NIDA สถาบันบัณฑิตพัฒนบริหารศาสตร์
วารสารการจัดการสิ่งแวดล้อม ปีที่ 6 เล่มที่ 1 มกราคม-มิถุนายน 2553 หน้า 18-27
JOURNAL OF ENVIRONMENTAL MANAGEMENT Volume 6 I Number 1 I January-June 2010

ดัชนีชี้วัดผลการดำเนินงานด้านสิ่งแวดล้อมและการยอมรับ ISO 14001 เพื่อการประเมินผลการดำเนินงานด้านสิ่งแวดล้อม ณ อุทยานแห่งชาติทางทะเลหมู่เกาะช้าง
Environmental Performance Indicators and ISO14001 Acceptability for Performance Evaluation of Koh Chang Marine National Park

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บทคัดย่อ

งานวิจัยนี้เป็นการศึกษาตัวชี้วัดทางด้านสิ่งแวดล้อม โดยการบ่งชี้ประเด็นปัญหาสิ่งแวดล้อม และกำหนดกรอบในการพัฒนาดัชนีชี้วัดด้านการจัดการ การปฏิบัติงานทางด้านสิ่งแวดล้อม และทำการประเมินผลการดำเนินงานด้านสิ่งแวดล้อมของอุทยานแห่งชาติทางทะเลหมู่เกาะช้าง รวมทั้งศึกษาระดับการยอมรับ ISO 14001 สำหรับผู้บริหารและเจ้าหน้าที่ ด้วยการสำรวจข้อมูลภาคสนามและการวิเคราะห์ในห้องปฏิบัติการ ผลการศึกษาพบว่า การดำเนินงานด้านสิ่งแวดล้อมโดยภาพรวมอยู่ในระดับที่ดี การดำเนินงานด้านการจัดการสิ่งแวดล้อมอยู่ในระดับดี การดำเนินงานด้านการปฏิบัติงานและผลด้านสภาวะแวดล้อมอยู่ในระดับปานกลาง การยอมรับมาตรฐานการจัดการสิ่งแวดล้อม ISO 14001 สำหรับผู้บริหารและเจ้าหน้าที่อุทยานแห่งชาติหมู่เกาะช้างอยู่ในระดับสูง

คำสำคัญ: การประเมินผลการดำเนินงานด้านสิ่งแวดล้อม ตัวชี้วัดทางด้านสิ่งแวดล้อม ประเด็นปัญหาสิ่งแวดล้อม

Abstract

This research aimed to develop environmental indicators for evaluating Koh Chang Marine National Park Environmental Performance operations and to study ISO 14001 implementation acceptability level. In-depth interview, field survey, and laboratory analysis

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were appropriately applied for data collecting and analysis. Research results indicated that the overall environmental performance and environmental management of Koh Chang Marine National Park were both at good level, while environmental operation and surrounding conditions were at moderate level. The ISO 14001 acceptance among Koh Chang Marine National park administrators and officers were at high level.
Keywords: environmental performance evaluation (EPE), environmental indicators, environmental aspect

1. Introduction

Marine nation parks are the most preferable tour destinations among Thai and foreign tourists who are interested in natural eco-tourism. Naturally, Thailand has abundant tourist attractions, mainly tour sites within national parks' boundaries. Nonetheless, promoting and developing tourism without proper management may deteriorate and damage tourism resources, which eventually affect many people (Komgrit Tupburi, 2002). Koh Chang Island and Trat coastal areas are the most preferable destinations among tourists because of their locations and abundant natural resources. Particularly, beautiful islands and coastal areas have become major tour attractions for many tourists (Department of National Parks, 2003).

The aim of the study was to develop specific indicators, the environmental performance evaluation (EPE) and process of organization including participation of people concerned. It was expected that applying such environmental performance indicators (EPI) to evaluate environmental performance of Koh Chang Marine National Park (KCMNP) could be the island's potential to appropriately support more tourists in the future, such as pollution and environmental problems decreasing. Besides, natural resources should be well managed and the national park would gain good image regarding the environmental and natural resources management with the participation and cooperation of people concerned.

