

## Article

# Building a Low-Carbon Community: Influencing Factors of Residents' Idle Resource-Sharing Behaviors

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**Abstract:** Promoting the sharing of idle resources to community residents is a potential means to building a low-carbon community. This study examined three communities with different attributes (college/university, middle and high income, and the elderly). An extended hypothesis model was constructed based on the theory of planned behavior. The influencing factors of community residents facing idle resource-sharing services were explored. Based on the equal sampling method, 100 questionnaires were randomly distributed in each community to verify the validity of the hypothesis model. The results show that residents' attitudes, subjective behavioral norms, perceived behavioral control, service expectations, and environmental motivations positively influence residents' behavioral intention to share their idle resources. The residents' service expectations for idle resource-sharing are the most critical. Moreover, in terms of community attributes, its attitudes, subjective behavioral norms, and perceived behavioral control significantly influence residents' behavioral intention to share idle resources. Specifically, the attitudes in the middle- and high-income community have opposite effects on residents from the attitudes in the college/university community and the elderly community. The hypothesis model proposed in this study provides a reference for building a low-carbon community from the perspective of residents' restriction of resource-sharing.

**Keywords:** low-carbon community; residents' sharing behaviors; idle resources; sharing behavioral intention



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## 1. Introduction

In recent years, attempts to change energy-related behaviors have gradually shifted related research focus from individual energy consumers to community energy consumers [1]. Individual low-carbon behaviors often require individual consumers to maintain extremely strict environmental behaviors. In contrast, the transition from “individual energy consumers” to “community energy consumers” in carbon governance realized by the community's management of environmental resources can promote low-carbon environmental behaviors to residents from a more comprehensive perspective [2]. Communities are widely envisaged to provide a setting for long-term human activity and interaction that is equitable, inclusive, and sustainable in the broader sense of the term (economically and environmentally as well as socially) [3,4]. In addition, promoting carbon emission reduction from a community perspective is considered positive and productive [5], which provides a new background for changing the behaviors of energy end users [6]. Therefore, guiding community residents to transition from traditional to green lifestyles and perform rational planning and scientific allocation of community resources has become critical to creating a sustainable community environment.

As a low-carbon community can be built by promoting community renewable energy technology, it can also be achieved by sharing idle resources. Idle resources refer to resources that are periodically or permanently vacant due to usage frequency, usage period, and iterative update [7,8]. In this study, the idle resources of community residents include school supplies, books, children's toys, and maternal and infant supplies. Every community

has many idle resources, such as a retired elderly people with valuable skills, idle parking spaces when residents are at work, and recyclable items. Sharing separates the right to use and ownership of resources, which can extend the use value of idle resources to residents, minimize energy consumption in the community, and promote the sustainable development of society. Many countries have made attempts at community sharing. For example, Neighbor Goods in the United States improves the circulation rate of idle resources in communities through renting and sharing [9]. A specific example in their study is that the idle bikes are used by leasing them, which increases their utilization rate by 20–30%. Australia provides textbook-sharing methods to improve the efficiency of textbook utilization and reduce textbook production. In China, the app platforms, Xianyu and Zhuanzhuan, are engaged in the transaction of second-hand goods. However, the lack of unified resource-sharing management in urban communities has resulted in unresolved disputes, such as vandalizing or taking possession of rented goods. Moreover, community management is led by government departments, resulting in insufficient attention to the sharing of idle resources in communities. Thus, most community residents are not highly motivated to share their idle resources, and community resources have not been effectively utilized.

Lifestyle refers to the distinctive pattern of personal and social behavior characteristic of an individual or a group [10]. Lazer [11] found that lifestyle could affect residents' behaviors through technological innovation. Their study suggests the progress and utilization of renewable energy promote a gradual decline in household energy consumption expenditure. For example, during winter, clean energy-based phase-change heat storage heating can reduce household energy costs by 50% compared to traditional central heating [12]. Wang and He [13] found that due to the potential reduction in household expenditure, residents may choose to adopt greener lifestyles, such as reusing degradable plastic bags and replacing cars with bicycles; for example, the Bed ZED community, which is located in Sutton of South London; and Shi-Kuan [14] having remarkably achieved sustainable community development and construction. Ceschin's [15] study integrated community residents' demand for disposal of idle resources into the innovative design of product service system. Pillich, Chen [16] found the online sharing of a new collaborative and publishing pattern for electronic publications within communities based on the Internet data exchange (NDEx) method. Knearem, Wang [17] proposed two resource-sharing strategies in community families through the user research approach. Laurenti and Acuña [18] built a peer-to-peer (P2P) sharing platform by developing and testing the conceptual behavioral model based on the Theory of Planned Behaviors (TPB). They claimed that resource optimization platforms are an effective choice for a more sustainable consumption model. Humphries, Hyde [19] conducted a qualitative and quantitative analysis of the two public health service provision modes through semi-structured interviews, including independent and shared public health service provision. They claimed that the two modes have their own pros and cons. A proper service provision mode should be carefully determined based on the local population size, local culture, and values. Kádár, Egri [20] integrated a matching algorithm with detailed numbers based on agent control to constructed a collaborative framework for manufacturers to dynamically reconfigure and share community resources. Man-Zhen, Zhao-Shen [21] applied statistical analysis to calculate the probability and realize the sharing of idle parking spaces to solve the shortage of community parking spaces. They found the problems in the sharing community's idle resources, analyzed the causes, and proposed suggestions on how to reasonably build a community idle resource-sharing platform. The purpose of this study is to analyze the influencing factors of community residents' idle resource-sharing behaviors. Specifically, we constructed an extended hypothesis model and verified it based on the TPB. Then, the impact of the influencing factors on residents' behavioral intentions was analyzed, and the model's validity was demonstrated through survey questionnaires. The results of this study will contribute to improving residents' intention to share idle resources during the construction of low-carbon communities in the future.

