# THE LEARNING OF A TOURISM COMMUNITY IN INFORMATION PROCESSING THROUGH ENVIRONMENTAL CARRYING CAPACITY APPRAISAL

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Thesis
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THE LEARNING OF A TOURISM COMMUNITY IN INFORMATION PROCESSING THROUGH ENVIRONMENTAL CARRYING CAPACITY APPRAISAL

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ABSTRACT

Community-based environmental management that is based on empirical information advances the sustainability of community-based tourism management. Hence, it is necessary that tourism communities, in order for them to appreciate the values of the environment, recognize the impacts of tourism on the environment and aspire for the capacity to plan for environmental management and to possess information processing skills. This participatory action research employed a community-improvised process of environmental carrying capacity appraisal as the learning environment in order to (1) innovate an instructional model of information processing for environmental decision by tourism communities, (2) evaluate the effectiveness of community learning through the learning output, and (3) analyze the factors that influence the learning success. Six leaders of the tourism community of Ban Nong Mae Na, Khao Kho District of Phetchabun Province where environmental resources were vulnerable, participated in the research on a voluntary basis.

The research reveals the following: (1) Through the research process, the Learn to Make an Informed Environmental Decision or the "L-Informed ED" instructional model was synthesized, comprising seven major steps of synergizing cooperation to treat collective environmental problems, collating environmental situations based on existing experiences and beliefs, assessing the actual environmental situations with newly acquired information, planning management guidelines for selected environmental problems, appraising the environmental carrying capacity for holistic environmental management planning, putting the plan to a trial use, and adopting the plan and its adaptations according to the changing situations as a collective rule. (2) The evaluation of the participants' environmental management plan by experts showed that, following this innovative model, the participants reflected their appreciation of the values of the environment, recognition of the impacts of tourism on the environment and mastery of environmental management planning at a high level ($\bar{x}$ = 3.50, SD = 0.46 ; $\bar{x}$ = 3.23, SD = 0.45 and $\bar{x}$ = 3.00, SD = 0.34 on a four-point scale, respectively). It was observed that the participants' practical experience and the information processing developed in the same direction. The more experience they had, the greater their capacity to select information with a greater technical value, instead of speculative information, and to engage in planning in a systematic manner. (3) The factors influential to learning success were classified into two groups. The learning environmental factors include the participants' recognition of the benefits of the research activities, the learning interactions among the participants, the continued enthusiastic characteristics of the participants and the learning support roles of the researcher. The information processing learning structural factors include an evaluation on the situational problem, attention to new information, selection of information, thinking, deciding, action and the subsequent meta-cognition that results in the long-term tacit declarative, procedural and conditional knowledge of the participants.

KEY WORDS: COMMUNITY LEARNING/ INFORMATION PROCESSING/ ENVIRONMENTAL CARRYING CAPACITY/ ENVIRONMENTAL EDUCATION

261 pages

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การเรียนรู้ของชุมชนแหล่งท่องเที่ยวในการประมวลสารสนเทศเพื่อประเมินขีดความสามารถในการรองรับของสิ่งแวดล้อม

THE LEARNING OF A TOURISM COMMUNITY IN INFORMATION PROCESSING THROUGH ENVIRONMENTAL CARRYING CAPACITY APPRAISAL

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บทคัดย่อ

การจัดการสิ่งแวดล้อมโดยชุมชนบนฐานของการใช้สารสนเทศเชิงประจักษ์มีความสำคัญยิ่งต่อการจัดการการท่องเที่ยวอย่างยั่งยืน ทักษะของชุมชนแหล่งท่องเที่ยวในการประมวลสารสนเทศเพื่อให้เข้าใจถึงคุณค่าของสิ่งแวดล้อม ผลกระทบของการท่องเที่ยวต่อสิ่งแวดล้อม และความสามารถในการวางแผนการจัดการสิ่งแวดล้อมจึงเป็นสิ่งที่ขาดไม่ได้ การวิจัยเชิงปฏิบัติการแบบมีส่วนร่วมนี้ใช้กิจกรรมการประเมินขีดความสามารถในการรองรับของสิ่งแวดล้อมเป็นสภาพแวดล้อมการเรียนรู้เพื่อ (1) สร้างรูปแบบการจัดการเรียนรู้การประมวลสารสนเทศเพื่อการตัดสินใจทางสิ่งแวดล้อมของชุมชนท่องเที่ยว (2) ประเมินประสิทธิผลการเรียนรู้ที่สะท้อนผ่านผลผลิตของการเรียนรู้ และ (3) วิเคราะห์ปัจจัยที่มีอิทธิพลต่อความสำเร็จของการเรียนรู้ แกนนำของชุมชนแหล่งท่องเที่ยวบ้านหนองแม่นา ตำบลหนองแม่นา อำเภอเขาค้อ จังหวัดเพชรบูรณ์ซึ่งเป็นแหล่งท่องเที่ยวที่มีสิ่งแวดล้อมที่เปราะบางจำนวน 6 รายเข้าร่วมกิจกรรมในฐานะผู้วิจัยร่วมโดยสมัครใจ

ผลการวิจัยมีดังนี้ (1) จากการวิจัยเชิงปฏิบัติการ สามารถสังเคราะห์รูปแบบการจัดการเรียนรู้การประมวลสารสนเทศเพื่อการตัดสินใจทางสิ่งแวดล้อมของชุมชนที่เรียกว่า L-Informed ED ประกอบด้วย 7 ขั้นตอนสำคัญ ได้แก่ ขั้นสร้างความร่วมมือเพื่อจัดการสิ่งแวดล้อมซึ่งเป็นปัญหาร่วมของชุมชน ขั้นระบุภาพสถานการณ์สิ่งแวดล้อมจากประสบการณ์และความเชื่อเดิม ขั้นประเมินสถานการณ์สิ่งแวดล้อมด้วยสารสนเทศที่ค้นหามาใหม่ ขั้นลองวางแนวทางการจัดการประเด็นปัญหาสิ่งแวดล้อมที่พบบางประเด็น ขั้นประเมินขีดความสามารถในการรองรับของสิ่งแวดล้อมเพื่อกำหนดแผนจัดการกับปัญหาสิ่งแวดล้อมชุมชนอย่างเป็นองค์รวม ขั้นทดลองใช้แผนการจัดการ และขั้นยอมรับแผนการจัดการที่สามารถปรับเปลี่ยนตามสถานการณ์ที่เปลี่ยนแปลงได้เป็นกติการ่วม (2) จากการประเมินแผนการจัดการสิ่งแวดล้อมของชุมชนโดยผู้ทรงคุณวุฒิพบว่า ภายใต้รูปแบบการเรียนรู้นี้ ผู้ร่วมวิจัยสะท้อนความเข้าใจในคุณค่าของสิ่งแวดล้อม และผลกระทบของการท่องเที่ยวต่อสิ่งแวดล้อม และความสามารถในการประยุกต์แผนการจัดการได้ในระดับดี ($\bar{x}$ = 3.50, SD = 0.46; $\bar{x}$ = 3.23, SD = 0.45 และ $\bar{x}$ = 3.00, SD = 0.34 โดยใช้มาตรวัดแบบ 4 ระดับตามลำดับ) โดยมีข้อสังเกตว่า ประสบการณ์การปฏิบัติของผู้ร่วมวิจัยมีผลไปในทางเดียวกันกับพัฒนาการในการเลือกใช้สารสนเทศที่มีความเป็นวิชาการมากขึ้น ลดการคาดเดาลง และความสามารถในการวางแผนการจัดการสิ่งแวดล้อมอย่างเป็นระบบ (3) ปัจจัยสนับสนุนความสำเร็จของการเรียนรู้จำแนกได้เป็น 2 ประเภทคือ ปัจจัยแวดล้อมของการจัดการเรียนรู้ ได้แก่ การเห็นประโยชน์จากการเข้าร่วมกิจกรรมของผู้ร่วมวิจัย ปฏิสัมพันธ์การเรียนรู้ภายในกลุ่มผู้ร่วมวิจัย ลักษณะความกระตือรือร้นอย่างต่อเนื่องของผู้ร่วมวิจัย และบทบาทสนับสนุนของนักจัดการเรียนรู้ ส่วนปัจจัยเชิงโครงสร้างของการเรียนรู้การประมวลสารสนเทศ ได้แก่ การประเมินสถานการณ์เพื่อตั้งประเด็นปัญหา ความสนใจต่อสารสนเทศใหม่ การคัดสรรสารสนเทศ การคิด การตัดสินใจและการปฏิบัติการ รวมถึงการรู้คิดซึ่งทำให้เกิดความรู้เชิงเนื้อหา กระบวนการและเงื่อนไขที่ฝังติดตัวผู้ร่วมวิจัยในระยะยาว

261 หน้า

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# CONTENTS


| | Page |
|---|---|
| **ACKNOWLEDGEMENTS** | **iii** |
| **ABSTRACT (ENGLISH)** | **iv** |
| **ABSTRACT (THAI)** | **v** |
| **LIST OF TABLES** | **ix** |
| **LIST OF FIGURES** | **x** |
| **CHAPTER I INTRODUCTION** | **1** |
| 1.1 Rationale and justification | 1 |
| 1.2 Research Questions | 5 |
| 1.3 Objectives of the Research | 5 |
| 1.4 Scope of the Research | 5 |
| 1.5 Operational Definitions | 6 |
| 1.6 Expected Benefits | 7 |
| 1.7 Research Conceptual Framework | 8 |
| **CHAPTER II LITERATURE REVIEW** | **10** |
| 2.1 Concepts and theories related to environmental education | 10 |
| 2.2 Concepts and theories related to information processing | 24 |
| 2.3 Concepts and theories related to critical thinking | 32 |
| 2.4 Concepts and theories related to environmental carrying capacity in tourism industries | 39 |
| 2.5 Summary of the literature review | 58 |
| 2.6 Study areas | 60 |


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# CONTENTS (cont.)


| | Page |
|---|---|
| **CHAPTER III RESEARCH METHODOLOGY** | **71** |
| 3.1 Study Area Selection | 71 |
| 3.2 Identification of Research Participants | 72 |
| 3.3 Procedures | 80 |
| 3.4 Tools and Tool Quality Examination | 97 |
| 3.5 Data Analysis | 98 |
| 3.6 Reporting the Implementation Results | 99 |
| **CHAPTER IV RESULTS** | **100** |
| 4.1 The innovation of an instructional model of information processing for environmental decision by tourism communities | 100 |
| 4.2 The evaluation of the effectiveness of community learning through the learning output | 193 |
| 4.3 Factors influencing the success of the instructional model | 201 |
| **CHAPTER V DISCUSSION** | **210** |
| 5.1 The L-Informed ED Model | 210 |
| 5.2 Application of the Information Processing Theory to the Community: Advantages and Limitations | 214 |
| 5.3 International environmental carrying capacity to actual local conditions | 220 |
| 5.4 Stepping through participatory action research | 227 |
| 5.5 Transition of the researcher's knowledge through participatory action | 229 |
| **CHAPTER VI CONCLUSION AND RECOMMENDATION** | **232** |
| 6.1 Conclusions | 232 |
| 6.2 Recommendations from the study | 240 |


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# CONTENTS (cont.)


| | Page |
|---|---|
| **BIBLIOGRAPHY** | **243** |
| **APPENDICES** | **253** |
| **BIOGRAPHY** | **261** |


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# LIST OF TABLES


| Table | | Page |
|---|---|---|
| 2.1 | Educational Philosophy and Environmental Education | 16 |
| 2.2 | Knowledge Combination | 34 |
| 2.3 | Skills Reflecting Critical Thinking | 35 |
| 2.4 | Community's Agricultural Calendar | 64 |
| 4.1 | Problems, Causes of Problems, and Management of the Participants | 112 |
| 4.2 | Issues Selected by the Participants | 123 |
| 4.3 | Review of Details of Tourism Activities | 151 |
| 4.4 | Summary of Information Selection and Planning for Information Search | 152 |
| 4.5 | Summary the Physical and Facility Carrying Capacity | 163 |
| 4.6 | The Management plan in Line with Carrying Capacity | 166 |
| 4.7 | Appraisal by the Qualified Experts | 196 |


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# LIST OF FIGURES


| Figure | | Page |
|---|---|---|
| 1.1 | Research Conceptual Framework | 9 |
| 2.1 | Environmental Education-Based Teaching and Learning Model | 15 |
| 2.2 | Cognitive Process | 25 |
| 2.3 | Metacognition Process Based on the Information Processing Approach | 30 |
| 2.4 | Growth of Living Beings | 40 |
| 2.5 | Location of Ban Nong Mae Na | 65 |
| 2.6 | Community Map | 66 |
| 4.1 | Analysis of the Issue of Disturbance of Lifestyles due to Tourism Services | 129 |
| 4.2 | L-Informed ED Model | 185 |


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# CHAPTER I
# INTRODUCTION

## 1.1 Rationale and justification

Tourism development in Thailand has been influenced by the concept of tourist volume-based development to create wealth for different sectors and tourist attractions (Butcher, 2003: 1-7).This style of tourism development has had considerable environmental, social and cultural impacts. In terms of physical environmental impacts, the construction of infrastructure has destroyed wildlife habitats, affected biodiversity, and changed wildlife population and behavior (Khowinthawong, 2012). Numerous studies on the effects of tourism confirm these impacts. Buranahirun (2008) found that beaches on Kho Chang Island, in Trat province, have experienced solid waste issues, land encroachment, disturbance to sand dunes, noise pollution, and water pollution as a result of tourism activities. Wiriyacosol et al. (2005) found problems with respect to wastewater discharge, damage to coral, and solid waste in the Sirinat National Park, in Phuket. The study by Wongsuryrat & Chiaochan (2007: 4-13 to4-14) pointed out that tourism development, especially the construction of accommodations and reservoirs on the Similan Islands, has resulted in a reduction in the number of *Cardisomacarni fex* and *Caloenasnicrobarica*, which are rare endemic animals. The study also revealed the disturbance to marine creatures and coral from diving activities and a lack of measures for systematic solid waste and wastewater disposal. All these effects clearly reflect the physical and biological environmental impacts of tourism.

Tourism development also has affected social thinking and belief systems. Valuable cultures and traditions, including Songkran, Serpent Skyrocket, and Loi Krathong Festivals (Chatchakul, 2007: 62-74) have been utilized ignorantly to create added value in the form of income. Converting the cultures and traditions into products has devalued them and has resulted in hidden meanings in rituals deviating from the original ones. In addition, using the environmental resource capital to serve

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as tourism resource capital has resulted in conflicts and disharmony in society, especially for tourism communities, as a result of thinking and belief conflicts, unfair distribution of benefits, and competition for resources for tourism among sectors, e.g. the household, agricultural and industrial sectors (Wongvipak et al., 2004: 82-86). The usage of community cultures to respond to tourism needs has posed many social issues, as witnessed in the research of Ngaokaew et al. (2006). The research found that tourism development in tribal communities in Chiang Rai province has changed the way they make a living, from agriculture to tourism services, and has transformed them into materialistic societies. This also has resulted in changes in their social thinking and belief system and imitation of tourist behaviors, which has led to conflicts with their beliefs and interests that are too difficult to correct within a short time.

Tourism development in which tourism communities go along the development stream without any defense will result in unsustainable tourism development in a long run. An approach to promote tourism sustainability is providing the opportunities for tourism communities to reflect, by means of information, upon what they are supposed to decide, do and change in a dynamic fashion (Prasertsan, 2011: 75-79). The study aims to understand information processing of tourism communities and searching for instructional models for tourism communities, with a dramatically increasing number, will offer an alternative to tourism development that mitigates environmental impacts. Nowadays, little knowledge is available about tourism communities' information processing for environmental management; therefore, it is very difficult to develop the instructional models concerning this matter. Thus, this research involves the conceptual framework of the information processing theory in conjunction with the concept of environmental carrying capacity appraisal to develop an understanding about this matter.

