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Research Article

To Establish and Inspect the Index of Low Carbon Management for Taiwan Leisure Industry- A Case Study on Pushin Ranch in Taiwan

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Abstract

Nowadays, the mainstream value is low-carbon society. Moving toward the goal of a low-carbon society is the beginning of facing the issue of global warming. According to the statistics from the National Energy Conference (2013) [1], the carbon emission had increased by 200.5% from 1973 to 2011 in Taiwan. The average annual growth rate is 5.8%. To analyze these statistics before and after the Kyoto Protocol was established, it is found that the growth rate of carbon emission from 1990 to 1997 is 59.6% with the annual growth rate being 6.9%, while the growth rate of carbon emission from 1998 to 2005 is 36.3% with the annual growth rate being 4.5%. This paper using the Pushin Ranch as a case study, empirically exams an evaluation index system for low- carbon tourism. It is hoped that studies can offer the tourism industry some references and indexes to follow and further explore.

Keywords: Delphi Method; Low-Carbon; Questionnaire Interviews with Experts

Introduction and Literature Review

The system of two days off every other weekend was implemented in 1998, and the five-day workweek system in 2001. Hot topics such as energy saving, renewable energy source, green building, and eco-friendly electric equipment have been very common in our daily life. And renewable energy is a type of endless energy which can be recycled in a sustainable way [2]. The environment where people live requires the low- carbon economy, which is an important advance in the history of mankind [3]. According to the statistics by the World Travel Organization (WTO, 2000), it was estimated that there would be 16.02 billion-person times traveling in 2020 around the world. The energy and resource waste thus caused could be very huge. And the tourist carbon emission would increase rapidly. Simpson et al. (2008) [4] indicated that the current trend of the global tourist industry can be changed and improved if individual tourists can choose programs offered by travel agencies which can achieve sustainable development, destinations, eco-friendly transportation, accommodations with environmental certifications, and local or organic foods in restaurants. There is evidence that the 'indirect' carbon requirements of tourism can be significant [5]. This study aimed to explore the current status of the low-carbon society and the leisure industry and to build evaluation indicators for low-carbon travels, with Pushin Ranch as an example for verification. The research motivation and the importance are described in the research purposes below:

- To explore the current status of the low-carbon society and the leisure industry;
- To build low-carbon evaluation indicators using the Delphi method based on the opinions from experts, as the reference for the related industries in planning and educational promotion and for the leisure industry in low-carbon applications; and
- To perform an empirical research on the evaluation of the low-carbon indicators using Pushin Ranch as an example

Research Methodology

Using the Delphi Method

The Delphi research is normally used as a forecasting tool because it can generate opinions and arrive at group consents on complicated issues and problems, which also has known as expert investigation which solved problems by summarizing the advice of expert consultant which each expert consultant got the questionnaires separately and independently.

Organizing these consolidated and convergent opinions and feedback for the problem from consulted experts and sent these feedback and opinions to these consulted experts. Each expert will modify their original opinions based on comprehensive advice, and then aggregated. So again, and again, and gradually get more consistent approach to make decisions and predictions. The Delphi method implementation steps: The research steps shall be implemented as follows (See Figure 1) :

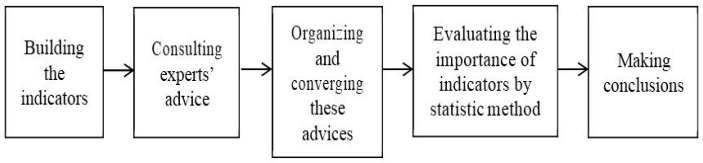

Figure 1: The research steps shall be implemented the evaluation of statistic method as following.

1. The mean value of the evaluations of all experts to the indicators (The greater mean value is referring to greater related importance)
2. The average standard deviation degree of the evaluations of all experts to the indicators. (The smaller value stands for more aggregated)

Furthermore, the research is aimed at obtaining Delphi expert views on the issue of consensus, according to Todd & Reece (1898) [6] that the importance of each question collars all the experts selected 4 and 5 of the total proportion of more than 75%, should be the problem has reached the consistency deemed importance. Based on the above, the approach taken in this study statistical averages to determine the importance of the indicators, and secondly, the use of standard deviation to determine the expert opinion of the discrete case, and delete each question based on the title of the circle but important the extent of the total proportion of all the experts' 4 and 5 of the 75% or less.