## 2. Literature Review

### 2.1. Community Sharing Services

Communities are key to building a sustainable, low-carbon society [5]. Sharing services provides consumers with flexible choices and reduces the negative impact of low-environmental efficiencies. Consumers engaged in sharing services value sustainability, economic efficiency, and altruistic values. Sustainability means that the consumption demand is satisfied while the environmental burden and resource consumption are not increased. Sustainability is an integrated point of economic development, environmental quality, and social equity [22]. As natural resources are limited, ecological balance and sustainable environmental development must be considered simultaneously in economic promotion. Thompson [23] proposed the Framework for Strategic Sustainable Development (FSSD), which is a five-layer system, namely system layer, success layer, strategy guidelines layer, action layer, and tool layer. Broman and Robèrt [24] claimed that the FSSD can help us reduce the negative impacts on ecological and social systems while capturing innovation opportunities, including new business models and exploration of new markets. Our previous study [25] applied the FSSD into a developing community's idle resource-sharing services, and designed an APP for residents to share idle resources in the community.

To improve the resource utilization rate of community units, many communities provide various sharing services, such as knowledge, agriculture, a framework for strategic sustainable development, and even energies. Fieldhouse [26] conducted a study on community shared agriculture, they found that residents are willing to share the rewards that come through a season's supply of fresh produce. Chan, Evans [27] claimed community-shared solar is promising in the context of deploying solar energy to maximize clean energy growth while equitably sharing benefits. Nakamura, Uchida [28] identified residents' expectations towards community transportation-sharing services. Their results suggest that opportunities to go out and community attractiveness improvements each had positive effects on future use intentions. Many studies indicate that residents do share their idle resources [29–33], however, only on very few occasions, such as sharing textbooks. Typically, there is scarce interaction or communication, which contributes to residents' lack of accessibility in idle resource-sharing services. In China, most communities are led by governments. This situation can affect residents' enthusiasm to participate in idle resource-sharing services. In this regard, the behavioral intentions of residents have a significant influence on sharing behaviors. Therefore, improving the behavioral intentions of residents is the focus of this study and the starting point for building a basic model. In this study, the service of sharing idle resources of community residents refers to a service system built around stakeholders such as community residents, operators, and government departments, which tells the community residents to make effective use of idle resources through leasing, selling, and donation. Therefore, the community sharing service is run by operators, and the community residents are both the providers and demanders of idle resources. Milfont et al. [34] claimed that collective pro-environmental actions play the same important role for individual pro-environmental tendencies of New Zealand's superordinate environmental identity. Lamm, McCann [35] found that the subjective norms construct of TPB is an important predictor of pro-environmental behavior although individual and collective actions have effects on climate change in the future. Ireland and Thomalla's [36] study suggested that in climate change adaptation, community-based collective action can produce positive influences on the local society.

### 2.2. Factors Influencing Residents' Idle Resource-Sharing Services

Ajzen [37] developed the basic TPB, which includes three constructs (i.e., attitude, perceived behavior control, and subjective norms) that influence behavior intention. This framework strengthens the predictive and explanatory power of behavior. Currently, TPB is widely used in studies on both individual and group behaviors. The TPB clearly explains that behavioral intention originates from intended and non-intended processes. Many scholars have investigated the value of this theory in encouraging environmental

protection motivations and green consumption intention. Han and Hyun [38] merged the theory of planned behavior and the norm activation theory into one model and tested its applicability in an environmentally responsible museum context, established the mediating role of study variables, and identified the salient role of personal norms and attitudes. Kim, Njite [39] constructed a theoretical framework of emotional correlation based on this theory to evaluate the relationship among variables and explain consumers' behavioral intention to choose environmentally friendly restaurants. Verma and Chandra [40] constructed an extended social psychological model based on the original variables of TPB and gained insight into the intention of young Indian consumers to stay in green hotels. In fact, community residents' idle resource-sharing services are also a concern for the environment and green behavior. Similarly, we can try to use the TPB model to determine the relevant factors that affect residents' sharing behavior. In this paper, the key factors affecting the sharing behavior are identified, and then the relationship between the factors is analyzed and studied.

Behavioral intention refers to a behavioral expectation, such as an individual's estimation of the likelihood that he or she actually will perform a specified action [41]. It is closely related to actual behaviors and has predictive value. Behavioral intention is often used as an important indicator to evaluate whether consumers can perform the same behavior consistently, and it exists both before and after the service, which refers to the behavior-triggering and the behavior consolidation stages (Figure 1). Behavioral intention triggers behaviors that run through the entire service process. It is vital to construct a service model to explore the influencing factors of behavioral intention and analyze the relationship among them.

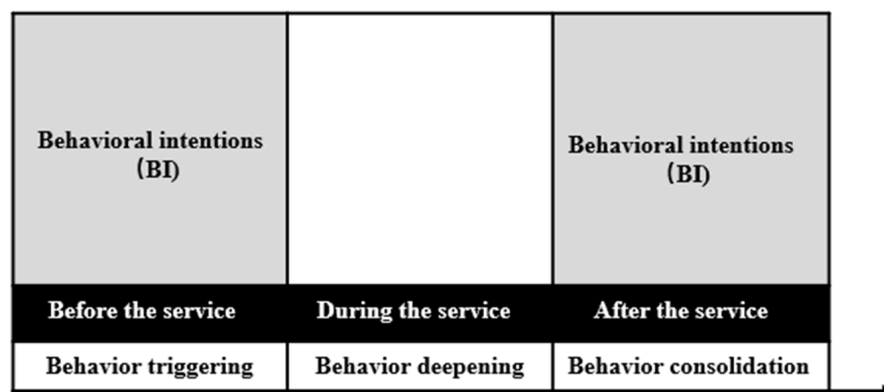


Figure 1. Relationship among behavior intentions, behaviors, and services.

