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Can short-term housing rental hosts make a long-term environmental impact

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Abstract

The rapid rise of sharing economy-related business models, such as short-term rental platforms, raises the questions of how these business models influence the natural environment and what environmental actions are available to both hosts and tenants to reduce environmental impact. Different from many studies addressing the role of guests' behaviours to decrease their environmental impacts related to short-term rental, the role of hosts is still under-researched. The objective of the study is to examine the factors influencing hosts' pro-environmental behaviour (such as increasing resource and energy efficiency, improving waste management practices)—a novel area that has been previously underexplored and important from the perspective of the overall environmental impact of the short-term rental sector. By extending the Theory of Planned Behaviour with the concept of prosumption, the research surveyed 112 short-term rental hosts in Hungary using a PLS-SEM approach. Findings support the research hypotheses, showing that general attitudes toward prosumption, environmental attitudes, subjective norms, and perceived behavioural control significantly impact hosts' pro-environmental behaviour. Notably, attitudes toward prosumption showed the strongest influence. Results imply that beyond creating positive environmental attitudes to short-term rental hosts, it is also important to promote positive attitudes to prosumption activities in general in order to foster pro-environmental behaviour among hosts. These insights are crucial for enhancing the sustainability performance of the short-term rental sector and other branches of tourism where prosumer behaviour is prevalent, thereby delivering societal benefits.

Keywords Short-term housing rental platforms, Prosumption, Pro-environmental behaviour, Theory of planned behaviour, PLS-SEM

1 Introduction

Recently, the sharing economy, a significant manifestation of sustainability-focused business models [1], has been rapidly spreading worldwide [2, 3]. A significant segment of the sharing economy comprises online platforms that connect homeowners with travellers seeking short-term accommodations. Proliferating within the tourism industry, these platforms offer several advantages, such as diverse lodging options, personalized



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experiences, and comfortable booking features catering to the ever-changing needs of modern-day travellers.

After the COVID-19 pandemic, the number of guest nights booked through four major online platforms (Airbnb, Booking.com, Expedia, and Tripadvisor) has increased significantly from 364 million in 2021 to 719 million in 2023. As a result, by now, short-term rental (STR) accommodations account for approximately one-quarter of all tourist accommodations in the European Union (airbnb.com). This fast growth highlights the popularity of STR, which is transforming the hospitality sector.

Letting rooms and apartments can be understood as a specific form a prosumption where consumers (homeowners) also act as producers and service providers. The rapid growth of short-term home rental platforms can be considered as part of a broader tendency of consumers increasingly engaging in activities aiming at production/service provision (e.g. household food production, installation of renewable energy systems, etc.).

Short-term rental operations have important implications for all three domains of sustainable development. The “tragedy of the commons” is a relevant concept in this context, where open access to tourism accommodations can lead to both economic and environmental overexploitation. This phenomenon results in mass tourism, characterized by low willingness to pay and significant environmental impacts [4].

However, the sustainability impacts of STR operations are not unambiguous, and both positive and negative effects may be present depending on local circumstances.

Potential economic impacts include an additional income for local homeowners, an increase in employment, and a boost to the local economy by directing tourist spending towards local businesses and services, rather than large hotel chains [4]. However, STR operations may increase local apartment prices and increase competition with traditional accommodation providers [5], which may pose new challenges to certain social groups.

From a social perspective, STR platforms can foster social interactions and cultural exchange between hosts and guests, which increases community resilience [6, 7].

Platforms can also assist individuals to become micro-entrepreneurs, providing economic opportunities and promoting inclusivity within communities. An example from Vietnam [8] indicates that Airbnb mutually supports resource conservation and residents’ living conditions. On the contrary, the proliferation of Airbnb providers in urban areas has been linked to significant urban transformations, often resulting in gentrification and the erosion of community social capital, as seen in cities like Madrid, Barcelona, and Palma de Mallorca [9].

As environmental benefits, the sharing economy model of Airbnb reduces the need for new construction, thus minimises the environmental impact related to building new hotels [10]. Further, Airbnb accommodations often consume less energy and resources compared to traditional hotels. This is due to the decentralized nature of the platform, as properties managed by individual hosts often lead to resource efficiency [11]. Airbnb hosts are also encouraged to adopt sustainable practices (e.g., water-saving measures and efficient heating systems) driven by both guests and the potential for financial and organizational support from the platform [12].

The success of Airbnb and similar platforms also has significant negative environmental impacts, mainly due to the facilitation of overtourism, such as in the Balearic Islands, leading to (i) heightened pressure on local resources and infrastructure [13], (ii) resource

overuse, like in water-scarce Cape Town [14] or carbon footprint increase in Australia [15], or (iii) increased noise and traffic [16].

Thus, while STR platforms are often promoted as sustainable alternatives to traditional hospitality businesses, their long-term environmental and social implications remain debated and may even be contradictory. This ambiguity is also reflected in the motives underlying participation in STR platforms. Although environmental considerations – such as resource efficiency, low-impact lifestyles, or support for local communities – may play a role in hosting decisions [17], earlier research suggests that hosting is more commonly driven by economic motives, such as supplemental income, and by social motives, including cultural exchange and interpersonal interaction [18]. Thus, while sustainability narratives may help legitimize STRs, actual participation often appears to be driven more by economic than ecological considerations.

However, motivations to participate in hosting do not necessarily overlap with motivations to engage in environmentally responsible hosting practices. While previous research has examined why individuals become STR hosts, much less is known about what drives hosts to adopt environmentally sound practices in the management of their properties. This constitutes the research gap addressed in this study. Specifically, we ask: What factors influence hosts' engagement in environmentally sound practices, such as improving resource and energy efficiency, reducing greenhouse gas emissions, and making environmentally conscious operational choices, including waste management?

While these practices also include motivating guests to follow suit, broader issues like overtourism caused by the reckless consumption behaviour of guests falls outside the scope of this research.

The article is structured as follows. First, we introduce the literature regarding the most important motivations of STR hosts to engage in apartment rental, as well as the environmental implications of the various motivation factors identified in the literature. Then, we highlight how the concept of presumption is related to the environmental impact of STR platforms.

Using these findings, we set up a research model and related hypothesis based on the extension of the Theory of Planned Behaviour (TPB) to uncover determinants of host behaviour. Next, we introduce our methodology, an empirical survey of STR hosts in Hungary followed by the results. Finally, we discuss our results and form recommendations to both practitioners and policy makers.

