered an obstacle to the trend towards small houses, might not be relevant in all countries.

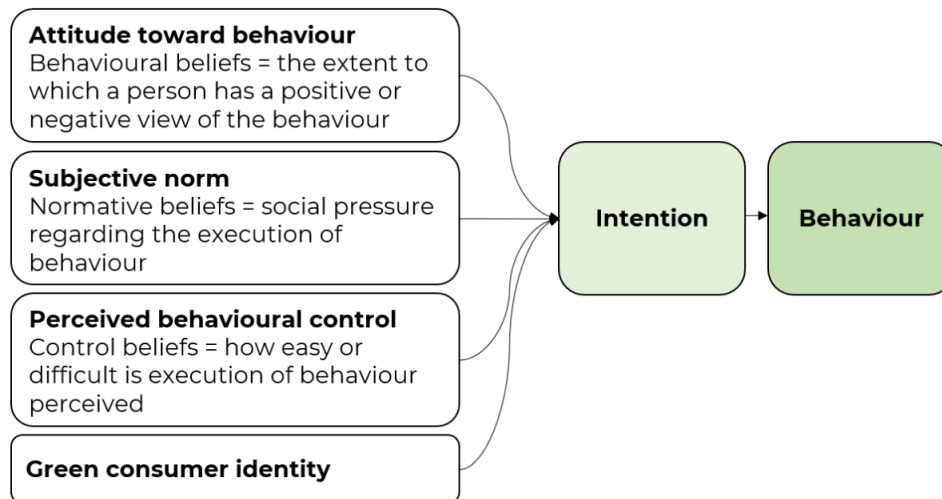
In addition, the current COVID-19 pandemic may have an impact on interest in tiny houses, which needs to be examined thoroughly. The pandemic has changed the way we live and work, with much more taking place in our homes now, making resilient building essential for our wellbeing and health [33]. A previous study by Amerio et al. [34] found that people who lived in poor housing conditions or small flats under  $60 \text{ m}^2$  during the COVID-19 lockdown were at higher risk of developing depressive symptoms. Some of the new recommendations on building resilience, developed by D'Alessandro et al. [33], speak for tiny houses, such as having a terrace, while others are usually not fulfilled by them, for example, having more than one bathroom. Another factor reinforced by COVID-19 is work from home, which can positively and negatively affect well-being, even in regular housing arrangements [35]. A study by Dubey and Tripathi [36] showed that most people had a positive attitude towards working from home during the COVID-19 lockdown, while

Tušl et al. [35] found that a higher percentage of employees experienced a negative impact of the pandemic on their work and personal lives.

## 2.2. Theoretical background

The behaviour of consumers who choose to invest in a tiny house can reasonably be defined as pro-environmental behaviour. Several scholars study factors that influence pro-environmental behaviour, see for an overview [37]. Black et al. [38], Stern [39] and Olander and Thøgersen [40] stress the influence of attitudes, beliefs and norms on pro-environmental behaviour. These scholars often build upon influential behavioural theoretical models. Two influential attitudinal theories comprise the theoretical framework of this study, the Theory of Planned Behaviour [41] and the Norm Activation Model theory [42].

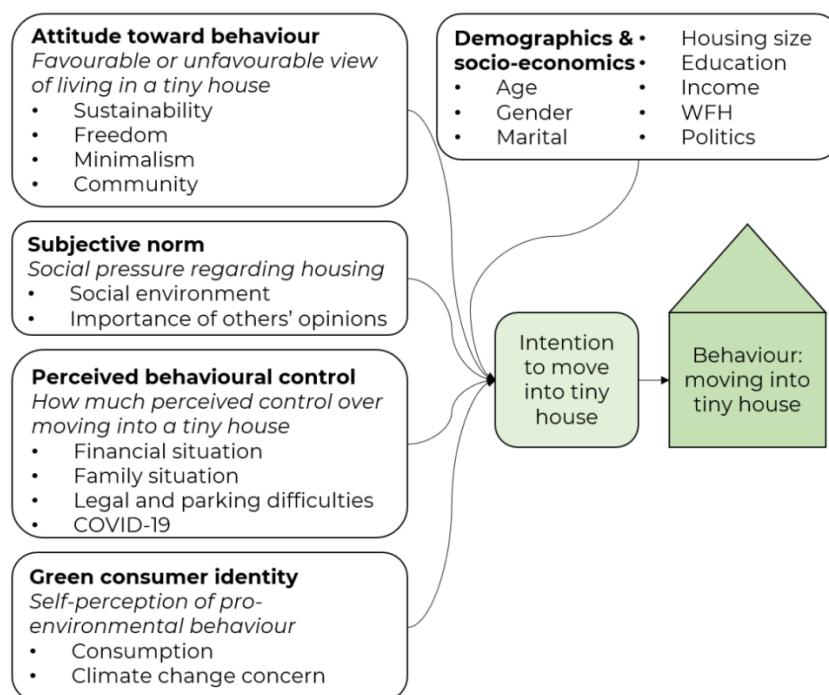
The Theory of Planned Behaviour (TPB) was established by Icek Ajzen in the early 1990's to explore and predict human social behaviour. It is based on a reasoned action approach, which main contention is that behaviour follows reasonably and consistently from the behaviour-relevant information available to an individual [43]. The theory asserts that behaviour is a direct function of behavioural intention which is an outcome of attitudes, subjective norms and perceived behavioural control towards the behaviour [41]. These in turn are based on an individual's beliefs regarding the potential outcomes of the behaviour, normative beliefs regarding expectations of others and beliefs on factors that potentially constrain the behaviour [41]. The TPB has been the most popular of the reasoned action models and it has been applied to understand and predict a wide array of human behaviours. It has been used to study energy conservation behaviours [44] willingness to take up household energy conservation interventions [45] and intentions to buy environmentally friendly products [46]. Kalafatis et al. [46] examined the appropriateness of the TPB in testing consumers' intentions to buy environmentally friendly products. They found that the TPB was proved useful in identifying cross market commonalities and differences across two samples. Recently, Judge et al. [47] used the TPB to predict intentions to purchase sustainable housing in Australia, and Vermeir and Verbeke [48] to predict sustainable food consumption in Belgium. The TPB enables investigation of the different determinants of adoption of tiny house living in a structured way. In the TPB, the intention to *perform a particular behaviour*, which consists of all the motivational factors, is the central factor for engaging and consequently executing this behaviour [41]. The Theory of Planned Behaviour is an extension of the Theory of Reasoned Action by Ajzen and Fishbein [49], in which the authors already recognised that a strong intention to do something is highly likely to lead to the execution of the planned behaviour. In the TPB, intention itself is jointly predicted by three different factors. Several studies have shown that these three factors significantly impact intention [41,47,50]. The study by Judge et al. [47] added green consumer identity to the TPB and found that it is an important predictor of intention in the context of sustainable housing. As tiny houses can be seen as a form of sustainable housing, the classic TPB by Ajzen [41] was also extended in this study to include the green consumer identity factor. The resulting theoretical framework is displayed in Figure 1.