The information processing theory is a learning theory concerned with gathering, organizing and classifying information in a systematic fashion to make it easy to remember and retrieve and to link new information to prior experience to formulate suitable problem-solving strategies (Khammani, 2011: 80-85). This learning theory focuses on learners as those who control, choose and process information on their own via metacognition, which verifies their prior knowledge and helps them

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determine what they do not know and what they partially know. This will encourage them to seek and select appropriate information for the formulation of problem-solving guidelines (Khotrakun, 2005: 226-227).

The concept of the environmental carrying capacity appraisal involves the usage of information to regulate the utilization of environmental resources without causing damage to local environmental, economic, or socio-cultural systems (Miller & Twining-Ward, 2005: 30) and to encourage continual monitoring (Shelby & Herberline, 1986: 11-16). Environmental carrying capacity appraisal is a comprehensive appraisal that links a wide array of indicators. These indicators consist of ecological components, psychological components, physical and facility components (Butler & Knudson, 1977), sociocultural components, and political-economic components) (Coccosis & Mexa, 2004: 59-60). The difficulty in continually linking the different components has resulted in environmental carrying capacity appraisals tending to be dependent upon external experts. Such dependency has some limitations (Faculty of Forestry, 2005). First, the definitions of environmental carrying capacity tend to be in line with experts' areas of expertise. Lucus (1964) Hendee et al. (1968) Stankey (1971, 1973) and Wargar (1974) (Shelby & Heberlien, 1986: 2). This has resulted in the appraisal results varying according to appraisers' qualifications. In addition, being an outsider usually makes the appraisal limited to just impact measurement that does not lead to tangible area management planning (Coccosis & Mexa, 2004: 40-41).

Alternative tourism development in Thailand has started to focus more on empowering tourism communities to manage their environmental resources utilized for tourism, in the form of community-based tourism. This aims to expose communities to learning and improved quality of life, with equal benefit distribution (Sarobon et al., 2003: 12-13). The study of tourism communities' learning about information processing will lead to the development of instructional models for information processing through effective environmental carrying capacity appraisal, reduce the dependency on outside experts, and enhance community capacity for environmental impact management (Fernando et al., 2004: 79).

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The study of such learning of tourism communities that manage tourism on their own may result in innovation in learning management for information

processing of the communities through environmental carrying capacity appraisal. Therefore, Ban Nong Mae Na, Nong Mae Na sub-district, Khao Kho district, Phetchabun province, has been selected. Located near the Thung Salaeng Luang National Park, this tourism community has famous environmental resources, which are freshwater jellyfish (*Crasapedacusta sowerbyi*), which are found in only six places on earth. This community has a diversity of rich natural resources, but it is vulnerable to exploitation from tourism (Ouithavon, 2003). In addition, this community has had concerns over the issues of disturbance to freshwater jellyfish and butterflies from tourism activities, disturbance to normal community lifestyles as a result of increased tourism jobs, and conflicts within the tourism management group, whose members have started to be estranged from one another (Interview, 2013). To address these problems, the community has developed measures for environmental impact mitigation by adopting rules and regulations to control behaviors that disturb freshwater jellyfish and butterflies and held group meetings to lessen the conflicts. However, such efforts have not yielded tangle results yet. It has been noticed that information the community has used to solve the problems has mostly been derived from their usual-practice experience, which may not be in line with current changing situations. Furthermore, the community's management has mostly focused on dealing with current problems. That is, management guidelines would not be formulated until a problem has occurred, which has involved risks as a result of the failure to recover some sorts of environmental resources in a timely manner (Hammitt & Cole, 1998:153-155). Monitoring and forecasting environmental impacts may be essential for the prevention of the deterioration of environmental resources due to tourism development. Nonetheless, by doing do, the community needs adequate information for supporting its decision about management guidelines in line with area situations and problemcharacteristics (Miller & Twining-Ward, 2005:110-111).

From the afore-mentioned discussion, the researcher was interested in conducting participatory action research involving Ban Nong Mae Na. This research aims to create an understanding about learning that results in the development of instructional models for information processing by identifying the environmental carrying capacity for this tourism community, which has managed tourism on its own. It also aims to encourage the community to learn about information processingin a

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systematic fashion to allow community members to be equipped with better knowledge and understanding about the community environment, to appreciate the value of the community environment as resources for tourism and other dimensions, and to utilize information for environmental management planning. When the community possesses information processing skills, it will be able to drive its community long-life learning and enhance its capacity for monitoring environmental changes as a result of tourism development and other factors by its own. This will allow the community to keep abreast of constantly changing situations and reduce limitations from relying on outsiders' assistance in impact monitoring. This will also promote opportunities for the community to develop the community environment management system perpetually.

## 1.2 Research Questions

1.2.1 What is the optimal instructional model that allows the community to reflect upon and attach great importance to environmental issues by determining its environmental carrying capacity for tourism development by itself?

## 1.3 Objectives of the Research

1.3.1 To innovate an instructional model of information processing for environmental decision by tourism communities.

1.3.2 To evaluate the effectiveness of community learning through the learning output.

1.3.3 To analyze the factors that influence the learning success.

## 1.4 Scope of the Research

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1.4.1 Study area – Mu 6, Ban Nong Mae Na, Nong Mae Na sub-district, Khao Kho district, Phetchabun province.

1.4.2 Population – Members of the Ban Nong Mae Na Forest Lover Group volunteering to join the research.

## 1.5 Operational Definitions

**1.5.1 Community learning**–Learning about usage of information to appraise the carrying capacity of tourism communities, which includes receiving, understanding, storing, retrieving, valuing, and reflecting upon information so as to achieve a determination of the environmental carrying capacity.

**1.5.2 Instructional model**–The model for learning management on the basis of environmental education that integrates the concept of the information processing theory and critical thinking. This aims to create learning, which allows the community to gain knowledge and understanding and realize the value and tendency of its behaviors concerning conservation of natural and environmental resources. Its substantive matters and approaches deal with learning by identifying the environmental carrying capacity for tourism development, which leads to indicators of tourism impactsand operations based on the findings.

**1.5.3 Environmental carrying capacity appraisal**–Finding the highest levels of natural and socio-cultural impacts or changes as a result of tourism development that the community can tolerate. The community will utilize the carrying capacity level to serve as monitoring criteria. In this research, it is believed that the community has potential for identifying its own environmental carrying capacity to cope with constantly changing situations, and the appraisal will involve information that is understandable for the community, and appraisal methods selected will be those that are practical for the community.

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**1.5.4 Tourism impacts**–Consequences of tourism with scales and negative and positive directions. This research focuses on the disturbance to and/or

destruction of natural, cultural and environmental resources, lifestyles, feelings and emotions, as well as esthetics related to lives of community members; destruction of valuable recreational experiences; and unpleasant experiences as a result of visitors.

**1.5.5 Environmental education**–This deals with environmental learning management for the community to create its environmental knowledge, understanding, awareness and positive attitudes, as well as the development of skills in solving environmental issues and the ability to forecast environmental situations. This must rely on the participatory process as the foundation for driving and learner-based learning, which involves actual problems to drive the learning process. In this process, the appreciation of the value of the environmental system and conservation behaviors of the community must be instilled.

## 1.6 Expected Benefits

There are three expected benefits (1) Community benefits (2) Academic benefits, and (3) Social benefits, which are described below:

**1.6.1 Community benefits:** (1) Develop learning about information processingin a systematic fashion,(2) Generate the appreciation of the value of the environmental system, co-learning, and self-value, (3) Develop environmental knowledge, understanding, practices and concerns, (4) Develop the interactions among group members and participation in environmental resource management, (5) Reveal the levels and nature of local tourism impacts, and (6) Develop planning skills to attain systematic environmental management on the basis of value, information usage, and keeping abreast of situational changes.

**1.6.2 Academic benefits:** (1) Reveal the community's instructional model and information processing, which will serve as an important database for development to achieve appropriate learning management for the community, (2) Encourage the community to take actions on its own, (3) Reveal the limitations,

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advantages, and conclusions about the enhancement of the community's environmental carrying capacity for tourism development, and (4) Acquire tools, approaches or methods that can be applied to tourism management in community-based tourism.

**1.6.3 Social benefits:** (1) Promote the development of eco-tourism, (2) Promote the image of community tourism focusing on tangible conservation and area management, and (3) Promote the appreciation and awareness of the value of the environmental system that will lead to natural resource and environmental conservation.

## 1.7 Research Conceptual Framework

In this research, a conceptual framework has been developed based on the assumption that the community will be able to identify and develop its environmental carrying capacity for tourism development while keeping pace with constantly changing situations when it is able to process and search for informationin a systematic fashion, has critical thinking, attaches great importance to the environment, and is prepared for taking actions for society. Thus, the researcher adopted the concepts and theory that respond to the assumption, which consist of: (1) Information processing theory, (2) Critical thinking, and (3) Environmental education for synthesis to serve as the learning management framework for the target group. The synthesis has led to the following learning management framework:

1) Learning must be related to environmental issues and impacts from tourism that the community must identify and learn by itself through its practices.

2) Learning must generate systematic information processing and information linkages to achieve information interpretation with critical thinking.

3) Learning must be linked to individual experiences and collective experience of the group.

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4) Searching and learning must be based on participation, from thinking, doing and receiving the results.

5) Learning involves long-life learning.

6) Appropriate learning management will help the community to learn about its environmental carrying capacity. That is, the community will be able to search for information and understand it, assess and sort it, and reflect upon it so that it can determine the level of its environmental carrying capacity, what the indicators of its carrying capacity should be, or what the environmental management plan should contain.

Based on the above-mentioned conceptual framework for learning management, when learning is managed it will encourage the community to expand the meanings of information received from activities blended with its experience. This will allow the community to fulfill its knowledge and understanding about tourism impacts and its carrying capacity, appreciate the value of the environmental system, and apply the knowledge to plan tourism resource management based on the findings. This will enable the target group to conduct monitoring and planning for management in line with changes in environmental situations. The conceptual framework for the research is outlined in Figure 1.1.

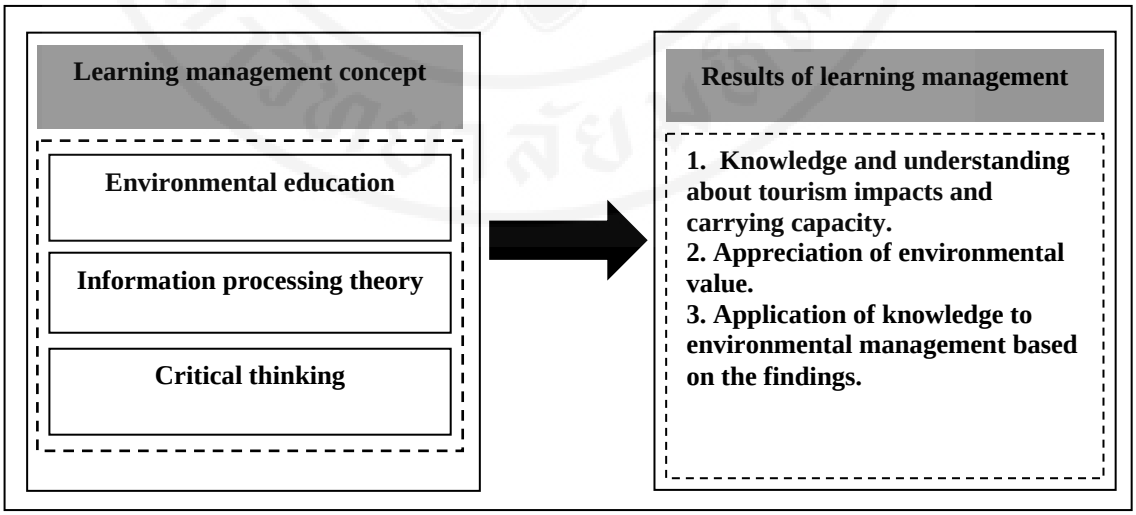


**Figure 1.1** Research Conceptual Framework

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# CHAPTER II
# LITERATURE REVIEW

The literature review in this study focuses on the concepts of design and management of learning that results in problem management, as presented in chapter I. Its substantive matters consist of: (1) Concepts and theories related to environmental education; (2) Concepts and theories related to information processing; (3) Concepts and theories related to critical thinking; (4) Concepts and theories related to environmental carrying capacity in tourism industries; (5) Summary of the literature review; and (6) Study areas, as outlined below.

## 2.1 Concepts and theories related to environmental education

Learning management that results in communities gaining a better understanding about, and attaching great importance to, the environmental system and that results in changes in behaviors toward the environment by searching for their carrying capacity is consistent with the learning management approach of environmental education. To provide a clearer picture of learning management, there is a need to provide an explanation of the essence of environmental education. The major points that need to be explained include: (1) Basic principles of environmental education, and (2) Environmental education and adult learning, each of which are outlined below:

### 2.1.1 Basic principles of environmental education

The basic principles of environmental education consist of: (1) The definitions of environmental education; (2) The goal of environmental education; and (3) The structure and operation of environmental education, as described below.

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#### 2.1.1.1 Definitions of environmental education

The definitions of environmental education are essential for determining instructional models. Currently, there is no agreement about the definitions of environmental education; they vary according to basic concepts of scholars or institutions (Rattanapojnard, 2001: 6). Despite having diverse definitions, their common gist is educating people about the environmental system and environmental issues that need resolution or environmental quality enhancement. Based on this focus, environmental education can be regarded as an educational process focusing on knowledge about the physical and social environment, both in concrete and abstract terms that have impacts on the environment and mankind as a whole. This aims to change attitudes, behaviors, and values in order to maintain or enhance environmental quality for individuals and the general public (Veeravatnanond & Siphanphong, 1996: 12-15).

Apart from diversity in its definitions as mentioned above, there is an overlap between environmental education and other similar principles, such as education for sustainable development (ESD), education for sustainability (ES), and education for a sustainable future (ESF). When compared with these principles, environmental education focuses on knowledge and understanding about the environmental system and solving environmental problems. On the other hand, ESD extends its interest to socio-economic aspects based on the sustainable development framework to consider optimal alternatives to environmental management to ensure sustainable use. EFS involves policy consideration, such as the formulation of environmentally-friendly policies and the formulation of civic duties to achieve environmental ethics (Blewitt & Cullingford, 2004: 48-50). However, despite possessing different goals and objectives, the essence of all these principles are targeted toward the same thing – management of learning to maintain a balance in the environmental system and change humans' use of the environmental system to achieve sustainable development in the future.

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#### 2.1.1.2 Goals of environmental education

According to the UNESCO and UNEP, at the meeting in Tbilisi, the Soviet Union in 1977, environmental education has three key goals: (1) To

develop awareness about economic, social and political importance, as well as relations in the ecosystem, both in urban and rural areas; (2) To create opportunities for seeking knowledge and creating values, attitudes, mutual agreement and skills needed for natural resource and environmental conservation by the general public; and (3) To create new behavior in individuals, groups, and society as part of the environmental system (Palmer & Neal, 1994: 13). The aim of learning management is as follows: (Veeravatnanond & Siphanphong, 1996: 32)

(1) Awareness – To make individuals and groups of people be aware of, and concerned with, the environment and environmental issues.

(2) Knowledge – To allow individuals and groups of people gain an understanding about, as well as gain diverse experiences involving, the environment and environmental issues.

(3) Attitudes – To allow individuals and groups of people to have an appreciation of, and affection for, the environment and an aspiration for preventing environmental problems and enhancing the environment.

(4) Skills – To allow individuals and groups of people gain skills in addressing and solving environmental issues.

(5) Participation – To provide individuals and groups of people the opportunities to participate in solving environmental problems at all levels.

Based on the goals and aims of learning management, it can be viewed that environmental education is characterized by lifelong learning, whereby learners need to search for information on their own in an integrated manner. The substantive matters to learn about involve maintaining the quality of human life and all living organisms in the environmental system. It deals with learning through practices and direct experiences, which is "*learners-based learning*" that relates environmental issues to daily life to create wisdom of, and skills in, solving problems with critical thinking. In addition, it is education for all, education for sustainable development, education for peace, education for environmental friendliness, and education to develop ethics and morality (Veeravatnanond & Siphanphong, 1996: 29-30).