The Research on Low-Carbon Evaluation Index System for Tourist Attractions

The Index System

Low-carbon tourism can be explained as a new economic development pattern that is guided by the concept of sustainable development, which reduces energy consumption and the emission of greenhouse gas. The core value of low-carbon tourism is reducing energy consumption and emissions. The way to choose the tourist destination has begun to take seriously. The evaluation in seeking to achieve the goal of low-carbon tourism: eco-environment, tourist facilities, management systems and participation attitudes.

A low-carbon evaluation index system for tourist attractions

We selected the 40 evaluations indexes in accordance with the closeness of the index to our own research, the reliability of the results reported in relative literatures and suitability of the evaluation for Delphi.

Screening the Low-Carbon Evaluation Indexes for Scenic Areas

Delphi Method

Through literature review, this study selected some low-carbon indicators. Then, the experts' and scholars' opinions regarding the low-carbon indicators in the leisure industry were integrated using the Delphi method. Lastly, Pushin Ranch was used as an example to review the low-carbon management in the leisure industry and proposed some management issues. Thus, the chapter of the research methods of this study contains 3 parts: research steps, research design, and data processing. According to the literature review, this study found that there had already been a complete set of ecological indicators for tourism in foreign places where ecological tourism was well-developed. Thus, this study discussed the ecological tourism related indicators based on the literature and selected the indicators for the low-carbon tourist industry, including indicators from four aspects: the environmental resource aspect, the management organization aspect, the tourist aspect, and the social cooperation aspects. In Zo's study (2000) [7] the Core Indicators of Sustainable Tourism proposed by the World Tourism Organization (WTO) were used as the indicators to evaluate sustainable management in tourist areas.

Questionnaire Design

The First Round

The first round is to design an unstructured questionnaire. We asked to scholars' and experts' opinions and let them evaluate the index which was relevant to low-carbon tourist attractions. And these experts will provide feedback and suggestions; we collected these feedbacks to create the questionnaires for the second round.

The Second Round

The second round is to design a structured questionnaire based on literature review results and the reports from those experts. We filtered these unsuitable indexes by selection rates of less than 60% and sort the rest of index as "very important", "relatively important", and "General", "unimportant and not important". And a new index system was established.

Analysis of the Weights of the Low-Carbon Evaluation Indexes for Scenic Areas

Regarding the responses to the items of the first-round questionnaire, 5 represented the most important item, while 1 represented the least important one. The average score of every item was calculated. The items of rather low importance (average < 4) were removed. Then the items suggested by the experts to

be included through the first-round questionnaire were added to create the second-round questionnaire. The statistical results of the first round were also included in the second-round questionnaire in the forms of modes and means, in hopes that experts and scholars could reference all the answers from the first round and answer the second-round questionnaire based on their own knowledge, experiences, and views. Furthermore, the strategies suggested to be added in the first-round questionnaire were included in the second-round questionnaire for experts and scholars to decide their importance. The stability of the experts' opinions was based on the two rounds of questionnaire surveys. The means of two surveys were tested using a statistical method. If the means of an item were not significantly different, that item was considered stable with the experts' opinions. The samples used for the two rounds of Delphi questionnaire surveys of this study were the same. Thus, to test the stability of the questionnaire items, paired t-test was applied to compare the means of the two surveys.

The statistical software package used to perform the paired t-tests in this study was SPSS 12.0. The results of the paired t-tests are summarized in Table 1, where mean difference represents the difference between two paired means. The significance under t-test is the paired p-value, which can also be used to determine significance. When p-value < 0.05, it means the means of the two paired samples were significantly different, and when p- value > 0.05, it means the difference was not significant. According to the results summarized in (Table 1, Table 2, and Table 3), all the p-values were higher than 0.05, meaning the means between the two paired samples were not significantly different. In other words, the opinions of the two surveys were stable.