**Figure 1.** Theory of planned behaviour, adapted from Ajzen [41], Judge et al. [47].

Evidence on the exact role of green consumer identity on behavioural intention and behaviour is still ambiguous. However, we suggest that it has an important role in decision making regarding tiny house adoption behaviours and can add explanatory power to the TPB framework. Additionally, demographic and socio-economic factors were also included as they emerged as important in the literature review but are not part of the TPB. By adding the two constructs, a more comprehensive understanding of the influences of tiny house adoption behaviour can be achieved. Thus, this study adopted the TPB framework as a basis and it has expanded it to include the additional factor green consumer identity, and the factor demographic and socio-economic elements.

For each factor of the adopted TPB, the framework shows the associated elements identified in the literature review, namely the key motivations, the key barriers and socio-economic factors. To establish the elements of each factor of the TPB, a list of all possible elements was first compiled. This was done by reviewing the literature for motivations, barriers, and other essential aspects, such as COVID-19, resulting in 32 items, which were then clustered, consolidated and prioritised resulting in 10 elements for the original TPB factors and two more for green consumer identity. For the additional factor green consumer identity, that is, the self-perception of pro-environmental behaviour, two elements were included. The first variable was accordingly the self-perception as an environmentally friendly consumer. Following Whitmarsh and O'Neill [51] and as confirmed by Sing [52] and Vasseur and Marique [37], concern about climate change tends to have a positive influence on pro-environmental behaviour, which is why it was included as a variable in this study. Also, demographic and socio-economic factors were included. The framework forms the basis of the quantitative research by establishing the variables and was also used to structure the research process. It is displayed in Figure 2.



**Figure 2.** Conceptual framework.

### 2.3. Hypotheses

Based on the literature review, 12 hypotheses were developed to examine the effect of each independent variable of the four factors identified in the previous section on the dependent variable *intention to live in a tiny house*. There is insufficient previous research to hypothesise about the effect of the demographic and socio-economic variables, so the hypotheses here only include the TPB factors. To simplify the analysis, the hypotheses were formulated in such a way that a positive effect of the independent variable on the dependent variable could be assumed. The hypotheses are summarised in Table 1.

**Table 1.** Summary of the hypotheses of this research.

|                               | Hypotheses | Independent variables             | Hypothesised effect on the intention to live in a tiny house |
|-------------------------------|------------|-----------------------------------|--|
| Attitude towards behaviour    | H1         | Sustainability                    | +  |
|                               | H2         | Freedom                           | +  |
|                               | H3         | Minimalism                        | +  |
|                               | H4         | Community                         | +  |
| Subjective norm               | H5         | Support                           | +  |
|                               | H6         | Independence from social pressure | +  |
| Perceived behavioural control | H7         | Financial situation               | +  |
|                               | H8         | Family situation                  | +  |
|                               | H9         | Overcoming hurdles                | +  |
|                               | H10        | COVID-19                          | +  |
| Green consumer identity       | H11        | Environmentally-friendly consumer | +  |
|                               | H12        | Climate change concern            | +  |

### 3. Data and methodology

This research used a mixed-methods research approach, combining qualitative data from interviews and quantitative data from an online questionnaire to investigate the factors determining the adoption of tiny houses in Germany. As the first step, 10 interviews were conducted based on the conceptual framework. As the next step, the resulting insights were used to ensure that no essential questions were missing from the survey. The quantitative data collected through the questionnaire then served to validate the findings from the interview and provide more generalisable results that have not been obtained by previous research. For all research questions, this was done using inferential and descriptive statistics.

#### 3.1. Data collection

As the first part of the data collection, 10 semi-structured in-depth interviews were conducted with tiny house supporters at different stages to ensure a diverse perspective and coverage of a wide range of topics. Four different groups of participants were chosen for this purpose. The first group consists of three people who are interested in tiny house living but do not yet have concrete plans to build or buy one soon. The second group includes three people at an advanced stage of planning or already building a tiny house. The third group consists of two people who have already been living in a tiny house for several months. The last group comprises two people involved in the commercial production of tiny houses.

Participants were recruited in various ways, through a Facebook group called “Tiny House Deutschland”, an online forum called “Tiny House Forum”, through snowball sampling and personal contacts of the researcher. Diversity in terms of gender and age of participants was emphasised in selecting participants, but this could not be implemented in all cases due to the limited number of volunteers. Nevertheless, the participants all gave detailed and thorough responses, providing sufficient insight to answer the research questions, as reflected in the fact that the results from the interviews reflected the findings from the literature review. Table 2 summarises the information and demographic data of the participants.