The developed performance indicators for this research were based on the principle of EPE, which was considered to be suitable for KCMNP management. The concept of this application was coincided with the research findings of Kingkaow Buttanu (2006) who had identified the environmental indicator suitable with Automotive Service Center, using EPE principles to identify indicators. But it could not appropriately be used for the National Park performance because of differences in the functions and operations of each organization.

Moreover, this research showed differences from the research of Atthapol Jitpukdee (2007) in identifying environmental performance indicators of Erawan National Park, Kanchanaburi Province. Even though his work identified the national park environmental performance indicators, but they were indicators for in-land national parks which were different from KCMNP, a coastal park.

2. Research Objectives

1. To develop environmental performance indicators (EPIs) for Koh Chang Marine National Park (KCMNP), Trat Province.

2. To evaluate the environmental performance management of KCMNP.

3. To study the ISO 14001 acceptability level of the administrators and officers working at KCMNP.

3. Expected Results

1. Knowledge gained from the study could be beneficial for planning to improve and manage environmental performance of KCMNP in order to increase its potential for tourism business in the future.

2. To get appropriate EPIs for KCMNP and could be applied for other areas.

3. The results could be an information source for any decision maker to use for planning to develop national parks and conserve national environment.

4. Methodology

Research site preliminary survey: the survey area was the tourism activity-oriented area in order to outline the environmental problems emerged from such areas and to generate environmental indicators for KCMNP. The indicators were then given important weighting score by environmental experts.

Identify environmental indicators and evaluation criterion: the conceptual framework to identify environmental indicators was studied based on the principle of the environmental performance evaluation (EPE) in terms of:

1. Environmental performance indicators (EPIs)
   - Management performance indicator (MPI)
   - Operation performance indicator (OPI)
2. Environmental condition indicator (ECI)

Methodology for environmental performance evaluation (EPE)

Indicators were revised according to the evaluation criterion, then were scored weighting (W) for important value for each indicator by expert working in the field of environment and national park management. The weighting values were ranked from 1-5 (1 was defined as the least importance and 5 was defined as the most importance). Rating (R) value for each indicator was scored by the researcher with 3 levels (score ranking from 1-3) by the checking list technique in accordance with the environmental performance evaluation criterion (Attapon Jitpugdee, 2007). Weighting score equation was as follows:

$$EPPM = \frac{\sum W_i R_i}{\sum W_i} = \frac{W_1R_1 + W_2R_2 + W_3R_3 + \ldots + W_nR_n}{W_1 + W_2 + W_3 + \ldots + W_4}$$

EPPM = Environmental performance level of the national park management

W_i = Important weighting value of the indicators from 1st to n^{th}

R_i = Ranking value of indicators scored by researcher form 1st to n^{th}

n = Number of Indicators (Attapon Jitpukdee, 2006: 41-44)

The results from weighting score equation value were compared between the level of environmental performance and rating value, which was 1-3. That were 1 = lowest rating value and 3 = highest rating value. And all of 3 levels of environmental performance (good level, moderate level and improved level) were divided by the range of rating value (max - min) = (3-1) / 3 = 0.66

The environmental performance was classified into 3 levels as follows:

Environmental performance at to be improved level = 1.00 - 1.66

Environmental performance at moderate level = 1.67 - 2.33

Environmental performance at good level = 2.34 - 3.00

Methodology for environmental condition indicator (ECI)

Table 1 shows the selecting sites and method of environmental condition indicators (ECIs) of this study.

