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Creating a low carbon tourism community by public cognition, intention and behaviour change analysisa case study of a heritage site (Tianshan Tianchi, China)

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Abstract: This study attempts to explore the establishment of a low-carbon tourism community by public cognition, intention, and behaviour change analysis in a case study of a heritage site, China. Low carbon tourism advocates a way of travel with low energy consumption, low pollution and low CO_2 emissions during personal activities. Behaviour change is not only influenced by internal individual aspects including a person's awareness, attitudes, and capacity to change, but is also driven by external social aspects including the culture and environments in which a person lives. In this paper, questionnaire surveys and field interviews were used to obtain basic information, and with reference to TPB, studied and analyzed the characteristics of cognition, intention and behaviour change practice by low carbon tourism community economy participants. With the help of SPSS analysis software, we found that a person's educational level or occupation might affect cognition of low carbon tourism, and motives for participating in low carbon tourism could reflect the public's perception of its emotional value, cognitive value and functional value. Most respondents knew about low carbon tourism; however, when putting it into practice, habitual behaviour was the main barrier for tourists while the residents were passive and followed the needs and choices of the tourists. Therefore, a comprehensive low carbon tourism community system was proposed not only for addressing the aspects of awareness, intention, and practice from individual behavior, but also for covering policy, infrastructure, institution systems and mechanisms at the community level.

Keywords: low carbon; tourism community; cognition, intention, behaviour change; heritage site; China

1 Introduction

The large amount of greenhouse gas emissions already released have produced a greenhouse effect that has become a great challenge worldwide as extreme weather does harm to nature and human health. Of these greenhouse gases, the contribution of carbon dioxide to global warming is most prominent, accounting for nearly half [1]. The causes of climate change are diversified, either natural or anthropogenic, or the interaction of both factors. We may be unable to control natural factors like volcanic activity and earth cycle orbit changes, but we can try to reduce the impact of anthropogenic factors like rapid population growth, destruction of land resources, reduction of forests, industrial emissions and so on. A report from the World Tourism Organization (UNWTO) showed that 1.3 billion tons of CO_2 had been discharged as a result of tourism development in 2005, representing 5% of all human activities, and this figure is projected to grow at an average rate of 3.2% per year by 2035 [2]. This severe reality starkly demands global efforts to curb carbon dioxide emissions across all economic sectors, and tourism is consequently seen as a sector that is particularly energy intense and difficult to decarbonize. Additionally, World Heritage Sites are considered to have outstanding value to all human beings regardless of their different backgrounds and cultures [3]. Unfortunately, climate change, natural disasters, environmental degradation, and inappropriate management have created serious challenges for heritage

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conservation [4, 5]. All countries and organizations are actively investigating the effect of climate change on the world heritage and the solutions to these problems. Low carbon tourism is considered to be a passive method of protecting tourism destinations [6–8].

An adjacent tourism economic community is an important component of scenic spots, and also the primary place of resources, energy consumptions, and carbon emissions for tourists and community residents. Community participation has always been a hot area for scholars to study, not only in relation to the economic benefits of tourism [9], but also about the environmental impact of tourism [10]. The involvement and participation of communities in the tourism industry should be considered and highlighted in the decision making process and in the sharing of the tourism benefits [11]. Some researchers have advocated for community participation and integrated tourism development planning in local destinations because community based tourism should be practiced for both economic and social benefits, and to encourage environmentally-friendly behaviours among residents, tourists, and tourism operators [12, 13]. Low-carbon tourism economics takes 'social responsibility for its ecological footprint' as its core concept, translating into low carbon tourism attractions through production cycles, low carbon lifestyles, and the construction of compact spaces within itself [14]. Generally, scholars mostly adopt the carbon footprint calculation, life cycle assessment and evaluation methods to study greenhouse gas emissions from tourism communities and activities [15–18]. Low carbon tourism community participation requires an understanding of community practices and composite emissions, as well as technologies, infrastructures, and institutions that can be accessible for the residents and tourists. Moreover, it requires an understanding of the connections between these integrated system components [19, 20]. That is why we considered the process of building low carbon communities to include the environmental initiatives developed by local community members as well as the tourists and government.

Public awareness of the consequences of energy consumption on climate change is increasing but there has been very limited change in actual behaviour, as demonstrated by travel patterns and consumption habits [21–24], although individual behaviour change could make significant contributions to energy consumption and carbon emissions reduction within a community [25]. For example, some scholars have discussed the attitudes of tourists toward the tourism industry, and evaluated their willingness to take the initiative in changing their travel behaviours against the background of climate change [26]. There is a case that shows that many British tourists never consider the impact of climate change when planning their holidays [27]. Governments and tourism enterprises have tried to launch a range of low carbon environmental policies in a bid to encourage low carbon consumption [28–34]. However, it seems environmentally-friendly behavioural changes are the most cost-effective approach to realize sustainable low carbon lifestyles rather than the top-down approach of 'being told what to do' in building low carbon communities [35]. A USA psychology professor put forth the 'Stages of Change Model,' which includes five stages for behaviour change: pre-contemplation, contemplation, preparation, action, and maintenance [36]. Providing accessible and accurate information is the first step to raise awareness of and assist individuals making behaviour changes. However, the right information is not the only condition that leads to sustained behaviour changes. Stronger awareness, proper approaches and consolidated mechanisms are necessary to encourage long-term behaviour changes [25]. Individual behaviour changes differ greatly depending on the variables they focused on, whether, for example, the variables are internal (micro-sociological) or external (macro-sociological). Internal variables reflected inside a person's mind include awareness, knowledge, values, attitudes, behaviour, rational thinking, emotional states and entrenched habits that vary between individuals. External variables are located in the physical, social and discursive environments in which a person lives [37, 38].