**Table 2.** Interview participant information.

| Participant group                    | Participant | Gender                              | Age | Recruited via                         |
|--------------------------------------|-------------|-------------------------------------|-----|---------------------------------------|
| Interested in living in a tiny house | 1           | Male                                | 26  | Facebook group Tiny House Deutschland |
|                                      | 2           | Female                              | 33  | www.tinyhouseforum.de                 |
|                                      | 3           | Male                                | 36  | Facebook group Tiny House Deutschland |
| Building a tiny house                | 4           | Male                                | 48  | Other participants suggestion         |
|                                      | 5           | Female (moves into TH with husband) | 50  | Other participants suggestion         |
| Living in a tiny house               | 6           | Male                                | 68  | www.tinyhouseforum.de                 |
|                                      | 7           | Female (lives in TH with boyfriend) | 26  | Personal contact                      |
|                                      | 8           | Female                              | 52  | www.tinyhouseforum.de                 |
| Manufacturing tiny houses            | 9           | Female                              | 23  | Personal contact                      |
|                                      | 10          | Female (Family business)            | 45  | Facebook group Tiny House Deutschland |



In the second part of the data collection, an online questionnaire was designed in Qualtrics and sent to Germans irrespective of their tiny house interest. That means that people who have never heard of tiny houses, as well as people interested in tiny houses or even tiny house residents, could fill in the questionnaire, see Table 3 for an overview of the responses. The questionnaire consisted of 19 questions, with different question types, including open-ended questions, single-choice and multiple-choice questions, a matrix table and a slider. The variables of the hypotheses as listed in Table 2 are questioned via a matrix table in which participants had to indicate the extent to which they agreed with 13 statements about tiny houses on a Likert scale from one to seven. A target sample size of  $n \geq 385$  was calculated for the German population to achieve a margin of error of 5% and a confidence level of 95%. A sample size of  $n = 410$  responses was achieved.

**Table 3.** Overview of the responses.

|                       |                   | Response |
|-----------------------|-------------------|----------|
| Gender                | Men               | 61.7%    |
|                       | Women             | 35.9%    |
|                       | Missing           | 2.4%     |
| Level of education    | Low secondary     | 15.6%    |
|                       | High secondary    | 31.2%    |
|                       | Academic          | 50.7%    |
|                       | Missing           | 2.4 %    |
| Age distribution      | 19–29             | 50.5%    |
|                       | 30–39             | 7.8%     |
|                       | 40–49             | 4.9%     |
|                       | 50–59             | 18.8%    |
|                       | 60–69             | 3.4%     |
|                       | 70–79             | 1.5%     |
|                       | 80–89             | 0.5%     |
|                       | Missing           | 12.7%    |
| Income                | <1000€            | 31.7%    |
|                       | <2000€            | 22.2%    |
|                       | <3000€            | 19.3%    |
|                       | <4000€            | 7.3%     |
|                       | <5000€            | 4.6%     |
|                       | >5000€            | 6.3%     |
|                       | Missing           | 8.5%     |
| Level of education    | Low secondary     | 15.6%    |
|                       | High secondary    | 31.2%    |
|                       | Academic          | 50.7%    |
|                       | Missing           | 2.4%     |
| Political orientation | Left-wing         | 6.1%     |
|                       | Rather left-wing  | 48.3%    |
|                       | Middle            | 7.6%     |
|                       | Rather right-wing | 10.0%    |
|                       | Right-wing        | 0.7%     |
|                       | Missing           | 27.3%    |

*Continued on next page*

|                                   |         | Response |
|-----------------------------------|---------|----------|
| Size in m <sup>2</sup> per person | 0–9     | 0.5%     |
|                                   | 10–19   | 4.9%     |
|                                   | 20–29   | 17.8%    |
|                                   | 30–39   | 18.0%    |
|                                   | 40–49   | 17.6%    |
|                                   | 50–59   | 11.5%    |
|                                   | 60–69   | 8.3%     |
|                                   | 70–79   | 3.9%     |
|                                   | 80–89   | 2.7%     |
|                                   | 90–99   | 1.0%     |
|                                   | 100–109 | 2.0%     |
|                                   | 110–119 | 0.2%     |
|                                   | ≥120    | 1.7%     |
| Missing                           | 10.0%   |          |

### 3.2. Data analysis

The qualitative data obtained from the ten interviews were analysed by coding, using the software Atlas.ti, by pre-coding [53], then open coding to iteratively code the data to categorise into code groups [54]. Finally, axial coding was applied to identify relationships wherever necessary [54]. All quantitative analyses were performed using IBM SPSS Statistics 27. The coding process resulted in a total number of 542 quotations, assigned to 56 different codes in nine code groups or categories. The number of codes assigned in each interview transcript ranged from 38 to 78. Five of the nine code groups or categories reflect the factors of the Theory of Planned Behaviour and the extensions: *attitude toward behaviour*, *perceived behavioural control*, *subjective norm*, and *green consumer identity*. The remaining categories comprise *first contact with tiny houses*, *manufacturing*, *status of tiny house living*, and *engagement in tiny house association*. These categories were created to capture different aspects that emerged during the interviews that did not fit into the TPB factors and highlight differences between respondents in tiny house experience and engagement.

The quantitative data was analysed using descriptive statistics and inferential statistics. The frequency distributions determined from the descriptive statistical analysis were used to provide an overview of the population, make the data collected easily comprehensible, and provide some non-generalisable insight into the participants' answers [55]. Inferential statistics were used to generate generalisable results, following the recommendation of Patten and Newhart [55]. To this end, multiple linear regression (MLR) is used for assessing the strength of the relationship between the dependent variable interest in tiny houses' and the independent variables (see Tabel 1 for an overview) as well as the importance of each of the variables to the relationship. Additional descriptive statistics were also performed for these young participants. This was done not only because a disproportionate number of young adults answered the survey but also because they could be an attractive target group for tiny house manufacturers in the near future. Five groups of independent variables were tested in the MLR, each with multiple independent variables, as shown in Table 4.

**Table 4.** Overview variables for MLR.

| Variables             |                                  |  |
|-----------------------|----------------------------------|--|
| Dependent variable    |                                  | Intention  |
| Independent variables | Attitude towards behaviour       | Sustainability                                     |
|                       |                                  | Freedom  |
|                       |                                  | Minimalism   |
|                       |                                  | Community  |
|                       | Subjective norm                  | Support  |
|                       |                                  | Independence social pressure                       |
|                       |                                  | Financial situation                                |
|                       | Perceived behavioural control    | Family situation                                   |
|                       |                                  | Overcoming hurdles                                 |
|                       |                                  | COVID-19   |
|                       |                                  | Environmentally-friendly consumer                  |
|                       | Green consumer identity          | Climate change concern                             |
|                       |                                  |  |
|                       | Demographics and socio-economics | Age  |
|                       |                                  | Gender   |
|                       |                                  | Marital status                                     |
|                       |                                  | Children   |
|                       |                                  | Size of accommodation per person in m <sup>2</sup> |
|                       |                                  | Education  |
|                       |                                  | Income   |
| Remote working        |                                  |  |
| Political orientation |                                  |  |
|                       |                                  |  |

In order to run the regressions, the non-metric variables had to be recoded into dummy variables. Four different regression models were tested based on a complete regression model (1) including all variables. The regression (2) was run without demographic and socio-economic variables, which is why it could also be referred to as the TPB model. Model (3) was the best-fit model that includes solely the statistically significant variables of the previous two regressions. The last regression model (4) was performed for young adults only, excluding the demographic and socio-economic variables.