Table 1 Selecting Sites and Method of Environmental Condition Indicators (ECIs)

Sampling site selection	Method for environmental quality study
1. Waste collection - Waste quantity was waste collection from collection rate by load count, analysis at sites located throughout the island, and at the waste separation plant.	1. Waste quantity exploring Waste quantity per 1 person was calculated as = Total waste quantity (per week) / Total number of tourists By load count analysis from collection rate.
2. Noise level sites (4 stations) St.1 Koh Chang Ferry Pier St.2 Aoe Sabbarod pier St.3 White Sand Beach St.4 Ban Salak Pitch	2. Noise level exploring Noise level exploring was conducted for 8 hrs by using “Sound Level Meter”.
3. Water quality sites (5 stations) St.1 Ban Bangbao St.2 Klong Proa Beach St.3 Klong Plu Waterfall St.4 White Sand Beach St.5 Ban Dan Kao	3. Water quality exploring Some parameters were analyzed at the sites while others were done in the laboratory.

Population and Sampling was classified into 3 groups. Specific sampling techniques were used as follows: head, assistant-head, and high level official (3 peoples), head of Koh Chang district and officials (3 persons), and officers as representatives of Koh Chang Sub-district Administration Organization (9 peoples).

Research instruments: data were collected by applying questionnaire (in-depth interview), the detail was focused on management and operation system, preliminary environmental performance, and environmental aspects of management and operation system.

Data analysis: the collected data of this study was analyzed as follows:

1. Descriptive statistics were applied for environmental performance indicators analysis.

2. Environmental performance evaluation of Koh Chang Marine National park was then classified by applying the following criteria levels: good level, moderate level, and need to be improved.

5. Results and Discussions

5.1 Results of environmental performance indicator (EPIs): the EPIs were considered based on the environmental characteristic of problems and management plan. Then, the indicators for environmental performance evaluation for this study were identified as follows:

Management performance indicators (MPIs) with 4 indicators

1. Policies and budget allocations for environmental performance
2. Managing measures and rules to control environmental problems
3. Training officers in environmental performance
4. Environmental performance frequency monitoring activity of officers of the National Park.

Operation performance indicators (OPIs) with 5 indicators

1. Waste collection and disposal
2. Controlling of waste quantity and prohibited container (foam container) bring into national park by tourists
3. Controlling of untreated waste water from hotel, resort, restaurant, and community flowed to the sea
4. Controlling the intrusive building along the public beach and in the sea
5. Noise controlling generated by tourists in the dense recreational area

Environmental Condition Indicators (ECIs) with 4 indicators

1. Waste quantity (waste generation) by load count analysis
2. Coastal-water quality surrounding Koh Chang
3. Water quality (as natural water resources)
4. Noise level in the dense activities recreation area

5.2 Results of the rating value (R) for environmental performance evaluation (EPE)

Table 2 shows the results of management performance evaluation (MPE) of Koh Chang Marine National Park, while Table 3 and 4 show the results of operation performance evaluation (OPE) and environmental condition evaluation (ECE), respectively.

Table 2 Results of Management Performance Evaluation (MPE)

Environmental performance	Indicator	Weighting Significant Value (W)	Rating Value (R)	W_iR_i	$\sum W_iR_i / \sum W_i$
1.Management (MPI)	1) The policies and budget allocations for environmental performance	4.17 4.67	3 3	12.51 14.01	
	2) Managing measures and rules for controlling environmental problems				
	3) Training offcers in environmental performance	4.00	2	8.00	
	4.) Monitoring of the performance of the national park officers	4.00	3	12.00	
	Total	16.84		46.52	
Management performance result					2.67

Table 3 Results of Operation Performance Evaluation (OPE)

Environmental performance	Indicator	Weighting Significant Value (W)	Rating Value (R)	W_iR_i	$\sum W_iR_i / \sum W_i$
2. Operational (OPI)		4.50	2	9.00	
2.1 Waste Management Performance	1) Waste collection and disposal				
	2) Control of waste quantity and the forbidden container (foam) brought in the national park by tourists	4.00	2	8.00	
2.2 Controlling activities effected to water quality	1) Control of released un treated waste water from hotel, resort and restaurant to beach	4.50	2	9.00	
	2) Control of trespassing building into the beach	4.50	2	9.00	
2.3 Controlling of Noise Level	1) Control of tourist's noise in the dense recreation area	3.33	3	9.99	
	Total	20.83		44.99	
Operational performance result					2.16