TPB is often used to explore the influencing factors in environmental protection behaviors, such as green transportation, waste recycling, water conservation, energy conservation, and low-carbon consumption (Table 1). These studies have shown that TPB can provide a sufficient theoretical framework for explaining sustainable consumption behaviors and analyzing behavioral intention [42–45]. Ajzen [37] suggested that the behavioral intention of an individual determines if the individual performs a specific behavior, which is jointly influenced by three variables: attitudes toward behaviors (AT), subjective norms (SN), and perceived behavioral control (PBC). Yadav and Pathak [46] identified the significant role of attitudes in the intention to purchase green products. Yue, Lee's [47] study suggests that attitude is a strong predictor of environmentally responsible behaviors. Han, Hsu [48] concluded that attitudes play a core role in predicting customers' intentions to visit green hotels. Wang, Lin [49] proposed that attitudes are positively correlated with an individual's intentions to save energy. Subjective norms refer to whether an individual decides to perform a specific behavior due to the social pressure exerted by others (i.e., family, peer group, society, and culture). Ek and Söderholm [50] found that community groups believe it is desirable to take measures to reduce electricity consumption, which

makes community members more inclined to reduce electricity consumption in response to community expectations.

**Table 1.** A list of TPB in sustainable development studies.

Author	Time	Content	Conclusion	Context
Yadav and Pathak [46]	2016	Purchase of green products.	The significant role of attitudes.	Green consumption.
Yue, Lee [47]	2016	Environmentally responsible behaviors.	Attitudes are a strong predictor.	Environmental protection behavior.
Han, Hsu [48]	2010	Visiting of green hotels.	Attitudes play a core role.	Green consumption.
Wang, Lin [49]	2018	Saving energy.	Attitudes are positively correlated with an individual's intention to save energy.	Environmental protection behavior.
Ek and Söderholm [50]	2010	Reducing electricity consumption.	Subjective norms are important.	Environmental protection behavior.

Perceived behavioral control refers to the extent of ease or difficulty with which an individual perceives a specific behavior. Generally, when an individual's attitudes and subjective norms are more positive, their perceived behavioral control is also higher, and the individual is more likely to perform a particular behavior. As in the studies on pro-environmental behaviors, sustainable transportation behaviors, and energy conservation, other variables were introduced from the norm activation model (NAM), which is a vested model that explains altruistic and environmentally friendly behavior by Schwartz [51], such as awareness of consequences (awareness of problems), attribution of responsibilities, the efficacy of outcomes, and ability of relief provision. These individual normative factors can better explain prosocial and environmental behaviors. For example, Wang and He [13] claimed that the TPB model is seriously problematic in predicting the integrity and efficiency of green behaviors. It focuses on measuring ecological behavioral intentions rather than behaviors. Thus, many pro-environmental behaviors are verified to not exist after measurements. Furthermore, the TPB model prioritizes attitudes but neglects environmental knowledge, habits, required effort, organizational values, and management support. Therefore, in constructing the basic model for residents' idle resource-sharing services, apart from the three basic factors, it is also necessary to explore other factors that are more convincing for sharing behavioral intention according to the basic characteristics of the research subjects. Moser [52] suggested that consumers have become increasingly aware of the importance of environmental awareness to social development, and found that their behaviors and reactions affect the environment and social wellbeing overall. Samarasinghe and Samarasinghe [53] claimed that many consumers have discovered that their purchasing behaviors significantly impact specific socioecological issues, such as awareness of environmental protection, and conservation of resources. Sadiq, Bharti [54] argued that irresponsible human activities have caused increasing environmental problems and raised environmental awareness among consumers, citizens, and governments. Increased environmental concern reflects that the public is aware of environmental issues and intends to make active efforts to address these problems, which directly influences pro-environmental behaviors. Environmental concern includes the emotions, attitudes, and practices of green awareness.

Our previous study [25] found that service expectations, which refer to the psychological expectations for services before individuals are served, are directly related to behavioral intentions and behaviors. Service expectations [55] are consumers' beliefs or concepts before a service is completed. These expectations act as a standard or reference and are compared with actual service experiences to conclude a judgment on service quality. When service expectations are met or exceeded, sharing behaviors are triggered accordingly. Residents' behaviors were analyzed in the service scenario process of "before the service-during the service-after the service". They proposed five demands, including the selection of

idle resources, sharing methods, online transaction methods, offline methods, and sharing effects. These demands were derived from a specific service experience. We also observed that residents, managers, and operators in different communities have varying attitudes towards idle resource-sharing. Community attributes are essential attributes that originate from the natural attributes of communities and form corresponding social organizations and functions, thus building a community ecosystem. Community attributes include geographical location, scale, resident structure, and management pattern. They determine that communities have different views and thus behave differently. Many studies regarding pro-environmental motivations have focused on resident attributes [56]. Residents' age, gender, educational level, and income level affect pro-environmental intentions and behaviors. As residents are an essential part of communities, community attributes are an obvious influencing factor in residents' idle resource-sharing tendencies and affect the relationship between other factors regarding sharing behaviors and intentions.