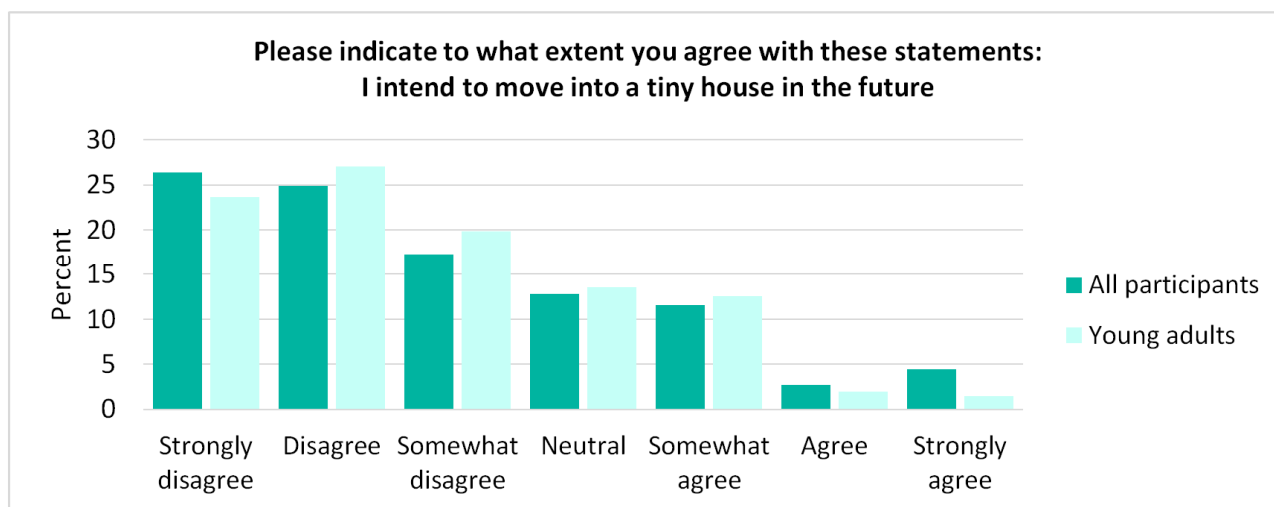
The limitations mainly concern the data and the analysis of the questionnaire, where only non-probability sampling methods were possible due to limited resources. Furthermore, despite the large sample size, the study is not free from sampling bias and therefore does not perfectly represent the population. Also, the dependent variable in an MLR should ideally be metric, whereas in this study it was ordinal.

## 4. Results

### 4.1. Intention to live in a tiny house

The descriptive statistics for the dependent variable *intention to live in a tiny house* show that relatively few people intend to move into a tiny house in the future. Out of 410 respondents, only 76 agreed at least somewhat with the statement, corresponding to 18.6%. 12.7% of the respondents were neutral towards the statement, while the majority disagreed with 67.8%. The frequencies for young

adults age 19 to 29 show a similar distribution. Figure 3 below shows the frequencies for each answer option to this question.



**Figure 3.** SPSS frequencies output of the dependent variable.

#### 4.2. Discussion of the hypotheses along the TPB

Table 5 gives an overview of the regression results for four different models.

**Table 5.** Regression results for four different models.

|                            | (1) Complete model | (2) TPB (Excluding D&S) | (3) Best fit model | (4) Young adults only |
|----------------------------|--------------------|-------------------------|--------------------|-----------------------|
| H1 sustainability (1)      | 0.097              | 0.093*                  | 0.122**            | 0.087                 |
| H1 sustainability (2)      | 0.056              | 0.043                   | 0.065              | 0.071                 |
| H2 freedom (1)             | 0.063              | 0.008                   | 0.014              | 0.117                 |
| H2 freedom (2)             | 0.182***           | 0.179***                | 0.172***           | 0.301***              |
| H3 minimalism (1)          | -0.156*            | -0.164***               | -0.133*            | -0.226**              |
| H3 minimalism (2)          | 0.093              | 0.153**                 | 0.132*             | 0.126                 |
| H4 community (1)           | 0.029              | 0.037                   |                    | 0.026                 |
| H4 community (2)           | -0.096             | -0.061                  |                    | 0.032                 |
| H5 support (1)             | 0.027              | -0.005                  |                    | -0.107                |
| H5 support (2)             | 0.077              | 0.031                   |                    | 0.043                 |
| H6 independence (1)        | -0.062             | -0.085                  |                    | -0.078                |
| H6 independence (2)        | 0.042              | 0.012                   |                    | -0.145                |
| H7 financial_situation (1) | -0.103             | -0.072                  | -0.143**           | -0.144*               |
| H7 financial_situation (2) | 0.154**            | 0.143***                | 0.138**            | 0.089                 |
| H8 family_situation (1)    | -0.027             | 0.005                   | -0.076             | 0.003                 |
| H8 family_situation (2)    | 0.169**            | 0.108                   | 0.091              | 0.069                 |
| H9 hurdles (1)             | -0.085             | -0.031                  |                    | -0.086                |
| H9 hurdles (2)             | -0.010             | -0.070                  |                    | -0.094                |
| H10 COVID19 (1)            | -0.026             | -0.017                  | -0.067             | 0.025                 |