This article plans to identify different variables of social characteristics (*e.g.* age; education; personal income, etc.) and psychological factors (*e.g.* knowledge; intention; cognition; etc.) that impact on behaviours changes of both tourists and community residents.

2 Research problem

Based on different economic, social-cultural and political conditions, there are some differences between western societies and China. China has a wealth of tourism resources, including many World Heritage Sites, some of which are also the settlements for minority nations. Their economic development here is relatively backward and the ecological environment is fragile due to poor transportation infrastructures and underdeveloped social background. The inevitable economic and ecological conflicts between the tourism industry and local residents may pose great challenges to China in the future. When carrying out research on heritage site tourism development and protec-

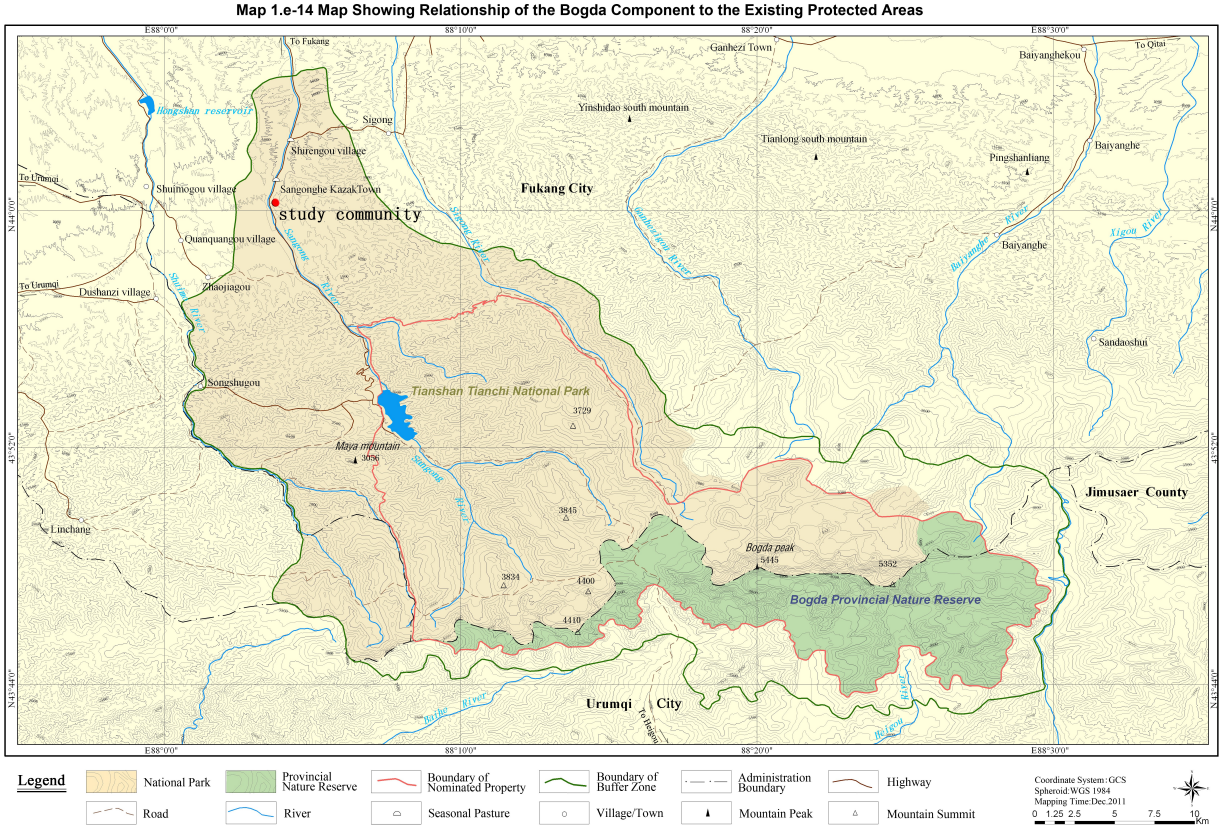

Figure 1: Extent and boundaries of Tianshan Tianchi

tion, economic and environmental interest for local development should be measured and balanced equally. Based upon these issues, this paper aims to set up a low carbon tourist-supported community as a place for environmentally friendly travel service which takes 'natural resources, ecological environment and folk culture protection of world heritage sites' as its criterion, and where there is participation in low carbon tourism by reducing energy consumption and carbon emission, as well as diminishing waste discharge by tourists and residents. So what are the personal factors that affect public cognition of low carbon tourism? What is the intention of the public when participating in low carbon tourism? What affects whether the public is willing to participate in creating a low carbon tourism community? How can individual behaviour be changed by certain steps? This paper tries to solve these questions in the following text.

3 Case study area

Tianshan Tianchi National Park is located in Changji Hui Autonomous Prefecture, Xinjiang, China, within the eastern part of Tianshan Mountain, which covers an area of 54,800 ha and is an altitudinal mountainous landscape in a temperate arid climate. It is famous for its complete high-altitude ecosystem, alpine lakes, snow-capped mountains and glaciers, as well as ancient mythology and ethnic customs. Most tourists come for the beautiful natural scenery, unique folk customs or scientific research. Typical summer activities are sightseeing, holidaying and entertainment (*e.g.* horseback riding, mountain climbing, lake cruising), and in winter tourists come for skiing. Tourism in Tianshan Tianchi began in 1982 and has developed rapidly since 2000. The park has a daily capacity of 9,300 day visitors and an average annual capacity of 3.1 million day visitors at present.

