THE INFLUENCE OF LOW-CARBON LABELLING ON TOURIST CONSUMPTION BEHAVIOR-- A CASE STUDY OF 5A SCENIC SPOTS IN CHINA'S HENAN PROVINCE

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This Independent Study has been Approved as a Partial Fulfillment of the Requirement of an International Master of Business Administration in International Business Management

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Declaration

I, QIAO YU, hereby certify that the work embodied in this independent study entitled "THE INFLUENCE OF LOW-CARBON LABELLING ON TOURIST CONSUMPTION BEHAVIOR-- A CASE STUDY OF 5A SCENIC SPOTS IN CHINA'S HENAN PROVINCE" is result of original research and has not been submitted for a higher degree to any other university or institution.

(QIAO YU)

Feb 20, 2023

Title: The Influence of Low-Carbon Labelling on Tourist Consumption Behavior-- A Case Study of 5A Scenic Spots in China's Henan Province

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ABSTRACT

This study focused on the influence mechanism of low-carbon labelling on low-carbon consumption behavior of tourists in China's Henan Province. It designed to explore the impact of local low-carbon labelling on tourists' low-carbon consumption behavior. Additionally, it seeks to clarify the relationship between consumer intentions and behavior, and articulate the influence path of carbon labelling on low-carbon tourism consumption behavior.

The objectives of this paper were: 1) To analysis of low-carbon tourism consumption behavior in a 5A tourism area in Henan, 2) To explore the influencing factors of low-carbon label on tourism consumption behavior, 3) To provide recommendations for promote low-carbon tourism in Henan.

The study adopted the quantitative research method, reviewing the literature related to low-carbon labeling and conducting a questionnaire survey. The analysis results indicated that 1) Tourists in China's Henan province suffer from a lack of environmental awareness, local dissemination and education is underdeveloped, and there is a large gap in low-carbon tourism intention between local tourists and those from developed countries, 2) Five factors had a significant effect on the low-carbon consumption behavior among tourists in China's Henan Province, namely credibility in low-carbon labelling, awareness of low-carbon labelling, ecological value, perceived behavioral control and consumer intentions. Consumers' credibility in low-carbon labelling exerted the strongest impact on the low-carbon tourism

intentions and behavior, 3) To promote low-carbon tourism in China's Henan Province, the following recommendations are proposed: firstly, There is a need for local governments to raise the public's awareness of low-carbon, and enhance their knowledge of low-carbon tourism consumption; secondly, There is a need to advocate low-carbon tourism consumption and steer low-carbon tourism behavior; thirdly, There is a need to foster the establishment of carbon footprint certification system and enhance the implementation of the low-carbon system policies; and There is a need for enterprises to shoulder responsibilities of low-carbon environmental protection and map out scientific programs of low-carbon tourism modes.

Keywords: green development, low-carbon labelling, low-carbon consumption behavior.

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Chapter 1 Introduction

1.1 Research Background

In February 2003, the UK government released the energy white paper, “Our Energy Future --- Creating A Low-carbon Economy”, which introduced the concept of low-carbon economy (DTI, 2003). It took carbon footprint and measurement of carbon sources as the starting point, and measurement of carbon dioxide as the main factor. Moreover, the white paper stated that reducing greenhouse gas (GHG) emissions and implementing low-carbon economy would become the focus of the international community in the coming decades. There was general agreement in the economically more developed countries and regions in the world that the new economic model should be transformed from high-carbon modes caused by high energy consumption into a sustainable economic development mode that controls and reduces carbon emissions.

In 2013, Xi Jinping, general secretary of CPC stated in his speech at the end of the inspection tour in China's Hainan Province, that the ecological environmental protection ultimately depends on the pattern of regional economic development and the economic structure (People's Daily Online, 2013). In the Report to the 19th National Congress of CPC, Xi Jinping made it clear once again to promote green production and consumer behavior (Xinhua News Agency, 2017). Therefore, it has become our necessary and important research topic that the transformation of economies towards low-carbon development and low-carbon consumption will be fostered with the development of green and low-carbon consumption patterns as long with the low-carbon market. At present, China is now faced with a severe environmental energy-related issues domestically, while China is put under the strain of the reduction of carbon emissions internationally. In this case, it is more pressing for the need to transform and upgrade the low-carbon economy in China.

Over the past 70 years, tourism has emerged as one of the fastest growing economic entities and the largest industry in the world. However, while tourism has brought huge economic benefits, it has led to a range of energy consumption and a rise in emissions of carbon dioxide, sulphur dioxide and others. On October 1, 2007, the second International Conference on Climate Change and Tourism noted as one of the sources of GHG emissions, emissions in the entire tourism sector accounted for 4% to 6% of the global total. Without emissions reduction, it was predicted that the emissions of carbon dioxide and other GHGes would increase by 1.5 times in 2035 (UN News, 2007).

With the energy consumption by rapid development of the tourism sector on the rise, the resulting environmental protection concerns has become a hot issue for social organizations and academics alike (Cohen and Vandenbergh, 2012). Eco-labelling is among these focuses of discussions and studies. As one kind of eco-labelling (Hornibrook et al., 2013), low-carbon labelling refers to the life cycle stages of products or services provided by consumers, involving in information on emissions of carbon dioxide and other GHGes, during the process of raw materials procurement, production, storage and transportation, removal and recycling (Schmidt, 2009). An increasing number of countries and organizations have incorporated low-carbon management into their development strategies. The distinguishing feature of this trend has been the creation and dissemination of carbon labelling and low-carbon products. Many countries in Europe and America and Asia have initiated carbon labelling programmed to promote low-carbon products, PAS2050 in the United Kingdom, Loi Grenelle in France, Certified Carbon Free in USA, Stop Climate Change in Germany, TSQ0010 in Japan, Label in South Korea, and the related programmed in Thailand, to name but a few.

1.2 Research Problems

China's exploration of carbon labelling and low-carbon products is still at the beginning stages, significantly lagging behind the development of low-carbon management in the world. In China, there are few domestic enterprises which have carried out low-carbon footprint certification and attached low-carbon labelling to their products, and there are no unified technical standards and clear relevant rules and regulations by far. Therefore, relevant departments and agencies of China's government must press for the establishment of the low-carbon product standards, and Chinese enterprises need to advance the management of low-carbon labelling and promote the application of low-carbon labels, so as to boost the awareness of low-carbon products, and enhance the credibility in low-carbon in Chinese market. Among them, only when consumers' behavior mechanism of using low-carbon labelling is clarified, can it be possible to assess and quantify the impact of low-carbon labelling on GHG emissions reduction, and then to inform relevant decision-making for stakeholders.

The main existing problems of low-carbon tourism consumption behaviors in China's Henan Province can be summarized as follows: (a) Consumers have a limited awareness and lack relevant knowledge of low-carbon labelling; (b) Tourists have low

trust in low-carbon labelling due to its incomplete relevant system; (c) Tourists show indifference towards low carbon practices and tend to engage in high-energy consumption; (d) There is unsound development and planning of scenic spots, resulting in high carbon emissions.

On the basis of the review of the studies on carbon labelling in domestic and foreign tourism sector, as well as the study on the impact of carbon labelling on the tourists' intentions to consume and the actual consumer behaviors, this study is designed to build a theoretical model of the influence mechanism of carbon labelling on low-carbon tourist consumption behavior in China's Henan Province, and address the issues mentioned above.

1.3 Objective of the study

This paper aims to explore the impact of low-carbon labelling on low-carbon tourism consumption behavior in China's Henan Province,to Clarify the relationship between low-carbon labelling and consumers' intentions and behavior, and articulate the influence path of low-carbon labelling on low-carbon tourism consumption behavior.

The specific goals of this paper are as follows:

1.To analysis of low-carbon tourism consumption behavior in a 5A tourism area in Henan.

2.To explore the influencing factors of low-carbon label on tourism consumption behavior.

3. To provide recommendations for promote low-carbon tourism in Henan.

1.4 Scope of the study

The study employs the quantitative research method, reviewing the literature related to low-carbon labeling and conducting a questionnaire survey. The field research took place from July to September 2021, collecting random samples, and issue questionnaires in hotels, restaurants, shops and stations near 13 5A scenic spots in China's Henan Province. With a review of the literature involved in carbon labelling, and drawing on the outcomes and experience of existing studies, the study identifies the deficiencies in previous studies and determines the desired path. Furthermore, it is the status quo and problems in the case of low-carbon tourism in China's Henan Province, together with the Theory of Planned Behavior (TPB) and Value-belief-norm theory

(VBN), that buttress the theoretical underpinnings for the conceptualization, theoretical modelling and hypothesizing in the study.

1.5 Research Significance

1.5.1 Theoretical Significance

Theoretically, the study is designed to enrich and expand the Theory of Planned Behavior (TPB)and the Value-belief-norm Theory (VBN). A large number of domestic and foreign studies showed that tourism consumers had a positive attitude towards low-carbon labelling, but they had fallen short of "walk the talk" in low-carbon consumption, which meant there were a major gap between their attitude and behaviors, or there was a lack of attitude-behavior consistency, thus their actual consumption behaviors were not correspond to their awareness or attitude shown in the static research. Based on the fact that tourism consumers directly or indirectly modify the consumption behavior theory, this study explores the influence mechanism of low-carbon labelling on low-carbon consumption behavior. The impact of some factors on decision-making concerning consumption intention and behavior, such as internal individual factors, external social factors and individual ecological values, and so on, were integrated into building a theoretical model of the influence mechanism of carbon labelling on consumption behavior of low-carbon product. Therefore, the study contributes to providing a clear picture of the issues and situations of tourists' deficiency of "walk the talk" in low-carbon consumption to bridge the gap between consumers' attitude and behavior.

1.5.2 Practical Significance

First, consumers are provided with carbon emission indicator and carbon footprint of products in the form of labels. It is explicitly demonstrated for consumers of GHG emissions of a product or service in its total life cycle. By developing individual awareness and intention of low-carbon, consumers can integrate their attitudes on low-carbon into direct actions, cultivate positive ecological values, and choose the travel patterns green, environmental friendly and low-carbon to pursue a low-carbon lifestyle.

Second, the government is provided with a theoretical basis for developing policies and measures to guide consumption to achieve the target of reducing carbon emissions. Through the analysis and study on the impact of external social factors on the intention and behavior of low-carbon consumption, it can be found that the carbon

label serves as the key factor influencing low-carbon consumption behavior, which contributes to the government's framing of effective policies and measures, facilitates dissemination of low-carbon knowledge, and orients consumers to low-carbon product consumption, thus achieving the purpose of reducing carbon emissions ultimately.

Third, enterprises are informed to support decision-making on low-carbon development strategies. As low-carbon labelling directly or indirectly induces consumers' consumption behaviors, enterprises are affected to make production decisions, adopt effective low-carbon marketing strategies, improve their low-carbon management efficiency, and enhance their dissemination and innovative capabilities in terms of low-carbon promotion. Therefore, consumers' low-carbon consumption behaviors are galvanized, and the goal to mitigate the negative environmental consequences can be achieved ultimately.

Fourth, scenic spots are provided recommendations on creating a low-carbon system. The construction of the model sheds light on the influence mechanism of consumers' perceptions on low-carbon tourism behaviors, identifies key priorities of reducing carbon emissions and sets a clear path for it, which includes, purposefully encouraging low-carbon tourism, promoting green tourism, and avoiding high energy-consumption tourism products.

Chapter 2 Literatures Review

With the rapid pace of advancement in the tourism sector, low-carbon labelling and low-carbon tourism model have been introduced into the tourism sector, which has also evoked the attention of a wide range of scholars and the fruitful results of its relevant studies took place. However, the research on carbon labelling in tourism were mainly conducted in foreign countries, while were relatively less carried out in China. With the growing prominence of the impact of China's tourism sector on the ecological environment, it is particularly essential to study how low-carbon labelling guides, affects, reshapes and changes the behaviors of tourism consumers (Li Qian et al., 2017).