Environmental motivations (EM) refer to an individual's perceived impact of their behaviors on environmental issues, which may result in environmental care and protection behaviors. Neutral attitudes or values cannot be used to successfully predict specific environmental behaviors or intentions, while positive environmental motivations may be more effective [57]. Consumers who care about the environment and believe that individual decisions make a difference are more inclined to purchase green products. Environmental motivations include environmental knowledge and concern. Environmental concerns refer to an individual's concerns about the environment and environmental issues; they are the strongest predictors of green behaviors and behavioral intentions. Environmental knowledge refers to an individual's general understanding of the environment, which impacts environmental protection behaviors and behavioral intentions. Yusliza et al. [58] emphasized that a lack of education or knowledge about the importance of environmentally friendly commodities results in a lack of positive attitudes towards environmentally friendly commodities. They further pointed out that an individual's understanding of environmental knowledge affects their behaviors.

### 3. Conceptual Model and Hypothesis

There are three factors in the TPB model influencing sharing services: attitudes, subjective norms, and perceived behavior control. The two other influencing factors, environmental motivations and service experience, are determined by the attributes and nature of community residents' idle resource-sharing services. As a result, these factors are included in the entire service process, as shown in Figure 2.

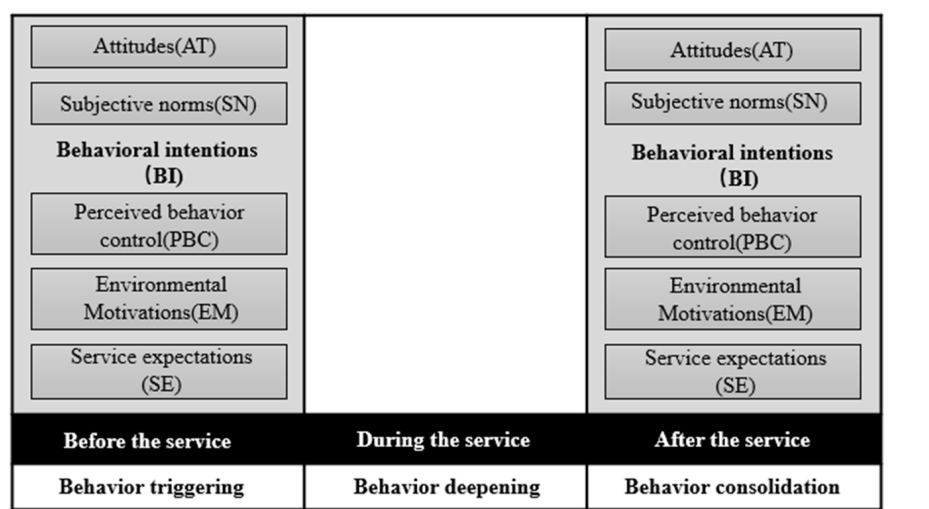
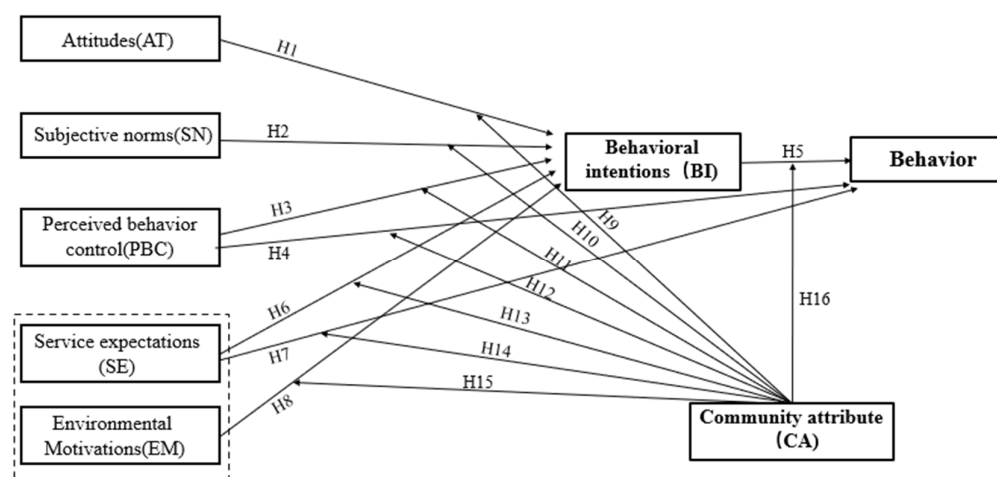


Figure 2. Basic components of behavior.

Behavioral intentions typically exist before and after a service. Before the service, behavioral intentions trigger sharing behaviors, while attitudes, subjective norms, perceived behavioral control, service expectations, and environmental motivations affect behavioral intentions. After the service, behavioral intentions trigger a new round of sharing behaviors. Specifically, service expectations are the most important influencing factor. In addition, the influencing factors of behavioral intentions also affect behavioral intentions before a service. In the original TPB model, community residents' attitudes, subjective norms, and perceived behavioral control determine their intentions to share idle resources, while perceived behavioral control determines their idle resource-sharing behaviors; intentions of sharing behaviors directly determine sharing behaviors. Different communities may have lifestyles directly formed by age, education background and income, and these lifestyles can have group characteristics [10]. Community attributes are the influencing factors that distinguish communities and their perception of sharing services and service effects but pose a potential moderating effect. For example, communities with a large number of elderly people are active in outdoor social activities even during working days, while communities with a high concentration of middle- and high-income people may see a sharp decrease in the flow of people during working days [59].

Based on the TPB model, this study constructs a hypothetical model on the influencing factors of community residents' intentions to share idle resources—namely the SBIIF model (sharing behavior intention influencing factor model) (Figure 3).