*Continued on next page*

|                            | (1) Complete model | (2) TPB (Excluding D&S) | (3) Best fit model | (4) Young adults only |
|----------------------------|--------------------|-------------------------|--------------------|-----------------------|
| H10 COVID19 (2)            | 0.139***           | 0.140***                | 0.126***           | 0.117*                |
| H11 PEB (1)                | -0.024             | 0.001                   |                    | -0.020                |
| H11 PEB (2)                | -0.030             | 0.014                   |                    | -0.029                |
| H12 CC_concern (1)         | -0.095             | -0.057                  |                    | -0.168**              |
| H12 CC_concern (2)         | -0.006             | 0.001                   |                    | -0.112                |
| Age                        | 0.183***           |                         | 0.156***           |                       |
| Gender                     | 0.039              |                         |                    |                       |
| Marital_status             | -0.009             |                         |                    |                       |
| Children                   | 0.034              |                         |                    |                       |
| m <sup>2</sup> _per_person | -0.106*            |                         | 0.006              |                       |
| education_low              | -0.043             |                         |                    |                       |
| education_academic         | -0.059             |                         |                    |                       |
| Income                     | -0.001             |                         |                    |                       |
| political_left             | 0.028              |                         |                    |                       |
| political_rather_left      | 0.054              |                         |                    |                       |
| political_rather_right     | 0.053              |                         |                    |                       |
| political_right            | -0.052             |                         |                    |                       |
| remote_yes                 | -0.053             |                         |                    |                       |
| remote_no                  | 0.029              |                         |                    |                       |
| Observations               | 303                | 405                     | 330                | 206                   |
| R <sup>2</sup>             | 0.433              | 0.387                   | 0.370              | 0.352                 |
| R <sup>2</sup> adjusted    | 0.352              | 0.349                   | 0.346              | 0.267                 |

\* Sig. < 0.1, \*\* Sig. < 0.05, \*\*\* Sig. < 0.01.

#### 4.2.1. Attitude towards behaviour

The regression models found a positive statistically significant result for three variables of attitude towards behaviour. As hypothesised in H1, the regression models (2) and (3) found a positive statistically significant result for the dummy variable *sustainability\_agree* at  $p < 0.01$ ) and  $p < 0.05$ ), respectively. For model (3), respondents who indicated that tiny houses align with the desire to live sustainably are on average 0.122 points more likely to consider moving into a tiny house in the future. Sustainability, especially in terms of low resource consumption and the use of durable and renewable materials, was also an important motivation for all interview respondents, although participant 9 mentioned that not all of their customers are interested in sustainability. Almost all participants addressed “self-sufficiency”, which they would like to achieve with their tiny house. For all participants of groups 2 and 3 (building and living in a tiny house), sustainability was an essential factor in building their tiny house. Nevertheless, financial, time, supply or regulatory constraints hindered the possibility of building a very sustainable tiny house or achieving self-sufficiency. Despite the general opinion of tiny houses being sustainable, participants 5, 7, 8 and 9 also saw some difficulties with the sustainability of tiny houses. These included trade-offs such as the need to commute by car, poorer insulation values due to natural insulation materials, or generally lower efficiency of tiny houses. Participant 8 added: “*Tiny Houses should not be allocated large plots of land, but rather placed on vacant plots*”. Contrary to the findings of the interviews,

participant 9, who is involved in the manufacturing of Tiny Houses, mentioned that not all of their customers are interested in sustainability, although it is important for many.

All four regression models are significant positive between freedom and the intention to move into a tiny house ( $p < 0.001$ ), making it the most significant determinant in this research from a statistical perspective. Most interview participants mentioned “freedom” and “changes in lifestyle” as important factors. The connotation regarding freedom was consistently positive, including aspects such as needing less money, therefore having to work less, and finally having more free time to do what they enjoy. Thus, both the interviews and the survey suggest that freedom is a major motivation for most people to move into a tiny house.

In line with the expectations, there is a significant positive effect for models (2)  $p < 0.05$ , (3)  $p < 0.1$ , and (4)  $p < 0.05$  between people that appreciated the minimalism of tiny houses and the intention to move into a tiny house. Moreover, there is a significant negative effect ( $p < 0.001$ ) for models (1), (2), and (3) for *minimalism\_disagree*. This means that people who do not appreciate the minimalism of tiny houses seem to be significantly less interested in moving into a tiny house. Minimalism was mentioned by all interview partners and seemed to be an important factor for their interest in Tiny Houses, except for three participants who mentioned that minimalism was not one of their main motivations. Participant 8 stated: “*I have everything I need, so to me, tiny living is not minimalistic*”.

#### 4.2.2. Subjective norm

The regression models did not show statistically significant results for both variables of the subjective norm.

#### 4.2.3. Perceived behavioural control

The regression models indicated a positive statistically significant effect for three variables of perceived behavioural control. The regression found a statistically significant positive effect for *financial\_situation\_agree* and intention to move into a tiny house for models (1) and (3) ( $p < 0.05$ ) and model (2) ( $p < 0.001$ ). There was also a significant negative effect for *financial\_situation\_disagree* for model (3) ( $p < 0.05$ ) and model (4) ( $p < 0.01$ ). For all interview participants, the financial benefits that tiny houses offer were a vital motivation, bringing more financial freedom and lifestyle options. Four interviewees were concerned about old-age poverty when they received their pension notice and felt that tiny houses were the best option to prevent this from happening. The estimated or achieved costs of the tiny houses range from 10000 to 100000 €, depending on size, features and materials.

The regression yielded a significant positive effect for model (1) for *family\_situation\_agree* ( $p < 0.05$ ), implying that people who felt that their family situation would allow them to move into a tiny house are more likely to intend to move into one in the future. The right family situation for moving into a tiny house is subjective; however, most interviewees live either with their partner or alone.

One of the main barriers identified in the literature and during the interviews was overcoming hurdles, such as dealing with regulations and finding a pitch for the tiny house. The related survey question was whether the respondents thought it would be easy to do so. Only 20.2% agreed at least

somewhat, while 13.7% even strongly disagreed. This shows that consistent with previous findings, overcoming legal hurdles, including finding a plot for a tiny house, is perceived by most people as problematic. The regression found no statistically significant results, which might be explained by the interview participants, as most indicated that they were aware that it would be difficult to build a tiny house but did not let this stop them. German bureaucracy can be burdensome not only for people looking for a place to build their Tiny House, but also for organisations that want to offer plots for Tiny Houses. As participant 9 raised, “it’s a huge investment to buy this meadow and develop it, because you have to do as much as in a regular construction area, which might not be necessary for such small houses”. Participant 2 observed that “legally and socially, the form of housing is not yet provided for at all”.