Organization management operation construct	**test results**			
Facility regulation	**t**	**Significance (two-tailed)**	**95% CI lower bound**	**95% CI upper bound**
maintaining original scenery while avoiding implementing too many infrastructures	-0.608	0.549	-0.67639	0.3687
using existing facilities to reconstruct if possible while avoiding redevelopment	0.374	0.712	-0.34809	0.50194
implementing constructions using ecological construction methods if possible	0.383	0.705	-0.33809	0.49194
designing scenery which can be integrated with local natural environment	0	1	-0.42004	0.42004
using local plants	0	1	-0.44905	0.44905
avoiding implementing too many artificial recreational facilities	0	1	-0.66098	0.66098
using on-the-spot materials to create recreational facilities blended into the nature	0.378	0.709	-0.34312	0.49697
safety principles for designing and constructing recreational facilities	0.48	0.635	-0.25357	0.40741
using government-certified and non-toxic agricultural products if possible	-0.306	0.762	-0.59544	0.44159
purchasing products with an environmental protection mark	0	1	-0.42004	0.42004
purchasing in-season materials, reducing low-temperature storage costs	0.397	0.695	-0.32262	0.47646
proper logistic management, reducing scrap rate of expired products	0.383	0.705	-0.33809	0.49194

proper disposal wastes (self-disposal or commissioned disposal)	-0.306	0.762	-0.59544	0.44159
using two-stage low-flow toilets	-0.319	0.753	-0.57477	0.42092
using energy-saving electric equipment	0.306	0.762	-0.44159	59544
using natural ventilation to reduce energy waste through air conditioning	0	1	-0.55755	0.55755
fully utilizing local energy (solar energy, wind power, and water power)	0	1	-0.72754	0.72754
completely classifying garbage	0	1	-0.51035	0.51035
percentage of kitchen waste utilization	0	1	-0.48502	0.48502
using shower instead of bath in a tub	0	1	-0.61488	0.61488
whether the concept of environmental protection is considered when providing foods and accommodations	0	1	-0.48502	0.48502
whether the concept of environmental protection is included in the management ideals when providing foods and accommodations Total bearing capacity control	0	1	-0.40992	0.40992
total capacity control design	0.617	0.543	-0.3606	0.66829
application of tourist carrying capacity control	0	1	-0.51851	0.51851
adjusting carrying capacity control flexibly according to environmental condition Emphasis on environmental education	0	1	-0.66098	0.66098
providing customer information regarding water saving and energy saving	0	1	-0.57242	0.57242
encouraging customers not to change bed sheet and towel every day	0	1	-0.61488	0.61488
providing a proper amount of individual cleaning supplies to reduce waste	-0.661	0.515	-0.63452	0.32683
asking customers to classify their garbage and recycle useful resources	0	1	-0.39954	0.39954
offering education regarding low-carbon environmental protection	-0.322	0.751	-0.57053	0.41669

Table 1: The results of the t-tests of the organization management operation construct.

Ecological tourism construct	Test result			
Low-carbon tourism experience	**t**	**Significance(two-tailed)**	**95% CI Lower bound**	**95% CI upper bound**
tourists receiving environmental education regarding low-carbon tourism	0	1	-0.39954	0.39954
tourists understanding the spirit of low-carbon tourism	0	1	-0.44905	0.44905
journey designed to allow tourists to experience the features of low-carbon tourism	0	1	-0.42004	0.42004
percentage of low-carbon ecological experience journey (time) in the whole trip	0	1	-0.61488	0.61488
tourists' satisfaction with the low-carbon natural tour experience	0	1	-0.58692	0.58692
whether the trip allows tourists to experience the importance of environmental sustainability	0	1	-0.44905	0.44905
whether the tour can present ecological features and local natural values	0	1	-0.42004	0.42004
designing special activities for tourists to experience	-0.34	0.737	-0.5443	0.39046

Table 2: The results of the t-tests of the ecological tourism construct.

Social cooperation construct	Test result			
Community development	**t**	**Significance(two-tailed)**	**95% CI Lower bound**	**95% CI upper bound**
cooperation with local industries on low-carbon issues	0	1	-0.33049	0.33049
participation in low-carbon issues of community development association	0	1	-0.39954	0.39954
provision of cooperation of economic effect on low-carbon issues	0	1	-0.55755	0.55755
applications and extensions of community industries and developments	0	1	-0.39954	0.39954

Table 3: The results of the t-tests of the social cooperation construct.