**Figure 3.** Hypothetical model.

## 4. Methods

### 4.1. Research Subjects

Community attributes include the natural, population, and social activity. Natural attributes include the time of establishment, community scale, location, and supporting facilities. Population attributes include residents' age, male–female ratio, educational level, and income level. Social attributes include management mode, management level, and external environment. Three communities were chosen based on the residents' ages, education and incomes. These factors can influence residents' cognition and further affect their behavioral intention towards idle resource sharing [60]. In this study, three different communities were investigated, as shown in Table 2. Specifically, Community A is located on the Zhongshan West road of Guangzhou, which is a university community with low-income college students aged at 18–25. Community B is the Huaxin community, which is located on the Shipai street of Guangzhou. The residents are mainly aged 25–45 and have good education backgrounds and high incomes. Community C is the Yuanyang community, which is located on Tianhe North Street. The majority of the residents in this community are middle-aged and older citizens aged 50–80, and most of them do not have a high income or education background.

**Table 2.** Basic information about A, B, and C communities.

No.	Community Attributes	Community A (College/University) Hehua	Community B (Mid-to-High Income) Huaxin	Community C (Elderly) Yuanyang
1	Time of establishment (year)	2005	2010	1998
2	Community scale (km <sup>2</sup> )	2	0.35	0.35
3	Location (urban or rural/downtown or others)	Urban–rural junction/others	Urban/downtown	Urban/others
4	Population (10,000)	3	0.18	0.3
5	Resident average age	20–25	40	52
6	Male-to-female ratio	0.9	1.02	1
6	Resident educational level	Bachelor’s degree or above	Associate degree or above	Primary or middle school graduate
7	Resident average income level (RMB 10,000 per year)	0–2	Above 50	6–10
8	Community facilities (school/hospital/entertaining facilities/fitness facilities/market/dining)	The community is relatively new, and the residents are mainly young students. The community is equipped with a gym, college hospital, and canteen.	The community is relatively new and high-end. The residents are mainly young and middle-aged. The community is equipped with tennis courts, swimming pools, fitness equipment, health paths, mahjong rooms, and dance rooms. There are provincial demonstration primary and secondary schools in the community.	The community is relatively old and low-end. The residents are mainly the elderly. The community is equipped with fitness equipment, a gym, and a swimming pool. There are kindergartens in the community.
9	Management mode (property management/district/resident volunteers) and level	The college management department is the main manager, the security department and the logistics department run systematic management, and student volunteers provide assistance.	There are 12 staff members who adopt a “four-in-one” collaborative governance service mode. The community is divided into five grids, and each grid is managed by a grid administrator, grid coordinating administrator, grid coordinator, and grid supervisor.	There are five dedicated staff members, including one staff director, one family planning officer, one civil affairs officer, and two public security officers. The director is mainly responsible for the community.

#### 4.2. Questionnaire

A questionnaire-based survey was conducted to verify the theoretical model proposed (Table 3). The questionnaire consisted of three parts: (1) The purpose and notes of the questionnaires. As most of the participants were unfamiliar with this study, the first part informed participants regarding the purpose of this study and the precautions based on the principle of prudence. (2) The questionnaires were distributed and collected from different communities for demographic-related information. Although detailed knowledge of community attributes had been obtained, this study still collected the basic information of participants, including gender, age, educational background, and income level for further analysis. (3) Factor measurement questions related to community residents’ idle resource-sharing services. Based on the 5-point Likert method, 30 questionnaires were first distributed for a small-scale test. Participants were interviewed to propose suggestions regarding questionnaire logic and description. Then, the questionnaire was adjusted, distributed, and collected on a large scale. Specifically, the most important measure of service expectations (Figure 4) is service experience, which is consumers’ perception of

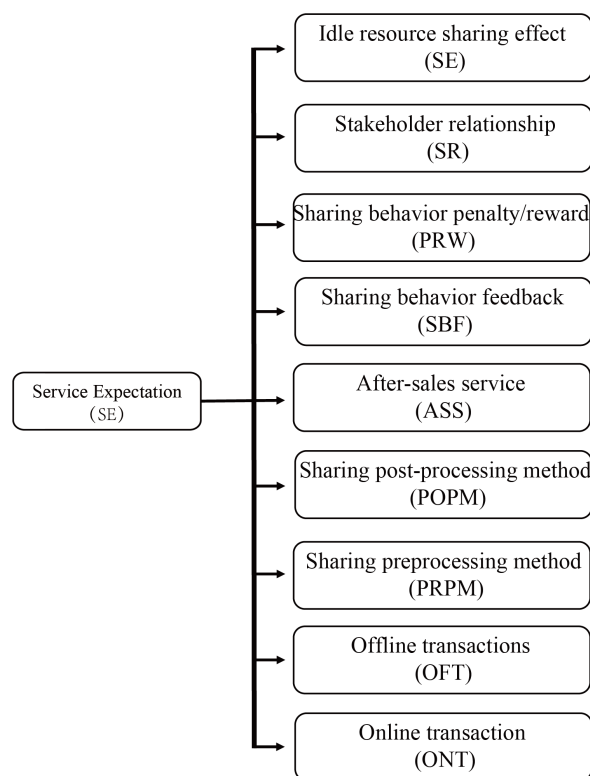
the service process [61]. Customer experience modeling (CEM), as proposed by Teixeira, Patrício [62], verified that the service experience is an individual's perception of different scenarios. The model refines the service experience into overall service experience, individual service experience, and service touchpoint experience. Based on the early-stage results of this study [25], the entire service process was visualized for illustration. Oriented by service expectations, this study described the service process and experience status of consumers. It refined service expectations into nine service experience modules, including online transactions, offline transactions, and pre-share processing, and set up corresponding questionnaire questions.