With rich natural and cultural resources, the area's world heritage sites have become popular tourist destinations. These mountain tourism destinations have com-

Figure 2: Kazak tourism communities of Tianshan Tianchi scenic site

plex biological habitats and vulnerable ecological environments, so more attention should be paid to environmental protection when developing the tourism industry of Tianshan Tianchi. This article chooses Kuokehula village in Tianchi as a study community (Figure 1). The village is made up of Kazak residents, as well as people of ethnic Han, Hui and Uighurs, and is located 15 kilometres north of the Tianshan Tianchi scenic site. It was established in 2005 and has grown into an ecological tourism village (there are not any industrial activities and ordinary residents here make living by supplying tourists services during the peak season and occasionally grazing during the off-peak season) with 130 service households capable of receiving 300,000 tourists annually. The community is a stronghold for tourists of Tianchi Park with several service facilities of transportation, accommodation, shopping, catering and recreation (Figure 2). The Kazak people are nomadic, and grazing and farming are their main ways of life. They are respectful of their national roots and the surrounding nature. Therefore, the establishment of a low carbon tourism economy here may be easy to implement in the future.

4 Methodology

4.1 Framework of low carbon behaviour in the study community

TPB (Theory of Planned Behaviour) considers that people's behaviour is the result of deliberate planning, which includes five items of individual behaviour, intention, attitude towards the behaviour, subjective norm, and perceived behaviour control [39]. This theory can help researchers to understand how people change their behaviour patterns. Research to date has indicated that a comprehensive socio-technical framework that considers both individual psychological factors, as well as the systems, standards and norms under which individuals operate, is fundamental to the development of successful strategies to move towards low carbon communities. With reference to TPB, this paper attempts to study and analyse the characteristics of cognition, intention and behaviour change by low carbon tourism economic community participants.

1. Low carbon tourism cognition

   Low carbon tourism cognition, that is, the extent of the public's (tourists, residents) understanding and recognition of low carbon tourism usually reflects the individual's positive or negative attitude towards it. People's cognition of low carbon tourism or heritage protection is an important psychological factor in motivating behavioural change and is derived from both internal and external variables such as a person's education, income and social status as well as their social, institutional and regulatory context. Some scholars have hypothesized that, owing to different cognitions and attitudes exist among all residents in the community, residents' attitude is one of the main factors affecting the development of sustainable tourism [40].

2. Low carbon intention of behaviour change

   Some scholars insisted that intention to form behaviour is the psychological tendency before taking a particular action [41]. Intention to form behaviour is a necessary process for any behaviour and is a decision made prior to the appearance of any behaviour. Creating a low carbon behaviour intention could be explained from two aspects of salient beliefs and evaluating the outcome of doing it. With increased awareness of (and interest in) environ-

mental protection, the consumer becomes more aware of the impact of their consumption on the environment. Low carbon tourism means reducing carbon emissions caused by tourist activities but does not mean lowering the quality of service or ignoring the feelings of tourists. That is to say, low carbon tourism should be based on the premise of maintaining or even improving the perceived satisfaction of the tourist. This article tries to analyze the public's intention to participate in low carbon tourism from their perceived gains or losses relating to products or services provided by the low carbon community.

3. Low carbon behaviour change

   Perceived behavioural control is the degree of control expected during a particular behaviour [39]. Low carbon tourism behaviour change requires participants to adapt to the operational mode of the low carbon tourism economy by constraining and changing their own behaviour. It is important to show the public rational reasons for it and the right way to practice it. Behaviour changes mainly because of self-recognition and the willpower to change. Mapping behaviour is an important precursor in achieving public behaviour change, and people's motivations should be given a great deal of attention and encouragement. Some companies do not provide ecologically friendly products because the low carbon business concept fails to satisfy the purchasing behaviours of the consumers. Additionally, government inaction may cause difficulties in establishing systemic change. It is not an adequate solution to expect participants to 'just try harder', as establishment of low carbon communities also requires a shift in social practices and the norms and values which shape them.

4.2 Questionnaire design

This study used questionnaire surveys and field interviews to obtain basic information. Questionnaires were designed respectively for tourists and residents and they were comprised of four parts: (1)Public cognition of low carbon tourism; (2) the public's intention to participate in low carbon tourism; (3) the public's limited carbon tourism behaviour in the community which includes catering, accommodation, shopping and entertainment; and (4) The demographic and sociological characteristics of the respondents. This study used the Likert 5 scale method (1~5 points respectively represent "strongly against" and "against", "neutral", "agree" and "strongly agree") in order to make statistical frequencies of the first three parts of the questionnaire as discussed above. Before the formal investigation, 30 respondents of college teachers and students were selected to do the preliminary questionnaire, and the questionnaire was revised according to the results and feedback information. The formal investigation included 60 local community residents and 240 tourists and was carried out during the holiday May 1 to 3, 2014. All of the respondents were Chinese who came from domestic provinces and all of them were one-day-tour tourists in Tianshan Tianchi. Several doctoral students and professors who majored in ecological tourism were invited to discuss and issue the survey questionnaires. The questionnaire sampling method used was random sampling, and some literal data and key information were collected through face-to-face interviews with community residents and the tourists. The industries studied in the community included 40 caterings sites, 10 accommodation sites, 6 shopping stores and 4 entertainment sites. The survey group issued 300 questionnaires and received 295 valid questionnaires (235 questionnaires from tourists and 60 questionnaires from residents) for the study. The demographic and sociological characteristics (Figure 3) show that respondents were of different ages, different levels of education and personal income and come from a variety of occupations. This guarantees the reliability of the analysis and conclusions as random to some extent.