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Based on the environmental education approach, basic concepts of learning management can be organized in three parts: (1) Education about the environment, which aims to develop knowledge and understanding about the

substantive matters concerning the environment on the basis of value and positive attitudes towards the environment; (2) Education for the environment, which will encourage learners to examine their own behavior and their relationship with the environment. This part must link the value and positive attitudes with knowledge and understanding to develop preferable behavior for sustainable development; and (3) Education in or through the environment, which uses environmental issues as resources for learning to develop connections between knowledge about, and skills in, exploration and communication about the acquired substantive matters (Palmer & Neal, 1994:13).

**2.1.1.3 structure and operation of environmental education**

The National Curriculum Council (1990) displayed the structure of learning in environmental education in three characteristics. The first is **knowledge –** it is important for learners to be developed in terms of knowledge and understanding. The key issues include knowledge about (Palmer & Neal, 1994: 22-25): (1) Natural processes in the environmental system; (2) Impacts of human activities on the environmental system; (3) Differences between the environmental system in the past and present; (4) Important environment issues; (5) Local, national and international control to protect or manage the policy-making and decision-making systems; (6) Interdependence between the environment of individuals, groups of people, communities and countries; (7) Living patterns of humans and their dependence on the environment; (8) Potential environmental conflicts; (9) Impacts of development on the environment; (10) Importance of planning, design, and the consideration of esthetics; and (11) Importance of effective practices concerning environmental conservation and management.

In terms of **skills**, the focus is placed on communication skills, numeracy skills, study skills, problem-solving skills, personal and social skills, as well as information technology skills. As for **attitudes**, the focus is on encouraging positive attitudes to the environment. It is crucial for learners to realize the value and importance of environmental conservation. The attitudes reflecting the admiration of the value in individuals are related to: (1) Appreciation of, care for, and attaching great

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importance to, the environment and all lives; (2) Freedom to think about environmental issues; (3) Respect for other people's beliefs and opinions; (4) Respect for evidence and reasons in arguments; and (5) Patience and an open mind.

In addition, Palmer (1997: 141-142) suggested that environmental education consists of four major components: (1) Empirical elements, which deals with examining the achievement of the goals, measurement and analysis to confirm that learners have diverse opportunities for interacting with the environment through observation, measurement, recording, interpretation and discussion as to what they observe; (2) Synoptic elements, under which learners need to realize environmental complexity, the main goal of which is to allow learners to understand issues pertaining to the complexity, avoid breaking the environmental system into parts, as well as be able to explain and understand the interactions in the environmental system in a holistic fashion; (3) Aesthetic elements, which help learners understand that there is no absolutely right or wrong answer and learn to compromise about environmental issues; and (4) Ethics elements, which are the heart of environmental education, aim to create environmental responsibility and stewardship. It is important for people who provide "*environmental-educational based learning*" to set the goals of desirable behavior on the basis of moral values. Based on these elements, the primary teaching and learning model based on environmental education is illustrated in Figure 2.1.

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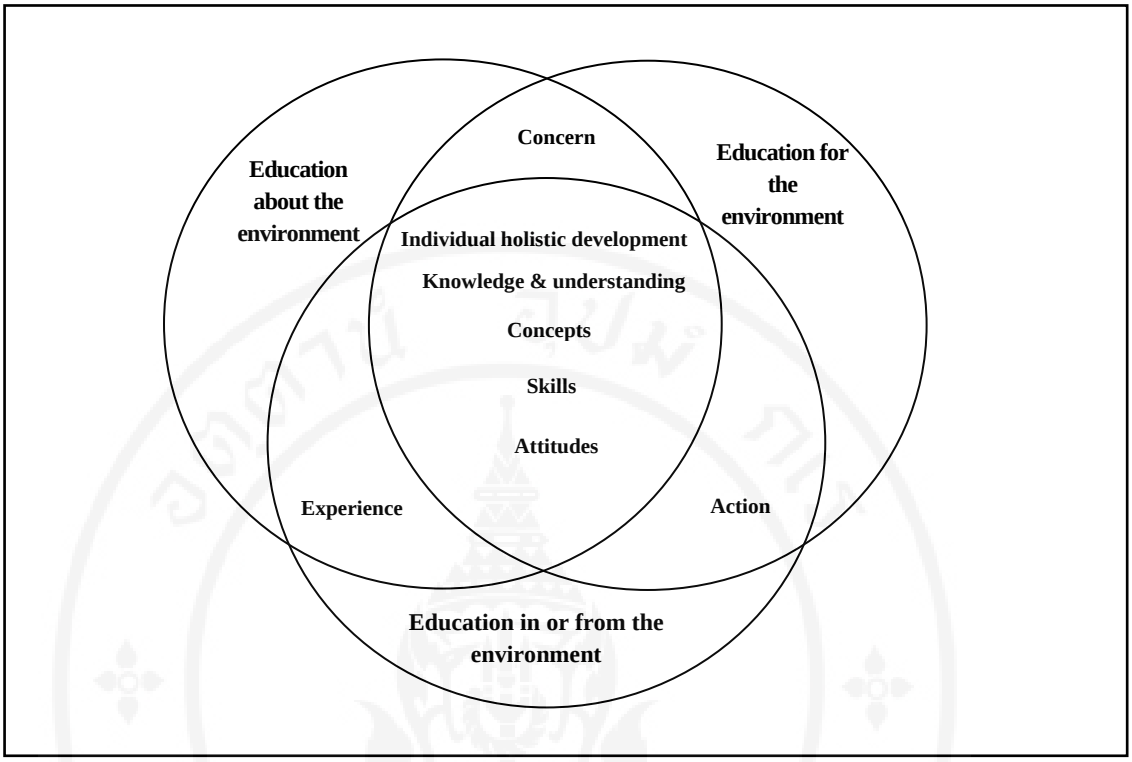


**Figure 2.1** Environmental Education-Based Teaching and Learning Model
Source: Palmer (1998: 145).

Based on the aforementioned details, environmental education has a close relationship with the teaching process. Thus, it takes different forms, varying according to the philosophical basis related to the human learning process. In this regard, Palmer (1998: 147-148) outlined the concept developed by Robottom & Hart (1993) to create an understanding about the guidelines for environmental education based on the philosophical basis related to human learning and integration of highlights of the philosophy, as shown in Table 2.1.

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**Table 2.1** Educational Philosophy and Environmental Education

| **Issue** | **Philosophical basis** | | |
|---|---|---|---|
| | **Positivist** | **Interpretivist** | **Critical** |
| • Purposes | | | |
| 1. Views of environmental education | Knowledge about the environmental | Environmental activities | Environmental actions |
| 2. Educational objectives | Vocational | Liberal | Socially critical |
| 3. Learning theories | Sometimes Behaviorist | Constructivist | Reconstructivist |
| • Roles | | | |
| 4. Roles of environmental education goals | External rules | External development, but usually with negotiation | Criticism |
| 5. Instructors' roles | Powerful people in knowledge | Environmental experience provider | Cooperation/participation in seeking knowledge |
| 6. Leaners' roles | Passive learner | Active learner | Active generator |
| 7. Curriculum supporters | Prepared publications about solutions to environmental problems | Interpreter from an environmental learner | Problem-solving network |

Source: Palmer (1998: 147-148).

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**Table 2.1** Educational Philosophy and Environmental Education (cont.)

| Issue | Philosophical basis | | |
|---|---|---|---|
| | **Positivist** | **Interpretivist** | **Critical** |
| • Knowledge and power | | | |
| 8. Views of knowledge | Systematically and objectively predefined; visions formulated by experts | Discernmentfrom experiences | Creation of/emergence from cooperation in seeking knowledge of groups |
| 9. Management of the principles of substantive matters | Discipline | Personal experiences | Environmental issues and community/society's management |
| 10. Power relations | Promoting power relations | Supporting and not supporting power relations | Challenging power relations |
| • Views of research | | | |
| 11. Research characteristics | Applied science/ Positivism/ Quantitative research | Qualitative research/ Subjectivism/ Constructivism | Learning for release/Qualitative research/ Criticism |
| 12. Research design | Predefined/Fixed | Predefined/ Responsive | Negotiation/ Emergence |
| 13. Researcher characteristics | External experts | External experts | Group of participants |

Source: Palmer (1998: 147-148).

Although educational philosophy is important for learning design, environmental education management needs to take into account the nature of the learners, in terms of locality, age, interests, physical performance, intellectual potential, etc. This research study was particularly interested in providing learning for

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local communities, which is in the form of adult education or informal education. Thus, environmental education needs to understand the nature of learning of the group of learners. The next section discusses major characteristics of adult learning that will be incorporated into the environmental education concept to ensure effective learning management.

### 2.1.2 Environmental education and adult learning

Andragogy, which is adult learning management, is distinct from pedagogy, which is child learning management. In the early 1950s, most educators believed that learning theories could be applied to both children and adults. But when pedagogical theories and pedagogy were applied to adults, they proved to be inappropriate and failed to develop learning effectively. This failure results from differences in characteristics changing across ages. These differences have brought about different teaching services. Learning for young people focuses on knowledge transmission. On the other hand, adults want to learn to achieve changed understanding or self-concept, enhanced self-directedness, and increased accumulated knowledge from prior knowledge. This, in turn, links to learning about new things, learning that tends to develop their work or social skills, and problem-centered learning rather than "*course-based learning*" (Holmes & Abington-Cooper, 2000). Issues arising from different learning styles between children and adults are described below.

**2.1.2.1 General characteristics of adults –** This helps describe some common qualifications or characteristics of adults that contribute to appropriate and effective andragogy. In this regard, Watanawong (2002: 41-46) suggested that they include: (1) Qualifications by definition – Adulthood is a period when people want to develop themselves for advancement and more freedom. Andragogy has to develop self-fulfillment; (2) Package of experience and values; (3) Set intentions; (4) Competing interests, as a result of a lot of burdens in life; and (5) Pattern of learning, which is associated with specific aptitude and experiences. Isarawatana (2000: 25) viewed that andragogy is centered around problems, rather

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than substantive matters or general matters. Developing an understanding about the characteristics or qualifications of adults will optimize andragogy.

In addition to the learning styles of adults as mentioned above, adults' physical characteristics are an important issue that needs to be taken into account when we define instructional models and activities, as this involves changes and deterioration from aging, such as vision, hearing, intellectual abilities, and memorizing abilities, which may be degraded by growth or older ages. However, the above limitations are only a precaution for designing learning activities, which must be consistent with the ages of the learners. Kidd (1975) believes that adults can learn throughout their life if they are content and their desire to learn is related to different motives. Roger (1977: 13-20) suggested that motives consist of (1) Vocational motives; (2) Self-development; and (3) Social motives. Thus, the key issues for andragogy deal with the creation of a desire or motivation to learn and link what they have learned to products and outcomes that will arise after learning (Isarawatana, 2000: 27-32).

**2.1.2.2 Learning styles in adults –** Lindeman (1962) studied learning styles in adults and summarized that: (1) Adult learning is related to the fact that adults themselves are aware that learning can help to meet their needs and interests. To trigger such needs and interests, they must be stimulated to be ready to learn. If the stimulation is in line with their past life experiences, it will increase their desire and readiness to learn; (2) Adult learning must focus on learning that benefits their life using life situations and life-centered learning. Thus, preparing suitable modules for adults should prioritize their life situations rather than course contents; (3) Experiences are the most valuable source of learning for adults. Therefore, a key principle for adult education is the analysis of the experiences of individual adults to see which part of their experiences can be applied to teaching and utilization of the experiences in the future; (4) Adults have an aspiration to be self-directing, so instructors should play a role in seeking mutual inquiry rather than giving knowledge; and (5) Individual difference increases by age. Learning management should attach great importance to compensating for the difference of learners, including learning styles, learning periods, and characteristics of activities (Photisuvan, 2001: 55).

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Knowles et al. (1998: 64-68) explained that basic beliefs about adult learning are different from those involved in child learning in terms of: (1) Change in self-concept, which changes from being dependent to self-directing; (2) Role of the learner's experiences that are accumulated in life; (3) Readiness to learn about necessary matters, perform effectively in life situations, and respond to social roles. If learning matters are in line with what adults want, they will be ready to learn or have a passion for learning; and (4) Orientation to learning – Adults will learn about what they think will be beneficial to them in current conditions.

The above discusses adult learning that will help with effective andragogy. There are other important issues to take into account concerning andragogy. Knowles et al. (1998) presented that issues beyond andragogy are associated with individual differences in adult learners. Jonassen & Grabowski (1993) explained that individual differences affect adult learning in three aspects: (1) Cognition, (2) Personality, and (3) Prior knowledge. Jonassen & Grabowski (1993) described these three key aspects (Knowles et al., 1998: 154-155). This study, however, focused on the cognitive domain, so the following sections are mainly dedicated to this domain.

**2.1.2.3 Individual differences in adult learning** – According to Jonassen & Grabowski (1993), individual cognitive differences are classified into four levels: **(1) Cognitive ability,** which is associated with intelligence. According to Horn & Cartell (1966), this ability consists of two key features. The first is fluid intelligence, which is similar to intelligence quotient (IQ). As an innate characteristic, fluid intelligence is not derived from education. The intelligence is reflected through the ability to resolve novel problems; it is well developed in adolescents and stable in adults. The second is crystallized intelligence, which is related to the environment, experiences, learning from working, and education, which increases during adulthood. Crystallized intelligence is a key to the explanation that most adults lacking fluid intelligence gain compensation from crystallized intelligence. **(2) Cognitive control**, which refers to the pattern of thinking that controls individuals' reasoning process about information that reflects the level of the learner's perception or comprehension of information as a result of contextual perceptions (Jonassen &

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Grabowski, 1993: 87). Knowledge and thinking control are concerned with two patterns of thinking. The first is field-dependent thinking for creating learning. The main features associated with this include generalization, being influenced by the environment, the need for social reinforcement, and awareness about the concept. The second type is field-independent thinking; its main feature is analytical views, not being influenced by the environment, self-confidence, loving to test hypotheses and systematicness, and adherence to principles.

Joughin (1992) suggested that field-dependent and field-independent learning are crucial to adult learning. Sometimes, field-dependent learning may reduce the ability of self-direction, while field independent learning will lead adults to critical reflection and self-organizing (Knowles et al., 1998: 159-160). **(3) Cognitive style**, which is a stable feature related to the investigation and processing of data about individuals. This style of thinking has evolved from the interest in individual differences. Concerning the study of cognitive styles, at first, psychologists focused on individual differences in terms of information processing, but they did not apply the concept to classroom teaching and learning. Later, psychologists interested in the development of classroom teaching and learning efficiency introduced the cognitive style concept, which focused on the classroom learning context. They developed a new concept called the learning style. **(4)Learning style** is a physical characteristic whereby individuals use thoughts and feeling to perceive, respond to, and interact with the learning environment in a relatively constant manner. It is involved with cognitive styles and learning strategies, which mean methods utilized by learners to manage or respond to learning activities that are in line with current situations and work. Thus, cognitive styles and learning styles are thinking and learning characteristics that individuals use on a regular basis. However, cognitive styles and learning styles do not directly refer to abilities, but are methods through which individuals use their existing abilities to think and learn in a particular style rather than another style.

Understanding individual differences, as mentioned above, will help with identifying and strategies and developing activities suiting the individuals to result in effective learning. In addition to cognitive differences, understanding learning processes is essential to andragogy. As for the question concerning how adults learn,

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Smith (1982: 19-20) regards that the adult learning process is involved with the processes of information processing or knowledge and skill enhancement developed from effective learning, which involves the efficiency of learning about diverse situations and goals. With respect to this matter, Gibbon (1990) classified dimensions about how to learn into three dimensions:

**Dimension 1: Kinds of learning,** which consist of (1) Natural learning, which is learning from individuals' close interaction with the environment and learning through different sources, such as other people, the environment, surveys, operations, and instructors; (2) Formal learning, which is learning about matters that other people selected to transfer to them. It is learning through teaching, giving assignments, basic learning, and outlining learning activities; and (3) Personal learning, which is self-directed and the interest in which will be developed in terms of skills to design what to learn, how to manage the learning process, and how to learn through experience.