2 Literature review

With the rapid growth of STR platforms, researchers have also turned their attention to various aspects of these new businesses and their customers. Platforms can be used to collect large amounts of data, which promises interesting insights, however, a lack of willingness to share data by platform providers and the limitations of data collected constrain research efforts. Therefore, a better understanding of the motivations behind actively engaging in STR platforms requires additional data collection and analysis.

Understanding host motivations is not only relevant for explaining participation in STR platforms, but also for assessing their environmental consequences. While STR platforms are often framed as sustainability-oriented business models, the dominant motivations of hosts may shape their environmental behaviour in different and

sometimes contradictory ways. Thus, analysing motivations provides a theoretical basis for understanding why hosts engage—or fail to engage—in pro-environmental practices.

Previous surveys identified an array of both intrinsic and extrinsic motivation factors behind STR platform use by both home-owners and renters; however, they are inconclusive regarding the importance of the different factors. More importantly, existing research has rarely explored how these motivations translate into environmental behaviour and long-term sustainability outcomes. This gap is particularly relevant, as the environmental impacts of STR depend largely on the everyday practices of hosts.

2.1 Prosumption and environmental behaviour in the sharing economy

Short-term rental hosting can be understood as a form of prosumption, where individuals simultaneously act as consumers and providers. Foundational work conceptualised prosumption as the blurring of roles of production and consumption [19], while more recent work emphasizes its relevance for value co-creation and platform economies [20]. This perspective provides a useful lens before discussing host motivations, because it highlights a possible tension between economic, lifestyle, altruistic, and environmental motives that may shape hosts' pro-environmental behaviour. Despite growing literature on prosumption and sustainability, these implications remain underexplored in the STR context.

Prosumers differ from traditional consumers and producers in several ways that may influence environmental outcomes. First, prosumers often have higher awareness of resource use due to their direct involvement in production processes [21]. Second, they may develop stronger intrinsic motivations, identity, and responsibility toward environmental issues [22]. Third, prosumer communities may facilitate peer learning and norm diffusion [23].

In the context of STR, hosts act as micro-entrepreneurs and providers of tourism experiences. Their decisions regarding infrastructure, consumption patterns, and communication directly influence the environmental footprint of accommodations [24]. Unlike hotels, sustainability practices in STR emerge in a decentralised and voluntary manner, which makes individual attitudes and social dynamics particularly important. Therefore, integrating prosumption theory with behavioural models such as the TPB can provide deeper insights into sustainability transitions in the sharing economy.

Overall, the literature suggests that financial aspects dominate the motivation to participate in STR platforms as hosts, although a number of intangible factors also exist, such as social relationships, personal development and flexibility. In contrast, the existence of environmental considerations is limited and controversial, which justifies further empirical research regarding the attitudes and behaviour of those renting apartments in the short term.

Building on this prosumption perspective, host motivations identified in the literature can be understood not only as drivers of participation in STR, but also as potentially shaping environmental behaviour in different and sometimes contradictory ways.

2.2 Economic motivations

The existing literature unequivocally indicates the role of hosts' short-term financial gains as one of the most important motivation factors of offering apartments on STR platforms. According to several empirical surveys, additional income plays a determining

role in the decisions of hosts to join and to stay with the platforms. For example, a study among Australian hosts [25, 26] showed that a predominant majority of apartment owners (81%) indicated additional income as their primary motive, ahead of social interaction and the idea of sharing. Other authors came to a similar conclusion using a German sample [27] and a sample in North America [28].

The importance of economic considerations is reinforced by those surveys, which considered entry and participation decisions in their broader structural contexts. According to a study conducted in Spanish towns [29], the availability of underutilised resources and the growth of the sector motivate entering STR platforms especially among those who have a low personal interaction with their guests. Other results [30] provide further detail: while in the case of potential hosts, perceived value is the most important motivation factor, already active hosts are motivated to maintain their participation by trust.

In case of professional short-term hosts, researchers found that while the possibility of a higher income is an important factor, it is not the only motivation to participate [31].

From a sustainability perspective, the dominance of financial motivations raises a number of important questions. On the one hand, economic motives may encourage environmentally beneficial investments, such as energy efficiency, if these also reduce operating costs. On the other hand, profit-oriented behaviour may prioritise occupancy rates, comfort and guest satisfaction, potentially increasing resource use and environmental pressures. Thus, the relationship between economic motivations and environmental behaviour is complex and context-dependent. This tension suggests that sustainability outcomes in STR platforms may not emerge automatically from participation but depend on the broader attitudes and behaviour of hosts.

This tension between economically extrinsic motives and environmentally oriented behaviour is consistent with Self-Determination Theory, which distinguishes externally regulated motivations from more autonomous and value-driven forms of motivation [32]. Environmental psychology research further suggests that intrinsic and norm-based motivations are often stronger predictors of pro-environmental behaviour than purely instrumental incentives [33].

2.3 Social relationships and experiences

Apart from economic factors, several studies emphasize the importance of social relationships and community experiences. A certain portion of hosts expressly enjoys meeting people and cultural exchange [35]. Furthermore, social relationships, cultural learning, and personal development often result in positive outcomes for hosts [36].

A deeper understanding of the social dimension of STR platforms is provided by the results of [34], indicating that the border between social and commercial motives is blurred, and hosts actively contribute to the construction of a romanticized experience of sharing. Another study during the pandemic showed that the intensity of social interactions influences the adaptation to crisis situations: hosts who live with their renters develop different adaptive practices compared to those who let full apartments [35]. Moreover, other authors also identified intrinsic motivations, such as the joy of making contacts with other people and the sharing of experiences [28].

These social motivations may also influence environmental behaviour and outcomes. Close interaction between hosts and guests can facilitate the diffusion of environmentally responsible practices, such as energy saving, waste separation, or water

conservation. Hosts motivated by social exchange may be more likely to communicate sustainability expectations and encourage responsible guest behaviour. Such mechanisms may also operate through social norm activation and value internalization, both identified as drivers of environmentally significant behaviour [33].

2.4 Flexibility, control, and lifestyle aspects

The specific characteristics of short-term apartment rental, namely the flexibility and the owner's control over the activity, are also important motivation factors. According to the survey conducted in Montreal [31], hosts put a high value on having a tighter control over their apartments, and that they can avoid risks and restrictions characteristic of letting apartments to long-term tenants.

