

Applying the Environmental Affordances Concept in Cultural Ecosystem Services of Ecotourism to Taiwan Wetland

Chao Chih-Liang & Hung Pei-Hsun

*Department of Environmental and Cultural Resources,
National Hsinchu University of Education, Taiwan*

Abstract—Ecosystem services provide the mangroves settings of wetland for much ecotourism or education opportunities in Taiwan, but the value attached to it, are hard to determine. On-site data from visitors have been collected and analyzed to incorporate measures of social value and natural resource conditions from the mangrove landscape features in Wazihwei Nature Reserve, Taiwan. Our objectives in this paper are : 1) to examine how visitors assign social values to a wetland protected area setting 2) to explore the relationship between social values and mangroves settings conditions. In the preliminary results suggest conclusions: biodiversity and ecosystem functioning interaction with human well-being need to be incorporated into decision-making processes aimed at the mangrove conservation management systems; and more integrative tools are required to account for the interactions of estuarine ecosystems with surrounding socio-economic activities.

Keywords—Ecosystem Services, Landscape Services, Structure–function–value chain, Wazihwei Nature Reserve

I. INTRODUCTION

IT'S no doubt that mangroves provide a number of ecosystem services that are vital to the sustainability of local communities, livelihoods, and infrastructure. In terms of cultural ecosystem, the Millennium Ecosystem Assessment (Sarukhán and Whyte 2005) have defined cultural ecosystem services as “the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences”. However, based on their non-consumptive direct

use values (Sarukhán and Whyte, 2005) and connectedness to the welfare of human beneficiaries, these definition has been criticized and suffer from poor quantification and integration in management plans (De Groot, Ramakrishnan, Berg, Kulenthran, Muller, Pitt, and Wascher, 2005). Recreation implied the ‘free services’ of natural capital in providing public ‘infrastructure’ for recreational pursuits. There are a number of critical cultural ecosystem services provided by mangroves; however, majority of cultural ecosystem services of mangroves will have inspirational and spiritual values produced by the aesthetic and recreation opportunities and have been called the aesthetic and ecotourism values defined by cultural ecosystem services. In Taiwan, mangrove ecotourism activities include boat tours, board walks, wind-sailing, bird watching and wildlife watching tours. Case studies from around the world have confirmed that ecotourism can be effectively applied to mangrove ecosystems to generate income and employment for local communities and for outreach and education purposes. In terms of valuation of ecosystem services, however, some authors recommend describing cultural ecosystem services via tracing visible manifestations of cultural ecosystem services on the physical landscape (Bieling, and Plieninger, 2012). According to these existing frameworks, some research have made the assumption of that human well-being strongly relies on the services provided by well-functioning ecosystems, changes in the ecological functioning of any system can have direct and indirect effects on human welfare. Common elements were identified as being of importance to cultural service provision. For recreation services, these elements included public

accessibility, physical accessibility, and recreation infrastructure, the presence of which has been documented to provide “cultural cues” to promote positive public perceptions (Nassuer, 2004). However, little is known about how individual’s preference and perception apply to mangroves environments that encompass terrestrial and aquatic systems and correspond to landscape features such as mangroves context (e.g., density or canopy coverage) and management infrastructure (e.g., trail systems). In terms of the concept of tourism satisfaction, more tourism opportunity can be provided, more easily to make users satisfied. However, the different argument have been gain recently in literature of Cultural Ecosystem Services, for example, “is ‘human capital’ (i.e. human inputs) always needed to provide a service? (De Groot, Jax, and Harrison, 2014) or “How do ecosystem services depend on ‘biodiversity’ (species/ecosystems/genes)? (Mace, Norris, & Fitter, 2012). These questions have implied the need for understanding the origins of ecosystem services.

To overcome these problems, the present study addresses these gaps by achieving an explicit psycho-cultural perspective in an effort to direct managerial attention toward the relationships between mangrove and human well-being in wetland setting.

