

**A STUDY ON LOCAL IDENTITY OF LOW CARBON TOURISM
BASED ON SOCIAL EXCHANGE THEORY- A CASE STUDY OF
TAIWAN'S CHARACTERISTIC HOT SPRING AREA**

Yu, Ouyang

Assistant Professor, Department of Tourism and Management (including the Master's Program in the Hot Spring Industry), Chia Nan University of Pharmacy & Science, Tainan, Taiwan, ROC
oyu528408@mail.cnu.edu.tw

Tsung-Lin, Lee*

Professor, Department of Architecture, China University of Science and Technology, Taipei, Taiwan, ROC

*Corresponding author: tllee58@cc.cust.edu.tw

Abstract

Hot spring resources are the characteristics and advantages of Taiwan's development of tourism industry. However, due to the fragile geology and the environmental disasters over the years caused by over-exploitation and natural disasters, it is imperative to develop the tourism industry of "symbiosis with hot springs", and thus the promotion of low-carbon concept in urban areas plays an important role. The scope of this research covers the Guanziling Hot Spring Area, which is a mud hot spring rarely seen in the world. Guanziling Hot Spring won the Champion of Taiwan's Top 10 Hot Spring awarded by Taiwan Tourism Bureau in 2018. Based on Social Exchange Theory (SET), this paper explores the changes of local residents' environmental awareness and tourism interests derived from the promotion of low-carbon policies by confirmative factor analysis and testing of relations between constructs. The results show that residents highly agree that the hot spring tourism industry is a local competitive industry, and generally hold a high positive evaluation of the tourism effect and environmental conservation driven by low-carbon campaigns. In terms of the construct of social exchange factors, "tourism value affirmation" and "fairness and reciprocity of tourism interests" are the main factors affecting the promotion of low-carbon tourism. The empirical research results can provide reference for relevant units to focus on promoting low-carbon cities and low-carbon tourism.

Key Words: Symbiosis with Hot Springs, Low Carbon Tourism, Social Exchange Theory (SET), Attitude towards Tourism Development

Introduction

In recent years, there have been news events of nature's rebellion all over the world. Taiwan is no exception. The root cause of such events is the global warming mainly caused by industrial development, together with the increase in the total emissions of individual carbon dioxide in transportation and various consumption behaviors in the tourism industry. Tourism is one of the fastest growing industries in the world. As travel demands will only continue to grow, both tourism operators and tourists will undoubtedly become the producers of today's global greenhouse effect. They have the responsibility and obligation to promote and practice low-carbon green tourism. Therefore, the concept of "Low-Carbon Tourism" was proposed at the World Economic Forum in 2009. "Low-carbon tourism" is a kind of tourism which combines "low-carbon" and "tourism". It is a recreational mode based on low energy consumption, low pollution and low carbon dioxide emissions.

Hot spring is one of the main characteristics of Taiwan's tourism industry, attracting tourists at home and abroad with such advantages as the diversified spring quality and the experience of hot spring bathing in wild creeks. As a very special type of tourism industry, hot spring resources are mostly found in areas with high environmental sensitivity, which suffer from environmental disasters and industrial losses caused by natural disasters over the years. As the residential

pattern in Taiwan is gradually becoming community-based, the development of communities is the epitome of development of the society and country. The behavior and activities of communities will result in carbon dioxide emission. If the concept and technology of low carbon emission, sustainable recycling of resources and environmental protection and ecology can be integrated and implemented in tourist communities, we could achieve the goal of sustainable environmental management. The scope of this research is Guanziling Hot Spring Area in the south of the Taiwan, with the local residents as the research objects. Based on the theory of social exchange, this paper explores the local residents' cognitive emotion and action tendency of participation in low-carbon tourism policies.