Control and flexibility may also strengthen hosts' perceived behavioural control regarding environmental actions, which may facilitate environmental innovation.

These aspects are also related to the legal environment of short-term apartment letting. A study demonstrated in European cities [36] that the type and implementation of local regulations differently affect professional and non-professional hosts and thus, indirectly, the costs and benefits of participation in STR platforms.

According to [37] the norms and expectations of the platforms drive the professionalisation of hosts, which may reduce the flexibility of traditional home sharing.

2.5 Sharing, altruism, and intrinsic values

The norms of the sharing economy and various altruistic motives also appear in the literature, although with a lower significance. An Australian study [25] identified the motive of sharing as a distinct category, while others also emphasize that the joy gained from helping others and identification with a community can also contribute to the formation of intention to participate in STR platforms [38].

By examining the process of a consumer turning into a service provider, it has been demonstrated that there is a multi-step motivation dynamics in which extrinsic and intrinsic factors play a different role at different points in time [31]. According to their results, the psychosocial need for self-determination is an important factor in participating on the platform over a longer period.

According to [40], the intrinsic motivations of altruism and social interaction also appeared in guest evaluations of hosts and their apartments. These intrinsic and identity-related motivations are closely connected to the broader concept of prosumption. In prosumption contexts, individuals combine consumption and production roles, which may foster a sense of responsibility and ownership over resources. This dual role has been associated with higher environmental awareness in fields such as household energy production, circular economy initiatives, and do-it-yourself practices. Therefore, prosumption may represent an important psychological mechanism linking participation in sharing platforms with pro-environmental behaviour. This interpretation is also consistent with Self-Determination Theory, according to which intrinsically motivated behaviours are more likely to be sustained and aligned with broader pro-social goals [32, 34].

2.6 Environmental and sustainability aspects of motivation

The role of environmental aspects in motivating STR activities is not unambiguous. According to some studies, environmental awareness and sustainability may appear behind intentions to share [38], while other research points to their marginal role.

This inconsistency is amplified by the findings of [41], who found that sustainability motivations do not have a significant effect on either satisfaction with the platform or commitment to it among the users of Airbnb, opposite to such more pragmatic factors as price and comfort. However, other researchers point out that some of the hosts are open to environmental certifications, especially if they bring about market advantages [39].

In the context of short-term apartment rental, the results indicate that the environmental attitudes of homeowners not only affect their own decisions, but also the behaviour of guests [39]. Hosts committed to sustainability have a higher chance of introducing environmentally conscious practices and are more sensitive with regard to similar expectations of their customers [42, 43].

However, existing studies mostly focus on sustainability as a motivation for platform participation rather than on sustainability as a driver of behaviour within hosting activities. This represents a critical research gap, as environmental impacts depend primarily on operational practices such as energy use, waste management, and communication with guests. Moreover, sustainability in STR is not institutionalised as in the hotel sector, but largely depends on individual hosts' attitudes, perceived control, and social norms. This logic also aligns with Value-Belief-Norm theory, which links environmental values and personal norms to pro-environmental action [33, 44].

2.7 Synthesis and research gap

Our review of the literature demonstrates that research regarding STR platforms mainly focuses on the motives of participation and on social and economic impacts, while the environmental behaviour of hosts has been given less attention. While the sharing economy is often considered a solution towards a more sustainable society, empirical evidence suggests that financial and lifestyle motivations dominate host participation. At the same time, research on environmental behaviour in the tourism sector often concentrates on hotels and their guests, where sustainability practices are more formalised and better managed. The specific case of hosting on STR platforms – where individuals act as consumers, producers, and service providers – remains theoretically underexplored from a behavioural sustainability perspective.

Furthermore, while the TPB has often been applied to explain pro-environmental intentions in the hospitality sector, it has rarely been integrated with prosumption theory to capture the hybrid consumer-producer role characteristic of STR hosts. Prosumption may shape environmental behaviour through heightened autonomy, responsibility, identity formation, and peer-based norm diffusion, yet these mechanisms have not been systematically examined in the STR context. Therefore, there is a need for an integrated framework that connects STR hosting as a form of prosumption with established behavioural theories to better understand the drivers of hosts' pro-environmental practices. Addressing this gap, the present study combines prosumption-related attitudes with the TPB framework to explain environmentally responsible behaviour among STR hosts.

3 Research model and hypotheses

Building on the synthesis of STR research, prosumption theory, and the Theory of Planned Behaviour, this section presents the research model, and the hypotheses derived from existing literature. The model integrates general attitudes toward prosumption with sustainability-related attitudes, subjective norms, and perceived behavioural control to explain hosts' pro-environmental behaviour in the STR context. Unlike hotel-based sustainability models, the framework captures the hybrid consumer–producer role of hosts and the decentralised nature of environmental responsibility within sharing platforms.

3.1 Theory of planned behaviour and prosumption

To be able to better understand and evaluate the latent drivers of environmental intentions and, indirectly behaviour in the context of prosumption and STR, the TPB framework is applied. Based on the original model from the psychology literature [45], three independent domains drive a specific intention and, consequently, a related behaviour. According to the core model, these three drivers are (i) attitudes (a way of feeling about something), (ii) subjective norms (such as social pressure) and (iii) perceived behavioural control (one's ability to be involved in a specific action). The TPB is widely used in academic literature to study environmental and sustainability-related intention and behaviour, e.g. [2, 46, 47]. However, its application to in the context of prosumption and especially in case of STR hosting requires further conceptual foundation. Unlike “traditional” consumption, STR hosts operate in a hybrid role, both as consumers and producers (service providers), which alters the dynamics and factors behind pro-sustainability behaviour.