The regressions found a statistically significant positive effect for *COVID-19\_agree* for models (1), (2), and (3) ( $p < 0.001$ ) and for model (4) ( $p < 0.01$ ). For six interview participants, COVID-19 had a positive impact on their opinion about tiny houses. The pandemic highlighted the freedoms that tiny houses bring, helping to cope with financial or job insecurities resulting from the pandemic or spending time in a community or outside during curfew. Nevertheless, there are also negative aspects of the situation, such as making it more difficult to socialise, communicate, collaborate and plan. For survey respondents who reported not to work from home, COVID-19 had a more positive impact on average than for those who stated they were sometimes or always able to work from home. However, this difference in means was not statistically significant.

#### 4.2.4. Green consumer identity

Regarding the factor green consumer identity, the regression showed a statistically significant effect only for concern about climate change. Consistent with the hypothesis, the regression model (4), including only young adults, found a statistically significant negative effect for *climate change\_disagree* and intention to move into a tiny house ( $p < 0.05$ ). This result suggests that young adults who are not concerned about climate change are statistically less likely to intend to move into a tiny house in the future. For all interview participants, climate change was an important issue and for many also an essential motivation for living in a Tiny House.

### 4.3. Discussion of the results

A study by Boeckermann et al. [11] provided descriptive statistics by conducting a survey among tiny house residents in the United States. However, earlier research did not present statistically significant findings on the demographic and socio-economic characteristics of people interested in tiny houses. This research found age and the current accommodation size. to have a statistically significant influence on the intention to live in a tiny house. With regard to age, the intention to live in a tiny house increases slightly with age at first but then decreases sharply as participants get older than 60 which is in contrasts with results from the United States, where most tiny house residents were under 40 years old [11]. These results may suggest that interest in moving to a tiny house is comparatively high for most life stages until approaching retirement, but less so after that. The current accommodation size is the other variable, namely the larger a person's current home, the less likely they were to intend to live in a tiny house in the future.

This research could confirm almost all of the motivations found in previous literature. Also in this study, the main factors were sustainability, cost reduction, changes in lifestyle or leading a simpler life with less work and obligations, freedom, minimalism, mobility, and a sense of community. This study even found a significant positive effect between the four main motivators sustainability, improvement of the financial situation or cost reductions, freedom, minimalism, and the intention to live in a tiny house. This implies that these factors should predict the adoption of tiny houses, considering the potential limitations of generalisability. Furthermore, this study found some motivations that do not seem to have been addressed in previous literature. People who see themselves in the right family situation for living in a tiny house, which is singles or, to a lesser extent, people in a partnership, generally without children, are significantly more likely to intend to live in a tiny house in the future. However, there are differences in the perception of the right family situation for living in a tiny house, and the perception might change over time. It should be noted that the different motivations are not equally important for everyone.

Legal barriers, that is, building and registration requirements and housing regulations in general, which lead to difficulties in finding a plot of land to park the tiny house, have been identified as the most important obstacles to tiny house living in previous research [16,27,28] as well as in this study. Most survey respondents indicated that they expected it to be difficult to overcome legal hurdles and find a plot for their tiny house, and interview participants largely confirmed this observation. The regulations in Germany are tailored to traditional housing and firmly established. The ease of the approval process seems to depend mainly on the municipality and the politicians involved. The cost and financing of tiny houses and property [16,27,28] were also confirmed as barriers by this study, although cost aspects were more often perceived a motivation rather than a barrier for interview participants. Nevertheless, it should not be underestimated that tiny houses can be expensive, particularly if sustainable materials and state-of-the-art technology are used. The survey found that people that did not perceive a tiny house to be helpful for their financial situation were statistically significantly less likely to intend to move into a tiny house. This could either mean that for a person who does not have financial problems, tiny houses are not of great interest or that people do not consider tiny houses to be an affordable alternative to their current housing situation. Other barriers mentioned in the literature were a negative social perception and a lack of support, knowledge, privacy, and space [16,26,27]. The negative social perception also occurred in this research. These stereotypes of tiny house inhabitants being unclean or hippies can be an actual obstacle for tiny house villages, as their plans have to be approved by the municipal council at each stage of approval, which is composed of members of society.

## 5. Lessons learned

In this paper we examined the demographic and socio-economic factors, motivations, and barriers for living in tiny houses. The main lessons from our analysis are as follow.

### (1) Impact of the COVID-19 pandemic on attitudes towards tiny house living

A special focus in this study was placed on the COVID-19 pandemic and its influence on the appeal of tiny houses. Although the pandemic only positively influenced the opinion towards tiny houses for 12% of the survey participants, there was still a statistically significant positive effect for people whose opinion was positively influenced by COVID-19 and their intention to move into a tiny house. This means that if COVID-19 had a positive impact on someone's view of tiny houses,



that person seems more likely to intend to move into one. Also, for six out of nine interview participants who mentioned COVID-19, it positively impacted their opinion or on their plans to build a tiny house. This was because the pandemic highlighted the freedoms of tiny house living, especially during government restrictions, as well as the economic uncertainties in many sectors, how tiny houses could be a potential solution. Nevertheless, there were also some adverse effects of the pandemic on the construction of tiny houses, such as supply shortages, long waiting times, and general planning difficulties. However, the actual tiny house residents did not mention any negative effects of COVID-19 on their situation. The literature suggests that the pandemic can negatively impact work and private life for those working from home [35]. As around 40% of survey respondents reported a negative impact of COVID-19 on their opinion of tiny houses, it could be that this work-life balance difficulty has an influence. However, no statistically significant difference in the mean score for the impact of COVID-19 was found between people who always, occasionally, or never work from home. This is not an entirely intuitive result, but perhaps reflects the general perception of tiny houses being in rural locations with ample access to outdoor space. Further investigation of this topic would be beneficial.