Low-Carbon Evaluation of Pushin-the Low Carbon Tour Attraction

In the recent years, the missions of Pushin ranch has been set to energy saving and carbon reduction and protecting the environment conveniently. In the aspect of the tree planning for Pushin Ranch, since the afforestation in the Ranch in 1983, the woods in the Ranch have been mainly acacia confuse with some camphor trees, swamp pines, beefwoods, kapok, Chinese fan palms, and banyans. And the forage grass planted is mainly pangola grass and Chinese pennisetum. It is estimated that there are over 700 types of plants in the whole Ranch. The major transportation method is by bicycles or electric vehicles.

Furthermore, in the accommodation area and the restaurant, tourists are encouraged to bring their own washing appliance and use recycled tableware. All the toilets are installed with a two-phase water-saving device. As for the overall equipment of the Ranch, lamps are being replaced one by one with power-saving bulbs. Regarding the recycling and waste disposal mechanisms, there is a volunteer team in Pushin Ranch in charge of the recycling operation and disposing wastes such as kitchen waste approved by the government.

Pushin ranch is divided into four areas, respectively, Ecological area, Camping and Barbecue area, landscaped garden area, Accommodation and Catering area. There are Butterfly Pavilion, Beetle restoration, dairy exhibition and aquatic area in ecological area. It provides the site for camping and barbecue in Camping and Barbecue area. In the landscaped garden area, there are Continental Garden, Japanese Garden, old Banyan tunnel, Valentine Road and Chun-Chin Lake…..so on different styles of landscape design.

Accommodation and Catering area, Pushin ranch also offers Chinese, Western, and fast food, and offers chalet in residential areas, Holland Village and the Mediterranean room lodging house. Pushin Ranch is a well-known ranch in Taiwan. In the recent years, the whole conglomerate has been working toward energy saving and carbon reduction and starting to protect the environment from small places. Under these enterprise cultural missions and the social responsibility of public welfare, Pushin Ranch has also been moving toward this direction. In addition, the research result was applied to tours to improve tourists'low carbon related knowledge and awareness, to increase tourists' willingness to choose low-carbon tours [8].

In the residential area and restaurant, Pushin ranch encouraged tourist to bring their own reusable tableware and toiletries. Pushin ranch also takes two-stage water-saving devices to save water, and it is undergoing to change the incandescent light bulbs of illumination equipments to energy saving light bulbs. Pushin ranch cooperates with Tzu-Chi for resources recycling and it also get the approval of government to execute the treatment of waste disposal. In the sum up of these conditions, Pushin ranch is considered as a very good the low carbon attraction.

With the benefits of tourist administration, tourism enterprises, tourism attractions, and tourists taken into consideration, some sustainable development countermeasures of the tourism industry are discussed, for the purpose of, with energy saving and emission reduction, achieving better quality of tourism experiences and higher economic, social, and environmental benefits [9]. The evaluation structure of Lin's (2002) [10] indicator system was mainly based on the structure designed by Ross and Wall in 1999 to evaluate ecological spots. Lin's study considered 3 evaluation element, tourism, local resident (local community), and resource, with 6 relationships between them. In the first level, the 6 indicator relationships were used as constructs (See Figure 2).

In the second level, the economic, social, and environmental aspects in each relationship were measured, in hopes of obtaining the sustainable development conditions in these 3 aspects in tourist areas. In the third level, the checklist method was adopted. And several domestic and foreign studies were referenced to summarize 68 important evaluation indicators. This study selected some related ones from these indicators as the evaluation indicators for the first expert questionnaire.

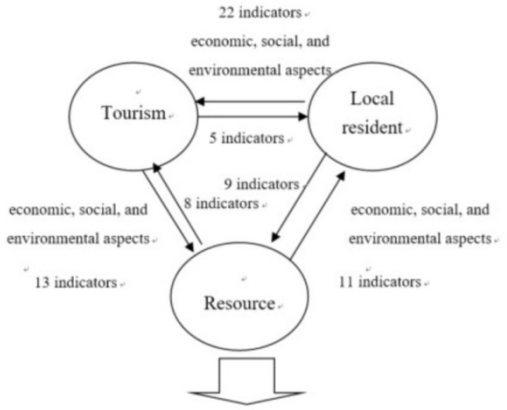

Figure 2: The 3 elements of ecological tourism Data source [10].