Within the TPB framework, prosumption [20] provides a complementary perspective that helps explain how behavioural drivers operate in an STR-related environment [48]. In this context, individuals are not merely passive decision-makers but active co-creators of value and are responsible for managing resources and interact with users [48]. More specifically, prosumption influences behaviour through three interrelated mechanisms within the TPB framework:

- (i) The dual consumer – (service) provider role supports the experiential grounding of attitudes. Because hosts directly experience the operational, financial, and environmental consequences of their decisions, their approach to pro-environmental practices are likely to be more specific than in purely consumption-based contexts [31].
- (ii) Prosumption may also strengthen perceived behavioural control. STR hosts typically retain a high degree of autonomy over their activities, including decisions related to infrastructure, energy use, waste management, and communication with guests. In contrast to employees in traditional hospitality-related organisations, whose actions may be more influenced by organisational structures [69], STR hosts operate more as independent decision-makers, which increases the role of control perceptions.
- (iii) Prosumption can also increase the role of subjective norms through platform-related interactions. Online guest reviews/ratings and host communities provide continuous and visible social feedback loops. According to [23], these mechanisms facilitate the role of social norms and expectations, also in relationship to environmental responsibility.

[40] also found the TPB framework valid for studying actual engagement in prosumption activities, with a strong role of attitudes. Studying prosumption in the field of household energy production as a specific example for prosumption [49], found strong positive relationship between being involved in prosumption activities and all drivers of the TPB framework.

In terms the empirical application of the TPB approach related to STR [50], found on a Chinese sample that all drivers of the TPB was positively associated with STR behaviour, but the strongest relationship could be found in link to landlord' attitudes [51]. used an extended TPB framework and found that Airbnb hosts' behaviour in engaging with STR is negatively linked to their risk perception. Similar findings can be derived based on [52].

3.2 Environmental behaviour related to short-term housing rental

Environmental behaviour is referred to both one's attempts to systematically avoid negative consequences of activities on the natural environment, as well as conducting actions in order to contribute to the improvement of the state of the environment [53, 54] [55]. differentiates between multiple aspects of pro-environmental behaviour, from incremental aspects like waste separation and energy efficiency to more radical ones (actions against consumerism or at least decreasing overconsumption etc.).

In terms of STR, this may be translated to reduced resource use, such as energy (both heating or cooling related [56]), water usage [14], reduction and proper management of waste [57], and promoting such behaviour by guests or tenants [58].

3.3 General attitudes toward prosumption

Attitudes toward prosumption indicate one's way of general feelings about its usefulness, as well as the creativity, joy and independence it may be associated with [59, 60]. On an international sample of students [61], found a positive relationship between pro-prosumerist attitudes and environmental behaviour. Similar findings can be derived from the results of [62] on a US sample.

In the context of STR [39], analysed Canadian Airbnb hosts and found openness among landlords to environmental certification schemes and environmental improvements in general related to their properties [63]. conducted field experiments in England and found that social and environmental attitudes of hosts nudges the environmental behaviour of guests (and thus indirectly of the whole STR process).

H1 *STR hosts with more favourable attitudes toward prosumption are more likely to engage in pro-environmental behaviour.*

3.4 Sustainability attitudes to STR

Sustainability attitudes indicate one's feelings about different aspects of (i) environmental issues (natural resource use and pollution, overconsumption etc.), (ii) social challenges (like social inequalities, impact of an activity on local communities, working conditions etc.) and (iii) economic aspects in a broader sense, like contribution of an economic activity to the welfare of multiple stakeholders [64, 65].

Based on a study among service providers of Airbnb and Uber in Taiwan [38], found a positive relationship between environmental consciousness (a form of environmental

attitude) and behaviour to be engaged in the respective presumption-related activity. From the results of a study by [39] analysing the motives of Airbnb hosts, it can be concluded that sustainability attitudes of hosts are positively associated with their future intention and behaviour to adopt environmental practices with their STR activity. Similarly [66], found that sustainability-oriented Airbnb hosts perceive and understand better similar expectations from guests and thus more probably develop their STR activity in a pro-environmental way. In a related sector (hotel industry), a Malaysian research [67] restricted to the environmental aspect of sustainability also found positive relationship between hotel's environmental attitudes and behaviour.

H2 *STR hosts with more favourable sustainability attitudes are more likely to engage in pro-environmental behaviour.*

3.5 Perceived behavioural control related to STR

In the research context, perceived behavioural control means the ability to be involved in STR [68]. Related to presumption [69], found a positive relationship between perceived behavioural control variables and pro-environmental behaviour among Swedish household-level solar panel owners. More generally, literature reviews of [70, 71] agree that perceived behavioural control is positively connected to environmental behaviour. In the context of STR, there seem to be no specific literature on this specific relationship. In the context of the hospitality sector, perceived behavioural control was mostly used as a mediatory construct [72]. studied hotels in Istanbul and found its positive role between green training of employees and environmental behaviour, while [73] had similar results on its role between environmental attitudes and behaviour, when studying eco-certified hotels in Greece.

H3 *Higher perceived behavioural control regarding environmental practices in STR hosting is positively associated with pro-environmental behaviour among STR hosts.*

3.6 Subjective norms related to STR

Subjective norms in the context of this study mean how one feels social pressure (from family, friends, peers) to be engaged in STR. In the context of the hospitality sectors, multiple studies have found positive relationship between subjective norms and pro-environmental behaviour [74, 75], but these focused on guests' behaviour and not on hosts. Specific literature on the relationship between the subjective norms affecting STR hosts, and their environmental behaviour was not found.

In a little broader scope, based on research among Australian prosumers [76], researchers found that expectations of the society to prosumers are positively associated with their environmental behaviour. Further expanding the scope [77], it was concluded based on a study in the Netherlands that personal and social norms (as subjective norms) are in strong relationship with the individual environmental behaviour.

H4 *Stronger perceived social expectations regarding environmental responsibility are positively associated with pro-environmental behaviour among STR hosts.*

3.7 Proposed research framework

The research model and hypotheses are summarized in Fig. 1.

4 Materials and methods

4.1 Data collection and sample

To better understand the influencing factors of STR hosts’ engagement in environmentally conscious behaviour, an empirical survey was designed as part of a nationwide research project assessing the major characteristics of prosumers living in Hungary. The method of computer-assisted web interviewing (CAWI) was initiated to survey online 2500 respondents undertaking various prosumer activities in the second half of 2022. A pre-test of a sample of 50 was applied and the feedback helped to fine-tune and finalise the questionnaire. By early 2023 112 prosumers engaged in short term room/apartment rental have been reached. While all 2500 respondents were invited to fill in questions regarding their attitudes towards prosumption in general, these 112 respondents also filled in a detailed survey of their host activities.