Literature Review

1. Low Carbon Tourism

Low-carbon tourism is a concept that integrates "low-carbon" and "tourism". Shi & Peng (2010) believes that low-carbon tourism is a green tourism with low energy consumption and low pollution emissions. Low-carbon tourism puts forward new requirements for the planning and development of tourism resources, as well as specific requirements for tourists. Its purpose is to improve the quality of tourism services while protecting the local natural and cultural environment. Horng & Liaw (2018) have found that using scientific climate information can efficiently strengthen tourists' travel

intentions toward engaging in low-carbon tours and can also reduce tourists' ambivalence toward low-carbon tours.

In response to this, the promotion of "Low Carbon Community" comes into being. It refers to a community that produces the minimum the carbon emissions generated by all its activities of the community, or even achieves the goal of zero carbon emissions. The target is to create a sustainable and energy-saving and efficient way of life through the joint efforts of government departments, planners, market enterprises and residents of the community.

At present, there are already several successful low carbon communities in the world, such as BedZED, United Kingdom, Vaxjo, Sweden, Vauban District, Germany, etc. The Pinglin District located in New Taipei City, Taiwan was selected as one of the "Top 100 Green Tourism Destinations in the World in 2018", affirming Pinglin's charm of nature and humanity and the determination of the public and private sectors to work together to develop sustainable tourism.

2. Social Exchange Theory (SET)

SET is a sociological theory rising in 1960s. Blau (1964) pointed out that due to the result of reciprocity in the process of social exchange, the participants will generate gratitude, sense of responsibility, and trust among each other, and seek various possible solutions to get the greatest possible benefits. In the process of developing community tourism, the main focus is on economic interests and the community as a whole shall be the only community. The conflicts arising from the

exchange of interests will be internalized by the strength of the group, thus generating an internal value consensus, but this value consensus will reversely affect the exchange assessment of human individuals (Chang and Sung, 2011).

Based on the SET applied to tourism, residents will evaluate their attitudes towards tourism based on their cognition of the impact of tourism. If the evaluation result is that tourism brings more profits than cost, residents may be more likely to hold positive attitudes toward tourism (Ap, 1992). Residents not only exchange with tourists, but also with those who develop or operate tourism-related businesses (Chang and Sung, 2011). SET is considered to have made the most important theoretical contribution to studies on residents' perceptions of tourism (Nunkoo, 2016). In terms of the affirmative attitudes of residents, those who are most likely to benefit from the plan would have the highest degree of support.

3. Attitudes towards Tourism Development

In promoting new policies in tourist areas, residents' attitudes play an absolutely important role, which is also the main factor determining the sustainable development of tourism in the region (Andereck, Valentine, Knopf, & Vogt, 2005; Chang, 2017). Bottlenecks may occur during the promotion of policies, especially in the cooperation, support and coordination of residents during the tourism development of the community (Ko & Stewart, 2002). Attitudes are persistent and consistent behavioral tendencies based on personal cognition and likes and dislikes.

Attitudes are generally divided into three categories: cognition, affection and action tendency (Gifford, 1997).

Community development must consider common interests and problems (Mbaiwa, 2003). Therefore, community attitudes towards tourism development not only lie in residents' personal feelings but are also affected by the interaction between the communities. Tourism interests will indeed affect the attitude of tourism development under the influence of the internalization of the groups (Chang and Sung, 2011). Therefore, some scholars applied SET to explain and clarify the reasons that affect the attitudes towards

tourism development in the communities from the perspective of individual value evaluation (Ap & Crompton, 1998; Gursoy & Rutherford, 2004).

Methods

1. Research Model and Hypothesis

The research model is to verify the influence of social exchange factors, such as tourism dependence, tourism attraction, tourism value affirmation and fairness and reciprocity of tourism interests on attitudes towards low-carbon tourism. The dimensions of each model are illustrated in Table 1.