5 Result analysis

The findings in this section all stem from questionnaires and interviews conducted within the case study community. Most questionnaires were finished via self-completion by the subjects themselves. However, as some respondents were of ethnic minorities (Kazak villagers) and with Chinese language comprehension obstacles, some questionnaires were finished with the help of translators and surveyors.

5.1 Public cognition of low carbon tourism and heritage protection

After Tianshan Mountain was successfully listed as a world heritage site in 2013, local residents became increasingly aware of world heritage site protection, and 'low

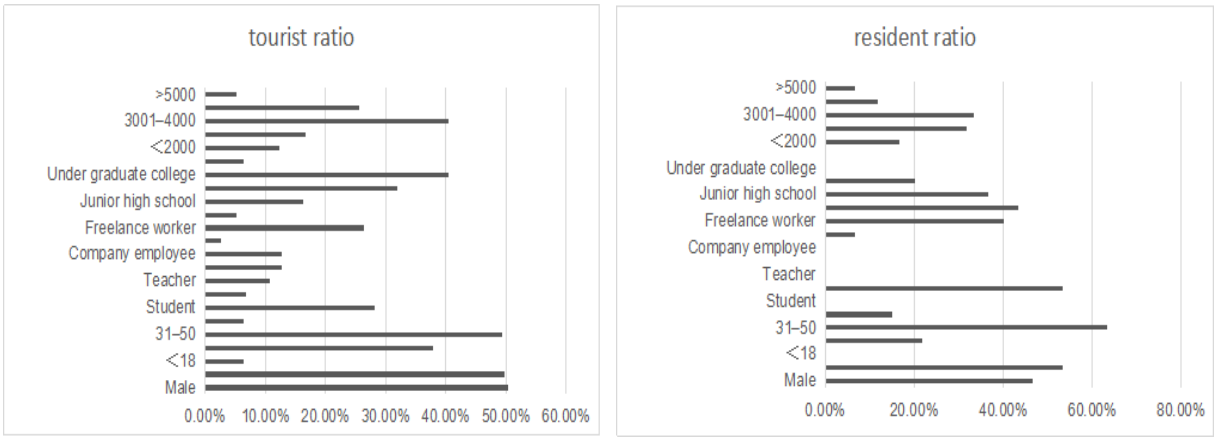

Figure 3: Demographic and sociological characteristics distribution ratios of 235 tourists and 60 residents (valid questionnaires)

Table 1: Analysis of the correlation between factors influencing tourists' cognition of low carbon tourism and world heritage

Item	Correlation Coefficient	Probability
Age	−0.094	0.108
Educational level	0.640	0.000**
Monthly Income	0.127	0.029*
Occupation	0.211	0.000**

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

carbon tourism' is no longer a new word because 'green tourism' and 'ecotourism' have gathered a large number of supporters. Comprehension of low carbon tourism is important in raising awareness and assisting individuals to make changes to their behaviour. 68% and 83% respectively of 295 respondents show that they are aware of low carbon tourism or heritage site protection.

Spearman correlation analysis was conducted by SPSS16.0 on the relationship between respondents' demographics as well as sociological characteristics (Table 1) and degree of cognition of low carbon tourism. The results show that a respondent's level of education and occupational factors are both significantly associated with the degree of cognition of low carbon tourism.

There is a consistent trend between level of education and the public's perception of low carbon tourism, that is, the higher the education level, the higher the recognition is. This phenomenon may be related to a person's knowledge and normal information gathered in daily life (Figure 4a). Additionally, there is a difference in cognition of low carbon tourism among various occupations. The cognitive degree of government officials, teachers or staff is higher, but that of high school students, farmers, and retirees' is lower. The government has historically advocated for a low carbon economy, so government civil servants tend to understand it best. For retirees or farmers, a living environment isolated from information may make them unaware of low carbon (Figure 4b).

In addition, the correlation between the low carbon recognition and different personal income is not obvious. People in the income group between 4001-5000 RMB have the highest degree of recognition of low carbon tourism, while the lowest degree of recognition is found among the group with personal incomes between 3001-4001 RMB (Figure 4c). However, there is no quantitative relationship between personal income and occupational classification, the groups of government civil servants and teachers have a high cognition of low carbon despite having a lower personal income. The high personal incomes of some freelancers do not bring about a corresponding higher degree of cognition of low carbon tourism. Additionally, the degree of cognition of low carbon tourism lessens with age, the young and middle-aged groups usually have a higher degree of cognition than older people (Figure 4d).