To ensure validity, we used/adopted scales from earlier validated scales (see subsection 4.2). To ensure clarity and accuracy, the questionnaire was tested by four experts of sustainable consumer behaviour who did not otherwise participate in the research. Explicit focus has been put to the exact wording, comprehensibility, relevance and easy understandability of the statements. Feedback from these pilot sessions led to modifications in several items before finalising and programming the questionnaire. To address further aspects of validity and reliability, please see the evaluation of the measurement model (subsection 5.1).

A 7-point Likert scale was used to measure the attitudes, motivations, intentions, and actual behaviour of respondents.

While the larger sample of prosumers is representative of the Hungarian population (between the ages of 18 and 70 in terms of gender, age group, level of education and type of settlement), the representativeness of the sample of STR hosts could not be achieved. The sample distribution is summarised by Table 1.

4.2 Measures

The structured questionnaire for this study was developed using questions adopted from previous surveys identified during the literature review.

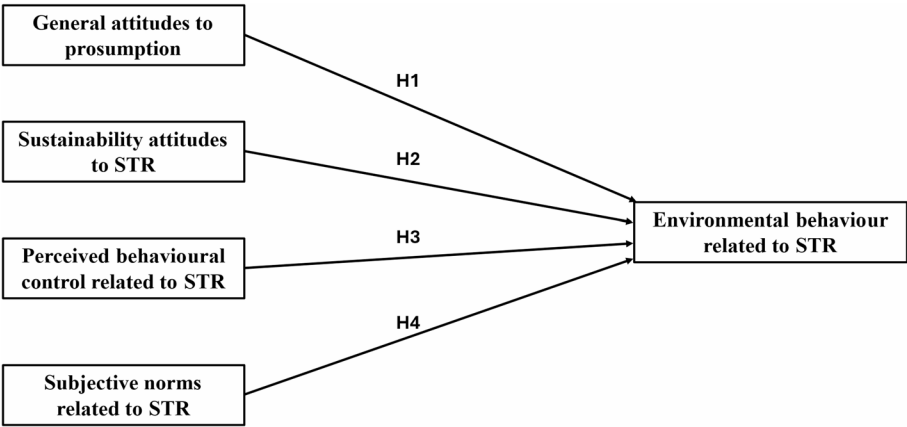


Fig. 1 The research model and hypotheses

Table 1 Distribution of the sample along socio-demographic variables ($n = 112$)

Variables	Sample distribution
Gender	Female: 42 (37.5%) Male: 70 (62.5%)
Age (years)	18–29: 48 (42.9%) 30–39: 25 (22.3%) 40–49: 21 (18.8%) 50–59: 11 (9.8%) 60–70: 7 (6.3%)
Education (highest)	Elementary: 3 (2.6%) Medium: 51 (45.5%) Higher: 58 (51.8%)
Settlement type	Capital: 24 (21.4%) Other city: 29 (25.9%) Town: 34 (30.4%) Village: 25 (22.3%)
Income (1000 HUF/month/person in the household)	Below 150: 17 (15.1%) 150–300: 48 (42.9%) 300–400: 22 (19.6%) Over 400: 19 (17%) Prefer not to disclose: 6 (5.4%)

4.2.1 Attitudes toward prosumption

Items describing attitudes toward prosumption were adopted from [78], who examined the motivations and attitudes of DIY consumers—a typical example of prosumers, who enjoy creating and sharing products with others and are often motivated by saving money.

4.2.2 Sustainability attitudes towards STR

Variables describing sustainability attitudes towards STR were adopted from a study by [79] who examined prosumer activities with regard to the household production of renewable energy and identified five latent psychological factors influencing the acceptance and adoption of renewable energy technologies: concern about environmental issues, interest in energy sharing, concern on climate change, social influence, and impact on bill cost. They also found that attitude, economic incentives, and age have a significant influence on the acceptance of becoming a prosumer.

4.2.3 Perceived behavioural control and subjective norms

Measures of perceived behavioural control and subjective norms related to STR were adapted from established scales, which have been used to assess entrepreneurial intentions before [80]. The Theory of Planned Behaviour (TPB) has been applied in entrepreneurship research extensively to predict and explain behavioural intentions and behaviour [81]. According to TPB, attitudes, subjective norms, and perceived behavioural control jointly influence an individual's intentions, which in turn drive actual behaviour. According to [82], the strength of these relationships can vary across contexts.

4.2.4 Environmental behaviour

Measures of environmental behaviour related to STR were developed by adopting items from several pro-environmental behaviour (PEB) scales [82]. These measures assess behaviours, which are relevant from the point of view of STR practices, such as the improvement of energy efficiency, waste selection and recycling, etc.

The scales themselves are presented in Appendix 1.

5 Results/data analysis

Data were evaluated utilizing PLS-SEM (partial least squares structural equation modelling) with SmartPLS 4 software. PLS-SEM is deemed more suitable for the research model and hypotheses of this study than CB-(covariance-based) SEM, due to its significant advantages [83, 84], like predictive capability concerning endogenous factors and resilience in the absence of normal data distribution. A further advantage is the reduced necessity for sample size is also a major benefit making results more robust. For the sample size, the '10 times rule' [85] was applied, that required a minimum sample size of 80, as the maximum number of links pointing to any latent variable is 8 (in case of the "Sustainability attitudes to STR" construct, see Appendix 1). Although there are also other approaches for setting the minimum sample size [86], admits that this is the most frequently used criterion. Our sample size of 112 satisfied this rule. Data analysis has two parts: the evaluation of the measurement and structural models.