Suggestions Regarding the Protection of Pushin Ranch in Terms of Carbon Emissions

In this section, this study selected the important strategies for the low-carbon indicators in the leisure industry based on the results from the Delphi questionnaire survey. According to the statistical analyses above, the items on which the experts' opinions were not consistent were deleted. Only those the experts believed were important in developing tourism were kept. In addition, based on the low-carbon indicators of this study, the importance of the remaining strategies of the constructs was analyzed.

Analyses of the Organization Management Construct

Under the organization management construct, there were 22 indicators under facility regulations: maintaining original scenery while avoiding implementing too many infrastructures, using existing facilities to reconstruct if possible while avoiding redevelopment, implementing constructions using ecological construction methods if possible, designing scenery which can be integrated with local natural environment, using local plants, avoiding implementing too many artificial recreational facilities, using on- the-spot materials to create recreational facilities blended into the nature, safety principles for designing and constructing recreational facilities, using government-certified and non- toxic agricultural products if possible, purchasing products

with an environmental protection mark, purchasing in-season materials, reducing low-temperature storage costs, proper logistic management, reducing scrap rate of expired products, proper disposal wastes (self-disposal or commissioned disposal), using two-stage low-flow toilets, using energy-saving electric equipment, using natural ventilation to reduce energy waste through air conditioning, fully utilizing local energy (solar energy, wind power, and water power), completely classifying garbage, percentage of kitchen waste utilization, using shower instead of bath in a tub, whether the concept of environmental protection is considered when providing foods and accommodations, and whether the concept of environmental protection is included in the management ideals when providing foods and accommodations. Those with the average under 4 were deleted. A total of 20 indicators converged, among which, safety principles for designing and constructing recreational facilities had the highest tendency. The result showed that the scholars from various fields all believed that among all the low-carbon indicators in the leisure industry safety principles for designing and constructing recreational facilities was the most important one. Implementing this indicator in the leisure industry required cooperation between government units and experts and scholars.

Under the organization management construct, there were 3 total bearing capacity control indicators: total capacity control design, application of tourist carrying capacity control, and adjusting carrying capacity control flexibly according to environmental condition. The averages of all these indicators were over 4.

Under the emphasis on environmental education construct, there were 5 indicators: providing customer information regarding water saving and energy saving, encouraging customers not to change bed sheet and towel every day, providing a proper amount of individual cleaning supplies to reduce waste, asking customers to classify their garbage and recycle useful resources, and offering education regarding low-carbon environmental protection. The average of encouraging customers not to change bed sheet and towel every day was under 4. Thus, this indicator was deleted. There were 4 indicators left.

Construct	Operational indicator	Item	Mean	Rank
		safety principles for designing and constructing recreational facilities	4.892	1
		proper logistic management, reducing scrap rate of expired products	4.651	2
		using on-the-spot materials to create recreational facilities blended into the nature	4.567	3
		fully utilizing local energy (solar energy, wind power, and water power)	4.541	4
		purchasing products with a environmental protection mark	4.541	5
		using government-certified and non-toxic agricultural products if possible	4.518	6
		designing scenery which can be integrated with local natural environment	4.463	7
		using energy-saving electric equipment	4.384	8
Organization management construct	Facility regulation	whether the concept of environmental protection is included in the management ideals when providing foods and accommodations	4.384	9
	REDECE	using existing facilities to reconstruct if possible while avoiding redevelopment	4.375	10
	REUSE	proper disposal wastes (self-disposal or commissioned disposal)	4.371	11
	RECYCLE	purchasing in-season materials, reducing low-temperature storage costs	4.371	12
		maintaining original scenery while avoiding implementing too many infrastructures	4.357	13
		completely classifying garbage	4.308	14
		whether the concept of environmental protection is considered when providing foods and accommodations	4.231	15
		percentage of kitchen waste utilization	4.221	16
		using two-stage low-flow toilets	4.213	17
		using local plants	4.157	18