II. METHODOLOGY

During this research, social values, the perceived, nonmarket values the public ascribes to ecosystem services, particularly cultural services, can be evaluated for various recreationists groups. Two steps data collected have been adopted. The first step was to collect these pictures which has been tagged in their Blog and discussed their perception in wetland environmental affordance. The second step was to design the self-administered survey questionnaires which were distributed to a representative sample of adult visitors from March through May, 2015. A total of 273 visitors were contacted and asked to participate in the study (see table 1). The on-site survey was administered over a six-week period mid-March through May. Survey days were stratified by time of the day (a.m. vs. p.m.). Respondents were contacted at various sampling points around Wazihwei Nature Reserve, including boat ramps, educational center and parks nearby the museum. During these sample periods, respondents were approached and asked to reflect on their most recent visit to and/or surrounding the protected area. For groups, the individual with the most recent visiting experience was asked to participate. The questionnaire included a series of closed and open-ended survey items, as well as a map of the

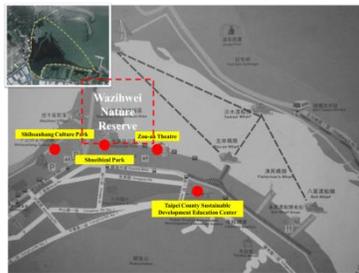


Fig.1 The Location Wazihwei Nature Reserve

map of the study site. Four sections of the survey questionnaire were analyzed for this paper: 1) trip characteristics, 2) a value mapping, 3) the preference of mangrove landscape features and 4) socio-demographics. The value typology adapted from Brown & Reed’s (2002) design was invited respondents to complete the tasks to assign some hypothetical “preference points” across 12 value types. The research concept will be shown below:

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Table 1. The Profile of Visitors.

Items	Level of Measurement	Frequency (%)
Gender	Male	102 (43.8)
	Female	131 (56.2)
Age	Under 20	16 (6.8)
	21~30	65 (27.4)
	31~40	106 (44.7)
	41~50	31 (13.1)
	Over 51	19 (8.0)
Education	Under Junior high school	11 (4.8)
	Senior high school	46 (19.9)
	University	138 (59.7)
	Graduated	36 (15.6)
Job	Statistician and technician	18 (8.8)
	Industry and commerce	62 (30.2)
	Freelance	12 (5.9)
	Retirement	3 (1.5)
	Student	33 (16.1)
	Interpreter	17 (8.3)
	Service Industry	46 (22.4)
	Others	14 (6.8)
	Income	Under NT. 20,000
NT. 20,001~40,000		87 (40.7)
NT. 40,001~60,000		48 (22.4)
NT. 60,001~80,000		20 (9.3)
NT. 80,001~100,000		6 (2.8)
Over NT. 100,001	4 (1.9)	
Motivation for Visiting (multiple-choice questions)	Leisure	82 (34.7)
	Ecotourism	12 (5.1)
	Photography	6 (2.5)
	Biking	78 (33.1)
	Others	2 (0.9)
Frequency	Never heard about Wazihwei Nature Reserve	128 (54.0)
	I have known Wazihwei Nature Reserve before I	105 (44.3)

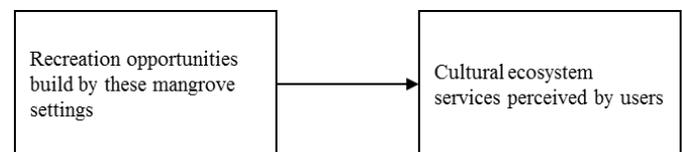


Fig. 2 The Concept of Research

III. RESULTS

A. Analysis I

For the understanding visits' perceptions toward what are environmental affordances of mangrove in Taiwan wetland, the mixed qualitative method from filed observation and keywords in Blog have been adopted. After content analysis, four types of pictures which were tagged in Blog and related to environmental affordances of mangrove have been identified and categorized. The first group was related to all kinds of plants and wildlife existed in mangrove ecosystem. Therefore, this group was entitled "mangrove natural resources". The second group was named as "recreation facilities", including interpretive center, bird-watching spot or hiking trail. The third group were related to social environment where people can talk or played together. Those pictures have shown the recreation opportunities in "social interaction". The last group of four was included parking lot, traffic signs and public toilets, and was called as "management issues". According to the results from content analysis, total 15 items have been organized into questionnaire for environmental affordance measures.