**Dimension 2: Aspects of learning** – This section deals with the following major issues: (1) Reason, which is relevant to the management of thinking rather than thinking itself. It has a close relationship with metacognition, and the key predictive factors of the reason's role in thinking is the development of individuals' abilities about perception, analysis, expression of ideas, images and reflections; (2) Emotion, which is a response to feelings, responsibility development, and actions on the basis of confidence. Its important predictive factors consist of feelings about experiences, clarity, development of confidence, development of commitment, and belief in one's own insight; and (3) Action, which is the part of learning that leads to meaningful actions. Its key predictive factors are composed of decision-making, creativity, practices, and problem-solving.

**Dimension 3: Domain of learning –** This is important to the effectiveness of adult learning and includes (1) Technical aspect in performing daily activities and work; (2) Social part for interaction with others; and (3) Development of learning for self-development.

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Accordingly, adult development need to focus on individual differences, as described above. The development of environmental education-based adult learning deals with continuous processes or diverse approaches or methods.

However, the literature review reveals that the adult development-related theory that is the most important for adult learning development is the cognitive development theory. It is important in two aspects. It helps explain different characteristics of adult learning during different stages of life and helps explain why learning in different stages of life is different. Bee (1996) suggested that the purpose of selecting the adult learning theory involves adult learning development in two dimensions, which are the focus on development and focus on change. If the focus is on development, cognitive development theories are more suitable, but if the focus is on change, life-span role development theories are more suitable.

Based on the aforementioned adult learning characteristics with regard to the need for self-direction, experiences accumulated in life, readiness to learn about what they think is necessary, as well as having clear goals of learning (Knowles et al., 1998: 64-68). Experiences and information retrieval, in particular, are highly developed during adulthood to compensate for the disruption of fluid intelligence (Jamornman et al., 1995: 28). The researcher realized the importance of applying the cognitive development theories to serve as a basis for learning management. The theories support the development of information processing skills and thinking systemization to systemize the information and link knowledge from the information processing to existing experiences and knowledge. This will result in enhanced knowledge and understanding and a broader interpretation of the meanings of the environment based on values.

It can be concluded that andragogy should focus on matters that interest adults, from work or life experiences. It should involve adults in field-independent learning in order to create freedom in their self-reflection. Management of learning for adults should not be lesson-based; adults should guide and direct themselves in learning. This should involve the development of expertise in what adults are interested in; generate change in themselves and change of existing practices into experience-based practices to ensure effectiveness and reasonable explanations; and utilize information as substantive matters to achieve the development.

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## 2.2 Concepts and theories related to information processing

In this research, the cognitive development theory served as a conceptual basis of community learning management. It focuses on knowing and thinking that start from attention, perception, remembering, reasoning, imaging, anticipating, deciding, communicating, as well as skills related to information management, such as classification, interpretation, conceptualization, and memory (Khotrakun, 2005: 187-198).

The information processing theory is consistent with the cognitive process; it helps explain community learning from information processing, which involves receiving, paying attention to, perceiving, encoding for storage, and retrieving information. Details of the theory were applied to describe information processing and the thinking processes of the community and applied to manage learning for the community. This aimed to develop information processing skills, which can lead to a greater understanding about the learning processes, support learning management, and expand the understanding about the theory. The theory is explained in three characteristics: (1) Basic principles of the theory; (2) Human information processing; and (3) Application of the theory in learning management.

### 2.2.1 Basic principles of the theory

The information processing theory is a contemporary theory originating from the dissatisfaction with the explanation for learning by the behaviorism school, which does not pay attention to the processes of the brain or thinking processes of humans. Believing that learning changes knowledge in terms of quantity and processing, the theory tries to explain how individuals obtain information or acquire new knowledge, how the information and knowledge are accumulated, and how individuals retrieve the accumulated knowledge. Its fundamental beliefs, according to Jamornman et al. (1995: 37) are that: (1) Human behavior is controlled by the preliminary information process, in which relations are ordered; (2) Humans act on information – learning and behavior will reflect the action upon the information; (3) Humans can accumulate and act on information in different ways; (4) There are only some human characteristics that remain stable under changing work conditions and the

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changing environment; and (5) Learning from problem-solving is the basis of the action upon the information available.

Khotrakun (2005: 220) added more details about fundamental beliefs for two issues: (1) To learn anything, learners can control the learning speed and steps and (2) Learning is changing learners' knowledge in quantitative and qualitative terms. Learners can gather and organize what they have learnt to retrieve it when they want to. This theory involves three connected parts: information, processing, and the processor. Their linkages indicate fundamental beliefs in the theory that information processing of humans is similar to computers.

According to Child (2007: 191), apart from explaining that human learning is similar to how a computer works, this theory explains humans' important memory systems: (1) Internal structure and (2) Other parts related to functioning of the internal structure, which deals with the working process of memory. The concept of Child (2007) reflects the process within the human brain. Information processing is a component of the cognitive process. Jamornman et al. (1995: 37) defined that it is the brain process related to discovery, selection, perception, thinking, and problem-solving through senses, which are expressed in the form of behavior. This cognitive process reflects the process that analyzes and changes internal patterns or phenomena, such as encoding, forgetting, remembering, thinking, and developing concepts. To provide a clearer picture, the cognitive process is illustrated in Figure 2.2.

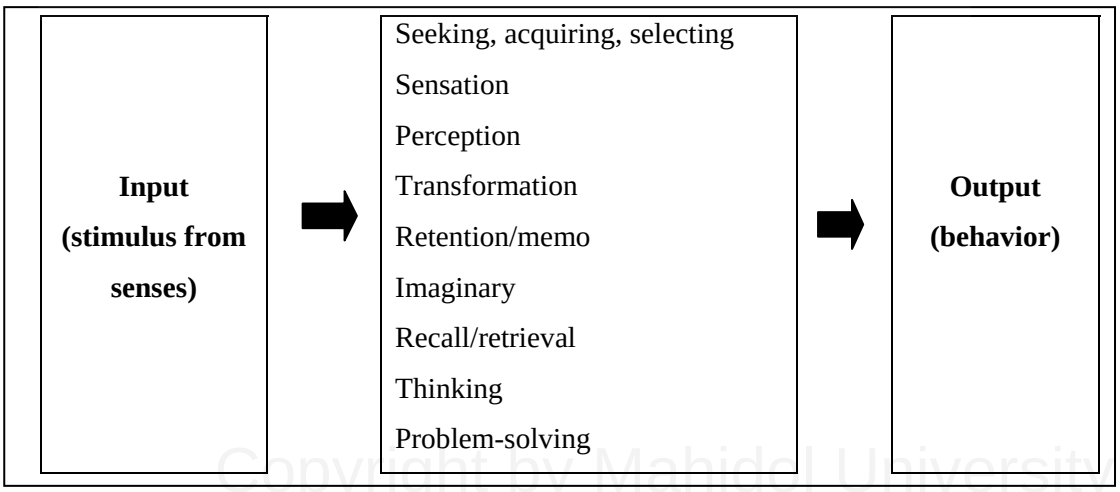


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**Figure 2.2** Cognitive Process

Source: Thanakanya (2003: 16)

### 2.2.2 Human information processing

Based on the abovementioned explanation, the cognitive process is important for information processing and cognitive functions, in terms of organizing information; incorporating knowledge or information together with prior knowledge; and adding, modifying, correcting and improving knowledge. The absence of a cognitive system, which is compared to the representative of components that allow the information processing system in the brain to run effectively, will result in the failure of information processing. Thus, information processing by humans involves collaboration of two important things – the process and the structure, which refers to three types of memory – sensory register, short-term memory (STM) or working memory, and long-term memory (LTM) to process information within the human brain. Information processing needs explanations of major components in order to expand the understanding about the structure and functions, which will result in a more profound understanding about human information processing. The details are as follows: (Cho. Chenchit, 2002: 221-223) and (Liamkaew, 1985: 9-10).

**2.2.2.1 Sensory register sensory memory storage** – It explains how humans learn when they are motivated by stimuli. It starts from translating codes or encoding, which coverts codes from stimuli received through senses to storage. The sensory register is the first memory system that stores data in a short period, of about 1-3 seconds, to allow individuals to decide if they have any interest. If they do, the interest will be passed to short-term memory. According to Khotrakun (2005: 221-222), sensory register or sensory memory storage is crucial for short-term memory. The first component is **recognition** of raw data from interpretation using cognitive content or schema. The raw data interpretation consists of two major characteristics: bottom-up processing and top-down processing. Based on the context of new information plus prior knowledge, individuals are able to interpret small chunks of information. The second component is a**ttention**, which deals with priority or interest given to bits of information. Learners pay attention to what they think about or are interested in. If they believe that learning is useful and meaningful to them, this will make learning effective. Interpreted data will be sent to the short-term memory storage.

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**2.2.2.2 Short-term memory** – There are other terms that refer to short-term memory, e.g. short-term storage, working memory, immediate memory, active memory, temporary storage, and primary memory. This memory is very important for acting upon information received and serves as the information processing center that controls thinking, sets strategies for problem-solving, and evaluates the best alternatives and methods. Sometimes, it is called working memory because short-term memory is the memory within a particular period. It lasts approximately 20-30 seconds only.

An important thing for short-term memory is **rehearsal**, which helps prolong our interest in short-term memory. **Rehearsal** consists of maintenance rehearsal and elaborative rehearsal. It consists of memorizing to remember information within a particular time, e.g. a phone number. It is useful for developing the ability to remember, but it is not relevant to long-term memory. Elaborative rehearsal is memorizing by linking new information to old information in long-term memory. Data is transferred into long-term memory and stored in short-term memory, which involves utilizing collected knowledge for learning (Leahey & Harris, 1985: 122-124). **Encoding** is interpreting what people are facing or perceiving, in the form of images, sounds and meanings. **Forgetting** comprisesforgetting by time and forgetting by the interference between new data and existing data.

**2.2.2.3 Long-term memory –** The cognitive school attaches great importance to it, believing that long-term memory has no boundary, but it is similar to an experience storage. Khotrakun (2005: 224) classified long-term memory into four types: (1) Episodic memory; (2) Semantic memory, comprising conceptualization and principles, such as working principles; (3) Motoric memory; and (4) Affective memory, such as liking or disliking. Leahey & Harris (1985: 130-131) classified the memory into two types: (1) Episodic memory, which is individuals' unique experience about space and time; and (2) Semantic memory, which is similar to general knowledge possessed by individuals. Both types of memory relate to each other.

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Key features of the elements of long-term memory, as mentioned above, reflect that long-term memory is critical to the management of

information received. The cognitive approach reflects the linkages of the thinking process and perception of surroundings. Anderson (1983, 1987, 1989, 1990) proposed adaptive control of the thought theory (ACT Theory) to explain linkages in human memory. Based on the ACT theory, knowledge stored in long-term memory has two key features. The first is declarative knowledge, which is knowing facts. The second is procedural knowledge, which explains what individuals have to do to know facts. Wilhite & Payne (1992: 218-222) further explains that declarative knowledge is defined as knowledge managed into the associative network, while procedural knowledge is a production system operated based on factual knowledge in work and activities. The combination of declarative knowledge and procedural knowledge, as described above, is included in schema, which refers to the structure of general knowledge. The framework for knowledge classification is the group of knowledge that shows general processes, goals, rules, events, linkages of events or social situations.

The key features of schema can be explained by the schema theory, which consists of three important elements, including the method of organizing knowledge in the human brain, how to acquire new knowledge to join with schema, and how to improve the schema (Tan-ngarmtrong, 1986: 94). The schema theory explains knowledge, which consists of either the schemata, the framework, knowledge structure, or script. Humans have the processes to acquire and digest information for the efficiency of representation. The structure of this knowledge is in order and classified by similar properties. This schema helps with processing and recalling information in long-term memory storage.

Wilhite & Payne (1992: 218-222) suggested that long-term memory consists of two types of knowledge: procedural knowledge and declarative knowledge. Declarative knowledge involves episodic memory and semantic memory, which reflect memory in the form of a representation or symbol inside individuals as conceptual knowledge, which is general knowledge, such as legislation and basic concepts. Remembering the meaning of words is crucial. Due to the collection of a great deal of concepts, if concepts are not arranged systematically, the retrieval duration and quality of information will be affected. On the other hand, if they are arranged systematically, retrieving the knowledge from long-term memory will be

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effective, and the systematization of meanings will help develop the working process of thoughts. The essence of managing semantic memory involves many elements. The first is **organization and recall**, which involves arranging hierarchical knowledge, which has a great influence on the facilitation of recalling the information about the semantic network of words. This part consists recalling hierarchical information and building the semantic network. The semantic network is used as knowledge in the form of diagrams. The second element is the **cluster of knowledge** (Reed, 2007: 209-222). Information processing is under the executive control of information processing, a system that controls all functions of information processing. It deals with controlling a cognitive activity called metacognition, which is the wisdom of learning with an understanding or awareness of one's knowledge and ability (Khammani, 2011: 82-83).

Based on the definition of metacognition mentioned above, Baker and Brown, 1984, cited in Khammani et al. (1997), identified two important components of metacognition. The first component is **awareness**, which is awareness of skills, methods, and information resources needed for effective working and awareness of how to achieve these. People know what they think, which is in line with learning situations and expressions of what they have learned by explaining it to other people. They can outline what they have learned or have methods of remembering, scoping, and taking notes. They can reflect their own thinking while reading stories or they can solve problems – the skills that allow people to work methodically. This allows them to know what components the work should comprise to optimize the work and even the working situation. The second component is **self-regulation**, which deals with the abilities for self-direction during problem-solving, consideration as to whether they have an understanding about a particular thing, assessment of efforts toward work, planning of work processes, test of methods, time-consuming decisions, and adoption of other solutions. Both components involve three factors. The first is the person factor, which refers to individuals' or learners' abilities. The second is the task factor, which is associated with things to learn, as well as the levels of difficulty of work. The last is the learning strategy, which is relevant to learners' age (Khotrakun, 2005: 227). The metacognition process based on the information processing approach is illustrated in Figure 2.3.

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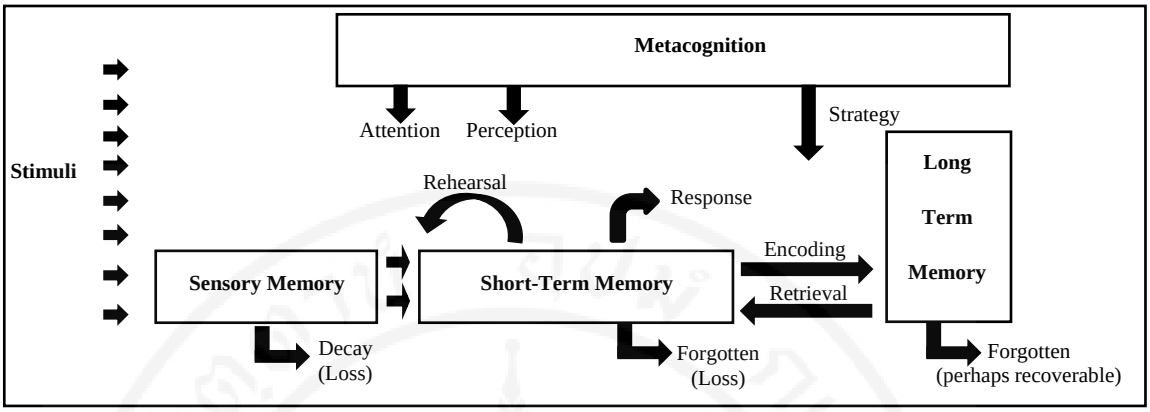


**Figure 2.3** Metacognition Process Based on the Information Processing Approach

Source: Khammani (2011: 83)

### 2.2.3 Application of the theory in learning management

As for Application of the theory in learning management, Khammani (2011: 84-85) described that:

(1) Recognition affects the perception of something. If people recognize something, they usually perceive it and store it in their memory. To recognize anything, individuals have to have known or experienced it before. Therefore, presenting stimuli that learners know or stimuli whose information they know can result in learners paying attention and recognizing it. The instructor can link it to something relevant.