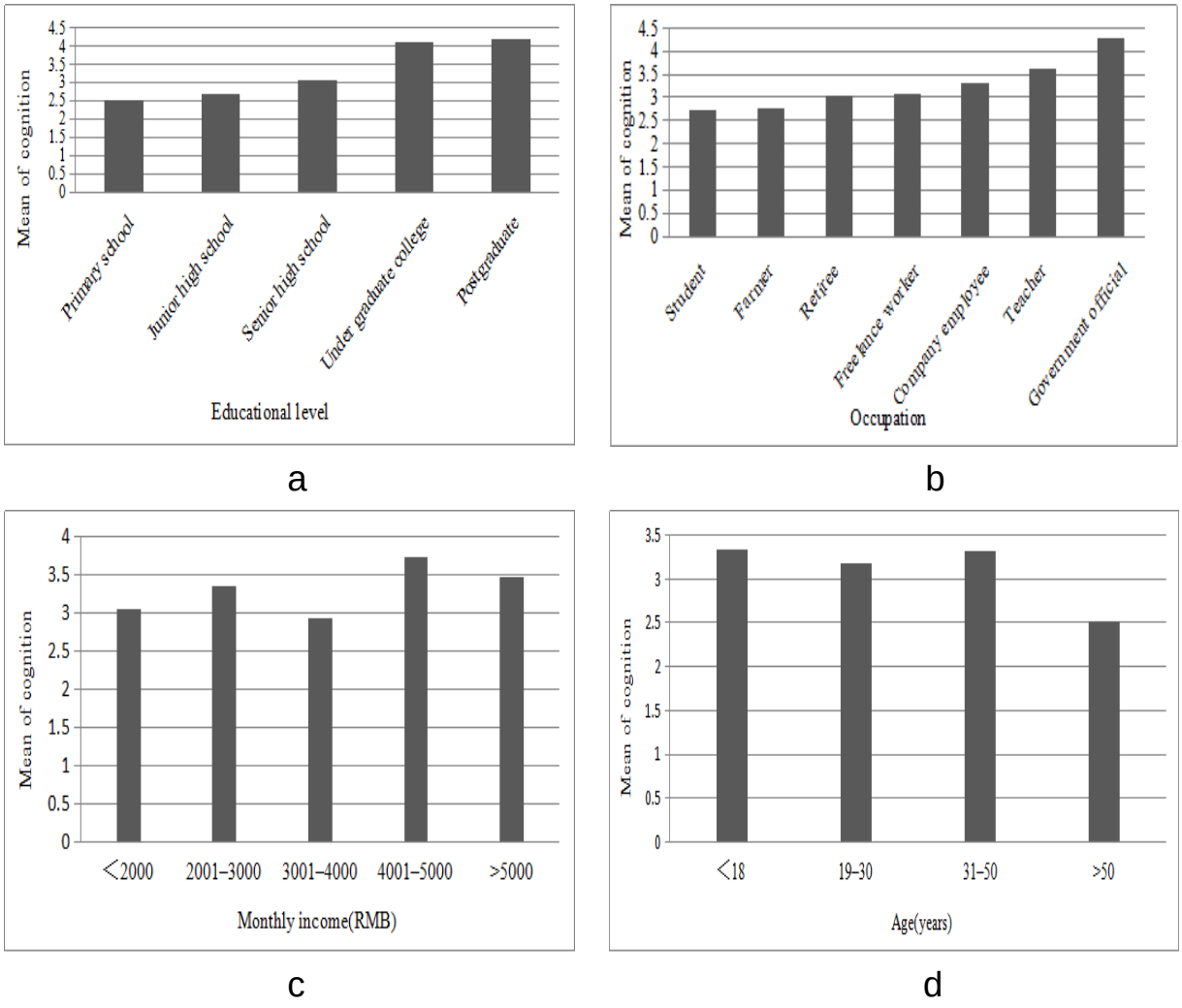

Figure 4: Public cognition of low carbon tourism as related to education level, occupation, monthly income and age
(From 1~5 respectively means "knows nothing", "incomprehension", "knows a little", "knows some", "knows well")

5.2 Public intention of participation in low carbon activity

Some scholars argue that a 'rational choice model' assumes that human action is the result of a person logically weighing the costs and benefits of different actions and choosing the option that maximises the expected benefits [42]. Tourists also consider the costs and benefits of engaging in low carbon community construction and behaviour change. Behaviour change in relation to low carbon may pose obstacles and difficulties in abandoning personal habitual behaviours and affect subjective comfort experience for some people. However, it may also bring self-identity and satisfaction for other people.

The design of the questionnaire item on tourist's intention is based on a related theory and literature about low carbon tourism's perceived value [43–45], then we conducted a preliminary study after interviewing the other professionals, and the final items in the questionnaire were determined. According to the results listed in section 5.1, 68% of the respondents said they were aware of "low carbon tourism", so we carried out a factor analysis on the 16 assessment item scores of these 200 respondents (164 tourists and 36 residents). All these factors got a loading above 0.545, and the items were associated significantly with common factors (Table 2). That is to say, the scale table of the perceived value of low carbon tourism has a high internal consistency and could readily measure tourists' perceived value from our analysis. The cumulative variance contribution of the four factors in the table reaches 67.868%, so the remaining 16 items could be expressed by four factors.

Table 2: Rotated Component Matrix and Scale Evaluation

Factor	Items	Factor loading	Characteristics root	Variance contribution (%)
1 Emotional value	Low carbon behaviour makes me leave a good impression to others.	0.875	3.67	22.941
	Low carbon behaviour lets me win much social affirmation and praise.	0.873		
	Low carbon behaviour sets up positive personal image.	0.854		
	Low carbon travel behaviour brings about self-identity.	0.685		
	Low carbon tourism behaviour can bring me enjoyable feeling.	0.629		
2 Experience value	I want to experience changes in low carbon tourism community.	0.867	3.577	22.357
	Low carbon behaviour makes travel/service more fulfilling.	0.827		
	We could learn new things by participating in low carbon tourism community.	0.824		
	Low carbon tourism is closer to nature.	0.710		
	Low carbon tourism is interesting and fresh to me.	0.545		
3 Functional value (Profit and loss)	Low carbon service is worse than the general service quality.	0.803	2.07	12.937
	Low carbon tourism community service projects are fewer.	0.758		
	Low carbon travel community services prices are high.	0.689		
	Low carbon travel community makes no sense to me.	0.581		
4 Functional value (Quality and quantity)	Low carbon tourism is simple to practice.	0.798	1.541	9.6340
	Low carbon service lets me rest assured.	0.773		