**Table 3.** Outline of Questionnaire.

Construct	Items	Ref
Community attribute (CA)	10	Heeren, Singh [63]; Blok, Wesselink [64]
Environmental concern (EC)	3	Kim and Choi [65]; Alwitt and Pitts [66]; Noordin and Sulaiman [67]; Esmaeilpour and Bahmiary [68]
Environmental knowledge (EK)	4	Maichum, Parichatnon [69]; Samarasinghe and Samarasinghe [53]
Attitude (AT)	5	Taylor and Todd [70]; Han and Hyun [38]
Subjective norm (SN)	5	Dixon, Deline [71]; Tang, Chen [72]; Sridhar and Srinivasan [73]
Perceived behavioral control (PBC)	3	De Leeuw, Valois [74]; Bagozzi [75]
Service expectations	Online transaction (ONT)	7 Tsou, Chen [76]
	Offline transactions (OFT)	5 Tsou, Chen [76]
	Sharing preprocessing method (PRPM)	3 Tsou, Chen [76]
	Sharing post-processing method (POPM)	3 Tsou, Chen [76]
	After-sales service (ASS)	3 Tsou, Chen [76]
	Sharing behavior feedback (SBF)	3 Tsou, Chen [76]
	Sharing behavior penalty/reward (PRW)	3 Baek, Kim [77]
	Stakeholder relationship (SR)	2 Edvardsson and Tronvoll [78]; Buhalis and Leung [79];
	Idle resource sharing effect (SE)	3 Choe and Kim [80]; Möhlmann [81];
Behavioral intentions (BI)	5	Baek, Kim [77]
Behaviors (B)	5	Möhlmann [81]

#### 4.3. Participants

The participants were all from the three communities and were recruited through the Internet and field distribution of questionnaire links. A convenience sampling method was adopted in this study. Firstly, we obtained the number of community members from the community manager and explained our study to receive permission to go into the community and conduct our survey under COVID-19 controls. On the one hand, our researchers who entered the targeted community looked for residents who were willing to fill in a questionnaire that can be filled online. On the other hand, we also distributed questionnaires in the community QQ or Wechat group (internal community chat group) of the community to potential respondents. To ensure that the number of questionnaires collected in each community and the sampling process were consistent, more than 120 questionnaires were distributed in each community. In addition, the Wenjuanxing app (a Chinese online questionnaire website) was used to limit online participants to 100 per community to achieve an equal number of questionnaires. Finally, a total of 300 valid questionnaires was collected (Table 4).



**Figure 4.** Measurement of service expectation.

**Table 4.** Participants' demographic information.

Item		Community A	Community B	Community C
		Num	Num	Num
Income	RMB 50,000 and above	1	19	1
	RMB 10,000–30,000	1	15	9
	RMB 30,000–50,000	1	6	3
	RMB 5000–10,000	2	59	37
	RMB 5000 and below	95	0	50
Gender	Female	55	58	60
	Male	45	41	40
Age	18–25 years old	93	38	1
	18 years old and below	7	2	3
	25–40 years old	0	52	14
	40–60 years old	0	7	55
	60 years old and above	0	0	27
Educational background	College	3	26	35
	University undergraduate	93	51	15
	Master's degree and above	3	20	1
	High school graduate and below	1	2	49

## 5. Results

### 5.1. Reliability Analysis

In this study, SPSS 23 was used to conduct a reliability analysis for each construct in Table 5. The results show that Cronbach's  $\alpha$  values of the constructs are all above 0.8, which

indicates the constructs have high internal consistency. Thus, the survey questionnaire results can be used for further research and analysis (Table 5).

**Table 5.** Reliability analysis results.

Construct	Cronbach's Alpha
Attitude (AT)	0.964
Subjective Norm (SN)	0.806
Perceived behavioral control (PBC)	0.856
Service expectations (SE)	0.983
Environmental motivations (EM)	0.884
Behavioral intentions (BI)	0.947
Behaviors (B)	0.942

### 5.2. Verification of Model Hypotheses

Multiple regression analysis was used to verify the hypotheses through SPSS 23 (Table 6). First, the influences of attitudes, subjective norms, perceived behavioral control, service expectations, and environmental motivations on behavioral intentions were verified; namely, H1, H2, H3, H6, and H8. The results show that perceived behavioral control (PBC) and service expectations (SE) ( $\beta = 0.18$ ;  $p < 0.001$ ) have significant positive effects on behavioral intentions (BI) ( $\beta = 0.34$ ;  $p < 0.001$ ). Attitudes (AT) ( $\beta = 0.06$ ), subjective norms (SN) ( $\beta = 0.07$ ), and environmental motivations (EM) ( $\beta = 0.16$ ) have positive effects on behavioral intentions, which indicates that H1, H2, H3, H6, H8 are established. H4 and H7 were also verified by multiple regression. The results show that perceived behavioral control (PBC) ( $\beta = 0.31$ ;  $p < 0.001$ ) and service expectations (SE) ( $\beta = 0.44$ ;  $p < 0.001$ ) have significant positive influences on behaviors (B). Service expectations (SE) are the most influential factor on behaviors (B). When the service expectations (SE) are higher, the feedback of behaviors (B) is better, which suggests that H4 and H7 are established. The verification results of H5 show that behavioral intentions (BI) ( $\beta = 0.92$ ;  $p < 0.001$ ) have a significant positive influence on behaviors (B), and thus H5 is established.