(2) Dichotomy between the idyllic rural self-build perception of tiny houses vs. the actual need for well-connected high-density urban tiny housing developments for the primary target markets of young and old

This research found that tiny houses in Germany so far seem to be located mainly in small towns, rural areas or at least in the outskirts of larger cities. This could pose a conflict for particularly younger adults interested in tiny houses because of their advantages but do not want to give up the benefits of cities, such as proximity to employment, entertainment facilities, shops, and services. People approaching retirement seem to be very interested in tiny houses as well. When they get older, they will also need to have easy access to services such as healthcare and shops, which might not be available in rural tiny house communities. In order to alleviate the housing crisis, these conflicts need to be addressed. More tiny house options in or closer to cities or a strengthened infrastructure around tiny house parks could be possible solutions. Policymakers could promote high-density urban tiny house villages, as done in Copenhagen [56] or designate small building plots specifically for tiny houses. However, the question arises whether tiny houses really belong in cities, where scarce building land is presumably best used for society and the environment by building multi-storey accommodation. Moreover, it appears that people deliberately ignore this conflict as they pursue the dream of an idyllic, rural, often self-built tiny house. Six interview participants mentioned the desire to spend as much time as possible outdoors and to enjoy nature experiences such as feeling the wind and hearing the rain in their tiny house. All participants wanted to build at least parts of their Tiny Houses themselves. As participant 3 noted: *“I would probably go the middle way, namely to commission the builder with my plans, and then try to do as much as possible myself, but under a construction supervisor so that the whole thing has a solid structure”*. While for participant 7 and her partner DIY was a big motivation to build the Tiny House, participant 4 stated: *“It wasn't explicitly that I wanted to live like this because I could build it myself, but conversely, I always said that if I ever lived like this, I would build my house myself”*. Therefore, urban, high-density, prefabricated tiny house options may not match the expectations and desires of the typical tiny house enthusiast. However, for people who are not interested in this “cliché” version of a tiny house, urban options could be of great interest as they may provide an affordable housing solution coupled with the benefits of city living.

### (3) Attitudes towards minimalism a key enabler and barrier to tiny house uptake

It was minimalism that the interview participants appreciated on the one hand and saw as motivation, but on the other hand, were sometimes a little afraid of. The regression results showed a statistically significant negative effect between aversion to the minimalism that tiny houses entail in terms of living space and possessions and the intention to move into a tiny house. This means that people who dislike minimalism also would not want to move into a tiny house, so minimalism has a restraining function for many people, making minimalism an extraordinary variable, as it was both a statistically significant motivator and a barrier. 56.8% of the respondents agreed with the statement “I appreciate the minimalism that tiny houses bring in terms of living space and possessions”, while only 28.3% disagreed. This seems to mimic the ongoing societal shift in attitudes towards possessions, status symbols and living space away from more is more towards less is more, which could be tied to the increasing focus on sustainability and sufficiency. Although the majority of respondents appreciate the minimalism of tiny houses, it is still a major barrier for many people and further attitudinal change may be needed for tiny houses to become more widely adopted.

### (4) Tiny house interest and uptake is often driven by necessity and circumstances

Tiny houses are often seen as a means to live a decent life with little financial resources, as their production and maintenance costs are relatively low compared to conventional forms of housing, especially now that there is a shortage of affordable housing in many countries. However, interest in tiny houses is often driven not only by a desire for financial freedom or less work and more free time, but also by necessity and a genuine fear of old-age poverty. Four out of ten respondents opted for tiny houses when they realised that their pensions would not be sufficient for a decent standard of living in the future. For the baby boomer generation, in particular, home ownership helped to build up wealth and was a form of protection against a variety of risks such as poverty in old age or unemployment, and thus brought economic security [57–60]. However, the consideration of housing as an investment tool caused property prices to rise sharply, which in turn led to a substantial decline in home ownership among younger adults, negatively impacting their opportunities in life [57]. The current crisis of housing affordability in Germany results from this intergenerational inequality [7]. To alleviate this problem, parents often support their children to find and obtain housing, but this further exacerbates the inequality between children of owners and tenants and does not help overcome other problems in the housing market [57]. The inequality between homeowners and tenants in Germany is substantial, as homeowners not only save more but are also financially wealthier than tenants [61]. Given the high cost of conventional housing, tiny houses may therefore be the only option for home ownership and independence for many young people.

### (5) Reflection on the adjusted TPB framework

The Theory of Planned Behaviour proved to be a sound theoretical framework for this research, as it provided context and structure to the research and focused on intention, which made it particularly valuable. This study adopted the TPB framework as a basis and it has expanded it to include the additional factor green consumer identity, and the factor demographic and socio-economic elements.

While several studies have shown that intention itself is jointly predicted by three original factors, this research showed that only two of these three factors have a statistically effect. Subjective norms or pressure from other people to move into a tiny house apparently does not have a significant effect because it does not originate from oneself (external) or is not their own volition. This in contrast to the other two factors, the attitude towards behaviour and perceived behaviour control, that

originate from within oneself so that someone will still have intention in moving to a tiny house. The added factors that influence the consumers' intention to move into tiny houses showed both statistically significant findings. Regarding the factor green consumer identity, the regression showed a statistically significant effect for concern about climate change, however, only for young adults. And, for the demographic and socio-economic characteristics of people interested in tiny houses also showed a significant finding. Especially, the significant positive effect between age and intention to live in a tiny house ( $p < 0.01$ ), so that with each year, the intention to live in a tiny house increases. In our view, we offer a novel contribution to the literature through the adjusted TPB framework which adds insights in the adoption research.

### *5.1. Implications and recommendations*

Several authors discussed the environmental benefits of tiny houses which leads to the question whether tiny houses are actually such an excellent solution for the environment. In general, multi-family houses have lower overall energy consumption than single-family houses, partly because the smaller living space leads to lower material and heating or cooling consumption, and heat losses from one flat are absorbed by neighbouring flats [62,63]. The more frequent use of public transport in cities also reduces the transport-related energy consumption of the residents of urban apartments [63]. However, this research found that many future or current tiny house residents seem to prefer to live outside of cities, either on a spacious plot or in tiny house parks, somewhere comparatively close to nature within small towns. This rural form of tiny houses appears to be inferior to both multi-storey and urban housing in terms of sustainability, as it would likely increase land consumption, potentially disturb nature, and undermine transport energy savings through car dependency and longer distances to work or service providers and supermarkets. Thus, the environmental impact of the average tiny house is difficult to assess, as it depends on various factors, including but not limited to the size, location, land use, materials, insulation, technology, heating system, energy use, lifespan, and consumption behaviour of the resident [64]. For instance, the cradle-to-gate life cycle assessment conducted by Verhoeven et al. [65] showed that tiny houses using only new materials have the largest impact on CO<sub>2</sub> emissions compared to ones using recycled materials, and that building with local products causes less GHG emissions than importing materials. Therefore, it is not straightforward to determine whether tiny houses are really a way to improve sustainability, and certainly, more research is needed.