When retrieval was conducted in the database of CNKI in China with such keywords in Chinese , corresponding to "carbon labelling", "carbon footprint", " low-carbon consumer behavior", " carbon labelling system" respectively, and such keywords in English as "low-Carbon tourism", "low-carbon labelling" and "carbon footprint" in foreign language databases, Google Scholar, EBSCO Host and Elsevier, to name but a few, it was found out that the academic research on carbon labelling centered in two aspects at present, namely, the research on carbon labelling system standards, and the survey on the market visibility of carbon labelling.

2.1 Low-carbon Tourism

Resource depletion and GHG emissions caused by high energy consumption pose a serious threat to the global environment. Therefore, the issue of energy utilization has become the initial stage of exploration for scholars to study low-carbon tourism. Tamirisa et al. (1997) assessed the energy demand of tourists in Hawaii with the input-output approach. Their studies revealed that the energy demand of tourists was as high as 60%, which first learned the connection between energy utilization and tourist destinations. In addition, Carlsson et al. (1999), Schafer et al. (1999) and Penner et al. (1999) respectively conducted key studies on energy consumption and GHG emissions produced by visitors in tour destinations. During the same period, there was no academic research on tourism and energy in China. At an early stage, studies revolved mainly around the energy consumption of tourism sectors, while there was still a lack of systematic studies in regards to the overall measurement of tour destinations, energy consumption of tourism sectors and carbon emissions.

Since the 21st century, the research on carbon emissions from tourism sectors has mainly viewed in the context of tourism sectors, tourists and travelling, and has

undertaken quantitative studies on energy consumption of tourism sectors. Gössling et al. (2000) first proposed the research method to systematically analyze tourism energy consumption, and undertook in-depth research on energy consumption and carbon emissions of tourism sectors with his collaborators, revolving in energy consumption and sustainable tourism (Gössling, 2002), tourism eco-efficiency (Gössling, 2005), voluntary carbon offsetting schemes for aviation (Gössling et al., 2007), carbon neutral tour destination (Gössling, 2008), food management in tourism (Gössling et al., 2010) and so on.

Compared to foreign research on low-carbon tourism, the related research in China is still at the beginning stage. In February 2019, there are only 14 contributing papers directly pertinent to carbon emissions in tourism sectors. Chinese scholars have carried out a large number of studies on low-carbon tourism, from the perspective of basic concepts, development paths and evaluation systems of low-carbon tourism, and the applied research on low-carbon tourism.

2.2 Low-carbon Tourism Consumer Behavior

The research on low-carbon tourism in foreign countries started early, with abundant literature and accurate, detailed, and reliable official statistics. These studies mainly used empirical research methods, collected data through questionnaires, built mathematical models for quantitative analysis, and highlighted the use of both quantitative and qualitative methods.

Foreign studies on low-carbon tourism mainly focus on three dimensions: public attitude towards low-carbon tourism, measurement of carbon emissions in tourism sectors, and measures to reduce carbon emissions in tourism sectors (Yang Junhui, 2011).

When it comes to public attitude towards low-carbon tourism, Becken (2005) firstly indicated in his study on the Fiji resort that tour operators agreed to mitigate climate change by reducing carbon dioxide emissions, but they argued that it was not an essential measure. In the research on Norway in Europe, the survey of Higham and Cohen (2011) found that Norwegians attached sensitivities to the climate changes in Europe caused by tourism, but they laid more attention to the carbon emissions generated by frequent short-distance air travel than long-haul air travel, such as the travel to Ottoyaroa or New Zealand. Then, in the research on British tourists' planning their holiday travelling, Hares et al. (2010) discovered that numerous public information activities of carbon footprint had been carried out, and less so of climate

change. Therefore, it may be said that the tourism sectors still faced many challenges for sustainable carbon emissions. Edwards-Jones et al. (2009) pointed out that at present, there were few studies on how consumers weigh various particular characteristics of products, and there were relatively few studies on producers' responses to consumers' various reactions to carbon labelling. Sellahewa and Martindale (2010) asserted that the sustainable ways to address climate change came from less consumption of high-carbon products, which means there was a need to change the purchasing behavior of consumers. Subsequently, Wheeler and Sharp (2011) conducted a study on Australian consumers, showing that consumers in this region at that time lacked the awareness of low-carbon, so it was difficult to distinguish low-carbon products from high-carbon products.

When it comes to studies on measures for carbon emission reduction in tourism sectors, Karen and Richard (2007) conducted research on air-ticket levy in the UK, showing that if carbon tax was adopted in lieu of departure tax, carbon emissions of aviation sectors decreased instead of increased at the same income level. Lin (2010) analyzed the data of five national parks in Kenting, Yushan, Yangming Mountain, Taroko and Xueba in China's Taiwan region and found that the carbon emissions of private cars were greater than that of other transports. Hence, public transport and jaunt should be encouraged to reduce carbon emissions in travelling. Dickinson et al. (2010) experiments proved that holiday travel brought a large amount of carbon emissions, so slow tourism may be promoted to effectively reduce the carbon footprint of tourism sectors.

Although Chinese scholars had a late start in their studies on low-carbon tourism consumer behaviors, they have facilitated relevant studies in China's tourism sectors in recent years, with the integration of theories, findings and experience achieved by foreign scholars. These studies focused on three aspects, namely, awareness， consumption preference and consumption patterns of low-carbon (Xie Yuanfang and Zhao Yuan, 2010). The research of Wang Xingdong and Jing Fengjie (2011) included the fact that the variable of credibility exerted the influence on attitude and intention of low-carbon consumption, on the basis of the research model of the value-attitude-behavior theory. Subsequently, Yujie Wang (2012) adopted the TPB theory to study on low-carbon tourism intention, by means of issuing questionnaires online, conducting reliability and validity analysis, confirmatory factor analysis, one-way analysis of variance and independent sample T test through SEM. The research findings showed

that subjective norms are the most significant influence facor of low-carbon tourism intention, followed by perceived behavioral control and attitude.

In his research on inhabitants' perceptions on and consumption intention of low-carbon products in Zhengzhou, China's Henan Province, Yang Bo (2012) pointed out that consumers'awareness on low-carbon products varied by individuals with various characteristics. Currently, there was the trust deficit for local residents who were informed with low-carbon products. Some key factors exerted implications on low-carbon consumption of residents, such as consumers' income level, credibility in low-carbon products, awareness of low-carbon products and the level of low-carbon consumption subsidies. On the basis of the TPB theory and the VBN theory, with consideration of the characteristics of tourism activities, Huang Xueli and Lu Zhengnan (2013) studied on the influence factors and mechanism of low-carbon tourism and life of residents' behaviors in China's Jiangsu Province, introducing a new factor of individual aspiration of leisure and comfort. They only studied on the measurement of latent variables in the model, but did not conduct empirical research to verify the explanatory power of the model, and not analyze the specific influence factors of low-carbon behavior of tourism and life. Wu Lin (2013) adopted the TPB theory to study on the intention of low-carbon tourism behavior of tourists in Hefei, China's Anhui Province. Findings in the questionnaire survey at field indicated that tourists' behavioral attitudes, together with subjective norms in terms of low-carbon tourism, had a significant positive impact on their intention of low-carbon tourism behavior, while perceived behavioral control has no significant influence. Deng Yunyun et al. (2014) took China's Southern Hengshan Mountain as an example, adopted questionnaire survey and introduced single factor model to evaluate the status quo of low-carbon environmental education in mountain scenic spots from the perspective of tourists. The results made it clear that the results of low-carbon environmental education in southern Mountain Hengshan was not always visible, and some factors were essential to affect tourists' perceptions on low-carbon environmental education, such as tourists' gender, age and education background, the type of residence. In the empirical research of low-carbon intention and behavior of tourists in China's Zhangjiajie National Forest Park, Tang Chengcai et al. (2018) found that tourists reached a high level in their awareness and intention of low-carbon tourism, and that some factors were significantly correlated with the level of awareness of low-carbon tourism, that is tourist's education background, knowledge of low-carbon tourism, choice of green travelling, while tourists' income was not significant. Cheng Zhanhong

et al. (2018) did similar empirical research in terms of tourists' awareness on low-carbon in China's Mount Wutai scenic spot, and made it clear that tourists reached the highest level of awareness of low-carbon travelling, while the lowest of low-carbon tourism. In terms of influence factors, awareness of carbon emissions has the greatest impact on tourists' awareness of low-carbon tourism, while individual values had the least influence.

2.3 The Application of Carbon Labelling System in Tourism Sectors

Carbon label, originating in the food industry, is used to describe the carbon footprint in the life cycle of food. Gössling et al. (2016) indicated that there were at least 128 eco-labels adopted in the tourism sectors worldwide, including carbon label. Following the EU energy efficiency labelling, carbon labelling has become an important tool to mitigate GHG emissions. The tourism sector was looking to the implementation of carbon labelling system for the purpose of emissions reduction.

The earliest foreign studies on carbon labelling in tourism sectors focused on the importance of carbon labelling. Gössling (2011) deemed that it was necessary for tourism sectors to establish a carbon labelling system. It could change consumers' awareness on consumption, which meant that it helped tourists understand the relationship between tourism and climate change, and provide more support for climate policies, even though it may not change tourists' behavior significantly. Peeters and Dubois (2010) also considered that, with the establishment of carbon labelling, tourism enterprises could not only demonstrate their responsibility and reliability, but also increased their competitiveness in the market. Buckley (2012) asserted that it was unclear whether carbon labelling could shape and change consumer behavior. However, Hall (2013) found that tourists from developed countries had a positive view of achieving sustainable tourism behavior and their participation of the carbon labelling system, and they were willing to orient their travelling behavior to policy and model demonstration. In addition, the survey of Cohen et al. (2014) discovered that carbon labelling could not only raise awareness of tourists on climate change, but also provided public access to GHG emissions of tourism enterprises, and promoted the transparency of tourism products.

As the significance of carbon labelling in the advancement of low-carbon tourism is increasingly recognized, scholars focus their studies on designing. Research results of Bruijn et al. (2013) showed that, carbon labels needed to be designed, catering for tourists' preferences to gain their acceptance and recognition, so as to achieve the

significance of carbon labelling. However, due to information asymmetry between carbon label designers and real consumers, the impact of carbon labels on purchasing decisions was mitigated in most cases (Heinzle et al., 2012), thus failing to achieve its ideal effect. Therefore, tourism carbon labels should be designed in the light of energy labels to address the problem of information asymmetry. Since many tourists had little knowledge of carbon footprint, Hartikainen et al. (2014) indicated that it was necessary to stress the importance of readability in designing tourism carbon labels. In order to verify the readability factor of carbon labels, Eijgelaar et al. (2016) conducted a survey on Dutch tourists' preferences, which showed that carbon labelling could have a positive and significant effect on Dutch tourists' travelling choice, with the condition that the carbon labels were explicit, recognizable and readable. When it comes to public perceptions on carbon labels, Upham et al. (2011) investigated the carbon labels of products in the supermarkets, which found that tourists were partial to those carbon labels clear and efficient, bearing resemblance to EU energy labels. In addition, by testing various carbon labels, Gössling et al. (2016) found that tourists showed preference for carbon labels with color coding. In the empirical study on the impact of carbon labelling on consumers' preference for low-carbon consumption, Agnes and Klaus (2018) made a case study of consumers in German supermarkets, and found that consumers devoted more attention to products with low-carbon labels, when relevant low-carbon information was provided, and their purchasing decisions were directly affected.

Compared to foreign studies on carbon labelling, relevant studies in China started relatively late, mentioning it as complementary tool for policy development of low-carbon tourism in most cases, with the absence of systematic studies. In the research on the low-carbon development of tourism enterprises, Wang Wenhui (2013) pointed out that at the macro level, there was a need for the tourism sector to establish a carbon labelling system, regulate the carbon emissions of enterprises, and measure the carbon emission index with the orientation of the life cycle of products, which served as the evaluation criteria to push enterprises ahead to actively reduce emissions. At the micro level, there was a need to steer the low-carbon production mode of tourism enterprises and the low-carbon consumption behavior of tourists. Subsequently, Shuai Chuanmin and Zhang Yukun (2013) found that, it was still unclear of consumers' response to carbon labelling. There was a lack of quantitative studies on it, with studies mainly focusing on the impact of carbon labelling on international trade. In the research on inhabitants' perceptions on and consumption intention of low-carbon products in

Zhengzhou, China's Henan Province, Yang Bo (2012) discovered that the attachment of the carbon label to products removed the information asymmetry.