(2) Attention is a key component to receiving data into short-term memory, so in teaching management, learning stimuli in line with learners' interests should be provided, as it results in learners paying attention to and recognizing it and storing it in short-term memory.

(3) The information that individuals recognize is stored in short-term memory, which, according to educational psychologists, last only 15-30 seconds. Therefore, if they want to remember it longer, they need to utilize various methods, such as repeated recitation or classification of what to remember to assist in remembering.

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(4) If we want learners to remember content for a long time, the materials must be encoded to enter into long-term memory. The encoding can be done in various ways, such as recitation, review, or the elaborative operations process, which involve composing, mixing, expanding and relating new knowledge to existing knowledge.

(5) When information is stored in short-term or long-term memory, it can be retrieved through "*effectors*," which is a vocal and motor response generator. It makes individuals express their inner thoughts into observable behavior. The fact that individuals cannot utilize information that is stored may be caused by the fact that they are not able to retrieve information to the conscious level or they forget.

(6) Brain processes are controlled by the executive control of information processing, which is comparable with computer "*software*." Therefore, if the learners have self-awareness and know how to manage and control their cognitive or thinking processes, they will be able to instruct their brain to do various actions, which will allow them to succeed in learning. For example, if learners know that that they are not good at a particular subject because they do not like the teacher of the subject, they may also find solutions, e.g. creating motivation or using alternative techniques or tactics.

Babadodan & Ünal (2011: 2157-2158) provided examples of learning design based on the theory. Teachers have to create interest in subject matters or content to teach and should inform students of the objectives of learning. To support retrieving data into memory in working, teachers have to stimulate learners' memory by asking questions related to what they have learned and are interested in. During their responses, the learners will integrate knowledge they have learned earlier to describe the questions, which will create meaningful learning.

With regard to selective perception, teachers have to teach students to give examples or search for factors that affect situations or what they learn in report writing or classification to describe their relationship and support importing data into long-term memory. Teachers must create data management that makes it easy to bring data into long-term memory. Examples of data management are classification or using diagrams; consideration of responses by asking questions or testing the responses to see what their responses are and see if the learning process occurs; and examination of

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the feedback, which teachers need to follow up on in order to check the accuracy of the contents of learning and solve problems, if necessary.

Management of learning by applying the principles mentioned above is expected to create major four development trends: (1) Attention, (2) Learning strategies, (3) Knowledge base, and (4) Thinking. In adults, the emergence of the four development trends involves thinking development; the focus for childhood is training and management rather than thinking (Phitchayanurak, 2006: 24). Critical thinking, in particular, is important for effective information processing. That is, if individuals are developed in terms of basic and advanced thinking skills, this will equip them with sharp and comprehensive information processing.

## 2.3 Concepts and theories related to critical thinking

As mentioned above, the importance of critical thinking is that it is aligned with the information processing theory. It will allow communities to learn to develop basic and advanced thinking skills through the process of identifying the carrying capacity of tourism development. This will lead to careful thinking, information use, or interpretation of phenomena with more meticulousness and comprehensiveness. Accordingly, the researcher applied critical thinking as a conceptual basis for managing community learning. The following section discusses critical thinking in terms of (1) Definition, (2) Components, and (3) Process.

### 2.3.1 Definition of critical thinking

Critical thinking means the use of skills of thought or strategies that increase the possibility of desirable results. This kind of thinking is used for describing meaningful and logical thinking with a direction toward the goal. It also involves problem-solving, formulating inference, calculating likelihood, and decision-making for individuals to ensure effective thinking skills in specific contexts and types of thinking about burdens or responsibilities.

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Another definition is logical inference (Simon & Kaplan, 1989). Critical thinking deals with the development of patterns of consistency and logical reasoning

(Stahl & Stahl, 1991) or careful thinking to make a decision about acceptance, rejection or judgment (Moore & Parker, 1994). All the definitions, as mentioned, can capture the ideas arising from mental activities that are useful for particular cognitive tasks. Meanwhile, critical thinking can be seen as the process of evaluation or arrangement of interesting issues in the form of some acceptance standards relevant to attitudes plus factual knowledge, as well as thinking skills that lead to cognitive thinking or intelligence thinking (attitude + knowledge + thinking skills) (Halpern, 1997: 4-5).

### 2.3.2 Components of critical thinking

Chatkhup & Chuchat (2001: 32-35) mentioned three key components of critical thinking. The first component is **mental operation**, which is comprised of two key issues – cognitive operation, which reflects the use of basic skills in data analysis and synthesis to develop knowledge, as outlined in Table 2.2, and metacognitive operation, which deals with individuals' thinking freedom to describe their thoughts and take actions. It involves planning and adjustment of strategies in basic skills in thinking, evaluating the functioning of thinking, and controlling or adjusting work based on results of evaluation of cognitive functioning. The second component is **disposition**, whichis a result of the functioning process of thinking that relies on reliable data, supporting evidence, listening to ideas, determination, and careful judgment. The third is **knowledge**, whichconsists of three important types of knowledge – knowledge of direct experience, individual knowledge, and knowledge about ideas (knowing what they are thinking about).

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**Table 2.2** Knowledge Combination

| **Knowledge combination** | | |
|---|---|---|
| **Basic skills in data analysis** | **Basic skills in critical thinking** | **Synthesis to knowledge** |
| Comparison | Questioning | Problem-solving |
| Classification | Analysis of arguments | Situational - investigation |
| Consideration of facts | Asking and answering questions that hit the points | Decision-making |
| Prediction | Judging the reliability of the information | Experiment |
| Analysis of errors in reasons | Observing and judging based on observation results | Invention |
| Establishment of arguments | Logical prediction | |
| Analysis of assumptions | Conclusion and decision based on facts | |
| System analysis | Creating correct decisions | |
| | Defining words | |
| | Setting assumptions | |
| | Defining the code of practices | |
| | Linkage with other issues | |

Source: Chatkhup & Chuchat (2001:33-34).

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### 2.3.3 Process of critical thinking

Aeimsri (2006:57-59) synthesized the critical thinking process. Decaroli (1973), Watson & Glaser (1964), Emis (1985) and Nekmanurak (1994) presented different sub-processes of critical thinking; however, they shared similar issues – the definition of issues, data collection, assumptions, conclusion, reference, and evaluation of the conclusion. The critical thinking process based on other approaches may be complex, and some approaches are appropriate for formal education. This study focuses on community participation; therefore, critical thinking according to Quellmeaiz (1985: 28-32) should be appropriate for this context. Critical thinking process based on Quellmeaiz's approach involves: (1) Defining problems involving questions and analysis of elements of problems; (2) Identifying information or substantive matters and important things for problem-solving (identifying data reliability); (3) Relating information to problem-solving and collecting data; and (4) Evaluating the achievement of the answers.

The critical thinking process is similar to a research process. To run the process, Sophasi (2003: 15-20) suggested that there are 12 skills related to critical thinking according to Norris & Enis (1989: 184-187), as presented in Table 2.3

**Table 2.3** Skills Reflecting Critical Thinking

| Ability | Details |
|---|---|
| 1. Ability to define or identify problems | 1.1 Identify problemsclearly<br>1.2 Define criteria to judge possible answers |
| 2. Ability to think critically | 2.1 Identify reliable information<br>2.2 Identify unreliable information |
| 3. Ability to ask challenging questions and answer questions clearly | 3.1 Why?/What are key issues?<br>3.2 Give possible examples<br>3.3 Opinions/What are supporting information? |
| 4. Ability to consider reliability of sources of data | 4.1 Reliability/Acceptance<br>4.2 Justify |

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**Table 2.3** Skills Reflecting Critical Thinking (cont.)

| Ability | Details |
|---|---|
| 5. Ability to observeorjudge information by oneself | 5.1 Observe/judge<br>5.2 Record one's own observation results |
| 6. Ability to synthesize | 6.1 Incorporate |
| 7.Ability to evaluate | 7.1 Consider alternatives and see the value of alternatives<br>7.2 Make decisions about each alternative |
| 8.Ability to interpret | 8.1 Identify similarities/differences<br>8.2 Classify<br>8.3 Provide operational definitions<br>8.4 Give examples |
| 9. Ability to identify assumptions | 9.1 Have logical ability and identify alternatives |
| 10. Ability to make decision on implementation | 10.1 Define problems/Choose appropriate criteria/Define diverse alternatives/Choose and review alternatives |
| 11. Ability to interact with others | 11.1 Respond to gain information<br>11.2 Use proper language |
| **12 skills** | |
| Elementary clarification | - Identify issues/ Analyze arguments<br>- Ask and answer questions clearly |
| Basic support | - Consider the reliability of data / observation |
| Inference | - Analyze/Synthesize/ Evaluate |
| Advanced clarification | - Explain and judge meanings<br>- Establish assumptions |
| Strategy and tactics | - Decide to take actions/ Interact with others |

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Source: Sophasi (2003: 15-18).

Although critical thinking is very beneficial to thinking skills development, in practice it is not easy to develop thinking skills to achieve critical thinking, especially in adulthood, when individuals have rigid knowledge, beliefs, and behaviors. Moreover, critical thinking is linked to other concepts, such as principles and theories concerning teaching, intellectual abilities, knowledge structures, and the interest in thinking about learners. Another important aspect of critical thinking is the diversity of definitions and techniques, as explained above, and questions as to what important things should be sought after in adulthood and what needs to be developed to think about. This is a challenge, and teachers need to design a learning management process that is suitable to communities, learners, areas, and situations, as well as the need for daily practice (Brookfield, 1987: 11-14).

Sirisak (2004: 19) summarized the concept of Mirman & Tishman (1988: 64-65), which indicates that teaching critical thinking can be applied to all activities, not only classroom activities. This is suitable for this research because teaching to local communities involves informal teaching. Phothisuk (1994: 101-102) concluded that teaching to produce critical thinking consists of (1) Organizing practical activities based on direct experiences; (2) Using the research process in pursuit of something one wonders about; (3) Using media to provoke thoughts, such as images, videos or real situations; (4) Using scenarios; (5) Presenting research work for sharing; and (6) Brainstorming. Phonsima (2000: 40-42) summarized learning that helps develop critical thinking from INNOTECH (1991), which consists of (1) Training students to think about the details of different things; (2) Training students to classify elements; (3) Training students to differentiate between divergent and similar ideas of individuals and/or groups; (4) Training students to differentiate facts from phenomena and news in daily life; (5) Training students to differentiate between logical and illogical reasoning; (6) Training students to classify the goodness and decency of things; and (7) Training students to search for information to support their opinions and facts they present.

In addition, the critical thinking principle has been combined with other forms of teaching. Bungbua (2010: 67-69)stated that teaching models which combine critical thinking are inductive thinking, which develops the ability for induction and reasoning and the inquiry teaching model. Wellington (1960) applied critical thinking

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using the discussion technique, starting with (1) Asking questions to encourage students to think about contents; (2) Drawing students into the discussion process to jointly identify problems clearly; and (3) Building and judging the correctness of the conclusions.

It can be seen that there are a variety of teaching styles to generate critical thinking and various concepts used in designing learning. However, the key components in the design of learning to develop critical thinking according to Sirisak (2004: 21) are as follows: (1) Presenting problems using media (such as text), arguments, situations or references to students to lead them to thinking. The contents are not necessarily in the subjects, but they should be what learners face and can link to their daily life; (2) Activities that stimulate thinking, which should include questions that trigger thinking which result in interactions of thought between teachers and students as much as possible, which may be in the form of dialogues, discussions or scientific problem-solving; and (3) Evaluation of thinking, which is part of examining a conclusion or result from thinking as to how logical it is, by means of questions allowing students to develop a conclusion and have a discussion. This helps them review and reflect on their own thinking process. If their goals are not achieved, they have to return to the elements of activities that stimulate the thinking process again.

Based on critical thinking's benefits in terms of supporting the community's information processing and meticulousness in the consideration of impacts of tourism and phenomena on the environment, the researcher was interested in utilizing the critical thinking concept to be part of the management of environmental education. The researcher proposed to do this by utilizing the issue of identifying the community's carrying capacity to reinforce its critical thinking process. At the same time, critical thinking is associated with the development of individual thinking for solving problems, identifying options, and decision-making based on information, as presented by the information processing theory (Khammani, 2005: 80). In addition, the development of the critical thinking process involves steps similar to those of the research process. The research approach was used to create linkages of systematic thinking for the community to allow it to explore its own carrying capacity in a systematic and logical manner.

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## 2.4 Concepts and theories related to environmental carrying capacity in tourism industries

Previously-discussed concepts and theories are related to management of community learning. Learning management needs content to transfer to students. The importance of using carrying capacity to drive learning about environmental impacts of tourism and installation of tools for surveillance of tourism-related problems for communities was mentioned. Therefore, to achieve a clearer understanding about the concept, the concepts and theories related to carrying capacity will be explained in three topics: (1) Carrying capacity concept; (2) Using the carrying capacity concept to manage tourism; and (3) Upgrading the carrying capacity concept.

### 2.4.1 Carrying capacity concept

The basic concept of carrying capacity consists of the following key components, which will create a basic understanding about the concept, development, and arguments about carrying capacity:

#### 2.4.1.1 Foundation for development of the carrying capacity concept

The concept of tourism carrying capacity stems from the ecological concept used for studying the population growth pattern in an ecosystem related to limiting factors, such as nutrients, energy, and environments (Shelby & Heberlein, 1986: 7-8). Based on this concept, carrying capacity is the performance or capacity of an area or ecosystem to allow all lives to coexist peacefully. This is called a state of equilibrium, in which the system can maintain its structure and function, which refers to the transfer of energy and circulation of substances of the system in a normal manner (Thailand Institute of Scientific and Technological Research, 1988: 2-1 to 2-2). The concept originates from the study of exponential growth during the first period in the J-shape pattern because living factors are sufficient and the population of living things is small. The growth will reach the point of inflection. Later, the population growth will decrease in the S-shape pattern because living factors start to affect the growth of living beings so that the growth starts to be stable and balanced,

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which is called carrying capacity (Suksaman, 1995: 152-157) and (Odum & Barrett, 2005: 127-129) and (Ruangphanit, 1998: 112-119), as shown in Figure 2.4.