Table 1. Definitions of Variables

Model	Variable	Definition	References
Social exchange factors	Tourism dependence	Dependence refers to the state that the "reinforcement" of the actors depends on others' behavior. Tourism dependence refers to the people who depend on tourism economically.	Ap (1992) Blau(1964) Kayat (2002) Ap & Crompton (1998)
	Tourism attraction	Attraction is the induction power of exchange relationship. The attraction is greater for residents expecting to benefit from tourism.	
	Tourism value affirmation	Residents' cognition and evaluation on profit.	
	Fairness and reciprocity of tourism interests	Social exchange is a kind of voluntary reward action with the nature of reciprocity, which can be divided into internal reward and external reward.	
Attitude towards tourism development	Cognitive emotions	Residents' perception, idea or understanding of low-carbon tourism through conscious activities.	Gifford (1997) Chang & Sung (2011) Chang(2017)
	Action tendency	The preparation, action and performance of participation in low-carbon tourism policies.	

2. Research Hypotheses

Lisrel 9.3 was used to conduct confirmatory factor analysis and to test the

relationship between the research constructs.

H_{1-4a} : Social exchange factors have a significant positive impact on “Cognitive emotions towards low-carbon tourism”.

H_{1-4b} : Social exchange factors have a significant positive impact on “action tendencies towards low-carbon tourism”.

H_5 : “Cognitive emotions towards low-carbon tourism” has a significant positive impact on “action tendencies towards low-carbon tourism”.

A structured questionnaire was used as the research tool, with a proper scale designed to measure the research variables. The research scale includes five variables. The research variables refer to the relevant scale, and the original questions were modified to be applicable to local residents’ daily-life cognition and actual participation situations. At the same time, according to the research purpose and suitability consideration, the questions that are difficult to define and measure in the context of this study were deleted in order to facilitate respondents’ responses.

3. Research Areas and Objects

In the first “Polling of Top Ten Hot Springs in 2018” organized by the Taiwan Tourist Bureau, the Guanziling Hot Spring Area was rated number one among Taiwan’s Top Ten Hot Springs and one of the Five Famous Spring Areas in Taiwan. Guanziling Hot Spring is not only popular with the Taiwanese, but also attracts continuous streams of international tourists. It can be regarded as a world-famous hot spring resort. In 2018, it attracted more

than 1.17 million tourists, with 190,000 tourists per month during the peak seasons of hot springs, bringing tremendous business opportunities to the local hot spring tourism industry. All the 29 hot spring operators in this area have obtained the “hot spring badge”, making it the area with the densest distribution of hot spring badges in Taiwan.

In this study, questionnaires were distributed to the major settlements in the Guanziling Hot Spring Area during the period from November 1, 2018 to November 30, 2018, covering the administrative districts of the Hsientsao Village and Kuanling Village in Baihe District. As of the end of October 2018, the total population of the inhabitants in the area was 2,554. Under the assumption that the sampling error is less than 5% and the reliability is 95%, at least 334 questionnaires are required in this study, so 400 questionnaires are expected to be distributed.

Results

1. Descriptive Statistics of the Samples

Among the collected questionnaires, those with regular answers and omitted answers were removed. As a result, there were 396 valid questionnaires, meeting the requirement of at least 334 valid questionnaires. Among the valid samples, the gender distribution was approximately equal. In terms of the age distribution, most of the residents were aged 21 to 40 years (32.9%); in the occupational distribution, it was obviously that most of the respondents were engaged in occupations related to tourism or hot spring industries, accounting for 35.7%, which shows that the hot spring tourism industry is

closely related to the employment of residents in this area.

2. Reliability and Validity Analysis of Scale

Confirmative factor analysis (CFA) was used to analyze the covariant relationship between the observed variables and their latent variables, and to test convergent validity and discriminant validity of the measurement model. Convergence validity refers to the criteria that there should be high correlation between the observed variables used to measure the same constructs. According to the evaluation criteria suggested in the literatures, the load and significance t values of the item factors in the measurement model were tested. As shown in Table 2, the observed variables all reached significant levels ($t > 1.96$, $p < 0.05$). The estimated load levels of parameter factors were all higher than the criteria of 0.45, indicating that the measurement model in

this study has convergence validity. The internal consistency of the model was acceptable. The mean square root of the average variation extraction of each latent variable in the model was larger than the correlation coefficient between dimensions (as shown in Table 3). Therefore, the latent variables in this study have sufficient discriminant validity (Jöreskog & Sörbom, 1992).