**Table 6.** Regression analysis.

Dependent Variable	Variable	$\beta$	$R^2$	F
BI	AT	0.06	0.443	$F(5, 299) = 46.692, p < 0.001$
	SN	0.07		
	PBC	0.18 **		
	SE	0.34 **		
	EM	0.16 *		
B	SE	0.44 **	0.411	$F(2, 299) = 105.167, p < 0.000$
	PBC	0.31 **		
B	BI	0.92 **	0.846	$F(1, 299) = 1646.429, p < 0.000$

Note: BI: behavioral intentions; B: behavior; AT: attitudes; SN: subjective norms; PBC: perceived behavior control; SE: service expectations; EM: environmental motivations. \*  $p < 0.05$ . \*\*  $p < 0.001$ .

### 5.3. Verification of the Moderating Effect of Community Attributes

This study adopted the grouping regression method to verify H9–H16, the moderating effect of community attributes (Table 7). The results show that community attribute (CA) had a significant moderating effect on the influence of attitude (AT), subjective norm (SN), and perceived behavioral control (PBC) on behavioral intentions (BI). Specifically, the attitudes (AT) of residents in community A ( $\beta = 0.27$ ) and the attitudes (AT) of residents in

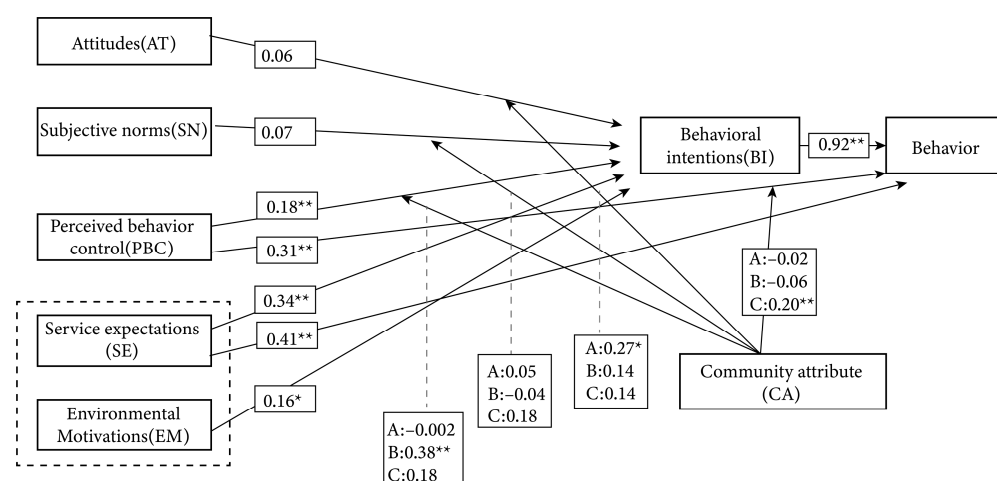
community C ( $\beta = 0.14$ ) had a positive impact on behavioral intentions. In contrast, the attitudes (AT) of residents in community B had a negative impact on behavioral intentions ( $\beta = -0.14$ ). The subjective norms (SN) ( $\beta = 0.05$ ) of residents in community A and residents in community C ( $\beta = 0.12$ ) had a positive impact on behavioral intentions. In contrast, the subjective norms of residents in community B had a negative effect ( $\beta = -0.04$ ). The residents' perceived behavioral control (PBC) in community A negatively impacted behavioral intentions ( $\beta = -0.002$ ). In contrast, the perceived behavioral control of residents in community B ( $\beta = 0.38$ ) and community C ( $\beta = 0.18$ ) showed a positive effect.

**Table 7.** Regression results by group.

Dependent Variable	Variables	Community A	Community B	Community C
		$\beta$	$\beta$	$\beta$
BI	AT	0.27 *	−0.14	0.14
	SN	0.05	−0.04	0.12
	PBC	−0.002	0.38 **	0.18
	SE	0.35 **	0.48 **	0.27 *
	EM	0.28 *	0.05	0.07
B	PBC	−0.02	−0.06	0.20 **
	EM	0.04	0.08	0.10
	BI	0.94 **	0.90 **	0.73 **

Note: BI: behavioral intentions; B: behavior; AT: attitudes; SN: subjective norms; PBC: perceived behavior control; SE: service expectations; EM: environmental motivations. \*  $p < 0.05$ . \*\*  $p < 0.001$ .

Community attribute (CA) had a significant moderating effect on the influence of (PBC) on behaviors. Specifically, the (PBC) of the residents of community A ( $\beta = -0.02$ ) and community B ( $\beta = -0.06$ ) had a significant negative impact on behavior (B). In contrast, the (PBC) of community C residents ( $\beta = -0.20$ ) had a significant positive effect. The adjusted model results are shown in Figure 5.



**Figure 5.** Model results. Note: \*  $p < 0.05$ . \*\*  $p < 0.001$ .

## 6. Discussion

Based on the TPB model, this study constructed a sharing behavior intention influencing factor model for community residents. Then, a survey questionnaire was designed to verify the relationship between the factors. The results of this study show, consistent with the TPB model proposed by Ajzen [37], that attitudes, subjective norms, and perceived behavioral control determine individuals' behavioral intentions. Based on this relationship, service expectations and environmental motivations were added as variables in this study

according to the characteristics of the research subjects. At the same time, community attributes were considered moderating variables. Finally, the influence of the above factors on community residents' idle resource-sharing behaviors was explored.