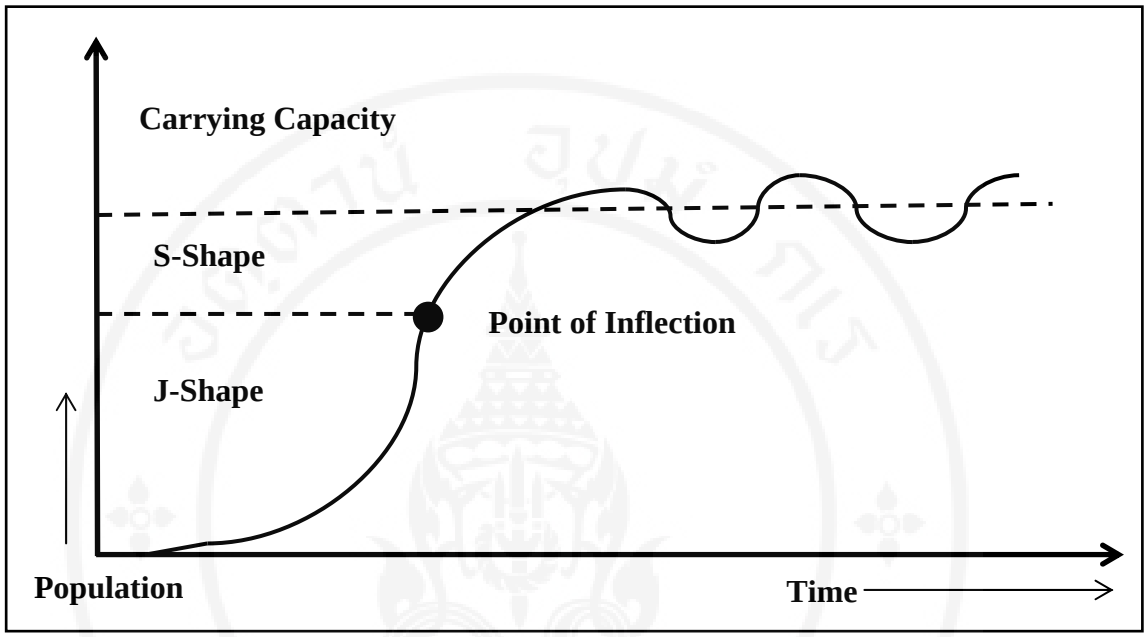


**Figure 2.4** Growth of Living Beings
Source: Odum & Barrett (2005:128)

The population growth above is the starting point of limits or limitations of the environmental system to human development, which is linked to the use of natural resources and the environment as resources for living, as well as bearing waste from human activities, which stresses the importance of limits of use. The study by Meadows et al. in 1972 dealt with the limit of growth by using a model to forecast the relationships among industrial development, population growth, food shortages, and depletion of natural resources. They believed world prosperity will cease within the next 100 years. Their study is in line with a study from the United States called '*The Global 2000*' in 1977, which believes that economic growth and world population growth will decline and stop as a result of scarce resources for living, pollution, and economic recession beginning in the year 2000 (Srivardhana, 1988: 31-59) and (Tietenberg, 2003: 4-6). The results of the study and other articles from 1960-1970 (Boulding's article "*The Spaceship Earth*" in 1966 and Hardin's article "*The*

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*Tragedy of Common*" in 1968) reflect the results of prosperity of the world ecology in the same direction.

The results of the study and articles above show the impacts of human development on the environment – resource depletion, pollution and a rapid increase in world population. This has been witnessed from developed countries, such as the United Kingdom and the United States for the past 50 years, which led to the establishment of the United Nation Environmental Programme (UNEP) in 1975 to address global environmental issues. This also resulted in the establishment of conferences on sustainable development, which drove the concept of environmental balance-based development in Rio de Janeiro, Brazil, in 1992. It was an agreement of the international community in endorsing Agenda 21 (Veeravatnanond, 1996: 16-17) to formulate the development approach that sustains the economic, social and the environmental systems with good quality, continuity, and fair distribution of benefits to society as a whole (Inkapatanakul, 2005: 57-66).These all stem from the need to emphasize the existence of environmental carrying capacity; and they are a critical turning point for implementing the concept in different sectors. This serves as a tool for environmental management in order to generate a balance of exploitation and revival of the environment in the limit-based approach. It can be said that environmental balance is a crucial mechanism for putting the evolution of thoughts, distribution and conversion into practice (Coccosis & Mexa, 2004: 16).

**2.4.1.2 Expansion of the carrying capacity concept**

Stressing the importance of carrying capacity, which needs balanced development amongst exploitation and revival of the environmental system, as described earlier, is a key turning point of awareness of limits of human use. The concept has gradually spread from biological science or ecology to the economic concept to build the tangibility of setting the amount of environment usage, both in terms of resource usage and waste generation from human activities to ensure that the environmental system will be healthy without the extinction of species or an increase in pollution. The linkage is reflected in two aspects. The first is explaining and defining a proper way of using natural resources in the form of recycling in the event that the use does not exceed the limit of resources, which are mostly biological

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resources (e.g. fishery and wildlife), and carrying capacity for waste in the environment (Isvilanonda, 1997: 2-3). The second is explaining the causes of environmental pollution or depletion of the common property resource (CPR) and the need for restricting uses. In this regard, carrying capacity will be used to explain the levels of intensive environmental use. Due to a failure to clearly limit the ownership of resources and the environmental system, individuals want to maximize the utilization, which causes the deterioration and depletion of resources and the environmental system. This leads to measures for studying the proper amount of utilization and guidelines for limiting the exploitation, e.g. using tax measures, prohibition of uses, and fees (Maning, 2007: 8-9) and (Srivardhana, 1988: 62-67).

Although the carrying capacity concept has spread globally and has been integrated into various fields, there are many issues that have been subject to criticism, arguments, and limitations of the concept (Coccosis & Mexa, 2004: 16 -21), which are presented in the next section.

#### 2.4.1.3 Criticisms about the carrying capacity concept

The view about the use of resources is not restricted to only the pessimistic view, which believes that resources are limited. The optimistic view of the group of people believing in scientific and technological advancement objected to the results of the study by Medows et al. about the limitations and the study called '*Global 2000*.' The optimistic view suggests that the factors used for developingthe model to forecast the limitation of advancement, especially in terms of scientific and technological advancement (which is an important tool that resolves the issue of limitation) are not comprehensive. The "*Green revolution*", which has been successful since 1940, has had a big influence on the argument as to whether the environment system has limited carrying capacity. Despite having a limited carrying capacity, it is believed that scientific and technological progress will solve problems in the end. The conclusion drawn from the pessimistic and optimistic views do not go in the same way, and this has resulted in different approaches to utilization of the environmental system and views about achieving a balance (Tietenberg, 2003: 4-6).

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In addition to the different views presented above, when carrying capacity is mentioned, it may not refer to something quantitative or universal,

but instead may refer to an abstract framework that represents careful utilization of resources. There is a dispute that carrying capacity does not indicate the levels of actual impacts on the environment, but instead indicates the levels of perception of the impacts, which possess subjectivity or inter-subjectivity. This has resulted in diverse definitions (which vary across individuals who conduct studies), indicators and/or standards, as well as approaches or methods of defining the carrying capacity. It is impossible to identify what approaches, standards or methods are the best.

The environmental system itself is complex and dynamic at the same time. Therefore, it is not clear how carrying capacity in the environmental system study can be investigated realistically and if the results of the study can be used for formulating guidelines for utilizing natural resources in the environmental system in an effective manner.

All of the arguments cannot lead to reaching a conclusion. The carrying capacity concept is popular as a key conceptual basis for the balanced utilization of natural resources in the environmental system. However, there is a need to develop more tangibility to the approach and to upgrade the concept and evaluation techniques and its status as part of policies towards the utilization of resources in the environmental system in line with goals of interested individuals in the future.

### 2.4.2 Using the carrying capacity concept to manage tourism

Despite various limitations and criticisms about the carrying capacity concept, as described in Section 2.4.1, it has played a crucial role in tourism. Hammitt & Cole (1998: 14) emphasized that carrying capacity is a top priority as a tool for management of natural tourist attractions and conservation areas. It is revealed that carrying capacity has an influence on, or is an important basis for, tourism management.

Therefore, to understand the importance of this concept, it is essential to understand the evolution of the concept as a player in tourism and its basic principles when it is applied to area management, its limitations, and solutions to problems, as outlined below.

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**2.4.2.1 Evolution of the concept of carrying capacity for tourism**

Documented evidence reveals that the carrying capacity concept started to play a vital role in tourism in protected areas affected by intensive use by tourists in the $18^{th}$-$19^{th}$ century (Liddle, 1997: 1-6). The statistics of tourists visiting the natural area of the U.S. National Parks, collected from 1930 to 2000, reveals a steady increase in the number of tourists (Maning, 2007: 19).

The increase in tourist arrivals to natural attractions had an extensive impact on the ecosystem, including physical setting and the biological system. The study by Sharp (1977) on the impacts of hiking on cliff-nesting creatures found that the activity disturbed their breedingand egg-laying activities of birds at the South Stack Cliff in North Wales, England. The study by Wilshire et al. in 1975 showed that desert plants were destroyed from the use of vehicles for recreational activities in California, U.S.A (Jongsutjarittem, 1995: 18-34). There are many research works, academic articles, and textbooks concerning the outdoor recreation ecology.

The deterioration and impact on the environmental system in natural attractions mentioned above were an important starting point in the quest for ways to manage areas to ensure sustainable utilization. Carrying capacity was chosen to be the main approach to the management of natural attractions at that time for the following reasons:

(1) Natural attractions or conservation areas are characterized as common property resources (CPR). All tourists have the right to utilize them and they try the utilize them as much as possible. This results in environmental degradation of natural attractions (Petranon, 2001: 223-225). Thus, determining the carrying capacity in natural attractions will help define the limit of use, which reduces the intensity of land use and the magnitude of impacts on tourism and resolve the issue of free use.

(2) The basic concept of conservation does not focus on conservation without utilization because this will lead to opportunity costs as a result of the fact that the environmental system is resistant and resilient by nature if the utilization does not exceed its carrying capacity. Carrying capacity is consistent with the need to provide the opportunity for wise use, which will not cause excessive

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changes in the environmental system beyond its carrying capacity (Hammitt & Cole, 1998: 155-160).

(3) A close relationship between carrying capacity and ecological principles – Conservation areas attach great importance to the impacts on the local ecosystem, it is an effective tool for area management.

The phenomenon showed that carrying capacity has been applied in tourism for a long time, and there is evidence supporting that when it was first used, it was aimed at reducing the impacts of tourism in conservation areas. There was a study on carrying capacity within the Gower Peninsula in South Wales, the U.K. in 1956 to maintain the conditions of beaches and cliffs threatened by tourists. The study reflects the introduction of carrying capacity to tourist attractions, especially in conservation areas (Ballinger, 1996). Other studies on conservation areas include Lucus (1964), Hendee et al. (1968), Stankey (1971, 1973) and Wargar (1974). This reflects that carrying capacity was focused on ecological carrying capacity, as the main component of study for the purpose of conservation of local wildlife, plants and the environment (Shelby & Heberlien, 1986: 2).

The concept has been continually developed and extended to economic, psychological and social-cultural, physical and facilities components. The study by Cichetti (1976) linked carrying capacity to cost-benefit analysis. The study by Mauren (1979) involved conducting an economic analysis as well as defining carrying capacity, which was then extended to economical carrying capacity. Shelby (1976) investigated tourist congestion and its impacts at the Grand Canyon, U.S.A. The article by Schreyer (1976) supported the extension to social carrying capacity (SCC), which is called psychological carrying capacity (PsCC) in some articles. The study by Nedelof (1989) examined the association of cultural changes of local communities with socio-cultural carrying capacity. The study by the WTO (1983) dealt with the linkages between carrying capacity and facilities and size of the areas in activities that contribute to physical carrying capacity (PCC) and facility carrying capacity (FCC) (Coccosis & Papairis, 1995: 28-30).

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Apart from the extension of elements of carrying capacity, the explanations above reflect the extension of the concept to reduce the impacts of tourism in tourist areas other than conservation areas. Mexa (2002: x-xi) pointed out

that carrying capacity can be applied to various types of tourist attractions, such as coastal areas, islands, conservation areas, rural areas, resorts, historical sites, and urban areas. Other supporting evidence is the study by Soubert & Hay (1995) which analyzed the carrying capacity of Angkor Wat, Cambodia. It revealed that it could accommodate up to 3,000 tourists per day. The study by Xiaoru, Fang & Kaixuan (2014) focused on carrying capacity in Hangzhou, China.

The study of carrying capacity today involves various components and focuses on the integration into actual conditions of tourist attractions. At the same time, it leads to the establishment of guidelines for area management to reduce or prevent potential adverse effects of tourism activities. The Thailand Institute of Scientific and Technological Research conducted a study on carrying capacity for tourism on Phi Phi Island in 1992 and a study on islands and coastal areas in Trat in 1994, which focused on the formulation of approaches to area management, as well as physical, environmental, social and economic components (Thailand Institute of Scientific and Technological Research, 1992, 1994).

**2.4.2.2 Basic principles when carrying capacity is applied to tourist area management**

Based on the above concept, the elements of the carrying capacity consist of (1) Ecological carrying capacity (ECC) – This deals with an awareness of the potential impacts of development of tourism activities on the local ecosystem, such as potential impacts on soil, plants, wildlife, and water resources. The Faculty of Forestry (2005) further explained that tourists' behavior and characteristics of tourism activities affect the ecosystem unequally; thus, defining bio-physical carrying capacity needs to take into account various factors in the ecosystem and selection of suitable factors and recognized measurement standards. (2) Spatial carrying capacity – This deals with awareness of impacts related to space or the size of space that can accommodate tourists and activities; (3) Facility carrying capacity – This deals with an awareness about the impact of the number of tourists on the amount of facilities, such as bathrooms, campsites, and accommodations to meet the needs of tourists; (4) Social carrying capacity, or psychological carrying capacity – This deals with an awareness of the perception of other groups of tourists or tourist congestion

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that will entail a conflict of local activities and affect the satisfaction levels and tourists' valuable recreational experience (Butler & Knudson, 1977) and (Rischbieter, 2004). Coccosis & Mexa (2004: 59-60) added the fifth component. (5) Sociocultural carrying capacity, which reflects local communities' levels of resistance to disturbances from lifestyle and cultural changes due to tourism, e.g. changes in life patterns and interaction of family, society and identity of communities; and (6) Political-economic carrying capacity, which reflects the carrying capacity for economic changes, such as employment levels, cost of living, area structure development, and the approach of policies toward area development. When the number of the components of carrying capacity increases, using carrying capacity to serve as an area management tool needs to look at the linkages of spatial factors and social factors for the consideration of patterns or characteristics of tourism. Therefore, to study carrying capacity, it is necessary to consider three key characteristics, as follows:

(1) Characteristics of local communities – What should be considered are the structures of social relations, economic structure, community capacity, local tourism resources, and the risks to the impacts of tourism development. In this regard, spatial carrying capacity associated with physical characteristics and community organizations and supporting factors in tourism management capacity should be studied.

(2) Characteristics of tourism, which reflect tourists' behavior, types of activities, spatial use, tourism operators, and linkages between local areas and tourists.

(3) Linkages between tourism development and the environmental system, which reflects the magnitude, pattern and dispersion of the impacts of tourism.

Although the study of carrying capacity presents the basic principles and framework for defining carrying capacity, as presented above, in practice, we encounter limitations and issues that are important for the consideration of carrying capacity, as outlined below:

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**2.4.2.3 Limitations in, and criticisms about, defining carrying capacity for tourism**

Key issues given heavy criticisms with regard to defining carrying capacity for tourism have consequences in a similar way to what is presented in the past section. The first issue focuses on a variety of definitions of carrying capacity for tourism. This is a very important part because definitions are like the study framework that has a relationship with defining approaches, methods, indicators, standards, and conclusions of the research.

Based on the reviewed literature, an important observation about the diverse definitions of carrying capacity for tourism is that the definitions are related to views, experiences, and training from sciences where researchers are carrying out their work. For example, ecologists define carrying capacity in relation to maximum stress. Buckley (1999: 706) defined carrying capacity for tourism as a state where the number of tourists does not cause so serious ecological changes or destruction that the tourist attraction ecology cannot be rehabilitated. Buckley (1999) also defined it as the maximum recreational use in terms of the number of tourists and activities that remains appropriate in the local areas/ecosystem before unacceptable/non-restorable changes occur in the ecosystem. Buckley's previously mentioned definitions focus on the production of studies on environmental impacts in tourist attractions. Economists' views about carrying capacity focus on tourists' preference and impacts in the form of value. The study by Pathomphatphan (2004) dealt with impacts of tourism on communities in terms of damages in Mae Fah Luang sub-district, Mae Fah Luang district, Chiang Rai province. In the eyes of the hotel and lodging business, carrying capacity for tourism deals with the number of users during the times when the tourist attractions can accommodate each year without permanent natural or physical degradation or destruction of recreational experience from tourism.

Several studies integrated perspectives in various dimensions. For example, the study of Prachinburawan (1988) links tourists' socio-economic data, the density levels that do not result in uncomfortable feelings, physical conditions, and facilities in local areas to determine carrying capacity. The study by CAMP (1999) in Fuka-Matrouh in Egypt was conducted on socio-economic components, physical components, administrative components, facilities, and environmental components.