3. Path analysis of the Dimensions

For the parameter estimation, Maximum Likelihood (ML) was used to estimate the fitness function of the structural equation model. The revised results show that the fitness indexes of the whole model are $\chi^2/df=2.66$; $GFI=0.94$; $AGFI=0.93$; $RMSEA=0.06$; $NFI=0.94$; $NNFI=0.92$; $CFI=0.92$; $SRMR=0.04$; the values shows the sample data are well fitted to the hypothetical model, and all the data meet the range of ideal criteria.

Table 2. Descriptive Statistics and Confirmative Factor Analysis of Variables.

Item		M	SFL	SMC	CR
Tourism dependence	η_1	4.31			.70
When the tourism industry in this area develops vigorously, it will drive my personal income.	X_1	4.61	.81*	.32	
When the tourism industry in this area develops vigorously, it will drive the income of my relatives and friends.	X_2	4.45	.77*	.46	
The implementation of low-carbon tourism will promote the output value of tourism industry in this area.	X_3	3.88	.71*	.58	
Tourism attraction	η_2	4.16			.89
The implementation of tourism industry will promote the development of other related industries.	X_4	4.21	.65*	.51	
Tourism industry resources are an important tourism attraction force in the area.	X_5	3.85	.76*	.37	
The implementation of tourism has made the development of tourism in this area more attractive.	X_6	4.43	.81*	.38	
Tourism value affirmation	η_3	3.98			.68

Item		<i>M</i>	<i>SFL</i>	<i>SMC</i>	<i>C</i> <i>R</i>
Tourism industry is an important industrial feature in this area.	X_7	3.75	.65*	.46	
Tourism industry is an important economic dependence of residents in this area.	X_8	4.35	.71*	.41	
The implementation of low-carbon tourism has promoted the evaluation of tourism in this area.	X_9	3.85	.61*	.38	
Fairness and reciprocity of tourism interests	η_4	3.79			.71
The implementation of low-carbon tourism industry will increase the substantial economic income of residents in this area.	X_{10}	3.27	.67*	.53	
The implementation of low-carbon tourism industry will strengthen the environmental identity of residents in the region.	X_{11}	3.95	.72*	.48	
The implementation of low-carbon tourism industry will reduce the impact of tourism on the local environment.	X_{12}	4.15	.71*	.41	
Cognitive emotions of low-carbon tourism	η_5	3.93			.77
Acknowledge the help of low-carbon tourism to the environmental protection of the area.	X_{15}	4.12	.61*	.42	
Acknowledge the help of low-carbon tourism to the industrial development of the area.	X_{16}	3.78	.62*	.32	
Acknowledge the help of low-carbon tourism to the city image of the area.	X_{17}	3.88	.58*	.44	
Action tendency of low-carbon tourism	η_6	3.56			.81
Be willing to cooperate with the government to promote low-carbon tourism policies in the area.	X_{18}	3.55	.71*	.49	
Be willing to participate in the government's plans to promote low-carbon tourism in the area.	X_{19}	3.25	.62*	.51	
Be willing to recommend the government to promote low-carbon tourism activities in the area.	X_{20}	3.88	.68*	.46	

Note: * indicates that when $\alpha=0.05$, it reaches a significant statistical level

Table 3. The correlation coefficient matrix and AVE.

Item	η_1	η_2	η_3	η_4	η_5	η_6	AVE
Tourism dependence(η_1)	0.71						0.51
Tourism attraction(η_2)	0.66	0.73					0.54
Tourism value affirmation(η_3)	0.33	0.31	0.78				0.61
Fairness and reciprocity of tourism interests(η_4)	0.35	0.41	0.51	0.74			0.55
Cognitive emotions of low-carbon tourism(η_5)	0.31	0.34	0.33	0.51	0.79		0.62
Action tendency of low-carbon tourism(η_6)	0.48	0.42	0.45	0.48	0.62	0.72	0.52

Note: The correlation coefficients are shown in the lower half of the matrix, and the square root of AVE is on diagonal lines.