When studying on the advancement of low-carbon emissions in the scenic spots, Annixing et al. (2013) conducted investigation on China's Lushan Scenic spot. They proposed to promote ecological labelling, such as carbon labelling, to steer tourists towards revolutionization of traditional consumption patterns, in line with the comprehensive assessment of carbon sources, carbon emissions and carbon absorption. However, Guo Xiaoxu (2015) considered that scenic spots would take advantage of carbon labelling to inform tourists of the low-carbon attributes of a range of activities, products, and commodities, so as to enhance tourists' recognition of low-carbon products and encourage tourists to buy tourism products with “carbon labels”. Similarly, in the research on the contribution of low-carbon labelling to reduce emissions in tour destinations, Zhou Lianbin (2013) made it clear that ecological measures such as carbon labelling, could foster tourists' habits of low-carbon consumption, which facilitated emissions reduction in tour destinations. On the contrary, in a survey on the tourism sector in Dunhuang, Lanzhou, China's Gansu province, Li Caiyun (2016) discovered that there was a need to integrate environmental philosophy with the green and healthy consumption perspective, and gradually develop tourists' awareness of low-carbon consumption, so as to reverse the status quo of unplanned low-carbon labelling to attract tourists. In terms of the promotion of carbon labelling, on the basis of comparative analysis on application of carbon labelling in the world, Lu Zhang and Qing Guo (2014) proposed that the certification of carbon footprint and promotion of carbon labelling needed to be strictly regulated, so as to head off the possible misuse of carbon labelling, and excessive even false hype promoted by enterprises, and preserve the image and credibility of carbon labelling in the eyes of consumers. Therefore, only when consumers' behavioral mode in response to low-carbon labelling was clarified, can it be possible to assess the efficacy of carbon labelling in reducing carbon emissions, and provide a resource for stakeholders to make correct decisions.

With a summary of China's and foreign studies on carbon labelling in tourism sectors, it might find that the various development levels of low-carbon tourism in China and foreign countries, had played a big part in how far relevant studies were conducted in these countries. With carbon labelling as a highlight of low-carbon tourism research, relatively exhaustive studies on it were conducted in foreign countries, including its significance and specific design in tourism sectors. While, the

relevant studies were still in the primary stage in China, and mentioned it as complementary issue for low-carbon tourism research, with the absence of specific and systematic studies.

2.4 Carbon Labelling Systems in Various Countries

In 2007, The UK government introduced the world's first carbon reduction label. In 2008, The Carbon Labelling Act of 2009 was issued in California, USA, establishing the carbon emissions evaluation system through legislation. The European Union, France, Japan, Canada, Germany, Switzerland, South Korea, Thailand, Taiwan and Hong Kong have introduced carbon labelling programs. Table 2-1 shows the carbon labelling systems in different countries and regions.

The developed countries or regions account for the majority of ones that have implemented the carbon labelling system, while the less developed countries are relatively few to embrace it. When it comes to the measurement of carbon emissions, although carbon labels adopted varied by countries or regions, it is recognized that the measurement can be conducted by reference to the carbon footprint of products. Currently, carbon labelling mainly involves B2B and B2C products. In the countries or regions that have implemented carbon labelling earlier, both types got involved, while for the later-entry countries or regions, only B2B products have been taken into account.

Given that food products show significant carbon emissions in the whole life cycle, which are relatively easy to measure, the majority of countries or regions that have implemented carbon labelling system prefer to attach carbon labels to food (Liu et al., 2016).

Table 2-1 A Comparison of the status of Carbon Labelling System in various countries and regions

Country	Name of Carbon Labelling System	Years	Convening Agencies or Standard -setting Bodies	Background	Measurement Standard	Product Range
UK （DC）	Carbon Reduction Label	2008	Carbon Trust	British Government as sponsor	PAS2050; GHG Protocol	All sorts of B2B/B2C products and services involved include: food, clothing, daily-use products, etc..
France （DC）	Group Casino Indice Carbon;Mandatory Environmental Control Standards	2008	Self-marketing Product of Casino	French Government	ISO14040; ISO14044	Products involved include: (1) food and meat; (2) electronic and electrical equipment; (3) maintenance products; (4) gardening products; (5) sanitation facilities; (6) aesthetic device; (7) clothing, home and domestic textiles, shoes/leather products; (8) furniture; (9) office paper, publications, cultural works, calligraphic works; (10) sports equipment; (11) toys, game consoles, etc.; (12) non- electric power tools; (13) financial services.
EU （DC）	CO_2 Star	2008	Jointly supported by EU	Governmental Organisation	Life Cycle Assessment; PAS2050	Products involved include: biodiesel sold at fuel stations in Germany, modified lubricants, low-carbon transport services in the Netherlands.
Germany （DC）	Pilot Product Carbon Footprint	2007	WWF, IAE, PIK, Themal	Governmental Organisation	Non-specific Life Cycle Assessment	Products involved include: telephone, bed sheets, shampoo, packing boxes, frozen food, etc..
	Stop Climate Change	2008		Non-governmental Organisation	ISO14040; ISO14044; PAS2050	
Country	**Name of Carbon Labelling System**	**Years**	**Convening Agencies or Standard -setting Bodies**	**Background**	**Measurement Standard**	**Product Range**
USA （DC）	Type 1, Carbon Free Label	2007	Carbon Label California	Specialized Institution of Non-governmental Organisation	Life Cycle Assessment	It involves products, including: health commodities, organic food, etc..
	Type 2, Carbon Free Label		Carbon Washington Foundation		Life Cycle Assessment	It involves products, including: clothing, sugary, canned beverage, ovens, and composite floors, etc..
	Type 3, Climate Conscious Label		The Climate Conservancy of Stanford University		Life Cycle Assessment	It involves 112 types of products, falling into 6 categories, including: power products, food, household appliances, office supplies, clothing, building materials.

	Type 4, Carbon Label		Conscious Brands		ISO14040; PAS2050; GHG Protocol	It involves 112 types of products, falling into 6 categories, including: power products, food, household appliances, office supplies, clothing, building materials.
Japan（DC）	Carbon Footprint;Voluntary Guidelines	2009	Ministry of Economy Trade and Industry（METI）	Governmental Organisation	TSQ0010	It involves products of 10 sectors, including: Food, clothing, daily-use products, household appliances, daily chemical products, etc..
Korea（DC）	Korea Carbon Footprint Label;Voluntary Guidelines	2008-2009	Minister of Environment of Korea	semi-official Organisation	ISO14040; ISO14064; ISO14025; PAS2050; GHG Protocol; EPD	It involves products of the following sectors: household appliances, beverages, food, aviation, furniture and others, with a total of 145 types, encompassing: 99 types of non-durable products, 13 types of energy-saving and durable products, 10 types of manufacturing products, 7 types of services, and 16 types of energy-consuming and durable products.
Thailand（LDC）	Type 1, Carbon Footprint Label Type 2, Carbon Label Type 3, The National Guideline Carbon Footprint of Product	2008	Thailand Greenhouse Gas Management Organization， TGO	Non-governmental Organisation	UNFCCC/CDM; ISO14040; ISO14044; PAS2050	34 types of products have access to the registration for carbon certification, covering 9 categories of products, including: canned/dried food, cement, artificial wood, packaged rice, condom, floor tile, tile, edible oil, milk.
Country	**Name of Carbon Labelling System**	**Years**	**Convening Agencies or Standard-setting Bodies**	**Background**	**Measurement Standard**	**Product Range**
Canada（DC）	Carbon Counted	2007	Carbon Counted, Carbon Footprint Solutions	Non-governmental Organisation	Life Cycle Assessment	It mainly involves beer products.
Switzerland（DC）	Climatop	2008	Okozentrum Langenbruc	Non-governmental Organisation	Life Cycle Assessment, PAS2050	It mainly involves following products and services: environmentally friendly shopping bags, organic sucrose raw materials, cream, laundry detergent, laundry liquid, toilet paper, dishtowels, batteries, etc..
Sweden（DC）	Carbon Footprint Label	2009	KRAV and Swedish Seal	Non-governmental Organisation	Life Cycle Assessment; PAS2050	It involves wind power, water conservancy, nuclear power, food, textiles, furniture, wood and paper products, plastic rubber/glass and chemical products, machinery and equipment services, etc..

China‘s Taiwan region（DC）	Carbon Footprint Label;Voluntary Guidelines	2010	Taiwan Association of Sustainable Development for Environment & Resources	Governmental Organisation	ISO14067	It mainly involves LCD display, CD, tea and sandwich cake, nougat, etc..
Singapore（DC）	Singapore Carbon Label	2010	Environmental Management Association Singapore; Singapore Institute of Manufacturing Technology	Governmental Organisation	Life Cycle Assessment; PAS2050; ISO14067	--
China's Hong Kong Special Administrative Region（DC）	Carbon Footprint Label	2013	Hong Kong Construction Association; Hongkong Zero Carbon Construction Co. LTD	Governmental Organisation	ISO14067	It mainly involves food, textiles, electronic products, building materials, etc..
China（DC）	Carbon Footprint Label	2018	China Electronic Energy Saving Technology Association; China Quality Certification Center; China's National Low Carbon Certification Technical Committee	Governmental Organisation	T/DZJN001—2018	It is expected to be officially adopted, involving products: LCD displays, mobile phones and other electrical and electronic products in April 2019, and tie in with implementation of carbon labelling policy and green procurement of the government.

Note. DC=Developed Country; LDC=Less Developed Country

All data was collated from the relevant literature.

With the overview of the current policies and systems of carbon labelling in the world, it may be said that carbon labelling is a new concept and has not yet been applied on a significant scale in China. In October 2009, China's Ministry of Environmental Protection proclaimed that it would implement the product carbon footprint project, and low-carbon labels would attach to products complying with the standards, in condition of their implementation of voluntary guidelines. In China, carbon labels were expected to be officially applied on products in April 2019, including LCD displays, mobile phones and other electrical and electronic products, and tie in with implementation of carbon labelling policy and green procurement of the government. China's carbon footprint evaluation of electrical and electronic products is carried out in accordance with the General Rules for Carbon Footprint Evaluation of Electrical and Electronic Products (T/DZJN001 -- 2018) issued by China Electronics Energy-saving Technology Association in accordance with T/CAS1.1-2017 "Guidelines for the Structure and Compilation of Group Standards". In the T/DZJN001—2018 the General Rules for Carbon Footprint Evaluation of Electrical and Electronic Products, carbon footprint evaluation of electrical and electronic products are conducted in line with the Implementation Rules for Voluntary Carbon Labelling Evaluation of Electrical and Electronic Products prepared by China Electronic Energy-saving Technology Association in accordance with T/CAS1.1-2017 Guideline for Structure and Drafting of Social Organization standard.

2.5 Relevant concepts and theories

2.5.1 The Concept of Carbon Labelling

The UK is the first country in the world to implement carbon labelling scheme. In 2008, the British Standards Institute, Carbon Trust and the Department for Environment, Food and Rural Affairs, jointly issued the new edition PAS2050, Specification for the Assessment of the Life Cycle GHG Emissions of Goods and Services, and proposed the world's first real concept of carbon label and certification system of carbon footprint label.

Because the definitions of carbon label vary by countries all over the world, there remain gaps among the types of information demonstrated by various carbon labels. At present, the definition proposed by Carbon Trust (2009) and Edwards-Jones et al. (2009) is recognized in the academic world. Carbon Label is "an innovative kind of eco-labels that informs consumers of the total GHG emissions released in the whole life cycle of products with quantitative indicators" (Carbon Trust, 2009).

With the main function of identification and communication. carbon labelling indicates product carbon emissions or GHG emissions, and provides the necessary support for consumers and other stakeholders to make decisions about purchasing products or services, resulting into a consumption of low-carbon products and carbon emissions reduction. This study takes a cue from the definition of carbon labelling proposed by Yu Yunjun et al. (2010), that it is a kind of eco-labels attached to product containers, which is designed to indicate to consumers the carbon dioxide emissions in the whole life cycle of a product, including production, processing, packaging, storage and transportation, sales, use and recycling. Thus, it promotes manufacturers to produce low-carbon products and leads to consumption of low-carbon products, to achieve emissions reduction targets.