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There are many studies that focus on a particular field. The difference in disciplines serving as the base of study of carrying capacity and definitions of carrying capacity have a relationship with the difference in dimensions studied, which vary according to researchers' interest. Accordingly, there are only particular issues that are studied and implemented – a study on carrying capacity cannot include all dimensions based on the basic principles. Patil & Patil (2008), Khanluang (2002) and Withisawat (2007) studied psychological issues. The focus of the study of Pakkanthorn (2009) was about psychological aspects (both tourist communities and tourists) and physical aspects of bicycle trails only. They are not comprehensive enough or may not be appropriate for defining carrying capacity to result in effective practices.

Apart from the fact that only particular issues can be studied, a consequence of diverse definitions is diverse indicators and standards. There is no clear agreement as to which standards or indicators really influence the determination of carrying capacity. This may vary from individual to individual equipped with a similar basic understanding. For example, among ecologists interested in investigating carrying capacity for tourism, some believe that the number of tourists has a relationship with the impact levels, so they emphasize limiting the number of tourists. In addition, their indicators reflect the overburdened carrying capacity of the environment by the number of tourists. Some groups of ecologists do not believe that the magnitude of impacts has a linear relationship with the number of tourists; they view that the characteristics of activities, use levels, and the durability of the environmental system are more important indicators than the number of tourists (Coccosis & Mexa, 2004: 38-39). Finally, there is no conclusion as to which approach is the most accurate or the most reliable approach for studying carrying capacity.

Another major criticism is the focus on proposing approaches to carrying capacity enhancement that are not in line with traditional concepts. The carrying capacity concept originates from the concept of user limits to preserve the environment and prevent resource degradation from human use. However, when it is applied to tourism development, there are studies on the expansion of carrying capacity because tourism is an economic activity. It is impossible to judge if it is a right or wrong concept because there are important issues that need to be taken into consideration when we define carrying capacity in terms of area characteristics and

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purposes of area development. The recommendations for the study of carrying capacity for developing tourism in tourist attractions on Samui Island, made by the Thailand Institute of Scientific and Technological Research (1988), were concerned with the capacity for area expansion, which was meant to be the overall area expansion. Areas that were vulnerable or at risk to damages were or provided with clear control measures. The study integrated diverse perspectives, as witnessed from the inclusion of physical, environmental, social and economic indicators and tangible measures for risk control. The tourist attractions were not in the conservation areas, and the area development aimed to respond to the country's tourism needs. For this type of study, if carrying capacity is not reached, development expansion can be implemented because detailed studies show that damage to the areas will not occur if the development happens. This should be a point for consideration, in comparison with traditional principles, to define proper carrying capacity. In addition, the study of tourists' psychological impacts will be a driving force that area managers give attention to in order to develop areas in accordance with tourists' demands. Apart from the impacts, they include political issues concerning some expectations of tourists, communities, and operators (Coccosis & Mexa, 2004: 40).

Using carrying capacity to serve as a tool for area management usually occurs after tourism development. This reflects that the study of carrying capacity for tourism deals with the consideration of the degree of impacts/changes compared with area conditions. One thing that should happen is establishing carrying capacity as a conceptual basis for planning and managing areas for tourism development from the start (in the case when area development is possible). Mostly, carrying capacity is defined after tourism services start, as evidenced by many studies. Some of the studies include Wongphakdi, Pukngamand & Tanakanjana-Phongkhieo (2009); research report by the Thailand Institute of Scientific and Technological Research (1988, 1992, 1994); research report by the Faculty of Forestry (2005); research article by Molinaro et al. (2003); research article by Huiqin & Linchun (2011); research article by Zacarias, Williams & Newton (2011); and research report by the University of Hawaii at Manoa (2008).

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Another important criticism about carrying capacity is the transformation of the study of carrying capacity into the study of impacts in terms of

outputs or figures of the maximum use amount, instead of the study that aims to create input factors into planning or area management. This reflects the self-completion of study – when the study results are obtained, they are not applied. They are not driven into actions or problem-solving in local areas. This reflects the conceptual basis that an ecosystem or tourism system is at a standstill, while it changes over time. In addition, most studies share similar results or recommendations despite different methods or standards. Studies about carrying capacity focus on products, such as the maximum number of tourists, maximum use, and maximum acceptable change. They do not focus on how to achieve goals in line with the results of the study. This phenomenon shows that carrying capacity is used as a database only.

Issues learned from defining carrying capacity reflect the learning process and knowledge that researchers or external experts possess. Studying the topic relies on special experiences and expertise, which results in tourism communities becoming passive participants – having no opportunity to participate in defining things so that they can have ownership or manage things on their own. Most relevant studies today focus primarily on conservation areas regulated by the government. Some are interested in community-owned tourist areas; however, they still utilize indicators involvingthe natural conceptual basis, subjectivism, and measurement from external experts who communities have to wait for to get assistance, whose presence cannot be predicted. The study by Pakpitjarean (2002) was conducted in tourist attractions, but it was characterized by external expertise. Relying on external expertise is not something that is right or wrong, but the issue is that knowledge will not be passed on to local communities for planning area management in a timely manner. In this case, Fernando et al. (2004: 79) suggested that educating communities, tourists, and other involved parties will lead to effective carrying capacity and enhanced recreational experiences for tourists.

All the criticisms as mentioned above reflect the difficulty in determining the limits of use and the maximum acceptable change level. This results in the concept being regarded as something idealistic and difficult to implement (Papageorgious & Brotherton, 1999: 271). In addition, the concept varies according researchers' interests, situations and values, as well as spatial issues. This is a challenge for interested individuals to apply the approach to tourist area management.

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Key issues to be taken into account consist of the need for integration of more diverse methods; involvement of parties concerned and/or local stakeholders; integration of numerical data and qualitative data to define carrying capacity for tourism to achieve the on-going process that should create a learning process and environmental ethics for communities, area managers; and incorporation of a variety of measures for area management (Fernando et al., 2004: 275–283).

### 2.4.3 Upgrading the carrying capacity concept

Criticisms and limitations associated with defining carrying capacity for tourism, as described under this section, are particularly important for the upgrade of the concept in studies on this topic to create consistent approaches or various techniques to reduce limitations in study. This is witnessed by the efforts to develop approaches that reflect three key characteristics: (1) Creating flexibility of definitions, not restricting the number of tourists or intensity of use but considering desirable conditions or the limits of acceptable change; (2) Making carrying capacity for tourism the on-going process; and (3) Reducing objectivity and focusing more on subjectivity/inter-subjectivity through the emphasis on tourism development stakeholders' involvement in the process and on opportunities of communities that are tourist-area owners or stakeholders to join efforts to create learning and monitor the impacts of tourism on their own, as seen from the approaches developed as follows:

(1) Limits of acceptable change (LAC), developed by Stankey et al. in 1985, which aimed to define desirable conditions and establish guidelines or strategies for area management to maintain and/or restore tourism attractions to desirable conditions. This approach does not focus on seeking limits of use, but depends on the recreation opportunities spectrum (ROS), defines desirable conditions with appropriate management guidelines in each region, and selects indicators and standards for measuring changes (impacts) to see if they are at a suitable level (Stankey et al., 1985).

(2) Visitor impact management (VIM), which is similar to the LAC. This conceptual framework focuses on controlling the levels of impacts of use activities on tourist attractions and identifies the impacts of tourism activities with regard to causes and strategies that are effective in reducing impacts of tourism, by defining desirable area conditions and assessing use activities and situations in tourist attractions in order

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to define the objectives of tourism management. VIM does not only focus on tourism but also on socio-economic development in local areas (Maning, 2007: 26-27).

(3) Visitor experiences and resource protection (VERP), which was developed by the U.S. National Park Service (USNPS) in 1992. It is a framework for tourist attraction management planning with a focus on impacts of utilization by tourists, recreational experiences, and tourism resources, which are the effects of tourists' behaviors, limits of use, types or characteristics of use, duration of use, and area conditions. VERP consists of four significant steps: preparing a working group with an emphasis on participation from the beginning to the end of the process; analyzing resources and existing resource use; defining or identifying visitor experiences; and determining the levels of resource conditions. Indicators and standards will be applied in line with the goals of the area monitoring plans, and solutions to problems will be proposed (Maning, 2007: 26-27).

The above-mentioned approaches need to involve a variety of techniques and need to be integrated with appropriate principles for area management. This is because each approach has a different limitation. For example, as for LAC, it is difficult to identify the acceptable change levels. As for VIM, it is impossible to identify clearly between the limits of use and the impacts that have no linear relationship with the limits of use but does have a relationship with characteristics of use, periods, seasons and many other factors (Coccosis & Mexa, 2004: 46).

Although the carrying capacity approach has been upgraded to become an approach that is consistent with the reduction of limitations or criticisms mentioned above, a significant number of arguments and imperfections in the conversion of the approach into a tool for area management have been found. However, the carrying capacity approach and other relevant approaches still have an influence and importance in the development of natural tourist attractions. This is witnessed from the study by the Faculty of Forestry (2005) which studied the carrying capacity of the Mu Ko Surin National Park, Phang Nga province. In the study, LAC was employed in conjunction with the establishment of carrying capacity that considers defining acceptable impact levels rather than the number of tourists. A monitoring system in the form of a database that allows drawing from data on changes of the area during different time periods was established to process the capacity for accepting changes

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from tourism in the form of models. In addition, training in the use of the database and the guidelines for developing management plans was provided to interested local people. This shows the application of the carrying capacity concept to serve diverse methods and to serve as a process, while maintaining the importance of the concept to the management of natural areas. Existing evidence reveals that the concept has been extended to serve as a tool for management of other forms of tourist attractions, such as cultural tourist attractions, as evidenced by the report by Saengkanchanawanit (1991) about the social carrying capacity of a historical site: the case study of the Emerald Buddha Temple. Another study focuses on the social carrying capacity of a public park: case study of SuanLumPhini Park by Phawayon (1997). The concept has been also extended to community-based tourism, as evidenced by the development of the research project on community-based carrying capacity management of the Thailand Community Based Tourism Institute (CBT-I) and the Community-based Research Division by the Thailand Research Fund (Thailand Research Fund, 2011) in four communities, including the Bang Nam Phueng Community, SamutPrakan; the Mae Kampong Community, Chiang Mai; the ThamPla Community, Chiang Rai; and the KoPhithak Community, Chumphon. This was a starting point for upgrading the carrying capacity concept to become a process and a starting point of identifying carrying capacity for area management, which will reduce limitations or criticisms of carrying capacity study in the form of results that are not followed by actions. The development will help create a learning process about the impacts of tourism development and define indicators originating from community areas on the basis of participation of parties concerned with community-based tourism development.

The above efforts reflect defining carrying capacity of tourism-based tourism in the form of numerical carrying capacity to avoid impacts that exceed the community's ecological, socio-economic, facility and health carrying capacity. They also focus on the predictive factors in impact degrees and measurement methods established by the community, which can be audited by comparing the group standard against some standards from outside. The development of community-based carrying capacity involves the participatory action research (PAR) principle in conjunction with the carrying capacity approach. This involves two goals: (1) Creating the process of learning about impacts of tourism and using carrying capacity for area management,

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and (2) Acquiring indicators, examination, standards, and community-based carrying capacity.

The efforts to mix the participatory action research principle with the community-based carrying capacity principle is a new dimension that are beneficial for issues involving: (1) The development of carrying capacity that applies technical principles to locality, which is assumed to be appropriate and in line with the area context and practical for area management; (2) Creating a learning process to make the community aware of the impact of tourism development that will trigger the community's interest in, and attention to, monitoring changes arising from tourism; (3) Upgrading carrying capacity to become a process and extending it to other forms of tourism, in addition to natural tourism; and (4) Empowering the community to manage areas with the approach it develops and to perform monitoring on its own.

Although the study of carrying capacity through participatory action research has benefits, as described above, the report of the study results in Phase 1 from three areas: the KoPhithak Community (Chumphon), the Mae Kampong Community (Chiang Mai), and the ThamPla Community (Chiang Rai) revealed an advantage of cooperation between external researchers and the communities in collecting data to assess the communities' carrying capacity. This provided the communities with the opportunities to play a role in joint research and formulation of the guidelines for tourism management. The researchers had a framework for external indicators to serve as the guideline for dialogue management. The study of the KoPhithak Community consisted of environmental aspects (solid waste), physical aspects, facility aspects (accommodation areas/parking spaces/bedding kits/bathrooms/water for domestic use), socio-psychological aspects (congestion/tourists' backgrounds/opinions), and economic aspects (income from tourism). The study of the Ban ThamPla Community comprised environmental aspects (water quality/solid waste/impacts from monkeys/smog/parking lots/erosion of the cliff), socio-cultural aspects (cooperation), physical aspects (capacity of temples/caves/cliff slides/landscaping), socio-economic aspects (community's economic data), and health aspects. The study of the Ban Mae Kampong Community included physical and facility aspects (number of accommodation/ visitors/ activities/ number of service providers/parking spaces/number of shuttle buses for tourists),

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socio-cultural aspects (economic data/ community welfare/ social network/ strength of leaders), ecological aspects (water for consumption/animals/solid waste/raw materials for cooking), as well as health and mental health aspects (number of health volunteers/ uncomfortable feeling from community tourism/illness/average ages/disease screening/drugs). All the three communities defined carrying capacity and formulated measures for management of the respective aspects.

The study of carrying capacity above partly dealt with impacts in the local areas and partly from the researchers' theoretical conceptual basis. The data collection methods were mostly those used in the academic circle. For example, the study by Na Thongkaew et al. (2011) adopted the concept of recreation opportunity spectrum (ROS) as a tool for research and for monitoring water quality of the laboratory of Ounvijit et al. (2011) and Thithichamroenphon et al. (2011). The environmental impact assessment (EIA) and health impact assessment (HIA) approaches also serve as models for assessment of Thithichamroenphon et al. (2011). Therefore, defining carrying capacity is characterized by collaboration – community researchers collected and provided data. The analysis focused on the main researchers to bring the results to establish the guidelines for managing factors beyond the carrying capacity and risk factors for monitoring. In addition, most standards used were international standards, for example, measurement of the weight of solid waste of the KoPhithak Community, water quality measurement of the Ban ThamPla Community/Ban Mae Kampong Community, and air quality monitoring of the Ban Mae Kampong Community.

Despite collaboration between the community researchers and the outside recommendations were given by Ounvijit et al. (2011) that the research management may need a research design in which communities have full ownership of the research project. The aim is to allow the communities to perform experiments and improve carrying capacity indicators. More of the existing local wisdom may be used in place of the external technical measurement tools in the future. This is an interesting perspective and reflects that there may be some indicators which may involve tools that the communities cannot implement by themselves, and they still need to rely on outside expertise at a great extent. It is found that the mainstream study of carrying capacity results in the study of the carrying capacity in different areas having a similar pattern.

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What happened reflects some problems of predictive factors as a result of the influence of the mainstream approach to environmental carrying capacity appraisal or approaches applied by previous studies. As for the community management approach applied by the Ban ThamPla Community, it was not necessary for the community to use BOD. as an indicator. This is because even after the value of the factor was known and it was concluded that the water quality did not exceed the carrying capacity, there were risks to monitor. In terms of management approaches, the community chose to dredge sand from streams and established rules pertaining to fish-feeding fish feeding. Actually, the approaches were its normal practices even though the predicative indicator was not used. Another observation was that the community itself was aware that water quality was problematic in terms of color and odor, which supported the consideration of predictive indicators and corrective methods in line with the community's carrying capacity.