5.1 Validity testing of the measurement model

The measurement model was evaluated across multiple dimensions. According to Table 2, the majority of the outer loadings for the variables of the various factors were

Table 2 Internal consistency, composite reliability, and convergent validity evaluation of the measurement model

Constructs	Items	Outer loadings	Cronbach's alpha	Composite reliability	AVE
General attitudes to prosumption	GA_1	0.865	0.88	0.882	0.736
	GA_2	0.822			
	GA_3	0.875			
	GA_4	0.869			
Sustainability attitudes to STR	SA_1	0.768	0.894	0.901	0.577
	SA_2	0.794			
	SA_3	0.789			
	SA_4	0.854			
	SA_5	0.795			
	SA_6	0.694			
	SA_7	0.647			
	SA_8	0.718			
Perceived behavioural control related to STR	BC_1	0.827	0.874	0.881	0.616
	BC_2	0.874			
	BC_3	0.82			
	BC_4	0.712			
	BC_5	0.688			
	BC_6	0.773			
Subjective norms related to STR	SN_1	0.812	0.843	0.85	0.616
	SN_2	0.692			
	SN_3	0.784			
	SN_4	0.801			
	SN_5	0.826			
Environmental behaviour related to STR	EB_1	0.897	0.932	0.933	0.787
	EB_2	0.922			
	EB_3	0.898			
	EB_4	0.899			
	EB_5	0.814			

Table 3 Discriminant validity evaluation of the measurement model

	Sustain- ability attitudes to STR	General attitudes to prosumption	Environmen- tal behaviour related to STR	Perceived behavioural control related to STR	Subjective norms related to STR
<i>Fornell–Larcker criterion</i>					
Sustainability attitudes to STR	0.76				
General attitudes to prosumption	0.454	0.858			
Environmental behaviour related to STR	0.543	0.588	0.887		
Perceived behavioural control related to STR	0.444	0.44	0.6	0.785	
Subjective norms related to STR	0.522	0.388	0.576	0.546	0.785
<i>HTMT criterion</i>					
Sustainability attitudes to STR					
General attitudes to prosumption	0.501				
Environmental behaviour related to STR	0.585	0.648			
Perceived behavioural control related to STR	0.488	0.497	0.657		
Subjective norms related to STR	0.598	0.452	0.646	0.626	

significantly beyond the acceptable threshold of 0.7 [83], whereas only a limited number of items achieved acceptable values over 0.6, predominantly nearing 0.7. The indicators for internal consistency, Cronbach's alpha and composite reliability were well above the permissible threshold of 0.7, with minimum values of 0.843 and 0.85 for the two indicators, respectively, demonstrating the model's internal consistency. The criteria for convergent validity are also met, since the average variance extracted (AVE) exceeds the threshold of 0.5 for all constructs, with a minimum value of 0.62.

Two distinct criteria were evaluated in terms of discriminant validity, as outlined in Table 4. The Fornell-Larcker criterion [87] is met in all relations, as the inter-construct correlations are smaller than the square root of the AVE values of the respective constructs. The Heterotrait-Monotrait criterion stipulates that HTMT ratio (cross-construct against within-construct correlation) must be below 0.85 [88], a condition that is properly met in all relationships (the maximum value is 0.657).

Considering the self-reported nature of the dataset, we had to address the possible common method bias through two channels. The first was – to decrease social desirability bias - to highlight in the survey questionnaire that there were no right or wrong answers and ensured anonymity to decrease common method bias. Second, we applied an ex-post test (Harman's single factor test) to evaluate whether a single factor accounts for the majority of the variance in a dataset. As a result of a comparison against a random variable, VIF values of each factor remained below the threshold of 3, indicating no high common method bias.

The findings of the statistical test and indicators suggest an acceptable quality level of the measurement model, supporting the further steps of the PLS-SEM process.

Table 4 Overview of the outcomes of the structural model

Hypo-thesis	Total effects	Beta	Conf. Int. 5%	Conf. Int. 95%	Standard deviation	T values	P values	Decision
H1	General attitudes to prosumption → Environmental behaviour related to STR	0.307	0.136	0.48	0.088	3.489	0.000	Supported
H2	Sustainability attitudes to STR → Environmental behaviour related to STR	0.168	0.005	0.336	0.085	1.975	0.048	Supported
H3	Perceived behavioural control related to STR → Environmental behaviour related to STR	0.269	0.025	0.537	0.129	2.083	0.037	Supported
H4	Subjective norms related to STR → Environmental behaviour related to STR	0.222	0.019	0.444	0.108	2.051	0.040	Supported

Two-tailed test

5.2 Testing of the structural model

The structural model was evaluated according to the aspects proposed by [83]. Multicollinearity was initially assessed concerning the endogenous construct (Environmental behaviour related to STR). All associated VIF (variance inflation factor) scores were below 2, ranging from 1.3 to 1.7 for the different exogenous constructs, far lower than the threshold value of 5, suggesting the absence of multicollinearity concerns. Subsequently, (SRMR) standardized root mean square residual values were assessed to evaluate model fit, as recommended by [88]. The SRMR value of the inner model was 0.072, far below the suggested range of 0.08–0.085, suggesting a proper model fit.

To assess the link between the model constructs and the significance level of the path coefficients, a bootstrapping method including 5000 resamples was conducted, as detailed in Table 4. Beta values indicate the strength of a certain link, whilst t and p values pertain to their statistical significance ($p < 0.05$ was deemed significant, meaning that the corresponding confidence intervals do not encompass zero).

Findings indicate that general attitudes toward prosumption demonstrate a particularly strong, positive and significant relationship with STR-related environmental behaviour, hence supporting H1. In contrast, the three other exogenous constructs of the research model (sustainability attitudes, perceived behaviour control and subjective norms related to STR) also show positive and significant relationship with STR-related environmental behaviour (and hence supporting hypotheses H2, H3, and H4), but these are notably weaker. The comparatively stronger influence of prosumption attitudes highlights its especially important role in shaping environmentally responsible behaviour.

After testing the links among constructs, the predictive power of our model was assessed, too [83]. The determination coefficient (R^2 score) of the endogenous construct (environmental behaviour related to STR) was 0.561, indicating that the model explains 56.1% of the overall variance of that construct. The Stone-Geisser's Q^2 -value for

Table 5 PLS predictive power analysis**Behaviour related to STR – Q²: 0.468**

Items	Q ² predict	PLS-SEM_RMSE	PLS-SEM_MAE	LM_RMSE	LM_MAE	(PLS-SEM-LM)_ RMSE	(PLS-SEM-LM)_ MAE
EB_1	0.406	1.406	1.058	1.627	1.278	– 0.221	–0.22
EB_2	0.376	1.439	1.057	1.642	1.246	– 0.203	–
							0.189
EB_3	0.398	1.483	1.121	1.66	1.305	– 0.177	–
							0.184
EB_4	0.377	1.38	1.043	1.618	1.226	– 0.238	–
							0.183
EB_5	0.343	1.512	1.127	1.709	1.315	– 0.197	–
							0.188

Environmental behaviour was also calculated, its 0.468 value indicates a strong predictive capacity of the research model.