2.5.2 The Concept of low-carbon consumption

As there is no consensus regarding the definition of low-carbon consumption mode in the academia, as shown in Table 3-1, this study refers to the definition of low-carbon consumption proposed by Chen Xiaochun et al. (2009) in The Studies of Low Carbon Consumption, that low-carbon consumption mode reflects a kind of consumers' awareness or attitudes, values, and behaviors. In essence, it is the process of consumers' evaluation, choice, decision-making and actual purchase, and consumption of the consumption target. Consumers integrate their actual needs and specific low-carbon consumption values into purchasing or using consumables, take low-carbon consumption indicators as the main assessment indicators in decision-making, and choose low-carbon products and services in the actual consumption.

Table 2-2 Definitions of low-carbon consumption

Author/Years	Definition
Chen Xiaochun, Tan Juan, Chen Wenjie (2009)	Low-carbon consumption is a kind of ecological consumption modes based on civilization, science, and health. In essence, it is an activity of consumers' choice, decision, and actual purchase of consumption objects. Consumers choose products or services, in conformity with their mentality and values of low-carbon consumption in the region then, take low-carbon indicators as a major consideration and impact factor in decision-making, and give preference for low-carbon products in the actual consumption.
Liu Min (2009)	Low-carbon consumption is a low-carbon-oriented consumption mode with low-carbon consumption patterns, and it is resource-saving, environment-friendly, symbiotic, civilized, and healthy.
Zhang Hao, Wang Yonggui (2010)	Low-carbon consumption refers to the fact that more consumers prefer or accept low-carbon products or services than high-carbon ones, and thus their subjective intentions or actual behaviors attach priority to the former. In terms of its connotation, low-carbon consumption is oriented to carbon emissions, a new evaluation factor, allowing the more maneuverable low-carbon consumption. In

	regards to its extension, low-carbon consumption meets people's various needs, such as material needs, spiritual needs, and ecological requirements, etc.
Chen Liuqin (2010）	Low-carbon consumption covers three notions: (a)it advocates consumers to consume uncontaminated or healthy green products; (b) it lays more attention to the disposal of waste, without risks of environmental contamination; (c) it orients consumers to natural and healthy mode, and allows them to take into account of energy saving and environmental protection while living a comfortable life, so as to achieve sustainable consumption.
Yu Xiaoqiang (2010)	Low-carbon consumption means avoiding consumption of goods and services attributed to the increased carbon dioxide emissions where possible, for the purpose of GHG emissions reduction.
Pan Anmin, Hu Haiyang, LI Wenhui (2011)	Low carbon consumption means purchasing the options of consumption patterns or materials with lower carbon dioxide emissions to meet needs. In essence, it is a symbiotic consumption mode oriented to low-carbon, for the well-being of society and future generations.
Guo Liwei, RAO Baohong (2011)	Low-carbon consumption, relative to carbon consumption, lays stress on GHG emissions reduction, especially on carbon dioxide emissions. In terms of the concept, low-carbon consumption is subordinated to green consumption and sustainable consumption. The former is the source and core mechanism of the latter, while the latter is the fundamental goal.
Xin Ling (2011)	It is the integration option of consumers' consumption concept along with consumption material supply and utilization in the context of advanced productivity level and production relations. It is also the civilized, scientific, and healthy ecological consumption pattern, actively implemented by contemporary consumers in the process of consumption, in line with the concept of low-carbon and sustainable development, for the purpose of low energy consumption, low pollution and low emissions.
Wang Xingdong, Jing Fengjie (2012)	Low-carbon consumption refers to the pro-nature and pro-society consumption behaviors that consumers show in the process of purchasing.
Sun Dechao, Cao Zhili (2015)	Low-carbon consumption means that, when it comes to consumption concept, consumption object, consumption structure, consumption pattern and consumption result, consumers take into account of others and social factors, move beyond resource-intensive, highly energy-intensive and polluting consumption, and take up advocacy campaigns of environmental protection, conservation and sustainable development, so as to achieve harmony and win-win relationship of individuals, economy, society and nature.

All information was collected from the relevant literature.

Broadly speaking, the connotations of low-carbon consumption covers five levels: (a) constant temperature consumption, which means to keep GHG emissions to a minimum in the consumption process; (b) economical consumption, which involves the minimum consumption of resources and energy; (c) Safe consumption , which means the consumption is least harmful to the health of the consumer and human living environment; (d) sustainable consumption, which means the consumption is least harmful to the sustainable development of mankind; (e) new consumption area , which refers that the consumption expands its business scope, reoriened towards new energy and low-carbon products (Chen Xiaochun et al., 2009).

2.5.3 Behavior Change Theory

1. Theory of Planned Behavior

By Theory of Planned Behavior (TPB), it is a theory developed based on the Theory of Reasoned Action jointly proposed by Ajzen and Fishbein (1975,1980), which proclaimed that individual behavioral attitude and subjective norm exert impact on consumers' behavioral willingness.

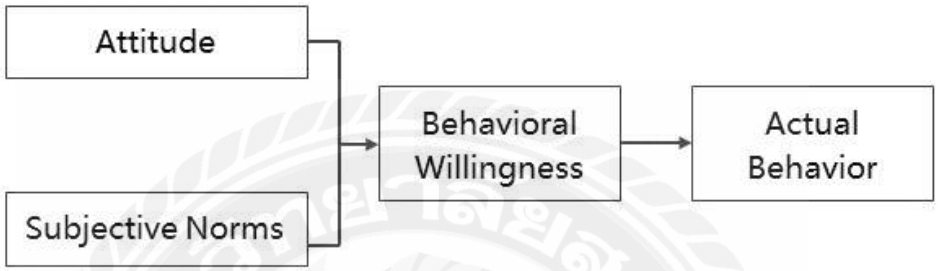


Figure 2.2 The Model of the Theory of Reasoned Action

According to Fishbein and Ajzen (1975), behavioral willingness was defined as the intensity of specific individual behavioral willingness. Attitude referred to the key tenet of behavioral outcome and its degree of importance; Subjective norms covered both the perceived expectations of the individual or organization concerned and the willingness that the reality stayed in line with expectations.

In 1991, Ajzen's research showed that human behavior is under control instead of entirely voluntary. Ajzen (1991) considers perceived behavior control as a factor influencing behavioral willingness, which developed into the TPB theory. The TPB theory includes three elements, namely, behavioral attitude, subjective norms, and perceived behavioral control, as shown in Figure 2-3.

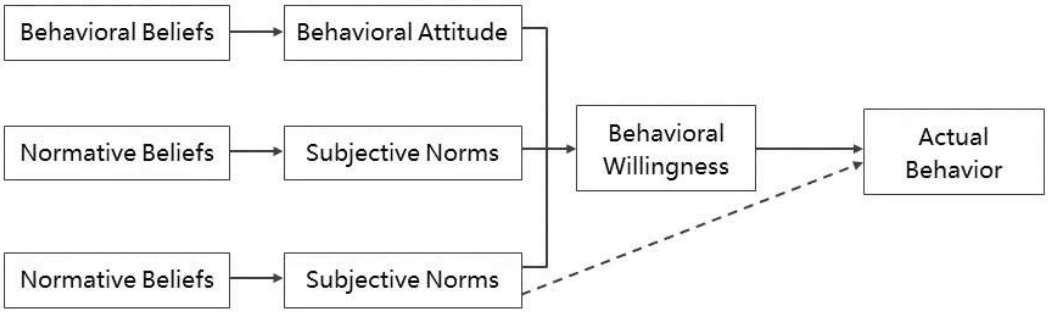


Figure 2.3 The Model of the Theory of Planned Behavior

The development of TPB can be divided into the following three phases: (a) In the first stage, TPB was proposed and continuously revised from 1980 to 1990. Fishbein and Ajzen (1975) found that the TRA theory was too rational and deficient. Therefore, perceived behavioral control was introduced as a predictor variable to enhance the accuracy of behavioral prediction; (b) In the second stage, the TPB theory was improved and grew to maturity gradually from 1991 to 2000. It is widely applied in different research domains, especially in empirical research, in that it interlinked attitude and behavior and was more predictable; (c) The TPB theory was improved and developed comprehensively from 2001 to the present.

2. Value-belief-norm Theory

Stern et al. (1999) proposed the Value-belief-norm Theory (VBN) on the basis of the theory of Ethics presented by Schwartz (1977). The VBN Theory includes the views of the three theories, Value Theory, New Environmental Theory, and Norm-Activation Theory. The VBN theory holds that, the chain of cause-and-effect composes of various factors, and triggers consumer behavior in the following sequence: individual values, new environmental paradigm, awareness of consequences, awareness of responsibility and personal norms (Stern, 2000).

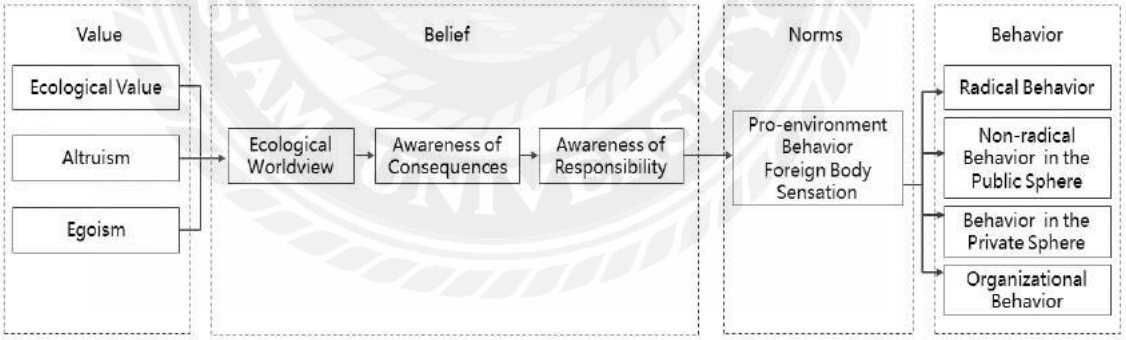


Figure 2-4 The Theoretical Model of the Value-belief-norm Theory

3. Conceptual Model

Based on the objective and content of this study, with the integration of the TPB theory and the VBN theory, the conceptual model of the influence path of carbon labelling on low-carbon consumption behavior was created, as shown in Figure 3-2.