B. Analysis II

The second analyses were to explore the relationships between environmental affordances and cultural ecosystem services. The fifteen-items of environmental affordances scale categorized from the results of the pictures in visitor's Blog and consisting of recreational facilities, management issues, social interaction, mangrove landscape structure, ecological diversity. The thirteen-items from cultural ecosystem service consisted of three types of service value, including sciences and learning value, life sustaining value, recreational and economic value. Further, two CFA model (in Fig. 3 and Fig.4) indicated that the two-factor correlated model fit these data very well. Measures of model fit, including goodness of fit (GFI = .928 or .937) and baseline comparison fit (CFI = .951 or .959) individual demonstrated a good fitting model. The standardized coefficients were all significant for the indicators of the environmental affordances scale factor and ranged from a low of $\beta = .63$ to a high of $\beta = .846$; or from a low of for the $\beta = .43$ to a high of $\beta = .89$ for the cultural ecosystem service factors.

For the SEM model, the path diagram used to illustrate the relationship between the two constructs of environmental affordances and mangrove ecosystems services shown in Fig.5. The standardized coefficients were all significant for the environmental affordances factor and the mangrove ecosystems services ranged from a low of $\beta = .11$ to a high of $\beta = .38$; Measures of model fit demonstrated a good fitting model, including goodness of fit (GFI = .997) and baseline comparison fit (CFI = .997). As expected, these factors were low or moderately positively correlated and have reflected the human preference of perceptions and elicited the perceived value from the mangroves environment quality. For the SEM model, the significant path from sciences and learning value

was influenced by recreational facilities and mangrove landscape structure and ecological diversity. For the life sustaining value was influenced by management issues and social interaction and ecological diversity. For the last recreational and economic value was influenced by all five factors except mangrove landscape structure. The relationships from SEM model have revealed that these values need opportunity for tourist access, which could be created by different environmental affordance elements.

The results of the connection between recreation and educational service reflected that recreation opportunities may be commensurate with the environmental features. For example, there is also an on-going discussion as to whether biodiversity is an ecosystem service itself (Mace, Norris. & Fitter, 2012). Similar with the results from some research revealed strong preferences to recreate in areas with water features in addition to a mixture of trees, mowed grass and cultural infrastructure such as trails (Schroeder and Louviere, 1999). Regardless of mangrove landscape feature, perception of public safety will be connected and influenced the value perceived by users, which is typically lower in areas with limited sight due to dense tree or understory cover (Gobster and Westphal, 2004) is likely to influence the utilization and preference for cultural services. Due to such safety perceptions, open areas may be more preferred for cultural activities (Schroeder and Anderson, 1984).

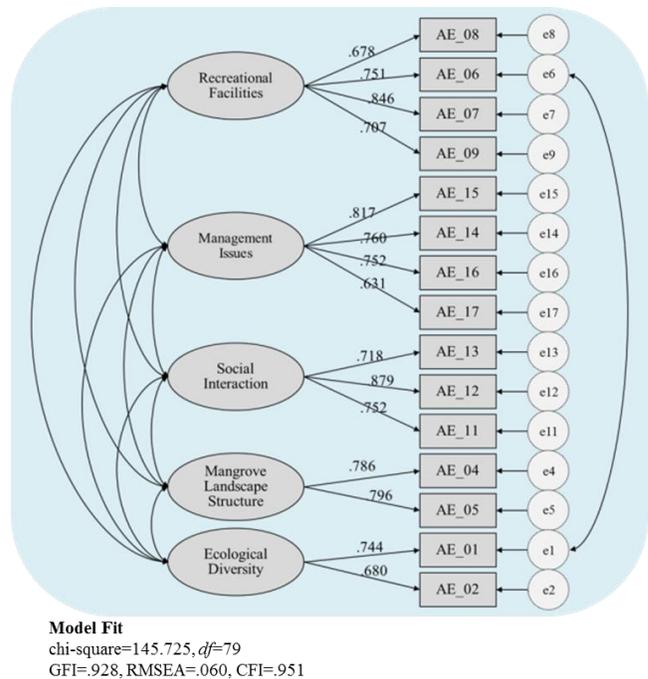
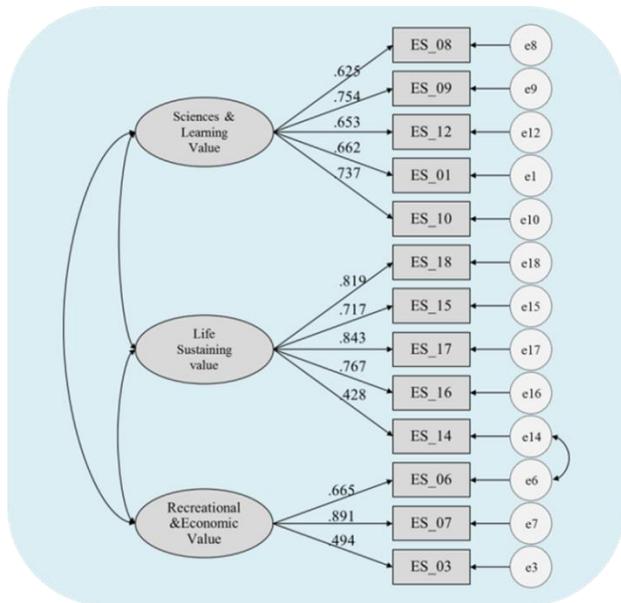
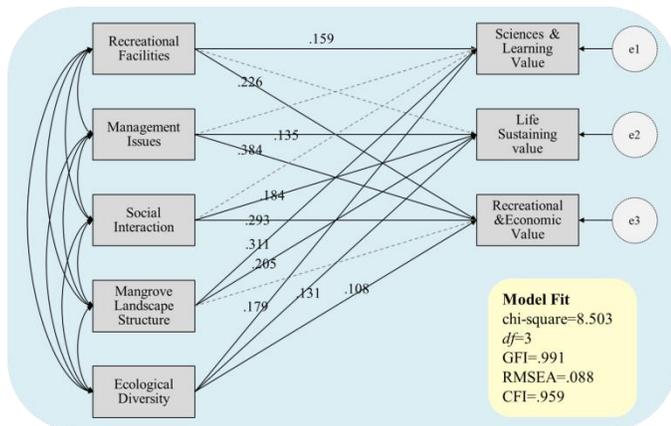