In addition to evaluating the relevance of the link between constructs, the predictive capability of the research model was also examined, as recommended by [89]. The determination coefficient (R² score) for the endogenous construct (environmental behaviour associated to STR) was 0.561, signifying that the model accounts for 56.1% of the total variance of that construct. Additionally, the Stone-Geisser Q²-value for Environmental behaviour was also computed, with a value of 0.468 showing a robust prediction power of the research model. Additionally, a PLS predictive analysis for the items of the endogenous construct was conducted. Results in Table 5 demonstrate that the Q²-values are positive for all items. Moreover, the prediction errors of PLS-SEM are inferior to those of the linear regression model (LM) for all items, as assessed by both RMSE and MAE.

6 Discussion

A key distinction in assessing the sustainability of short-term rentals is that home sharing is not the same as commercial short-term rentalisation. In its original peer-to-peer form, home sharing – where residents occasionally rent out a spare room or their primary home – has been linked to more efficient use of existing housing, supplementary household income, and more localized tourism experiences [52;90]. However, the expansion of professionalised short-term rentals through platforms such as Airbnb has increasingly shifted the model toward a form of tourism-related real estate use. Compared with traditional hotels, short-term rentals differ in relying on dispersed private housing rather than purpose-built accommodation, operating through platform-mediated arrangements rather than formal hospitality services, and often bringing tourists into residential neighbourhoods rather than concentrating them in tourism districts. These differences create distinct sustainability implications. Environmentally, short-term rentals may make use of existing housing stock more efficiently, but they can also increase local resource pressures and travel demand. Socially, they may support more embedded tourism experiences, while also contributing to housing pressures, gentrification, and conflicts with residents. Economically, they can spread tourism income more widely than hotels, but may also generate regulatory imbalances and reinforce the financialization of housing [91]. As a result, their sustainability impacts depend less on the model itself than on scale, the regulatory environment and the type and behaviour of the guests and hosts [25].

6.1 Theoretical contributions to the literature

Our research contributes to the literature in several ways. First, despite the various and often controversial environmental [10] and social [8, 9] impacts of STR, there is still a knowledge gap regarding our understanding of the drivers of hosts' environmental behaviour related to STR. While the Theory of Planned Behaviour has been successfully used before in research focusing on why individuals become hosts on short-term rental platforms [38, 49, 50] much less attention has been paid to how hosts subsequently behave including how they manage the environmental impacts of their properties. By examining pro-environmental behaviour rather than participation decisions, our study addresses an underexplored dimension of STR research.

Second, although the traditional tourism sector has been investigated before regarding its environmental performance, these results have limited value in the case of STR platforms since while environmental practices in hotels and other hospitality providers are institutionalised, in an STR setting environmental responsibility rests primarily with individuals (hosts) [74, 75]. Demonstrating that TPB constructs remain relevant in this context reinforces the robustness of the framework while also showing that behavioural theories may operate differently in decentralised, platform-mediated settings compared to traditional organisational (hotel industry related) contexts, which is in line with [52].

Third, our study differentiates between sustainability attitudes and prosumption-related identity orientation. While both constructs relate to environmental responsibility, they reflect distinct psychological dimensions [60]: sustainability attitudes describe an individual's position toward environmental protection, whereas prosumption attitudes reflect orientation toward active involvement, autonomy, and co-creation [59]. The finding that general prosumption attitudes are stronger predictors of hosts' environmental behaviour than sustainability attitudes deserve particular attention. Prosumption reflects an orientation toward autonomy, creativity, and active value co-creation [59, 60], which may strengthen a sense of responsibility toward the resources used in hosting activities. In the STR context, hosts operate as micro-entrepreneurs who combine consumption and production roles, and whose decisions directly affect energy use, waste management, and communication with guests. Such identity-related and intrinsic motivations may therefore translate more strongly into everyday operational behaviour than abstract sustainability attitudes. This interpretation is consistent with research showing that self-determination and entrepreneurial motivations play an important role in hosting activities and participation in sharing platforms [31] line with Self-Determination Theory [32].

Finally, our findings demonstrate that framing STR as a sustainable business model has its limitations and that environmental outcomes depend on individual behaviour and motivations behind it, in line with [62].

6.2 Practical contributions

Our results have several practical implications for STR-related stakeholders. For operators of STR platforms who are concerned with the environmental implications of their platforms, the findings indicate that pro-environmental behaviour of hosts is driven more is most strongly associated with general attitudes toward prosumption, while sustainability attitudes play a weaker but still significant role. Hosts who perceive themselves as active, creative co-producers of value are more likely to adopt environmentally

conscious practices, such as energy efficiency improvements, water-saving measures, and waste management. This supports earlier findings that intrinsic motivations and an entrepreneurial attitude are central to hosting behaviour [31], while hosts' attitudes can also influence guest behaviour [63]. The positive effect of subjective norms implies that hosts are influenced by peers and perceived social expectations, and thus, platforms may support pro-environmental behaviour by strengthening social norms among hosts, for example through peer benchmarking dashboards or visibility labels for environmentally responsible listings to promote environmentally responsible hosting, in line with previous evidence on social influence within STR platforms [10].

The results have also indirect implications on the role of STR guests to promote pro-environmental practices. Earlier research showed that hosts' environmental commitments can nudge guest behaviour [63], while guests' expectations and feedback can also influence host decisions [47, 66]. Clear communication of environmental expectations to guests – for example through default thermostat settings, visible recycling instructions, or short in-apartment prompts on possible pro-environmental actions – may also promote environmentally responsible practices [57], and as the savings emerge at the hosts' side and indifferent for the guests in terms of costs, there are lower chances for a rebound effect [92]. Through awareness raising [93], guests act not only as resource users but also as contributors to promoting sustainability. Results are also in line with [55], stating that not only environmental attitudes drive pro-environmental behaviour, other, non-cognitive ones (like frugality) are at least that important.

For policymakers, the significant role of perceived behavioural control highlights the importance of clear and predictable regulatory frameworks in the STR field. Clear and predictable regulations – for example subsidies for energy-efficient refurbishment or simplified permitting for efficiency upgrades – may strengthen hosts' perceived behavioural control regarding environmental investments [36]. Beyond regulation, awareness-raising initiatives may help improve sustainability-related attitudes among hosts – including the better management of their sustainability footprints, too [90], especially if also shorter-term benefits (like cost savings) are clearly communicated [39].