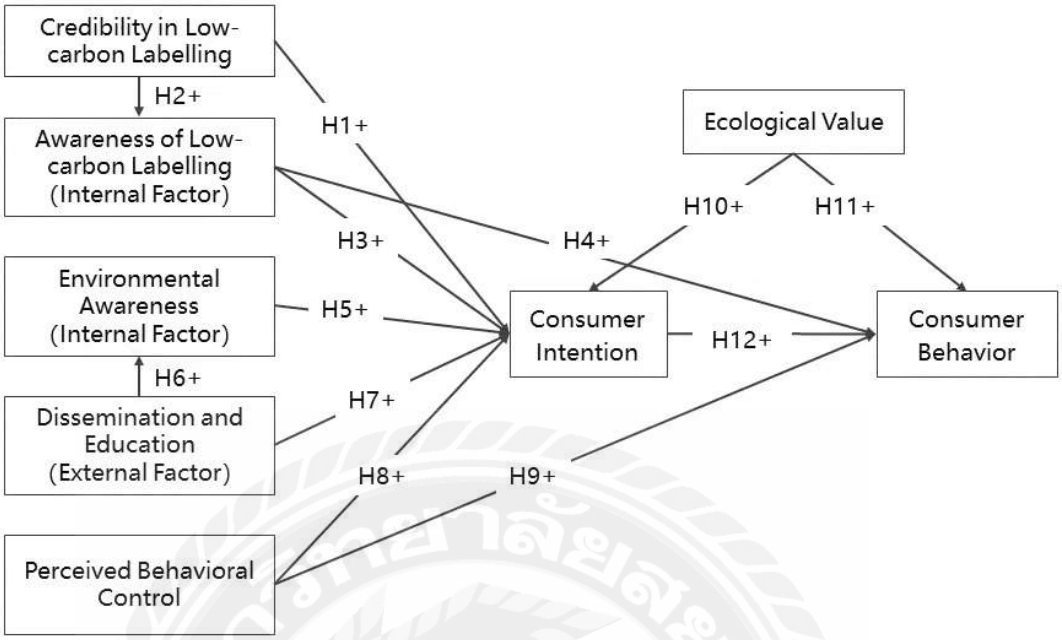


Figure 3-2 Conceptual Model of the Influence Path of Low-carbon Labelling on Low-carbon Consumption Behavior

2.6 Variables and Hypotheses

2.6.1 Credibility in Low-carbon Labelling

Delgado-Ballester and Luis (2001) asserted that consumers trusted a brand when they felt that the brand was reliable, preferred the brand in their mind and took action. In the empirical research, Fan Lixian and Li Xinlu (2018) made it clear that, awareness factors of brands such as customers' awareness of brand value, imposed a direct influence on brand trust. In the research on low-carbon labelling, Hansen and Kull et al. (1994) found that respondents were skeptical about the environmental information of the green label on the LCD screen. Only when the respondents trusted the information, would they take the green label as the basis for the purchase decision. Zhang Lu (2014) indicated that there were two types of carbon footprint label certification, namely official certification, and unofficial certification; The latter was subdivided into enterprise certification and the third-party certification. In that the unofficial certification was hardly convincing, the effect of the granted carbon labels on consumers was seriously underestimated. In the research on perceptions on low-carbon products and the consumption intention of residents in Zhengzhou, China's Henan Province, Yang Bo (2012) discovered that the attachment of carbon labels to qualified products removed the information asymmetry. Moreover,

respondents had some knowledge of the low-carbon product, but had little trust on it, which reduced their intention to purchase these products. The relation of proportionality between certification bodies and information of low-carbon labels, universally inspired consumers' trust on products attached to the carbon label. The more awareness consumers had of the low-carbon label, the higher trust they had on it. Therefore, the hypothesis is proposed as follows:

H1: Credibility in carbon labels has a significant impact on consumer intention.

H2: Credibility in carbon labels has a significant impact on consumer awareness.

2.6.2 Awareness of Low-carbon Labelling

Awareness of Low-carbon Labelling refers to consumers' awareness of carbon labelling and its systems (Chen Xiaochun et al., 2009). Ajzen (1991) illustrated in the Theory of Reasoned Action that awareness was regarded as the basis for the formation of attitude, and it significantly affected the development of attitude and consumption behavior. Subsequently, Foxall et al. (1998) counted that consumers generally focus on stimuli particularly relevant to their own needs, beliefs, and attitudes. However, once a consumer took note of something, relevant information was provoked for interpretation, remained in the memories, and exerted influence on attitudes and behaviors. Tourism consumers' awareness on products or services had an impact on consumers' intention and behavior (Liu Yaping and Liu Qing, 2013; Cheng Zhanhong et al., 2018; Tang Chengcai et al., 2018). Yiridoe (2005) considered that consumers'skepticism of the authenticity of organic products and organic labels may hinder consumers' purchase. In the research on the guiding path of low-carbon preference mechanism, Zhang Hao and Wang Yonggui (2010) showed it clear that various accessible information or stimuli indirectly affected consumers' awareness or affection of low-carbon products, and their consumption preference, finally influencing their consumption behavior. Therefore, the hypothesis is proposed as follows:

H3: Awareness of Low-carbon Labelling has a significant impact on consumer intention.

H4: Awareness of Low-carbon Labelling has a significant impact on consumer behavior.

2.6.3 Environmental Awareness

Environmental awareness describes the weight of consideration that individuals have given to the environment. Relevant studies have shown that environmental awareness provides incentives for individual to change their own behaviors for the purpose of the address the mitigation issues (Barr et al., 2003; Li Qian et al., 2009). Environmental awareness is regarded as the first psychological variable affecting environmental behavior in the vast majority of studies, which has been generally confirmed by scholars. The low-carbon intention and behavior of consumers vary by their environmental awareness. The research by Vlosky (1999) found that consumers' environmental awareness was positively correlated with their willingness to pay for environmentally friendly products, and college students putting more weight on the environment preferred to pay for green products. Khalil et al. (2007) reckoned that environmental awareness was an important factor affecting behavioral willingness concerning the environment, and environmental attitude steered residents' behavioral willingness subjectively. The empirical research of Yu Lin (2015) revealed that there was a weak relationship between Chinese consumers' environmental awareness and their willingness to pay for carbon-labeled food. Therefore, the hypothesis is proposed as follows:

H5: Consumers' environmental awareness has a significant impact on consumer intention.

2.6.4 Dissemination and Education

Bonner (1985) asserted that external environmental factors, like internal psychological factors, can shape, develop, promote, stimulate, and guide consumer behavior. In terms of dissemination and education concerning low-carbon, Foxall et al. (1998) showed it clear that some measures contributed to individual compliance with the codes as expected by the social fabric, including: (a) incentive or sanction for individuals; (b) excellent model demonstration; (c) the authority of experts. Based on considering dissemination and education as external social factors by Foxall et al. (1998), this study was designed to advocate in matters relating to low-carbon, and enhance dissemination and education of low-carbon social system, by means of developing incentive and sanction measures, encouraging model behavior, and counting on the authority of experts. Dissemination and education were aligned with consumers' internal psychological factors and consumer behavior (Li Junpeng and Jin Guodong, 2006; Qu, 2009). In the empirical study by Zhang Lu and Guo Qing (2015),

it was shown that dissemination and education had a positive effect on consumers' low carbon environmental awareness (coefficient =0.115; $p<0.01$) and consumer intention (coefficient =0.19; $p<0.001$), while it has no correlation with consumer behavior. Therefore, the hypothesis is proposed as follows:

H6: Dissemination and education have a significant impact on environmental awareness.

H7: Dissemination and education have a significant impact on consumer intention.

2.6.5 Perceived Behavioral Control

In Ajzen's (1991) TPB theory, perceived behavioral control (PBC) reflected the impact of contributing or impeding factors on the production of consumer behavioral willingness. PBC was a variable and was introduced, as consumer behaviors were not entirely the consequence of rational behaviors, and could potentially be affected by internal and external factors independent of the perception in the occurrence of behavior, such as time, conveniences, individual capacity, and others. In the research, Liu and Gao (2012) showed it clear that PBC had the greatest impact on community residents' willingness to participate in ecotourism in China's Chongming Island (path coefficient=0.56, $p<0.001$). Guo et al. (2013) also confirmed that self-efficacy and perceived facilitation, as the elements of PBC, had a positive correlation with rural tourism intention. Subsequently, in the research by Lu Min et al. (2019), PBC better predicted uncivilized intentions as well (path coefficient= 0.490, $p<0.001$). Proceeding from the practice of the relevant research, in the condition that purchases of low-carbon products are relatively rare in the entire consumer market, and low-carbon products achieving the carbon footprint are far from the daily consumption, more empirical studies in China have been irrespective of the impact of PBC on behavior, but center in the influence of PBC on behavioral willingness (Wu, 2013; Zhang, 2015; Lu et al. 2019). However, given the affordance of exportability as well as the possibility of doing research, the hypothesis is proposed as follows:

H8: PBC has a significant impact on consumer intention.

H9: PBC has a significant impact on consumer behavior.

2.6.6 Ecological Value

The value is an enduring belief in specific behavior patterns and the meaning of life, and influence the attitudes and behaviors of social members through the

formation of the codes (Su et al., 2013). Laukoff and Wang (2015) asserted that values provided a strong internal driving force for the occurrence of consumption behavior and played a significant role in steering consumption. VBN theory proposed by Stern et al. (1999), held that variables of environmental attitude (belief) were affected by individual value system (value). Accordingly, lots of studies took the value of environmental protection as an antecedent factor affecting a specific environmental behavioral attitude, and universally felt that the stronger an individual's environmental values were, such as environmental responsibility, the more active his attitude towards environmental behavior would be (Steg et al., 2009; Von et al., 2013; Poortinga et al., 2014; Zhao et al., 2015). Through the empirical research on low-carbon consumption behaviors of urban residents, Xie et al. (2013) found that among the important factors such as sense of responsibility, ecological value, conveniences, awareness of low-carbon, product price and the visibility of policies, ecological value (coefficient =0.212; $p<0.001$) was the most influential factor. Therefore, the hypothesis is proposed as follows:

H10: Ecological value has a great impact on consumer intention.

H11: Ecological value has a great impact on consumer behavior.

H12: Consumer intention has a great impact on consumer behavior.

2.6.7 Consumer Intention and Behavior

Low-carbon consumption intention plays a driving role in tourists' behavior, which encourages tourists to adopt low-carbon behavior as an internal driving force (Liu, 2014). Therefore, low-carbon consumption intention refers to the subjective behavioral willingness generated in the product decision-making process, and can effectively predict consumer behaviors. At present, most Chinese scholars conducted studies on low-carbon tourism intention or preference targeted at a certain scenic spot or current tourist group. However, low-carbon consumer behavior refers to consumer' s conduct form of taking behavioral alternatives in travelling for the purpose of carbon emissions reduction, including the final decision-making and actions of purchasing low-carbon products or services (Liu, 2014). The research by Hines et al. (1987), found that studies on low-carbon consumption behavior all confirmed the close relationship between low-carbon consumption intention and pro-environment behavior, with an average correlation degree of 0.49. In addition, Wen, and Peng (2001) also affirmed that low-carbon incentives and consumer preferences were main factors steering and spurring consumers' low-carbon consumption. The empirical

research by Yu (2015) showed that there was a gross underrepresentation of the fact that China's consumers had the awareness of low-carbon labelling for food, and there was a weak relationship between consumers' awareness and attitude towards carbon labelling and their intentions to pay for carbon labelling goods. Therefore, the hypothesis is proposed as follows:

H12: Consumer intention has a significant impact on consumer behavior

Chapter 3 Research Methodology

3.1 Introduction

The study adopts the method of quantitative research, when literature review were conducted on relevant literature in regard to studies and application of the TPB theory and the VBN theory, it indicated that, there was a need to discuss and analyze the path of low-carbon tourism consumption behavior oriented to low-carbon labelling, especially from the perspective of the impact of individual internal factors of consumers' environment-friendly preferences and behaviors, such as consumers' ecological value (value), awareness of low-carbon labelling (belief), credibility in low-carbon labelling (belief), environmental awareness (norm), and so on. Firstly, the study would explore the impact of such consumers' internal factors, as awareness of low-carbon labelling, environmental awareness, credibility in low-carbon labelling, on their pro-environment intention and behaviors. Secondly, it would explore the indirect and potential impact of consumers' external factors, such as dissemination and education, on their pro-environmental behaviors.

The significance of the combination of the TPB theory and the VBN theory lay in the fact that, it clearly and plenarily explained that low-carbon labelling helped to shape consumer behavior under the combined effects of individual internal factors and social external factors. Moreover, it proved and developed the point that behavioral willingness tipped the scales for actual behavior.

In conclusion, this study puts down the credibility in low-carbon labelling, awareness of low-carbon labelling and environmental awareness as individual intrinsic factors, while dissemination and education as an external social factor. In addition, on the basis of the impact of low-carbon attitude and consumer behavioral willingness on actual low-carbon purchasing, it created a theoretical model of the influence path of low-carbon labelling on tourism consumption behavior, as shown on Figure 3-1.

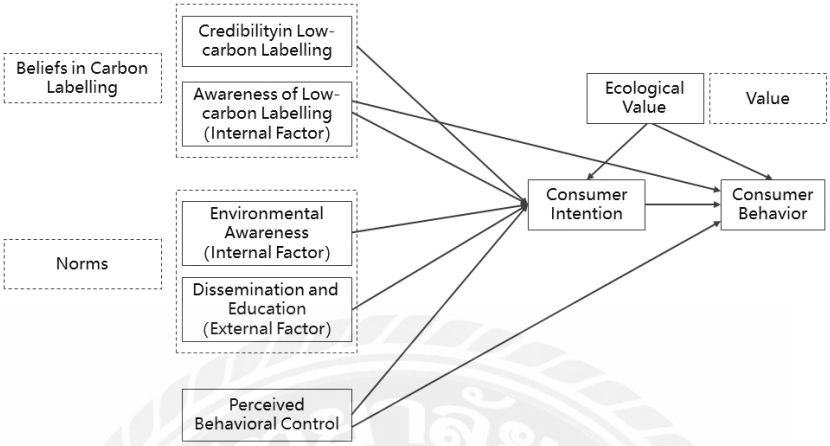


Figure 3-1 A Theoretical Model of the Influence Path of Low-carbon Labelling on Low-carbon Consumption Behavior

3.2 Research Design

In this study, the questionnaire design process includes the analysis of domestic and foreign literature, pre-experimental questionnaires, questionnaire revision and formal questionnaire.