This study found that service expectations have a significant positive impact and effect on behavioral intentions and behaviors. This indicates that service expectations significantly impact residents' sharing behaviors while constructing a low-carbon community featured by idle resource-sharing. Communities can improve their service quality to promote residents' idle resource-sharing behavior. Roy [82] and Chen, Tsou [83] investigated the connections between consumers' experiences, feelings, and behavioral intentions when sharing services. They focused on the relationship between service experience and behavioral intentions. Similar to our results, service experience can be a strong factor in affecting a resident's behavior intention, which in this study is the willingness to share idle resources. This study focused on residents' expectations and evaluations of service value and emphasized their expectations before receiving service, as behavioral intentions and behaviors are often induced by an individual's cognition of the service before it is received instead of their actual experience during service. Therefore, it is more rational to adopt service expectations as influencing factors and explore the impact of different elements of the service process on service expectations, including online transactions, offline transactions, and sharing preprocessing. Thus, a research framework for service expectations was built. The results of this study show that although the attributes of the communities studied were different, the service expectations of the three communities had a significant impact on residents' behavioral intentions regarding idle resource sharing and even became the most influential factor. When residents had higher expectations for idle resource-sharing services, they had higher behavioral intentions and more frequent behaviors. Compared with the research by Choe and Kim [80] on sharing service experience, service expectations were discussed and analyzed in this study as influencing factors. This study has proven that the factors that affect behavioral intentions and behaviors in service design are defined in a more precise and reliable manner, which is the most important contribution of this study.

The essence of community residents' idle resource-sharing services lies in reducing the waste of resources, and the services are motivated by environmental protection and attention. Environmental motivations may be a key influencing factor. The results of this study reveal the correlation between environmental motivations and behavioral willingness to green consumption, which is similar to the findings of Brunner and Ostermaier [84], Dunlap and Jones [85], and Prakash and Pathak [86]. Liere and Dunlap [87] suggested that environmental awareness and motivations have become a social norm and play a decisive role in generating behavioral intentions. This study shows that environmental motivations (EM) are only one of the influencing factors, while the decisive factor is service expectation (SE). A potential explanation is that this finding is related to the perspective of service design in this study, which refers to designing a system that promotes residents' idle resource-sharing behaviors. As a closed-loop system, service design has a key influence on the expected experience and value of the entire service process.

This study also found that although community attributes cannot directly affect residents' behavioral intentions and behaviors, community attributes are an important moderating factor. The hypothetical model established in this study is based on the basic unit of "community". Zhao, Wu [88] proposed that the links inside communities are closer than the links between different communities. Furthermore, these links are affected by the educational level, cognitive level, income level, and age level of community residents. This study's A, B, and C communities include one college/university community, one middle and high income community, and one elderly community. These three communities not only differ in residents' ages but also residents' lifestyles, living habits, and management methods. This study's results reveal that when residents in the college/university community and the elderly community are more positive toward sharing idle resources, they are more likely to share, while the residents of the middle and high income community are not. A possible reason may be that the residents in the college/university community

and the elderly community have more leisure time and are more concerned about their community's development and construction than the residents of the middle and high income community. Walker [5] believed communities could promote the construction of a low-carbon community through learning, education, and publicity, which are more feasible in the college/university community and the elderly community.

The influence of subjective norms on behavioral intentions also differs due to varying community attributes. Residents in the college/university and the elderly communities are more likely to be influenced by people around them, affecting their behavioral intentions. A potential reason is that compared with people in middle and high income communities, the elderly and college/university community are more often involved in the social activities of people around them, which gives them more opportunities to communicate with their neighbors and is more likely to affect them than people in middle and high income communities. In contrast, residents in the middle and high income community are quite the opposite. Interestingly, perceived behavioral control positively affects residents' idle resource-sharing intentions in both the middle and high income community and the elderly community. On the contrary, the college/university community residents are quite the opposite.

There are limitations in this study that require further exploration. First, three different communities were defined in this study based on qualitative analysis during the selection of community attributes. However, quantitative analysis was not adopted to determine the specific lifestyles of the communities. Therefore, quantitative analysis can further verify the moderating effect of community attributes. Second, although the factors that affect the construction of idle resource-sharing services in different communities have been determined in this study, no suggestions were proposed for service design based on the results. The design blueprint for idle resource-sharing services in different communities can be refined in the future based on this study.

## 7. Conclusions

In this study, a sharing behavior intention influencing factor model for community residents was built and verified using a survey questionnaire designed based on a literature review and our previous study [25]. The hypothesis model in this study is an extension of the TPB model in terms of residents' idle resource-sharing behavior. On the basis of TPB, two new constructs, namely service expectations and environmental motivations, were added to the model. The results of this study suggest that service expectations are the most critical factor affecting residents' willingness to share their idle resources. Environmental motivations include two subconstructs, including environmental concerns and environmental knowledge, which measure community residents' concerns and perceptions regarding the environment. As moderating variables, community attributes determine communities' size and population structures. In this study, a survey questionnaire was performed to verify the model. Three communities with different features, including a college/university community, a middle and high income community, and an elderly community, were considered the research subjects. Residents from the three communities were randomly and equally sampled. In addition, the results of this study suggest that perceived behavioral control and service expectations significantly positively impact behavioral intentions and behaviors. In contrast, environmental motivations significantly positively impact behavioral intentions, indicating these factors significantly affect community residents' intentions to share idle resources. The fact that service expectations have the most significant impact suggests that communities can promote their residents' sharing of idle resources by improving service quality.

Furthermore, the results of this study reveal that community attributes have moderating effects on the influence of attitudes, subjective norms, and perceived behavioral control on behavioral intentions. Residents' intentions to share idle resources may vary with different community attributes. The hypotheses model proposed in this study was used to explore the specific effects of key influencing factors and provide a reference

for constructing a low-carbon community from the perspective of the restrictions on residents' resource-sharing.

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