		using natural ventilation to reduce energy waste through air conditioning	4.102	19
	Total bearing	total capacity control design	4.152	1
	capacity control	application of tourist carrying capacity control	4.013	2
		adjusting carrying capacity control flexibly according to environmental condition	4	3
	Emphasis on environmental education	providing a proper amount of individual cleaning supplies to reduce waste	4.125	1
		asking customers to classify their garbage and recycle useful resources	4.021	2
		providing customer information regarding water saving and energy saving	4	3
		offering education regarding low-carbon environmental protection	4	4
Ecological tourism construct	**Low-carbon tourism experience**	whether the tour can present ecological features and local natural values	4.871	1
		percentage of low-carbon ecological experience journey (time) in the whole trip	4.51	2
		journey designed to allow tourists to experience the features of low-carbon tourism	4.254	3
		whether the trip allows tourists to experience the importance of environmental sustainability	4.214	4
		tourists understanding the spirit of low-carbon tourism	4.213	5
Social cooperation construct	**Community development**	designing special activities for tourists to experience	4.021	6
		provision of cooperation of economic effect on low-carbon issues	4.314	1
		cooperation with local industries on low-carbon issues	4.214	3
		participation in low-carbon issues of community development association	4.014	3
		applications and extensions of community industries and developments	4.001	4

Table 4: The low-carbon indicators in the leisure industry ranked by importance.

Analyses of the Ecological Tourism Construct

Under low-carbon tourism experience there were 8 indicators: tourists receiving environmental education regarding low-carbon tourism, tourists understanding the spirit of low-carbon tourism, journey designed to allow tourists to experience the features of low-carbon tourism, percentage of low-carbon ecological experience journey (time) in the whole trip, tourists' satisfaction with the low-carbon / natural tour experience, whether the trip allows tourists to experience the importance of environmental sustainability, whether the tour can present ecological features and local natural values and designing special activities for tourists to experience. Among these indicators, the averages of tourists receiving environmental education regarding low-carbon tourism and percentage of low-carbon ecological experience journey (time) in the whole trip were under 4. Thus, these two indicators were deleted. There was a total of 6 indicators left.

Analyses of the Social Cooperation Construct

There were 4 community development indicators: cooperation with local industries on low-carbon issues, participation in low-carbon issues of community development association, provision of cooperation of economic effect on low-carbon issues, and applications and extensions of community industries and developments. The averages of all these indicators were over 4.

Summary

In this section, the strategies under all constructs were ranked by their importance in Table 4. The table shows the importance obtained from the expert questionnaire survey categorized by construct. Under facility regulation, safety principles for designing and constructing recreational facilities was the most important indicator, as well as the one of the highest importance among all

the constructs, followed by proper logistic management, reducing scrap rate of expired products and using on-the-spot materials to create recreational facilities blended into the nature. Under total bearing capacity control, the indicator with the highest importance was total capacity control design, followed by application of tourist carrying capacity control and adjusting carrying capacity control flexibly according to environmental condition. Under emphasis on environmental education, the indicator with the highest importance was providing a proper amount of individual cleaning supplies to reduce waste, followed by asking customers to classify their garbage and recycle useful resources and providing customer information regarding water saving and energy saving. Under low-carbon tourism experience, the indicator with the highest importance was whether the tour can present ecological features and local natural values, which was also the second important indicator among all 42 indicators, followed by percentage of low-carbon ecological experience journey (time) in the whole 0trip and journey designed to allow tourists to experience the features of low-carbon tourism. Under community development, the indicator with the highest importance was provision of cooperation of economic effect on low-carbon issues, followed by cooperation with local industries on low-carbon issues and participation in low-carbon issues of community development association.

Conclusion

Because Pushin Ranch is a low-density recreational place where there are a lot of perennial trees planted using natural technology. Plus, the conservation of large areas of lawns, this place has been considered as a spot for low-carbon tourism. In the ranch there are bicycles and electric vehicles as the main transportation. In the recent years, the ranch has been actively replacing diesel ranch vehicles with electric ones. Furthermore, in the accommodation area and the restaurants, tourists are encouraged to bring their own toiletries and to use recycle tableware. Some of the toilets are water-saving two-stage toilets. In the aspect of lighting, the old bulbs have been gradually replaced with energy saving ones. As for the recycling and waste disposal mechanism, volunteers from Tzuchi come to Pushin Ranch to collect resources and wastes such as kitchen wastes are handled by a waste treatment plant approved by the government.

Yet, the result of the examination with indexes shows that Pushin Ranch has not met the standards for low-carbon tourism. There are still many improvements required. Thus, it is suggested that whether a place is suitable for "low-carbon tourism" cannot be determined based on estimation by eye or perception. The assessment system shall be applied for examination purposes, in order to achieve the effects of equity and justice.