Path analysis was used to verify the causal relationship between dimensions. It shows that five of the hypotheses made by this study are valid (as shown in Table 4), and the cognitive emotion for low-carbon tourism has a mediating effect on tourism dependence, tourism value affirmation and action tendencies towards low-carbon tourism.

1. The path coefficients of the impact of tourism dependence on cognitive emotions and action tendencies towards low-carbon tourism were 0.36 and 0.18 respectively, which indicates a significant positive impact. Thus, H_{1a} and H_{1b} were supported, that is to say, the higher the local residents' cognition of tourism dependence, the higher their emotional recognition and action tendency towards low-carbon tourism.
2. The impact of tourism attraction on neither cognitive emotions towards low-carbon tourism nor the action tendencies towards low-carbon tourism reached the significant level. Thus, H_{2a} and H_{2b} were not supported.

ism reached the significant level. Thus, H_{2a} and H_{2b} were not supported.

3. The path coefficient of the impact of tourism value affirmation on the cognitive emotions towards low-carbon tourism was 0.41, indicating a significant positive impact. Thus, H_{3a} was supported, that is to say, the higher the local residents' recognition of tourism value is, the more they identify emotionally with low-carbon tourism.
4. The path coefficient of the impact of fairness and reciprocity of tourism interests on action tendencies towards low-carbon tourism was 0.42, reaching a significant positive impact. Thus, H_{4b} was supported, that is to say, the higher the local residents' recognition of the fairness and reciprocity of tourism interests, the higher their action tendencies towards low-carbon tourism. The verification model constructed by this study is shown in Figure 1.

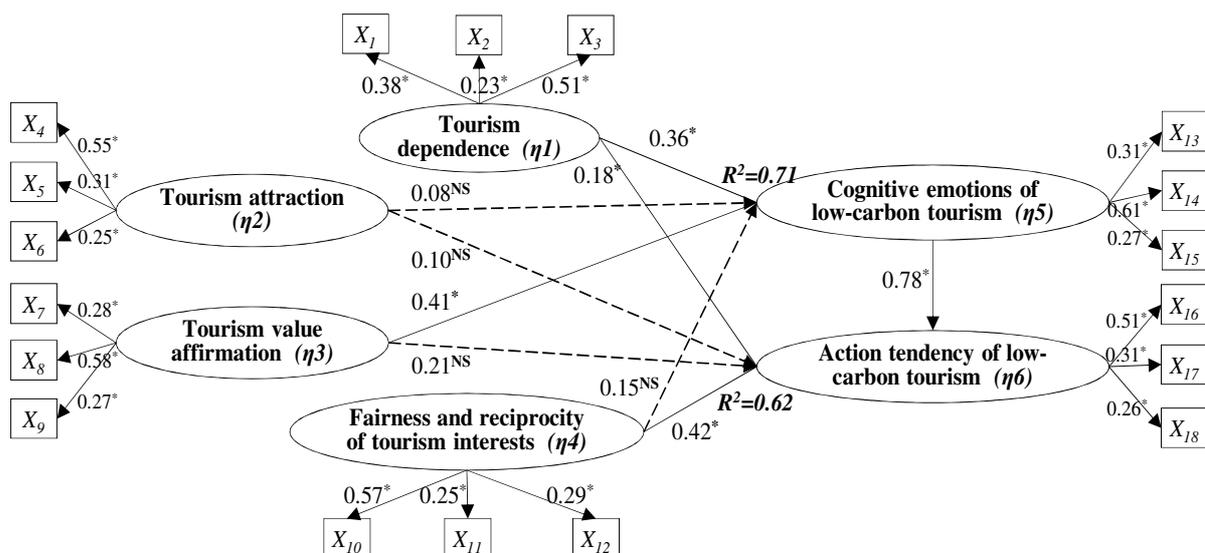


Figure 1. Overall Structural Mode Verification Diagram.
 * $p < .05$; NS indicates the significant level is not reached.

5. The path coefficient of the impact of cognitive emotions towards low-carbon tourism on action tendencies towards low-carbon tourism was 0.78*, which reached a significant positive effect. H_5 was supported.