Fig. 3 The CFA model from environmental affordances



Model Fit
 chi-square=110.537, df=61
 GFI=.937, RMSEA=.059, CFI=.959

Fig. 4 The CFA model from cultural ecosystem services of mangroves



Model Fit
 chi-square=8.503
 df=3
 GFI=.991
 RMSEA=.088
 CFI=.959

Fig. 5 The path between these constructs of environmental affordances and mangrove ecosystems services.

IV. CONCLUSION

This research has attempted to explore the relationship between ecosystem or physical resource characteristics and their associated functions and services could be quantified. In terms of application and implication for natural resources management strategies, two issues should be addressed:

A. Linkage between social value and ecosystem functions.

Ecosystem services are the benefits provided by nature, which contribute to human well-being. These benefits can range from tangible products such as food and fresh water to cultural services such as recreation and aesthetics. However,

there are still some questions related to other cultural ecosystem services except recreation or ecotourism from mangroves, for example of becoming extremely important for understanding the historical perspective on mangroves. The proposed framework implies taking into account both the functional and the commodities points of view upon natural ecosystems and by this representing a line of thought which will deserve further research to explore more in detail the conceptual links between biodiversity–ecosystem functioning–services provided..

B. Management Issues in Protected Areas

Protected areas are a widely used management tool that can help prevent mangrove loss and degradation in specific locations. Protected areas can provide social, economic and environmental benefits, both directly through more sustainable management of resources, or indirectly through protection of ecosystem services. Unfortunately, many of these protected areas are poorly designed or poorly enforced and some fail to prevent mangrove loss and degradation within their boundaries.

To be effective, systems or networks of protected areas need to incorporate the full representation of species and ecosystems services, and should take into account representation, and connectivity of management approaches. Better recognition of the values of the full range of goods and ecosystem services derived from mangroves may provide the needed impetus for further implementation or improvement of protected areas that incorporate mangrove habitats.

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Chih-Liang Chao. Associate Professor in Department of Environmental and Cultural Resources of National Hsinchu University of Education, Taiwan. This author became a Senior Member (SM) of Outdoor Recreation Association (Taiwan) in 2003. She earned her Ph.D. degree in Parks, Recreation and Tourism Management, Clemson University, U.S.A. in 2003. Current and previous research interests are related to social value in outdoor recreation or ecotourism and community development in sustainable tourism.

Pei-Hsun Hung, Research Assistant in Department of Environmental and Cultural Resources, National Hsinchu University of Education, Taiwan. This author became a Member (SM) of Outdoor Recreation Association (Taiwan) in 2009. She earned her Master degree in Tourism Management, Providence University, Taichung City, Taiwan, R.O.C.