Tiny houses can be an enrichment for society, as they may help alleviate the housing crisis, and for individuals, as they can contribute to positive lifestyle changes, bring joy and freedom, and alleviate fears of poverty in old age. In order to make tiny houses more attractive, a change in mindset from society is needed in addition to economic and political changes. It would be beneficial if the regulations were relaxed so that at least the 18.6% who are interested in tiny houses would find it easier to realise their wishes. 4.4% of the survey respondents had the firm intention to live in a tiny house, which, if generalised to the number of German households of approximately 41.5 million [66], would lead to 1.8 million potential tiny house households. This would undoubtedly have some impact on the housing market and possibly alleviate some of the tensions. However, tiny houses alone cannot solve the shortage of affordable housing in Germany, as most of this housing is lacking in cities [8], which are not the most suitable locations for traditional tiny houses due to the scarcity of the required building land. Tiny homes within larger residential buildings could be a possible

compromise but are usually not considered tiny houses and might not fulfil the main motivations for tiny house living. Moreover, this research found that the preferred location of tiny houses in Germany so far seems to be rather rural. The potential conflicts for particularly younger adults and people approaching retirement interested in tiny houses that do not want to give up the benefits of cities, such as proximity to employment, entertainment facilities, shops, healthcare and services need to be addressed in order to alleviate the housing crisis.

Based on the lessons learned as well as the implications, Table 6 provides an overview of some recommendations for manufacturers and policy makers.

**Table 6.** Recommendations for manufacturers and policy makers.

| Category   | Recommendations for Policy makers  | Recommendations for Manufacturers   |
|--|--|---|
| Residential development strategy and the housing mix                             | Consider how and to what extent tiny houses should be included in overall housing mix<br>Uniform regulations for tiny houses, simplification of obtaining building permits, facilitating the use of vacant lots<br>Create new building laws for tiny houses or update existing building and road traffic regulations |   |
| Supporting infrastructure requirements   | More options in or closer to cities, strengthened infrastructure around tiny house parks   | Build tiny house apartment buildings (in cities)  |
| Sustainability performance and technological innovation                          | Exceptions from grid connection obligation to support self-sufficiency   | Improve sustainability by using new technology and increase energy efficiency   |
| Consumer choice and sense of freedom   | Promote high-density urban tiny house villages or designate small building plots   | Improve attractiveness by offering larger-sized tiny houses, space efficiency, DIY kits, design options; improve humidity and thermal regulation    |
| Facilitating consumer behavioural shift by improving financing and affordability | Government financial support (subsidies or grants) linked to the premise of building a state-of-the-art tiny house to ensure sustainability<br>Encourage private sector by introducing policy measures   | Lease out tiny houses<br>Provide low-cost financing option or cooperate with banks to provide mortgage<br>Offer maintenance services and warranties |
| Building of community  |  | Opening tiny house parks with community facilities and services to attract elderly and young families   |

To solve the housing crisis, which is especially prevalent in cities, and to improve the environmental impact, tiny houses would have to be built there. Although this should be in the interest of the younger population and also provide benefits to the elderly, it is questionable whether cities are the right place for conventional tiny houses due to the scarce building land (small apartments and high-density housing are probably more appropriate). It, therefore, remains to be seen

whether and to what extent an increase in the number of tiny houses will help the tense housing situation and climate change in the future. If the housing crisis worsens and property prices continue to rise, it seems likely that tiny houses will become of greater interest and necessity to consumers and policymakers in both rural and urban areas irrespective of environmental concerns.

## 6. Conclusions

This study continued the research on tiny houses, particularly in Germany, where tiny houses are becoming more popular. It has increased the knowledge about tiny houses and hopes to increase their legitimacy further. This study aimed to answer which factors enhance the adoption of tiny houses in Germany and discuss their potential to alleviate the housing and climate crisis by using the TPB. In terms of demographic and socio-economic characteristics of current and potentially future tiny house residents, it was found that they tend to be older, have few or no children, be more left-leaning politically, and not currently live in a large apartment. Drawing conclusions from the results requires some caution due to the potential methodological limitations. However, where there has been previous research, the results are largely consistent with previous findings for both Anglophone countries and Germany. This paper confirmed that the main motivations are sustainability, appreciation of minimalism, cost reductions or even the fear of old-age poverty, freedom, change of lifestyle and community, while the main barriers are legal obstacles, difficulties in finding a building plot, and an aversion to minimalism. Therefore, the attitude towards minimalism seems to play an important role in the uptake of tiny houses. COVID-19 negatively affected the intention to live in a tiny house for about 40%. However, it had a positive influence on those who were already interested in tiny houses. Detached housing, being close to nature, implementing own design conceptions, flexibility, and mobility seemed important for many people interested in tiny houses, however, these factors are perhaps not very compatible with urban living and mass production. This could have a considerable impact on the potential of widespread adoption of tiny houses in the future, as cities provide a better infrastructure than rural areas, especially interesting for young adults and the elderly, and offer many sustainability benefits.

Research into the different perceptions of detached tiny houses and tiny flat apartment buildings could also be insightful in this regard. Also, a more in-depth study of the long-term impact of COVID-19 in relation to working from home and work-life balance in tiny houses seems important given the changing work environment.

Based on the results, this research provided recommendations for policymakers and tiny house manufacturers to endorse the tiny house movement. These included simplified regulations for the construction and land use of tiny houses, access to subsidies and adequate financing options, promotion towards young adults, and more options in or closer to cities. Together, this could be valuable for society, the economy and the environment.

## Conflict of interest

The authors declare no conflict of interest.

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