KMO of 0.831, Bartlett's test concomitant probability of 0.000

Factor 1 includes five items about the emotional satisfaction of tourists after low carbon tourism participation, such as a sense of personal beauty, pride and pleasure. Therefore, we named factor 1 as emotional value, it refers to the perception-intention of satisfaction of meeting emotional needs aroused by low carbon products or services in the process of low carbon travel. Factor 2 includes five items about the satisfaction of the tourist experience such as curiosity, a feeling of freshness, and a thirst for knowledge that comes from low carbon tourism. Therefore, we named factor 2 as experience value, as it refers to the perception-intention of contentment that occurs when special experiences are aroused by low carbon products or services during low carbon travel. Factor 3 includes three items about tourists' negative feelings as a result of low carbon tourism. Therefore, we named factor 3 as functional value (profit and loss), as it refers to the negative perception-intention or adverse feelings caused by low carbon products or services. Factor 4 includes two items about the tourists' contentment regarding quality and quantity during low carbon tourism. Therefore, we named factor 4 as functional value (quality and quantity, since it refers to the perception-intention tourists gained from the quality and quantity of low carbon products and the process of low carbon tourism services. Recognizing the perceived intention of tourists and community residents for low carbon tourism could help to improve and promote low carbon tourism products and community services.

5.3 Low carbon behaviour change

Some scholars have posited that changing the way tourists travel could reduce energy demands and carbon emissions to a large degree [46]. Perhaps low carbon tourism

Table 3: Analysis of the public's low carbon travel behaviours (235 tourists)

Survey item	Low carbon function	Approval (%)	Disapproval (%)	Neutral (%)
Choose locally produced food or products	reduce the carbon emission during the food transport process	80	7	13
Remove rubbish from tourist sites	reduce waste for community	56	10	34
Choose low carbon modes of travel (*e.g.*, hiking, climbing)	reduce personal carbon emission	75	12	13
Choose environmentally friendly accommodations	reduce personal carbon emission	70	13	17
Use recycled daily items	reduce waste for community	36	47	17
Buy tourism products with simple packaging	reduce energy consumption	64	13	23
Bring own food and water	reduce energy consumption	30	50	20
Refuse to use disposable tableware	reduce waste for community	40	46	14
Refuse to use high energy consumption appliance(*e.g.*, air-condition)	reduce energy consumption	65	10	25
Take rest food	reduce waste for community	68	12	20

could be realized through improving energy efficiency and cutting carbon emissions in transportation, accommodations, and tourist activities. Behavioural change depends on personal will. Low carbon behaviour change first needs people to raise their awareness about their use of energy so that they may in turn modify their activities in the process of obtaining related information, applying technical measures, and the results of a low carbon maintenance process. In this section, we also carried out a questionnaire survey from the 295 respondents in section 5.1.

5.3.1 Tourists' behaviour change

Instituting low carbon consumption patterns could help reduce 75% of the per-capita carbon emissions among urban residents [47]. This may also be true for the low carbon tourism model. However, according to our survey, few people are willing to use recycled items such as bedding or towels on a daily basis. It was obvious that people did not want to change their consumption habits. Some tourists continued using disposable tableware because they thought it was cleaner and more convenient. It may be hard to change personal lifestyles from normal daily life for low carbon travel, but we could make the low carbon tourism lifestyle more interesting, safer and secure. The tourism community could encourage low carbon behaviour in tourists by providing luggage storage, a sterilizing service for personal items, processing their own food for free, giving rewards to low carbon tourists, etc.

By contrast, tourists are more willing to choose locally produced food or materials and low carbon tourism modes (Table 3) that sound interesting. Hiking, climbing, and camping are now becoming more popular instead of traditional high energy-consumption entertainment projects. Choosing to eat locally produced food or materials will make a significant reduction in energy consumption and carbon emissions, minimizing the long-distance transportation of food ingredients. Some tourists with a strong awareness of environmental protection may tend to choose low carbon accommodations and products with simple green packaging. In some countries, tourist hotels no longer provide basic amenities for customers. This practice, however, has not been accepted in China as it is closely related to public living habits. In addition, 30% of the tourists agreed to save resources and energy by bringing their own food and water, and more than half would remove rubbish from tourist sites, take away leftover food, and refuse to use high energy consumption appliances.

5.3.2 Residents behaviour change

Tianshan Tianchi is a one-day tour destination for most tourists, so the catering industry is much greater in size than other industries. The research on hotel industry in Tianshan Tianchi found that only 30% of hotels, yurts, and farmyards have taken energy-saving and emissions-

Table 4: Analysis of the residents' low carbon travel behaviour (60 community residents)

Item	low carbon function	Approval (%)	Disapproval (%)	Neutral (%)
Provide recycled tableware	reduce waste for community	32	0	68
Use of local, seasonal ingredients	reduce the carbon emission during the food transport process	28	0	72
Use environmentally friendly recycled construction materials	reduce carbon emission	85	0	15
Refuse to use or set energy-consumption appliances and equipment	reduce energy consumption	42	0	58
Increase vegetation coverage	increase carbon sequestration capacity	90	0	10
Waste classification and recycling	reduce waste for community	40	50	10
Use clean energy (solar energy, methane, rainwater etc.)	reduce energy consumption	30	70	0
Provide propagandize of low carbon tourism for tourists	raising low carbon awareness	60	10	30

cutting measures, such as solar energy utilization or waste recycling techniques.