To ensure the reliability and validity of the questionnaire, a preliminary experiment was conducted, with 16 tourism enthusiasts randomly selected as participants. The feedback information indicated, (a) the majority deemed that there was a need of the insertion of Screening Questions to ensure accuracy of sample selection and meet the study requirements; (b) 7-point Likert scale could be used here.

The revised formal questionnaire consists of four parts. Part one is screening questions to ensure that all the survey samples are tourists from China's Henan Province. Part two is the questionnaire description, mainly to articulate purposes of the questionnaire for participants, and requirements for filling in the questionnaire, and appreciate participants for their involvement and collaboration. Moreover, it offers the explanation of relevant concepts, covering low-carbon tourism and carbon labelling, so as to advance the better level of participants' understanding of the questionnaire. Part three is the questionnaire scale with a total of 26 items, involving credibility in carbon label, consumer awareness, environmental awareness, dissemination and education, PBC, ecological value, consumer intention and

consumer behavior. Part four is personal information, covering 12 items, such as gender, age, education background, occupation, income and so on.

Among these items, there were seven vectors measured with 7-point Likert scale, including credibility in carbon label, environmental awareness, dissemination and education, PBC, ecological value, consumer intention and consumer behavior. There were seven points in the scale, including " strongly disagree"," disagree ", " disagree somewhat “, “neutral", " agree somewhat ", " agree ", " strongly agree " (1= strongly disagree; 7= strongly agree). The vectors of consumer awareness were measured with the 7-point Likert scale, including " do not understand at all "," do not understand ", " do not well understand “, “neutral", " understand somewhat ", " understand ", " completely understand " (1= do not understand at all; 7= completely understand).

All vectors and items in the questionnaire have been used by scholars at home and abroad. The specific items are shown in Table 3-1.

variables	Items	Reference literature
Credibility in Low-carbon Label	1. I consider products achieving carbon footprint label certification as low-carbon ones.	Chang Nannan (2014), Wu (2014), Yang Jie (2017)
	2. I think the information issued by carbon labels is true and reliable.	
	3. I think products achieving carbon footprint label certification can be manufactured in accordance with the certification standards.	
	4. I think the carbon footprint label certification agency is highly credible.	
Awareness of Low-carbon Labelling	5. Do you understand the concept and meaning of carbon labelling?	Yiridoe（2005）, Schumacher（2010）, Yu Lin (2015), Zhang Lu and Guo Qing (2015)
	6. Are you aware of the carbon labelling system?	
	7. Do you know the difference between high-carbon and low-carbon products?	
Environmental Awareness	8. I have a high awareness of the hazards of a high-carbon lifestyle.	Dunlap et al. (2000), Zhao Liming et al. (2015); Cheng Zhanhong et al. (2018)
	9. I have the behavioral willingness of low-carbon in daily life.	
	10. I am greatly concerned about policy measures aiming at low-carbon environmental protection.	
Dissemination and Education	11. I am willing to participate in the awareness-raising campaigns on carbon labelling.	Foxall et al. (1998), Xie Shouhong et al. (2013), Zhang Lu and Guo Qing (2015)
	12. I am willing to proactively outreach carbon labelling.	
	13. The information in the mass media on low carbon consumption puts an impact on my purchases.	
Perceived Behavioral Control	14. If there are products attached to carbon labels in the market, I think they are easily available in my community.	Ajzen(2000), Kelly et al. (2008), Chang Nannan (2014)
	15. I largely determine various purchasing items in my house.	
	16. If there are products attached to carbon labels in the market, I am confident that I will make the purchase next time, if it so wishes with regard to	

	low-carbon products.	
Ecological Value	17. Human beings are obliged to save energy to protect the environment.	Dunlap et al. (2000), Sun Yan et al. (2012), XIE Shouhong et al. (2013)
	18. Protecting the ecological environment is the common social responsibility.	
	19. In order to protect the environment, I can accept a certain level of inconvenience.	
Consumer Intention	20. I am willing to buy low-carbon products with the presently available resources.	Shen Yue (2013), Zheng Yan and Huang Suhua (2011), ZHANG Lu and GUO Qing (2015)
	21. I will definitely choose to buy low-carbon products in the following days.	
	22. I will recommend low-carbon products to others.	
	23. I will actively promote low-carbon products.	
Consumer Behavior	24. I will choose to buy low-carbon products.	Wang Jianming and He Aizhong (2011), Zhang Lu and Guo Qing (2015), Zhang Ling (2015)
	25. I am willing to pay a "premium" for low-carbon products.	
	26. I will recommend others to buy low-carbon products.	

3.3 Sample and Data Collection

In this study, random sampling method was adopted to issue questionnaires. The data was collected from questionnaires handed out randomly in hotels, restaurants, shops and stations near 13 5A scenic spots in China's Henan Province from July to September 2021. A total of 650 questionnaires were issued, 50 in each scenic spot. Among 632 questionnaires recalled, there remained 600 valid ones, with the elimination of the incomplete samples, achieving a 95% efficient rate. Table 3-2 shows the distribution, issue, and recall of questionnaires specifically.

Table 3-2 Statistical Table of Issue and Recall of Questionnaires

	Scenic Spots	Location	Questionnaire Issued	Questionnaire Recalled	Valid Questionnaire	Effective Recall Rate
1	Yongcheng Mangdang Mountain Tourist Area	Yongcheng in China's Henan province	50	48	45	90%
2	Red Flag & Canal Taihang Grand Canyon	Linzhou in China's Henan province	50	45	44	88%
3	Chaya Mountain Scenic Area	Zhumadian in China's Henan province	50	50	45	90%
4	Laojieling in the Funiu Mountain & Dinosaurs Park	Nanyang in China's Henan province	50	46	44	88%
5	Longtan Grand Canyon Scenic Spot	Luoyang in China's Henan province	50	50	45	90%
6	Laojunshan Mountain in Luanchuan & Jiguan Cave Tourist Area	Luoyang in China's Henan province	50	50	46	92%

7	Yaoshan Central Plains Giant Buddha Scenic Area	Pingdingshan in China's Henan province	50	50	45	90%
8	Yin Ruins Scenic Spot in Anyang	Anyang in China's Henan province	50	43	43	86%
9	Baiyun Mountain Scenic Area	Luoyang in China's Henan province	50	50	48	96%
10	Kaifeng Qingming Riverside Scene Garden	Kaifeng in China's Henan province	50	50	50	100%
11	Yuntai Mountain Scenic Spot	Jiaozuo in China's Henan province	50	50	50	100%
12	Longmen Grottoes Scenic Spot	Luoyang in China's Henan province	50	50	48	96%
13	Songshan Shaolin Scenic Spot	Dengfeng in China's Henan province	50	50	47	94%
Total（Sum/Means）			650	632	600	92%

With questionnaire recalled and data entered, the analysis of basic characteristics of the samples were conducted, centered in the characteristics of statistical distribution using descriptive statistics, as shown in Table 3-3.

In regards to gender dimension, there were 346 men participants, accounting for 58%, greater than 254 women participants, taking up 42%. From the age distribution, more consumers were between 22 and 35 years old, taking up 43%, among whom and the post-80s and post-90s were the dominant tourism consumers, while consumers between 36 to 45 years old accounted for 20%. It indicated that students had sufficient leisure time to go sightseeing, compared to employed individuals. In terms of the dimension of education background, the vast majority were undergraduates and postgraduates, taking up 55% and 25% respectively, which was largely consistent with the characteristics of the current levels of education in China, namely, undergraduates took up the majority of young people.

Referring to the dimension of individual monthly income, consumption groups with monthly income of 2,500-4,000 yuan accounted for 42%, and those with 6,001 to 10,000 yuan took up 27%. When it comes to channels to deliver information about low-carbon and environmental protection, 69% consumers took the Internet and social media software as information resources, 12% learned it through relatives and friends, 10% knew it on television and radio, and 9% understood it in newspapers and magazines. The distribution was consistent with the current situation of China's cyber citizens, namely the middle-aged and young people made up a significant majority of

users. Among them, 20 to 29 years old users took up the highest proportion, and the greatest number of users were students.

Concerning the attitude towards supporting low-carbon tourism, 98% consumers were in favor of it, and 2% were neutral. Meanwhile, 78% tourists were willing to undertake low-carbon tourism, 13% were uncertain about it, and 9% were not willing to do it. 27% participants were inclined to take the road trip, 21% preferred the car ride and 28% chose the train trip. Among those participants, the majority of the high-income tourists had the preference for the road trip.

When it comes to the dimension of the main source of carbon emissions, 32% consumers considered that it came from transportation, 24% from accommodation, 23% from catering, and only 11% from shopping. 58% samples showed consumers were just aware of half cognitive problems concerning low-carbon tourism, indicating that Chinese consumers' awareness of low-carbon tourism was relatively low.

Table 3-3 Basic Descriptive Statistics of Samples

Statistical Variables	Sample Number	Percentage	Statistical Variables	Sample Number	Percentage
Gender			**Individual monthly income**		
Male	346	58%	Less than 1500 yuan	54	9%
Female	254	42%	1500-2500 yuan	72	12%
Age			2501-4000 yuan	96	16%
18~21 years old	98	16%	4001-6000 yuan	456	26%
22~26 years old	101	17%	6001-9000 yuan	90	15%
27~35 years old	156	26%	9001-10000yuan	72	12%
36~45 years old	122	20%	Above 10000 yuan	60	10%
46`50 years old	78	13%	**Occupations**		
Over 51 years old	45	6%	General staff	12	12%
State of employment			Managers	66	11%
The employed	354	59%	Staff of institution and enterprise	54	9%
Students	192	32%	Entrepreneur	72	12%
Retirees	18	3%	Educational, health-care personnel and boffins	108	18%
The unemployed	36	6%	Self-employed individual	42	7%
Educational levels			Freelancer	36	6%
Elementary school or below	45	8%	Student	192	32%
Secondary school	18	3%	Retiree	18	3%
Vocational and ordinary high school	24	4%	**Common option of domestic travelling**		
Secondary specialized school and college	36	6%	Road trip	160	27%
University	330	55%	Car ride	126	21%
Postgraduate school or above	147	25%	Train ride	168	28%
Channels to deliver			Airplane ride	73	12%

information about low-carbon and environmental protection					
Newspaper and magazine	54	9%		54	9%
Television or radio	60	10%	Car-pooling boat trip	19	3%
Internet	240	40%	**Attitude towards supporting low-carbon tourism**		
Socia media, such as microblog, wechat and so on	174	29%		589	98%
Relatives and friends	72	12%	Agree Neutral	11	2%
Awareness of low-carbon tourism				0	0%
Completely understand	143	24%	Disagree No idea	0	0%
Understand somewhat	347	58%	**Main source of carbon emissions**		
Do not well understand	110	18%	Transport	189	32%
Low-carbon behavior willingness			Accommodation	142	24%
Willing	467	78%	Catering	137	23%
Uncertain	78	13%	Entertainment	65	11%
Unwilling	55	9%	Shopping	67	11%

3.4 Data Analysis Tools and Methods

In this study, the hypotheses were verified with SPSS27.0. Statistical analysis of structural equation models commonly involves the following steps: (a) Model setting. The prototype model was developed on the basis of the theory or previous research findings; (b) Model analysis. The appropriate regression model was used to estimate model parameters; (c) Model evaluation. Goodness of fit between the model and data points was calculated, and the model would be revised and reanalyzed when results verified that the model fitting was not reasonable. (Hair et al., 2010).

3.5 Hypothesis

The hypothesis of the comprehensive research is proposed as follows:

H1: Credibility in carbon labels has a significant impact on consumer intention.