Table 4. Hypothesis Testing.

	Path	Structural coefficient	Verification result
H_{1a}	Tourism dependence($\eta 1$) → Cognitive emotions of low-carbon tourism($\eta 5$)	0.36*	Established
H_{1b}	Tourism dependence($\eta 1$) → Action tendency of low-carbon tourism($\eta 6$)	0.18*	Established
H_{2a}	Tourism attraction($\eta 2$) → Cognitive emotions of low-carbon tourism($\eta 5$)	0.08	NS
H_{2b}	Tourism attraction($\eta 2$) → Action tendency of low-carbon tourism($\eta 6$)	0.10	NS
H_{3a}	Tourism value affirmation($\eta 3$) → Cognitive emotions of low-carbon tourism($\eta 5$)	0.41**	Established
H_{3b}	Tourism value affirmation($\eta 3$) → Action tendency of low-carbon tourism($\eta 6$)	0.21	NS
H_{4a}	Fairness and reciprocity of tourism interests($\eta 4$) → Cognitive emotions of low-carbon tourism($\eta 5$)	0.15	NS
H_{4b}	Fairness and reciprocity of tourism interests($\eta 4$) → Action tendency of low-carbon tourism($\eta 6$)	0.42**	Established
H_5	Cognitive emotions of low-carbon tourism($\eta 5$) → Action tendency of low-carbon tourism($\eta 6$)	0.78**	Established

Conclusions and Implications

This study applies SET to explore the impacts on local residents' cognitive emotions and action tendencies towards low-carbon tourism facing the implementation of low-carbon tourism policies. Residents agree that the promotion of low-carbon tourism is conducive to the maintenance of the environment in Guanzilin. The results also show the residents know the importance of understanding the implementation of low-carbon, but they believe that the implementation of policies is full of uncertainty. We can refer to the experience of foreign countries to build the awareness of the community resi-

dents first and then make the residents take the lead in promoting the policies with the support by the government. It is believed that the low-carbon tourism policies can be more successfully promoted if the community residents can identify with the tourism development policies and then cooperate with practical actions.

1. Tourism dependence

Local residents are deeply aware of the importance of tourism resources and the impact of natural environmental resources on their life and economy. The stability of hot spring water sources has always been the

advantageous conditions for this area to develop hot spring tourism. In addition to having abundant water resources, this area also has sufficient high-quality hot spring water for the reasonable use by the local industry operators. Moreover, the government has been actively promoting the public hot spring pipelines and hot spring license plan to ensure stable hot spring water sources in the area, creating advantages for this area to build famous hot springs in Taiwan.

2. *Tourism attraction*

The empirical results show that the low-carbon tourism attraction doesn't have a significant impact on recognition and action tendencies towards low-carbon tourism. Moreover, the fairness and reciprocity of tourism interests is a factor with significant impact only next to the action tendencies towards low-carbon tourism. According to the findings, on the local hot spring tourism industry, the most important consideration for respondents is whether the tourism interests developed in the future can meet the increased cost of its participation in low-carbon tourism. The creation of tourism attraction mainly lies in the competitiveness of local hot springs and tourism industry. Creating better tourism competitiveness in the area without reducing the existing advantages of tourism is a key factor of tourism attraction.

3. *Action tendencies of policy participation*

Although this pattern of top-down governance has relatively good policy performance, the local residents would lack the sense of participation and the

policy awareness is difficult to be implemented in daily life. Therefore, it is suggested that during the promotion of low-carbon tourism, we can expand the mechanism of citizen participation, allowing participants from different backgrounds to discuss and share opinions on related issues to identify more new ideas and concepts, so that the objectives of the new plan can be closer to the current situation reflected by the local residents. In this way, local residents will become active participants and participate in the operation to establish good partnerships.