From Table 4, the residents in Kuokehula village show a relatively strong willingness to participate in the low carbon tourism economy. Residents are willing to achieve energy savings by improving local service facilities. "Use environmentally friendly recycled construction materials" and "Increase vegetation coverage" items are supported by 80% of the residents but when coming to some items such as "Provide recycled tableware", "Use of local, seasonal ingredients" or "Refuse to use or set energy-consumption appliances and equipment" which may affect tourists' benefit, most residents show hesitation and have a neutral attitude. Some of the community residents are opposed to "Waste classification and recycling" and "Use clean energy (solar energy, methane, rainwater etc.)" because they need a significant amount of money and technical support. As a common and satisfactory kind of clean energy, neither solar power nor methane is being widely used in the research community because of public ignorance and the lack of related technologies and equipment. It would be nice if most of the residents are willing to make low carbon tourism related propaganda for tourists and provide pure natural community environment.

6 Conclusions and discussions

6.1 Conclusions

The paper established a research framework of low carbon tourism behaviour within a community, and it referred to relevant theories and designed different questionnaires respectively for community residents and tourists. The results show:

1. Most of the respondents show that they are aware of low carbon tourism or heritage site protection. There is a consistent trend between educational level and the public's perception of low carbon tourism, that is, the higher the education level, the higher the degree of recognition. This phenomenon may be related to a person's knowledge and information gained through their usual daily life. A difference in cognition of low carbon tourism exists among various occupations, personal income or ages.
2. The intention to participate in low carbon tourism could reflect the public's perceived value of low carbon tourism, that is the overall perceived evaluation of products or services provided by the low carbon tourism community, which includes four factors as emotional value, cognitive value and functional value (profit and loss) and functional value (quality and quantity).
3. Under the premise of informing low carbon behaviour function, tourists' behavioural patterns are different from those of residents'. The tourists do not want to change their consumption habits relating to personal health or living while the residents are willing to make energy conservation by improving their service facilities. Relating to other items concerning servicing the tourists' daily life, the residents are passive and willing to follow the needs and choices

of the tourists in order to guarantee their operational profits.

6.2 Discussions

In some western countries, some low carbon community constructions have been supported and sponsored by local governments and departments either by means of facility construction or system restrictions. However, low carbon tourism has not been widely implemented in the market, let alone within China. The Chinese government is more like an advocate without an effective system including laws and regulations, measures and maintenance and so on. Therefore, this preliminary research is to study the power of and resistance to low carbon travel behavioural changes among tourists and community residents. Although most respondents are aware of low carbon tourism, tourists' intentions toward low carbon behavioural participation differ from residents'. For example, a few changes seem difficult to achieve due to tourists' benefits and habits, while residents are unwilling to take the low carbon technology or engineering in terms of cost saving and profits making. Also, the authors want to find better ways to make and consolidate low carbon tourism behavioural changes according to the survey results.

What this study has shown is that tourism is a hedonistic industry, where having a good time is prioritised over concern for climate or environment. Thus people are probably less receptive to what they should do and are happier to indulge in what they want to do during travel. So in this article, except for strengthening the social common sense of low carbon, tourists also need community guidance and assisting facilities for breaking bad habits and achieving behavioural changes. As for residents, cultivating a sense of belonging and identity (by raising awareness) towards low carbon community is a top concern. Strategies such as changing operation ideas, taking part in professional training, and developing diversified and interesting low carbon service patterns (by beyond barriers) could be better for residents to save cost and make profits (the residents are willing to do this from interviews), and they would likely make low carbon tourism community behavioural changes under the premise of meeting tourists' requirements and satisfactions. The changes need to be consolidated. Therefore, based on what has been discussed above, this article establishes a comprehensive socio-technical system including the influence factors, behaviour transformation processes and general steps needed to accelerate and keep public behaviour change in building a low carbon tourism economy (Figure 5).

(1) Raising awareness

Behaviour change is not only influenced by internal individual aspects, which include a person's awareness, knowledge, attitudes, and capacity to change, but is also driven by external social aspects including the culture and environment in which a person lives. The social contexts in which we live and our sense of self-control or agency also affect our behaviour changes. Providing accessible and accurate information is the first step in raising awareness and assisting individuals in making behaviour changes. As presented above in 5.1, the community service staff are mainly freelance workers with low cognition of low carbon tourism. In the Kuokehula tourism community, in order to provide information on low carbon sustainability for the residents, energy saving campaigns, workshops and training courses that are easily accessible for each resident or member of service staff in the community have been held between November and January since 2012. However, despite the awareness of a low carbon lifestyle being accepted by the residents, the general collective awareness of low carbon practices did not effectively result in behavioural changes. Community residents are more willing to provide the corresponding service to meet the tourists' demand and gain economic profits. So it is suggested that changing the traditional energy-intensive patterns, advocating environmentally-friendly personal travel and life habits, eliminating extravagant and wasteful life styles, and making low carbon tourism propaganda and communicating to the large groups of tourists and local residents should be conducted.