The results of this study can be summarized into 3 conclusions, as listed below: (See table 5) According to the research results, among the 37 indicators, the one of the highest importance was safety principles for designing and constructing recreational facilities under facility regulation of the organization management construct. Thus, the experts of this study cared most about how to implement the concept of low carbon into all the facility regulations and designs to set up a set of principles in the leisure industry.

In addition, the second important indicator was whether the tour can present ecological features and local natural values. Previously, New Taipei City held the Pinglin Low- Carbon Trip activity with the purpose of combining the awareness of environmental protection, energy saving, and carbon reduction with the concept of community construction, encouraging people to participate in local activities and achieve local industry upgrading, to further activate the markets in the leisure industry and promote local features to produce a win-win-win result.

In sum, among all the 37 indicators, 12 have been implemented in Pushin Ranch, which are: using local plants, using government-certified and non-toxic agricultural products if possible, purchasing products with an environmental protection mark, purchasing in-season materials, reducing low-temperature storage costs, proper disposal wastes (self-disposal or commissioned disposal), using energy-saving electric equipment, completely classifying garbage, whether the concept of environmental protection is considered when providing foods and accommodations, providing customer information regarding water saving and energy saving, providing a proper amount of individual cleaning supplies to reduce waste, asking customers to classify their garbage and recycle useful resources, and using two-stage low-flow toilets.

As for the total bearing capacity control indicators, low-carbon tourism indicators, and community development indicators, the current implementations in Pushin Ranch were reviewed and the parts which can be improved in the future were summarized.

Construct	Operational indicator	Item	Check Note
		safety principles for designing and constructing recreational facilities	
		proper logistic management, reducing scrap rate of expired products	
		using on-the-spot materials to create recreational facilities blended into the nature	
		fully utilizing local energy (solar energy, wind power, and water power)	
		Purchasing products with a environmental protection mark	Purchased product had a certified mark.
		Using government-certified and non-toxic agricultural products if possible	Purchased product had a certified mark.
		Designing scenery which can be integrated with local natural environment	
Organization management construct	Facility regulation REDECE REUSE RECYCLE	Using energy-saving electric equipment	Energy saving lamps was used instead.
		Whether the concept of environmental protection is included in the management ideals when providing foods and accommodations	
		Using existing facilities to reconstruct if possible while avoiding redevelopment	
		Proper disposal wastes (self-disposal or commissioned disposal)	A qualified institution was commissioned to dispose wastes/ Meals were made of in-season foodstuffs
		Purchasing in-season materials, reducing low- temperature storage costs	
		Maintaining original scenery while avoiding implementing too many infrastructures completely classifying garbage	
		Whether the concept of environmental protection is considered when providing foods and accommodations	Tzuchi was the partner for resource recycling Recycled tableware was used
		Percentage of kitchen waste utilization using two-stage low-flow toilets	The toilets used were two-stage flush toilets.
		Using local plants	80% of plants used were local plants
		Using natural ventilation to reduce energy waste through air conditioning	
		Total capacity control design	

	Total bearing CAPASITY CONTROL	Application of tourist carrying capacity control adjusting carrying capacity control flexibly according to environmental condition	
		Providing a proper amount of individual cleaning supplies to reduce waste	People were encouraged to prepare their own supplies
	Emphasis on environmental education	On asking customers to classify their garbage and recycle useful resources	
		Providing customer information regarding water saving and energy saving	Classified Trash Cans were offered related slogans were put up in toilets
		Offering education regarding low-carbon environmental protection	
		Whether the tour can present ecological features and local natural values	
Ecological tourism construct	Low-carbon tourism experience	Percentage of low-carbon ecological experience journey (time) in the whole trip	
		Journey designed to allow tourists to experience the features of low-carbon tourism	
		Whether the trip allows tourists to experience the importance of environmental sustainability tourists understanding the spirit of low-carbon tourism	
		Designing special activities for tourists to experience	
		Provision of cooperation of economic effect on low-carbon issues	
Social cooperation construct	Community development	Cooperation with local industries on low-carbon issues	
		Participation in low-carbon issues of community development association	
		Applications and extensions of community industries and developments	

Table 5: The low-carbon indicators in the leisure industry: using Pushin Ranch as an example for checking.

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