H2: Credibility in carbon labels has a significant impact on consumer awareness.

H3: Awareness of carbon labelling has a significant impact on consumer intention.

H4: Awareness of carbon labelling has a significant impact on consumer behavior.

H5: Environmental awareness has a significant impact on consumer intention.

H6: Dissemination and education has a significant impact on environmental awareness.

H7: Dissemination and education has a significant impact on consumer intention.

H8: PBC has a significant impact on consumer intention.

H9: PBC has a significant impact on consumer behavior.

H10: Ecological value has a significant impact on consumer intention.

H11: Ecological value has a significant impact on consumer behavior.

H12: Consumer intention has a significant impact on consumer behavior.

3.6 Reliability and Validity Test

Cronbach Alpha value was used to evaluate the reliability of the scale (Fornell and Larcker, 1981). The validity of the scale mainly included two aspects: content validity and construction validity. When it comes to content validity, the questionnaire adopted the mature scale which was developed previously, and had been commonly used in related studies (see Table 4-1). Therefore, in this study, the construction validity was mainly evaluated by confirmatory factor analysis. At the same time, the convergence validity and discriminant validity of the scale were evaluated by standardized factor loading, composite reliability and average variance extracted (AVE) and other indicators (Hair et al., 2010).

Findings from Hair et al. (2010) showed that, when the Cronbach's alpha was greater than 0.7, the reliability of the scale was high. When the Cronbach's alpha was greater than 0.6, the scale was considered reliable. When the Cronbach's alpha was less than 0.5, the scale was not reasonably reliable, which indicated that the questionnaire structure needed to be modified. In the reliability test of the questionnaire, the indicator that the alpha value was greater than 0.6, was used to verify the reliability of each subscale and the overall questionnaire.

The results of reliability test (Table 4-1) showed that the Cronbach's alpha of the overall questionnaire was 0.833, indicating that the overall indicators were highly consistent. The average variance extracted of all vectors was above 0.5. The standardized factor load, combination reliability (CR) and mean variance extraction (AVE) of various variables are shown in Table 4-1.

Table 4-1 Results of Exploratory factor analysis (**EFA)**

Vectors	Items	Factor loading	CR	AVE
Credibility in Low-carbon Label	1. I consider products achieving carbon footprint label certification as low-carbon ones.	0.871	0.877	0.642
	2. I think the information issued by carbon labels is true and reliable.	0.721		
	3. I think products achieving carbon footprint label certification can be manufactured in accordance with the certification standards.	0.726		
	4. I think the carbon footprint label certification agency is highly credible.	0.874		
Awareness of Low-carbon Labelling	1. Do you understand the concept and meaning of carbon labelling?	0.740	0.762	0.517
	2. Are you aware of the carbon labelling system?	0.753		
	3. Do you know the difference between high-carbon and low-carbon products?	0.660		
Environmental Awareness	1. I have a high awareness of the hazards of a high-carbon lifestyle.	0.712	0.790	0.557
	2. I have the behavioral willingness of low-carbon in daily life.	0.759		
	3. I am greatly concerned about policy measures aiming at low-carbon environmental protection.	0.766		
Dissemination and Education	1. I am willing to participate in the awareness-raising campaigns on carbon labelling.	0.697	0.767	0.524
	2. I am willing to proactively outreach carbon labelling.	0.713		
	3. The information in the mass media on low carbon consumption puts an impact on my purchases.	0.760		
Perceived Behavioral Control	1. If there are products attached to carbon labels in the market, I think they are easily available in my community.	0.686	0.776	0.537
	2. I largely determine various purchasing items in my house.	0.807		
	3. If there are products attached to carbon labels in the market, I am confident that I will make the purchase next time, if it so wishes with regard to low-carbon products.	0.700		
Ecological Value	1. Human beings are obliged to save energy to protect the environment.	0.681	0.754	0.507
	2. Protecting the ecological environment is the common social responsibility.	0.672		
	3. In order to protect the environment, I can accept a certain level of inconvenience.	0.778		
Consumer Intention	1. I am willing to buy low-carbon products with the presently available resources.	0.833	0.882	0.651
	2. I will definitely choose to buy low-carbon products in the following days.	0.830		
	3. I will recommend low-carbon products to others.	0.748		
	4. I will actively promote low-carbon products.	0.814		
Consumer Behavior	1. I will choose to buy low-carbon products.	0.739	0.839	0.635
	2. I am willing to pay a "premium" for low-carbon products.	0.815		
	3. I will recommend others to buy low-carbon products.	0.834		

Chapter 4 Finding

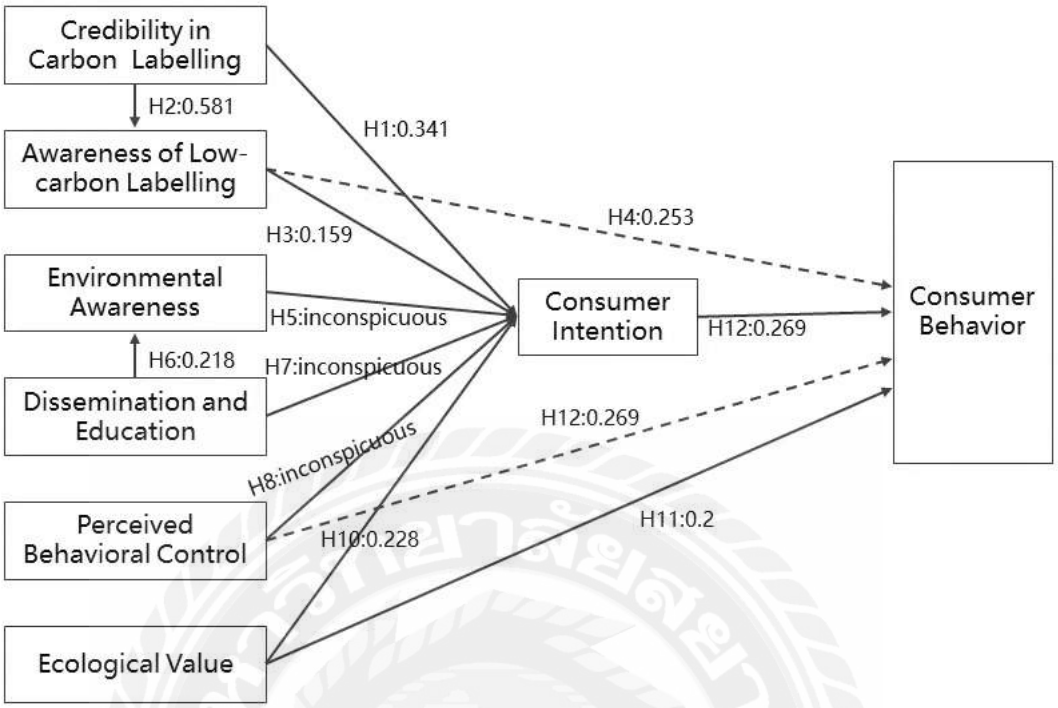
4.1 Path Analytics

To verify the proposed hypothesis, the mean centered values of manifest variables associated with six latent variables were measured respectively, namely, credibility in low-carbon, awareness of low-carbon labelling, environmental awareness, dissemination and education, consumer intention and consumer behavior. Multiple regression analysis was conducted with SPSS on the relation between dependent variables and independent variables, intermediary variables and independent variables, dependent variables and intermediary variables, and variables. There are twelve hypotheses to be verified, and the results are shown in Table 4-2.

Table 4-2 Statistical Significance of Low-carbon Consumer Behavioral Willingness Variables

Hypothetical Path	**Standardized Coefficient *β***	**Significance *P***	**Hypothetical Conclusion**
H1:credibility in carbon labelling →consumer intention	0.341	***	reasonable
H2:credibility in labelling →awareness of low-carbon labelling	0.581	***	reasonable
H3:awareness of low-carbon labelling →consumer intention	0.159	***	reasonable
H4:awareness of low-carbon labelling →consumer behavior	0.253	***	reasonable
H5:environmental awareness →consumer intention	-0.024	0.458	unresonable
H6:dissemination and education →environmental awareness	0.218	***	reasonable
H7:dissemination and education →consumer intention	0.051	0.153	unresonable
H8:perceived behavioral control →consumer intention	0.027	0.569	unresonable
H9:perceived behavioral control →consumer behavior	0.175	***	reasonable
H10:ecological value →consumer intention	0.228	***	reasonable
H11:ecological value →consumer behavior	0.200	***	reasonable
H12:consumer intention →consumer behavior	0.269	***	reasonable

*Note: ** indicates significant at p<0.05; *** indicates significant at p<0.001.*
Data was collated according to results of SPSS multiple regression analysis.



Finally, according to the regression coefficient and significance, the types of direct and indirect effects were judged. Table 4-3 lists the results.

Table 4-3 Direct, Indirect and Total Effect of Variables on Consumer Intention and Consumer Behavior

Variable	Direct Effect	Indirect Effect	Total Effect
credibility in carbon labelling →consumer intention	**0.341**	**0.095**	**0.433**
credibility in carbon labelling →awareness of low-carbon labelling	0.581	-	**0.581**
awareness of low-carbon labelling →consumer intention	0.159	-	0.159
awareness of low-carbon labelling →consumer behavior	**0.253**	**0.043**	**0.296**
dissemination and education →environmental awareness	0.218	-	0.218
perceived behavioral control →consumer behavior	0.175	-	0.175
ecological value →consumer intention	0.228	-	0.228
ecological value →consumer behavior	**0.200**	**0.061**	**0.261**
consumer intention →consumer behavior	0.269	-	**0.269**

*Note: * indicates significant at p<0.05; *** indicates significant at p<0.001.*
Data was collated according to data analysis results.

The results in Table 4-3 showed that credibility in carbon labelling was the antecedent variable of awareness of carbon labelling, and had a direct effect on it significantly. It indicated that individual trust in the carbon footprint label certification significantly influenced whether they would further raise their awareness of carbon labelling later. Credibility in carbon labelling imposed direct and indirect effect on consumers' intention to go travelling, both of which were significant, and the total effect was the strongest (0.433). Awareness of carbon labelling indirectly influenced consumer behavior through consumer intention, and the overall effect was stronger (0.296). Ecological value had a significant effect on both consumer intention and consumer behavior, especially affected consumer behavior directly and indirectly, and the total effect was obvious (0.261). Dissemination and education was the antecedent variable of environmental awareness, and influenced its formation to a extent. PBC also had a significant impact on consumer behavior.

4.2 Test of Demographic Differences in various low-carbon behaviors

In this study, there were four dimensions of gender, age, education background and personal monthly income to conduct independent sample T-test on various low-carbon consumer behaviors and its determinants (see Table 4-4).

Table 4-4 Results of Independent Samples T-test of Demographic Differences

Variables	**Male**		**Female**		t	Sig.2-tailed
	Mean	Std. Deviation	Mean	Std. Deviation		
Consumer intention	5.9557	1.0564	6.2854	0.7533	-4.245	.000**
Consumer behavior	6.4265	0.6878	6.5732	0.5618	-2.785	.006**
Variables	**Under 26 years old**		**Over 27 years old**		t	Sig.2-tailed
	Mean	Std. Deviation	Mean	Std. Deviation		
Consumer intention	5.523	1.0524	6.455	0.6306	11.516	0.000**
Consumer behavior	6.278	0.6929	6.627	0.5488	6.200	0.000**
Variables	**Education Level of College or below**		**Education Level of University or above**		t	Sig.2-tailed
	Mean	Std. Deviation	Mean	Std. Deviation		
Consumer intention	6.145	0.9093	6.162	0.9018	0.113	0.910
Consumer behavior	6.506	0.6226	6.595	0.6143	0.843	0.400

Variables	Individual Monthly Income of under 6000 yuan		Individual Monthly Income of over 6000 yuan		t	Sig.2-tailed
	Mean	Std. Deviation	Mean	Std. Deviation		
Consumer intention	6.1700	0.9043	6.1047	0.9153	-0.849	0.396
Consumer behavior	6.5520	0.5492	6.4414	0.7254	-1.965	0.050 **

*Note: ** indicates significant at p<0.05; *** indicates significant at p<0.001.*
Data was collated according to data analysis results.