(2) Beyond barriers

The public shows their perception-intentions of the pros and cons of participating in low carbon tourism before making behaviour changes. Positive intentions can provide sustainable behaviour change, while negative intentions may become the obstacle or constraint on behaviour change. Investigations show that the barriers and constraints to behaviour change in the context of low carbon tourism in the Kuokehula tourism community may exist on four interrelated levels, i.e. low carbon service quality, price, projects and low carbon tourism being subjectively significant for a person. As for tourists, the factors identified as barriers and constraints are related to custom-

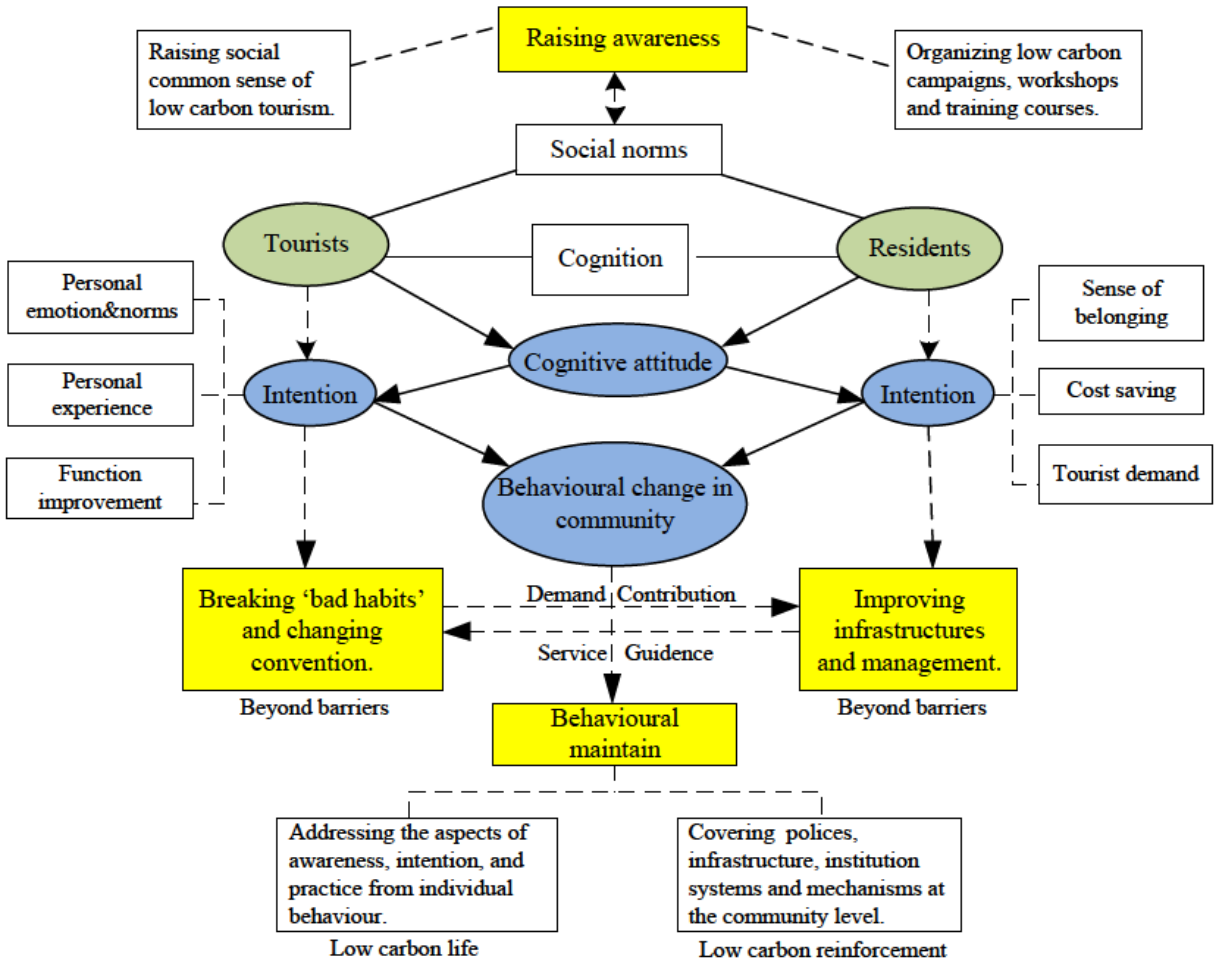

Figure 5: The system of the low carbon tourism community establishment in TianShan Tianchi

ary behaviours and habits. So beyond raising awareness of energy conservation and environmental protection, it largely depends on identifying and overcoming such behavioural barriers as 'bad habits'. It is difficult to ascertain whether personal living habits and hobbies for low carbon behaviour choices are right or wrong. The key solution to overcoming these barriers is to provide individuals with the capacity to change his/her behaviour. As for residents, infrastructures are essential for supporting and maintaining people's behaviour change [48], but at the community level, the barriers to behaviour change may include a lack of infrastructures, weak management, or poor resources. Other suggestions include improving the operational efficiency of the tourism community, introducing technology to conserve energy and reduce emissions, reducing carbon consumption, and eventually becoming the low carbon and environmentally-friendly community service and consumption chain model.

(3) Maintaining behaviour change

Tourists and residents at Kuokehula community could become increasingly motivated to reduce energy use and carbon emissions through information sharing and raising awareness. Their capacity for taking action towards low carbon sustainability can be strengthened by improvement of the community facilities and management as well as changes in personal habits. However, a single person may feel powerless to face the tremendous task of reducing energy use and carbon emissions. The public is more willing to create behavioural changes when they are clearly informed that their individual actions can significantly make a difference in the community, and that they can really be a part of an entire community and work together with each other. Besides awareness, intention, and practice being key aspects of making sustained and continued individual behaviour changes towards a low carbon tourism community, the energy saving and carbon reduction polices, institutional systems and mechanisms also need to

be addressed in building a low carbon community. Transitions in social norms and regulations made by local government and community would reinforce a sense of collective requirements for public support and the drive for wider-scale institutional and continuous changes.

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