References

- Andereck, K. L., Valentine, K. M., Knopf, R. C., & Vogt, C. A. (2005). Residents' perceptions of community tourism impacts. *Annals of Tourism Research*, 32(4), 1056-1076.
<https://doi.org/10.1016/j.annals.2005.03.001>
- Ap, J. (1992). Residents' perceptions on tourism impacts. *Annals of Tourism Research*, 19(4), 665-690.
[https://doi.org/10.1016/0160-7383\(92\)90060-3](https://doi.org/10.1016/0160-7383(92)90060-3)
- Ap, J., & Crompton, L. (1998). Developing and Testing a Tourism Impact Scale. *Journal of Travel Research*, 37(3), 120-130.
<https://doi.org/10.1177/004728759803700203>
- Blau, P. M. (1964). *Exchange and power in social life*. New York, NY: John Wiley.
- Chang, K.C. & Sung, B.M. (2011). *A Study of Constructing the Model*

- of Residents' Attitudes for Community Tourism Development. *Journal of Outdoor Recreation Study*, 24(1), 31-55.
[http://dx.doi.org/10.6130/JORS.2011.24\(1\)2](http://dx.doi.org/10.6130/JORS.2011.24(1)2)
- Chang, K.C. (2017). A Model for Community Tourism Development Attitudes Based on Social Exchange Theory and Social Capital Theory. *Journal of Outdoor Recreation Study*, 33(3), 1-45.
[http://dx.doi.org/10.6130/JORS.2017.30\(3\)1](http://dx.doi.org/10.6130/JORS.2017.30(3)1)
- Gifford, R. (1997). *Environmental psychology: Principles and practice*. Boston: Allyn and Bacon, Inc.
- Gursoy, D., & Rutherford, D.G. (2004). Host attitudes toward tourism: An Improved Structural Model. *Annals of Tourism Research*, 31(3), 495-516.
<https://doi.org/10.1016/j.annals.2003.08.008>
- Hornig, J.S., & Liaw, Y.J. (2018). Can we enhance low-carbon tour intentions through climate science or responsibility sharing information?. *Current Issues in Tourism*, 21(8), 877-901.
<https://doi.org/10.1080/13683500.2017.1304363>
- Jöreskog, K. G., & Sörbom, D. (1992). *LISREL: A Guide to the Program and Applications*. 3rd ed. Chicago: Scientific Software International, Inc.
- Kanga, S.K., & Leeb, J. (2018). Support of marijuana tourism in Colorado: A residents' perspective using social exchange theory. *Journal of Destination Marketing & Management*, 9, 310-319.
<https://doi.org/10.1016/j.jdmm.2018.03.003>
- Kayat, K. (2002). Power, social exchanges and tourism in Langkawi: rethinking resident perceptions. *International Journal of Tourism Research*, 4(3), 171-191.
<https://doi.org/10.1002/jtr.375>
- Lankford, S. V., & Howard, D. R. (1994). Developing a Tourism Impact Attitude Scale. *Annals of Tourism Research*, 21(1), 121-139.
[https://doi.org/10.1016/0160-7383\(94\)90008-6](https://doi.org/10.1016/0160-7383(94)90008-6)
- Mbaiwa, J. (2003). The socio-economic and environmental impacts of tourism development on the Okavango Delta, north-western Botswana. *Journal of Arid Environments*, 54(2), 447-467.
<https://doi.org/10.1006/jare.2002.1101>
- Nunkoo, R. (2016). Toward a More Comprehensive Use of Social Exchange Theory to Study Residents' Attitudes to Tourism. *Procedia Economics and Finance*, 39, 588-596.
[https://doi.org/10.1016/S2212-5671\(16\)30303-3](https://doi.org/10.1016/S2212-5671(16)30303-3)
- Shi, C., & Peng, J. (2011). Construction of low-carbon tourist attractions based on low-carbon economy. *Energy Procedia*, 5, 759-762.
<http://dx.doi.org/10.1016/j.egypro.2011.03.133>

Stern, N. & Taylor, C. (2010). What do the Appendices to the Copenhagen Accord tell us about global greenhouse gas emissions and the prospects for avoiding a rise in global average temperature of more than 2 C?, Centre for Climate Change Economics and Policy, <http://www.cccep.ac.uk>.