6.3 Limitations

Beyond its theoretical and practical contribution of the better understanding the pro-environmental behaviour of STR hosts, the study has several limitations. First, it applied a simplified TPB approach. In future research further, non-cognitive attitudes, as well as the construct of behavioural intention can be included. Second, the database is generated through self-reporting, and thus is the subject of social desirability bias. STR hosts may overestimate their environmental behaviour. Parallel, this may also lead to a higher path coefficient between the constructs of subjective norms and environmental behaviour. Third, our survey covered only one country (Hungary). Fourth, 62.5% of respondents were males. However, we do not consider it as a major bias, while short-term rentals are mostly managed at a family or household basis, so the person who filled in the questionnaire is of secondary importance. Even though the topic is internationally relevant, results can be generalised only with caution.

Although sample size met the criteria for the PLS-SEM analysis, the sample itself is not representative (even though, mainly because of loose regulation, it is hard to say the exact features of the basic population of STR hosts in a Hungarian context – in case

of a stricter regulatory environment, more data would be available on the basic sample, enabling to use most advanced sampling techniques). Furthermore, even if sample size exceeded the minimum required sample size by 40% (see Sect. 5), it raises external validity issues, so again, findings shall be interpreted cautiously.

7 Conclusions

This study addressed the driving factors of STR-related environmental behaviour of hosts, a novel field under-researched despite the considerable interest in the motivations of both hosts and guests participating in STR. Similar to European tendencies, Hungarian homeowners are becoming increasingly aware of environmental issues, especially regarding energy efficiency and the use of renewable energy sources. Our results indicate positive impacts of general attitudes to prosumption, sustainability attitudes, subjective norms and perceived behavioural control (with attitudes to prosumption being the strongest predictor of pro-environmental behaviour), adding new insights to both literature and practice to better understand how environmental behaviour of hosts can be improved in future, an important success factor of the long-term impacts of STR and thus, the whole tourism sector. Our results have clear implications on hosts (entrepreneurial attitudes and learning from peers are at least as important as environmental attitudes themselves), guests (clear communication from hosts enable them to act more environmentally friendly in an STR context) and policymakers (the need for regulation stability on housing refurbishment and energy efficiency standards).

On the whole, the findings also contribute to clarifying several ongoing debates in the literature on STR and sustainability. Previous research shows a growing consensus that the environmental impacts of STR platforms depend largely on the everyday practices of hosts, even if empirical studies remain divergent regarding the motivations that drive such behaviour. Some of them highlight environmental awareness and sustainability values as the key drivers, many others state that economic and lifestyle-related motivations are the ones that dominate participation in STR platforms. Our results indicate that broader prosumption-related attitudes – reflecting autonomy, creativity, and active involvement – may play a more decisive role in promoting environmentally responsible practices than sustainability attitudes alone. This implies that environmental behaviour in decentralised platform models (such as STR) may be influenced less by explicit environmental concern and more by identity- and activity-related motivations. Parallel, the limited empirical evidence on hosts' environmental practices indicates that further research is needed to better understand how these motivations translate into concrete sustainability outcomes across different institutional and regional contexts.

Beyond the results of this study, there are many further potential research directions for the future. Our study focused on the environmental behaviour of hosts, however, to promote sustainability in the field, an important future research direction can be also to better understand the drivers of social impacts, as well. To better understand the attitude-intention-behaviour chain of the TPB logic, a direct coverage of hosts' intention can add more specific insights. Our survey can contribute to the understanding of major trends in Europe and beyond, however, in order to uncover regional differences, further investigation in other parts of the world is needed, to be able to provide cross-country, or even cross-regional comparisons.

Appendix 1

Constructs used in the PLS-SEM model

General attitudes to prosumption (adopted from [78])

GA_1	I find it useful if people produce products and/or services for their own consumption
GA_2	By producing products and/or services ourselves, we can increase our independence
GA_3	By producing products and/or services ourselves, we can bring joy to our lives
GA_4	I find those people creative, who produce products and/or services for themselves

Sustainability attitudes to STR (adopted from [79])

Compared to traditional accommodations (e.g. hotels) apartments rented out for a short term through an internet platform...

SA_1	...are more environmentally friendly
SA_2	...better promote sustainable development
SA_3	...are more favourable from the point of view of energy use
SA_4	...better help conserve natural resources
SA_5	...have more beneficial social impacts
SA_6	...better help local communities
SA_7	...better help disadvantaged social groups
SA_8	...contribute to the mitigation of social inequalities better

Perceived behavioural control related to STR (adopted from [80])

BC_1	It depends entirely only on me if I rent out my apartment for the short term
BC_2	I do determine the condition of the rental of my apartment
BC_3	There are no legal barriers to short term apartment rental at the moment
BC_4	I do have the skills required to rent out an apartment for the short term
BC_5	In the future I expect that legal regulation will not hinder my activity
BC_6	I expect that tax condition will not change in the future

Subjective norms related to STR (adopted from [80])

SN_1	Several of my friend and acquaintances use accommodation sharing platform during their travels
SN_2	There are other people among my family members and friends who rent out apartments for short term
SN_3	Nowadays it is fashionable to rent out apartments
SN_4	My family supports me to rent out my apartment
SN_5	According to others, short term apartment rental contributes to environmental protection and the solution of social problems

Environmental behaviour related to STR (adopted from [82])

EB_1	I do consider environmental aspects when renting out my apartment
EB_2	I pay attention to energy consumption when renting out my apartment
EB_3	I pay attention to water consumption when renting out my apartment
EB_4	I pay attention to the appropriate handling of waste when renting out my apartment
EB_5	I do motivate my guests to do so as well

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Author contributions

G.H. and G.Z.: conceptualization, literature review, manuscript writing, discussion and conclusions, revision, G.H. data curation, methodology and formal analysis. G.Z.: data and survey, project management.

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Data availability

The original dataset is available from the authors upon request.

Declarations

Ethics approval and consent to participate

Based on the regulation of the Research Ethics Committee of the organization of the corresponding author (Provision of the Rector No. 2/2020.) a research ethics permission is not required for the research reported in this article. Participation in the study was voluntary and anonymous. Respondents were informed about the purpose of the study and gave their consent by proceeding with the survey.

Consent for publication

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Competing interests

The authors declare no competing interests.

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