According to results of the independent sample T-test (see Table 4-4), in terms of low-carbon intention and low-carbon behavior, male and female were significantly different from each other. Moreover, there was a significant difference between the consumer group under 26 years old and the group over 27 years old, in that the latter group performed better. But there is no significant difference between consumers with the educational level of college or below and those with the level of university or above. Besides, for consumers with monthly personal income of under 6000 yuan, and those over 6000 yuan, there was a significant difference between them in the aspect of low-carbon behavior, in that the lower income group performed better, while they were not significantly different in terms of low carbon intention.

4.3 Analysis of Model Results

In this study, the TPB theory and the VBN theory were integrated into the analysis on low-carbon tourism consumer behavior, which enhanced interpretability and predictability of the TPB theory, and revealed how low-carbon labelling worked on tourists' low-carbon intention and behavior. There were some findings in the structural equation model analysis, as follows:

H1: The higher consumers' credibility in carbon labelling is, the stronger their intention of low-carbon tourism is (beta =0.341, p<0.001). So H1 is reasonable.

H2: The higher consumers' credibility in carbon labelling is, the stronger their awareness of low-carbon tourism labelling is (beta=0.581, p<0.001). So H2 is reasonable.

H3: The higher consumer's awareness of low-carbon tourism labelling is, the stronger their intention of low-carbon tourism is (beta=0.159, p<0.001). So H3 is reasonable.

H4: The higher the consumer's awareness of carbon labelling is, the better their behaviors towards low-carbon tourism are (beta=0.253, p<0.001). So H4 is reasonable.

H5: The stronger the consumers' environmental awareness is, the stronger their intention of low-carbon tourism is (beta=-0.024, p=0.458). Therefore, H5 is unreasonable.

H6: The more accesses to dissemination and education consumers get, the higher their environmental awareness is (beta=0.218, p<0.001). So H6 is reasonable.

H7: The more accesses to dissemination and education consumers get, the stronger their intention of low-carbon tourism are (beta=0.051, p=0.153). Therefore, H7 is unreasonable.

H8: The more PBC consumers feel, the stronger their intentions of low-carbon tourism are (beta=0.027, p=0.569). Therefore, H8 is unreasonable.

H9: The more PBC consumers feel, the better their behaviors towards low-carbon tourism are (beta=0.175, p<0.001). So H9 is reasonable.

H10: The stronger consumers' ecological value is, the stronger their intention of low-carbon tourism is (beta=0.228, p<0.001). So H10 is reasonable.

H11: The stronger the ecological value of consumers is, the better their behaviors towards low-carbon tourism are (beta=0.2, p<0.001). Therefore, H11 is reasonable.

H12: The stronger their intention is, the better their behaviors are (beta=0.269, p<0.001). So H12 is reasonable.

Chapter 5 Conclusion and Recommendation

5.1 Conclusion

This study focuses on the influence mechanism of carbon labelling on low-carbon consumption behavior. Firstly, based on literature review, comparative study and theoretical review, a theoretical model of the influence path of carbon labelling on low-carbon consumption behavior was developed. Then questionnaire survey was used to collect data and information to verify the theoretical model. Finally, problems in low-carbon tourism behaviors of consumers in China's Henan Province were summarized. and policy recommendations were proposed for the local government on application and promotion of carbon labelling.

5.1.1 Status analysis

Tourists in China's Henan province suffer from a lack of environmental awareness, local dissemination and education is underdeveloped, and there is a large gap in low-carbon tourism intention between local tourists and those from developed countries. Most local rural residents have heard of the concept of low-carbon consumption and global warming, while a handful of them better understand the connotation of low-carbon consumption as well as the harms of global warming.

Secondly, credibility in low-carbon labelling, awareness of low-carbon labelling and ecological values exert a significant influence on consumers' intention and behavior. However, the field research findings show it clear that consumers’ low awareness of low-carbon labelling and their low trust in it, impact their final decision on low-carbon behavior. At present, the absence of agreed criteria of low-carbon labelling in China, resulting in information asymmetry, gives rise to consumers' little trust in low-carbon label products and services.

Thirdly the research findings on ecological values make it clear that the majority of tourists in China's Henan Province have a preference for products providing mental pleasure and physical comfort. There is dissipation and waste in consumption, that is to say, the consumption is non-sustainable and excessive. Besides, there are unhealthy patterns of consumerism, such as face-saving or flamboyant consumption, at the expense of massive energy consumption and significant GHG emissions. Tourists are indifferent about low carbon and make high-energy consumption.

In addition, when it comes to the development and management of low-carbon tourism products, scenic spots put a high value on the economical benefits, but

present deficiencies about the protection of the ecological environment of scenic spots.

5.1.2 Influencing factor

The study involves six independent variables: credibility in low-carbon labelling, awareness of low-carbon labelling, environmental awareness, dissemination, and education, perceived behavioral control and ecological value, as well as two dependent variables: consumer intention and consumer behavior. The analysis results indicated that five factors had a significant effect on the low-carbon consumption behavior among tourists in China's Henan Province, namely credibility in low-carbon labelling, awareness of low-carbon labelling, ecological value, perceived behavioral control and consumer intentions. Consumers' credibility in low-carbon labelling exerted the strongest impact on the low-carbon tourism intentions and behavior. Both ecological value and low-carbon tourism intention had a greater effect on the low-carbon tourism behavior. Besides, perceived behavioral control has the minimal impact on low-carbon tourism behavior. Moreover, the effect of credibility in low-carbon labelling on low-carbon tourism intention was significant and greater. Such conclusion proved that the TPB theory and the VBN theory provided an effective guidance for the relevant research on consumers' alterations in the behavior, and indicated that consumer behavior was the consequence of a combination of individual internal factors and social external factors.

5.1.3 Recommendations

1. There is a need for local governments to raise the public's awareness of low-carbon, and enhance their knowledge of low-carbon tourism consumption.

First, in order to facilitate tourism consumers' overall comprehension of the concept and related policies of low-carbon tourism consumption, the government need to initiate large-scale information campaigns to educate and engage general public to recognize the connotation and significance of low-carbon labelling and low-carbon consumption, so that consumers truly understand carbon labelling and realize its role and function. It helps facilitate consumers to accept carbon labelling, and instill low carbon values, pushing for transformation into environmentally friendly consumption habits. Secondly, in the era of digital media, in addition to the traditional channels of communication, it is practicable to introduce the emerging media such as the Internet and mobile phones, catering to the target consumers. Thirdly, it is necessary to link tourists' daily life to the concept of low-carbon tourism, and take advantage of hot issues and tipping points to capture tourists' interest.

Fourthly, sectors related to scenic spots need to implement educational and training activities to carry forward low-carbon labelling popularization for the staff at scenic spots, catering and hotel staff in the neighbouring areas and residents, so that the relevant individuals raise the low carbon environmental awareness, and serve as both champions and practitioner of low carbon tourism. Thus tourists develop good travelling behavior.

2. There is a need to advocate low-carbon tourism consumption and steer low-carbon tourism behavior.

First, it is necessary to steer tourists to the positive attitudes towards consumption, to push for the universal consensus on low carbon consumption. To this end, it is proposed to take advantage of media, for instance, TV, radio, newspapers, digital signages, billboards, to widely publicize the far-reaching significance of energy saving, emissions reduction, and low-carbon consumption, actively create a positive climate in public opinion, and steer residents to moderate and low-carbon consumption. Secondly, classroom education and family education need to be facilitated to shape the low-carbon outlook. Thirdly, it is necessary to eliminate the misperceptions on consumption, such as pursuing for personal convenience, extravagance and paying for face-saving and so on. A paradigm shift from traditional high-carbon model to a low-carbon one is strongly promoted on all sides of daily life, covering clothing, food, accommodation, transport and daily use, to promote healthy and low-carbon lifestyles and habits. For example, it becomes involved on a daily basis in life and consumption to contribute to reduction of resource consumption and carbon emissions, turning off lights before you leave, walk-to-work, less frequently taking elevators, buying low-emission cars, using reusable shopping bags, recycling textbooks and waste, to name but a few. This can raise the awareness of environmental protection, thus effectively spurring the intention for low-carbon consumption, and indirectly steer consumers to low-carbon behavior.

3. There is a need to foster the establishment of carbon footprint label certification system and enhance the implementation of the low-carbon system policies.

First, pilot sites will be selected to promote carbon labelling. In China, it is not feasible to carry out carbon footprint label certification nationwide, but a mixed approach of carbon footprint labelling and carbon labelling can be adopted for domestic products, by learning from practices in Thailand, South Korea and Hong Kong. Carbon footprint labelling can be piloted in specific sectors, such as food,

beverage, and other consumption sectors, to steer consumers to low-carbon consumption. Secondly, the carbon footprint label certification agencies will be confirmed, and information of low-carbon labels will be normative. Seeing that China is embarking on introducing low-carbon labelling, the government needs to establish and improve relevant laws and regulations and management system in the early deployment of low-carbon labelling, confirm the carbon footprint label certification agency. Besides, the government need to safeguard against the possible misuse of carbon labels, excessive even false hype promoted by enterprises, and preserve the image and credibility of carbon labelling in the eyes of consumers. Thirdly, it is necessary to establish the low-carbon tourism criteria, introduce the evaluation system of low-carbon in tourism sectors, assort assessment indicators and supervision mechanism of low-carbon tourism environment, strengthen the assessment and management of low-carbon tourism scenic spots and related enterprises.

4. There is a need for enterprises to shoulder low-carbon environmental protection responsibilities and map out scientific programs of low-carbon tourism modes.

First, tourism enterprises need to live up to their social responsibilities and become the key players in promoting low-carbon labelling and encouraging low-carbon consumers. Vehicles that fail to meet China's environmental protection standards will be strictly banned or severely restricted into the scenic spots. Besides, scenic spots should make available environment-friendly vehicles for sightseeing tour. Moreover, it is necessary to better manage the number of visitors. Especially on golden week in tourist season, it is supposed that all visits are by appointment only, and the number of visitors is limited. There is a call for waste recycling and toting your own eating implements. What is more, it is ought to bring together resources in the scenic spot, such as stores, hiking trails, to carry out low-carbon campaigns. for instance, planting memorial tree for low-carbon. Hotels in tourist attractions can actively implement low carbon standards, giving priority to environmental protection, low carbon and green style. Secondly, local and tailored programmed are preferred in terms of low-carbon consumption, and it is better to steer tourists to low-carbon consumption in regional contexts, even though there has been a certain successful case of low-carbon tourism in and out of China. Thirdly, the sound guidance and the replicable models are to be implemented. Fourthly, it is required to make detailed analysis on the low-carbon consumption market, and dig for the key customer groups of low-carbon consumption. Tourism enterprises ought to actively promote and apply

new technologies, materials and new technological skills regarding energy saving and emission reduction, comprehensively improve the level of energy saving and emissions reduction, constantly develop new low-carbon products, and continually reduce the price of low-carbon products.

5.2 Research Prospect

Overall, the expected research objectives have been achieved, concrete innovative research results have been delivered, and conclusions are of great theoretical value and practical significance. However, given the limited funds, time available and energy, there are weaknesses in the following four aspects: There is insufficient information presented on the survey areas. The survey was conducted in China's Henan Province, failing to investigate the low-carbon tourism behaviors of consumers in other scenic spots in China; There is insufficient information presented on survey target areas. The survey areas here are all 5A scenic spots in China's Henan Province, not involving scenic spots at various levels in China's Henan Province. Due to the limitation in the time available, the survey data was collected from July to September 2021, and then the research group collated and analyzed the collected information and data, without dynamic follow-up survey of the research objectives. There is insufficient information presented on the survey objectives. The survey is targeted at consumers, not involving upstream enterprises, and fails to make investigate on the impact of low-carbon label manufacturers on promoting the consumption of low-carbon products. But it is precisely that these insufficiencies may provide opportunities for follow-up studies. If the subsequent researchers keep a watchful eye on these aspects, there is a potential to enrich and develop studies related to the leading role of carbon labelling to low-carbon consumption behavior, to provide energetic support for the promotion of carbon labelling and the advancement in environment protection.

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