Table 4 Results of Environmental Condition Evaluation (ECE)

Environmental performance	Indicator	Weighting Significant Value (W)	Rating Value (R)	WiR_i	$\sum W_i R_i / \sum W_i$
3. Condition (ECI)					
3.1 Waste	1) Waste quantity	4.17	1	4.17	
3.2 Water quality	1) Coastal water quality	4.50	3	13.50	
	2) Water quality	3.83	3	11.49	
3.3 Noise	1) Sound level	3.17	2	6.34	
	Total	**15.67**		**35.50**	
Environmental condition result					**2.27**
Total results (∑)		**53.34**		**127.01**	
Evaluation of environmental performance of Koh Chang Marine National Park					**2.38**

Remarks: *weighting significant value (W) was 1-5, they were 1 = the least weighting significant value, and 5 = the most weighting significant value. Rating value (R) was 1-3, they were 1 = lowest rating value and 3 = highest rating value.*

The results show that the overall environmental performance of KCMNP was 2.38, which was at good level. The three components of environmental performance can be summarized as follows. The evaluation score of management performance at 2.76 point, which is at good level. The evaluation score of both operation performance and environ mental condition are at moderate level with score 2.16 and 2.27 respectively.

5.3 The ISO 14001 Acceptance level of KCMNP

The ISO 14001 acceptance among Koh Chang Marine National park Administator and officers was at high level. The test of 3 hypotheses showed that there were no significant difference between 1) educational level and the ISO 14001 acceptance level, 2) the department or organization concerned and the ISO 14001 acceptance level and 3) knowledge-understanding about ISO 14001 and the ISO 14001 acceptance level at statistical significant level of 0.05

5.4 Discussions

According to the results, KCMNP should emphasize on OPI and ECI in order to enhance the overall environmental performance. To improve the OPI, responsibilities should considered OPI 2.1 and 2.2, which is given rating 2 such as determining the rules or

regulations to control waste from tourists and restaurants etc. To improve the ECI, responsibilities should concentrate on the waste quantity because it is given the lowest rating while it is given high weighing value. According to Dachanee et al. (2003) who studied the waste quantity per person per day reported that 1.5 kilograms of waste generation per day could cause serious effect to the environment. And the concept of this application was coincided with the research findings of Komgrit Tupburi (2002) who had studied the readiness of local community for tourism development at Koh Chang, Trat Province, and found that the readiness of local community for tourism development was 89.90%.

Knowledge gained from the study could be beneficial for planning to improve and manage environmental performance of KCMNP in order to increase its potential for tourism business in the future. And the results could be an information source for any decision maker to apply for planning to develop national parks and conserve natural environment.

4. Conclusions and Recommendations

According to the study, 13 environmental performance indicators (EPIs) were established. The EPIs consisted of 4 management performance indicators (MPI), 5 operation performance indicators (OPI), and 4 environmental condition indicators (ECI). These 13 indicators covered EPE of KCMNP, which is based on environmental aspects and management plan of marine national park.

It was found that overall environmental performance and environmental management of KCMNP were both at good level whilst environmental operation and surrounding conditions were at the moderate level. The ISO 14001 acceptance among administrators and Koh Chang Marine National park officers were at quite high.

The results of the study were submitted to the head of KCMNP for validation. The head of KCMNP was satisfied and accepted the outcomes. Voiced his reasons, he was willing to collaborate with other division to enhance environmental performance as well as expressing his gratitude to the Faculty of Environment and Resource Studies, Mahidol University.

However, KCMNP should arrange projects or activities to avoid creating more waste. If the project had already been in place, it must be practiced regularly to reduce waste amounts on the island as better alternative for eliminating wastes with landfill that could be incorrect method of solving problem. Since this research has pointed out severe environmental impacts from waste amount/person/day, solving existing waste problems should be an urgent priority.

Acknowledgements

This research is supported in part by the grant from the Center for Toxicology, Environmental Health and Management of Toxic Chemicals under Science & Technology Postgraduate Education and Research Development Office (PERDO) of the Ministry of Education.

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