Some of the above-mentioned limitations do not represent a failure of the study project. The project report revealed that some knowledge about environmental carrying capacity appraisal was fed to all three communities. The project encouraged the communities to learn about new methods from outside sources to access information and to review their own capacity by using a variety of information. For this type of implementation, communities should possess a good understanding about principles, data collection methods, and information that they are working on. Focusing on issues learnt through the carrying capacity appraisal process is, therefore, crucial in enabling communities to (1) understand principles, methods, and information; (2) take actions by themselves, which will reduce dependence on the outside and limitations as mentioned above; and (3) monitor impacts of tourism from data or methods that they understand and know well.

Proper design and management of learning for communities are important for the reduction of the vagueness of the goals of learning – to transfer knowledge about carrying capacity to communities and to develop skills needed for carrying capacity appraisal to ensure that communities can take actions on their own on a continual basis when there are changes in tourism situations or in a new context. The researcher believes that carrying capacity assessment carried out by communities may not need external standards, but standards formulated by communities, monitoring

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criteria based on their experiences, or knowledge that can be explained among tourism operators and/or community members in terms of indicators, decision-making criteria, and auditing methods that originate from the study areas. If this can be achieved, it can reduce the use of standards from outside that communities do not understand and reduce similarity of the patterns of assessment for defining carrying capacity of different communities to a certain level, too. It also reflects their ownership of the research and context-based management, which involves actions that are simple and can be managed by the communities.

From the need for managing the learning process, the researcher was interested in integrating this concept into other related concepts, such as environmental education, information processing, and critical thinking to enable the community to use the carrying capacity concept to serve as substantive matters to achieve enhanced information processing skills, environmental consciousness, and tools to manage impacts, based on its knowledge, understanding, and information about the areas. This would improve community carrying capacity to ensure natural resource and environmental conservation that is sustainable and keeps pace with environment changes, which are dynamic.

## 2.5 Summary of the literature review

The above concepts and theories were outlined to lead to the synthesis of the conceptual framework for community learning management, which are as follows:

**2.5.1 Environmental education**, which is an important part as it is the core concept that transforms community learning management by searching for environmental carrying capacity for tourism development. It encourages communities to learn to stay close to their own environmental system to create learner characteristics that are in line with the goals of the concept.

The application of the environmental education concept for learning management emphasizes learning management through the relationship between the environmental system and tourism development, a community's search for values and

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meanings, an understanding about the relationship between the environment and the community, and support for learning about the environment, whereby people learn about the environmental system within their own community to apply the study results to address their own challenges.

**2.5.2 Information processing theory**, which is important because it is used to explain learning and to design learning management based on the assumption that learners are able to develop learning through systematic information processing and to control their own learning. This will reflect the brain capacity that can be developed by efficient information processing through organizing information received from prior knowledge in a systematic fashion, developing the skills in linking the information so it can be interpreted, and applying it to solve problems. This will encourage communities to think and make decisions based on reasonable use of information.

The application of the theory to learning management involves creating attention to information, informing learners of the learning objectives, retrieving information, selective perception, encoding the information into long-term memory, and responding to information. Principles related to data management, such as organization and recall, cluster of knowledge, and other techniques will be involved in learning management.

**2.5.3 Critical thinking**, which is important because it supports the development of cognitive skills, which is used in the development communities' cognitive process to cope with changes in tourism and the environment. The careful development of the cognitive process will contribute to problem-solving, drawing conclusions, forecasting possible outcomes, and decision-making of communities to determine carrying capacity over time. Other potential issues will be taken onto consideration.

The application of critical thinking to learning management deals with development of communities' cognitive skills and examination of products of thinking, which consist of elementary clarification, basic support, inference, advance clarification, as well as strategies and tactics to allow communities to address issues

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and make decisions and result in the process of reviewing the cognition from the cognitive process.

**2.5.4 Carrying capacity**, which is important because it is the gist of learning management and supports systematic processing a variety of information.

The application of the carrying capacity concept focuses on searching for indicators and determining carrying capacity by means of collecting, organizing, and linking information related to carrying capacity in the community context.

## 2.6 Study areas

This section comprises eight topics: (1) Historical context, (2) Location, (3) Demographic and economic conditions, (4) Public services and major places, (5) Cultures and traditions, (6) Local resources, (7) Background of tourism in the community, and (8) Importance of the community.

### 2.6.1 Historical context

Nong Mae Na sub-district was an important stronghold for the Communist Party of Thailand, which had an ideological conflict with the Thai government, thus resulting in violent fighting from 1968 to 1982 to protect the areas. The 3rd Army was designated to combat government opponents by applying tactics to purge the Communist Party. The 3rd Army built a road off Phitsanulok-Lom Sak Road at KM 100 km, Ban Camp Son. In 1974, the Army built Na Ngua Road to Ban SadoPhong to connect with the first road, put pressure on the opponents, and facilitate the deployment of supporting forces of the government. In 1975, His Majesty the King BhumibolAdulyadej visited the Royal Special Forces, SaritSena Camp, Phitsanulok. He suggested the use of the "*Strategic Development Plan*" to settle the fighting by using both sides of the roads to benefit the general public, not only military. The Army requested the use 1 km of land on both sides of the road from the Department of Forestry to set up villages and undermine the influence of the Communist Party.

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Interviews with the community leaders and savants reveal that the name of the community originated from its richness in natural resources, as a low basin area with paddy fields, which were the major sources of provisions for the Communist Party. As for community members, in 1981, the military ordered purges of the Communist Party in Nong Mae Na as it gathered forces for military training, a hospital, and supplies. The major forces consisted of rangers from the 3rd Army and infantry soldiers from Tak. In the same year, this area was seized, so the village was set up in 1982 to prepare the area for peace keeping. At first, most of the soldiers were rangers that volunteered to stay in the community to keep peace. There were 50 houses the government built for these rangers. An area of 2 *ngan* was allocated for building houses and an area of 15 rai was allocated for each household. Now, there are only around five houses that have retained their original style.

At first, the community consisted of 50-60 people, which experienced some sporadic battles between the rangers and the Communist Party. Because it was a soldier village, it was ruled mainly based on the military disciplines, under which there were four company commanders in charge of keeping peace in the community. An interview found there was one company commander respected by the community members, and a monument was built to honor his sacrifice to protect his subordinates during a clash with opponents. His name was Major Thongdaeng Bunyanuson.

After the end of the fighting in 1983, the Than Tawan Village was set up. It was a volunteer community whose members assisted the government in keeping order in the area. At first, it consisted of approximately 50 households. In this same year, on February 26, 1985, His Majesty visited the village to boost morale of the rangers and volunteers. After the end of the fighting, some rangers discharged from duty decided to settle in this village. They were granted a right to live there and allowed to draw a lot to choose a house and farmland on a fair basis. They brought their families to the village, too.

Ban Nong Mae Na does not have a long history, but its stories are related to major events of the country as a battlefield of different political ideas and ideologies. A community survey and discussions with some community members showed that Ban Nong Mae Na is a "community with united families" – a community comprised of people from different places. During the start of the community, people

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were not linked through kinship. Most of them were originally from Phetchabun province and northeastern provinces. Major groups of people in the village consisted of: (1) Those marrying village members and then migrating into the village; (2) Soldiers discharged from duty from other areas but allocated farmland in Ban Nong Mae Na; (3) People renting farmland; and (4) Those escaping from legal charges or debt from other areas, who moved to the area as it was remote and hard to access (Interview, 2013).

### 2.6.2 Location

Ban Nong Mae Na is located in Mu 6, Nong Mae Na sub-district, Khao Kho district, Phetchabun province. It connects to the Thung Salaeng Laung, and it is partly near the Pa Pang Ko-Wang Chomphu National Reserve Forest, which was declared to be the Khao Kho National Park. The village is located near the Forest Preservation and Protection Operation Base 2 (Nong Mae Na). Land use in the village was granted under the conditions that members have to pay local tax (Pho Bo Tho 5). It is 22 km away from Khao Kho district, and the most popular transport mode is cars, using two routes: (1) Phitsanulok-Lom Sak Road no. 12, at KM 100: Ban Camp Son-SadoPhong; (2) Route no. 21: Ban Na Ngua-SadoPhong, which is 56 kilometers from Phetchabun. The total area consists of 1,200 rai, 780 rai of which is farmland, 80 rai is a residential area, and the remaining area is public land. Its boundaries are:

| | |
|---|---|
| North | ThanTawan Village |
| South | Lam Nam Khek Village |
| East | Forest Reserve Area |
| West | Lam Nam Khek, the Thung Salaeng Laung Natural Park |

The geography of the village shows that it is rich in natural resources, as it is located next to the national park and is passed by Lam Nam Khek, where agriculture can be cultivated all-year-round. The average annual temperature does not exceed 25 degrees Celsius. The location of the community is shown in Figure 2.5.

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### 2.6.3 Demographic and economic conditions

Ban Nong Mae Na consisted of 124 households, with a population of 402 consisting of 199 males and 203 females (Nong Mae Na Sub-district Administrative Organization, 2014). The majority of jobs are in the agricultural sector. Interviews showed that all households do farming or have farmland. Seven households do rice farming and ten do fruit farming for jackfruit, local peach, and mango. Two do aquaculture.

Important crops of the community include passion fruit (22-27 baht per kilogram), chili (20 baht per kilogram), radish (five baht per kilogram), bell pepper (50 baht per kilo), corn (8,000 baht per ton), chayote (20 baht per kilogram), and Chinese cabbage (12-15 baht per kilogram). Upland rice is commonly grown for domestic consumption rather than for sale as a cash crop. It can be seen that agriculture is their main occupation; agricultural jobs are done all-year-round. During winter, they grow lettuce, chili, celery, cabbage, radish and passion fruit. During the wet season, they prepare plots for planting rice and maize. During the dry season, they collect bell peppers. The cultivation season is presented in Table 2.4.

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**Table 2.4** Community's Agricultural Calendar

| Crop | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| Maize | | | | | | | Seeding and cultivation | | | Harvest | | |
| White cabbage | | Seeding and cultivation | | Harvest | | | | | | | | |
| Bell pepper | Seeding | Cultivation | | | Harvest | | | | | | | |
| Passion fruit* | Seeding | | Cultivation | | | | 1st harvest | | 2nd harvest | | | |
| Upland rice | | | | | Prepara-tion | Cultiva-tion | | | | Harvest | | |
| Radish** | Cultiva-tion | Harvest | | | | | | | | | | |
| Yam | | | | | Cultivation | | Harvest | | | | | |
| Chayote | | Cultivation and harvest | | | | | | | | | | |

* The plots for planting passion fruits are used once every two years.

** Year after year.

Apart from agriculture, some community members are self-employed with a wage between 150 and 250 baht per day, depending on the nature of work. Other occupations include merchants, government officials, and company employees, who are a minority of the community. In addition, some community members have a second job from tourism, making brooms, processing community products, such as passion fruit juice, upland rice and mulberry leave tea, as well as sericulture. The average income of each community member is approximately 50,000 baht per year.

The principal funds in the community consist of: (1) The Village Fund, (2) The Poverty Alleviation Fund, (3) The Savings for Agriculture Fund, (4) TheWomen Development Fund, (5) The Community Mill Fund, (6) The Nong Mae Na Forest Lover Group, (7) The Village Bank Fund, and (8) The Market Demonstration Center Fund, including informal funding sources with loans amounting to 300,000 baht a year (Nong Mae Na Sub-district Administrative Organization, 2014).

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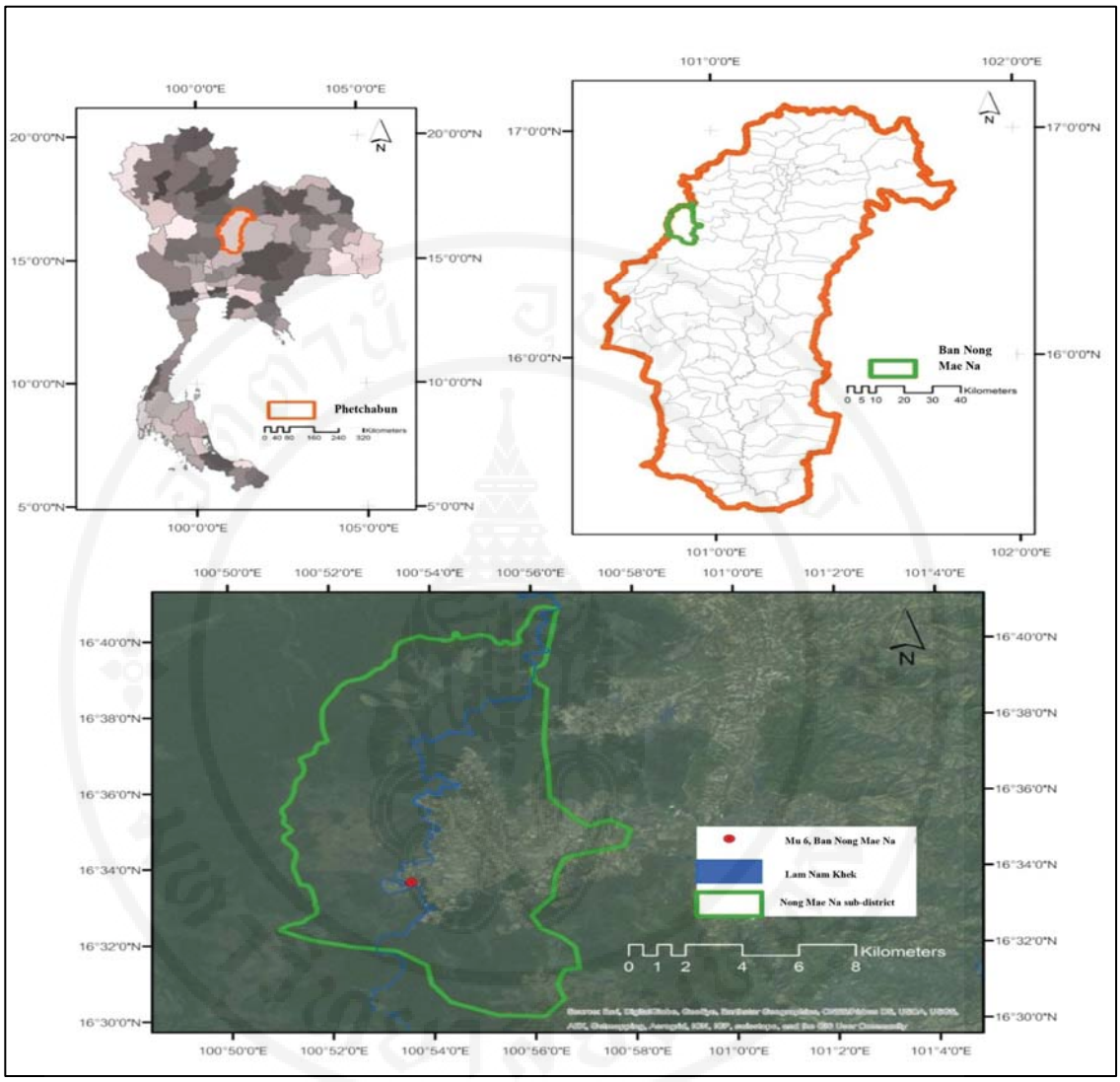


**Figure 2.5** Location of Ban Nong Mae Na

### 2.6.4 Public services and major places

Public services in the community comprise Ban Nong Mae Na school, which is an educational opportunity school open to students from kindergarten to elementary levels, Nong Mae Na Temple, an important place for religious ceremonies, a child development center, a health station, a community hall, a community cooperative shop, private shops, a broadcast tower, a village stadium, a tourist information center, and the Forest Preservation and Protection Operation Base 2 (Nong Mae Na).

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Most households can access electricity, with only 3-5 households having no access to electricity. The community has community waterworks supplying water for domestic use, which is taken care of by the village committee. The community has a public water body covering 14 rai, three groundwater wells, and 20-rai of community forests. The community has four reinforced concrete routes with a distance of 715 m, an asphalted road, and a laterite road. Places serving as their mental refuge consist of Ban Nong Mae Na Temple, grandfather-grandmother shrines, and the Major Thongdaeng Bunyanuson Monument, which are the centers of belieffor community members. The community map is illustrated in Figure 2.6.

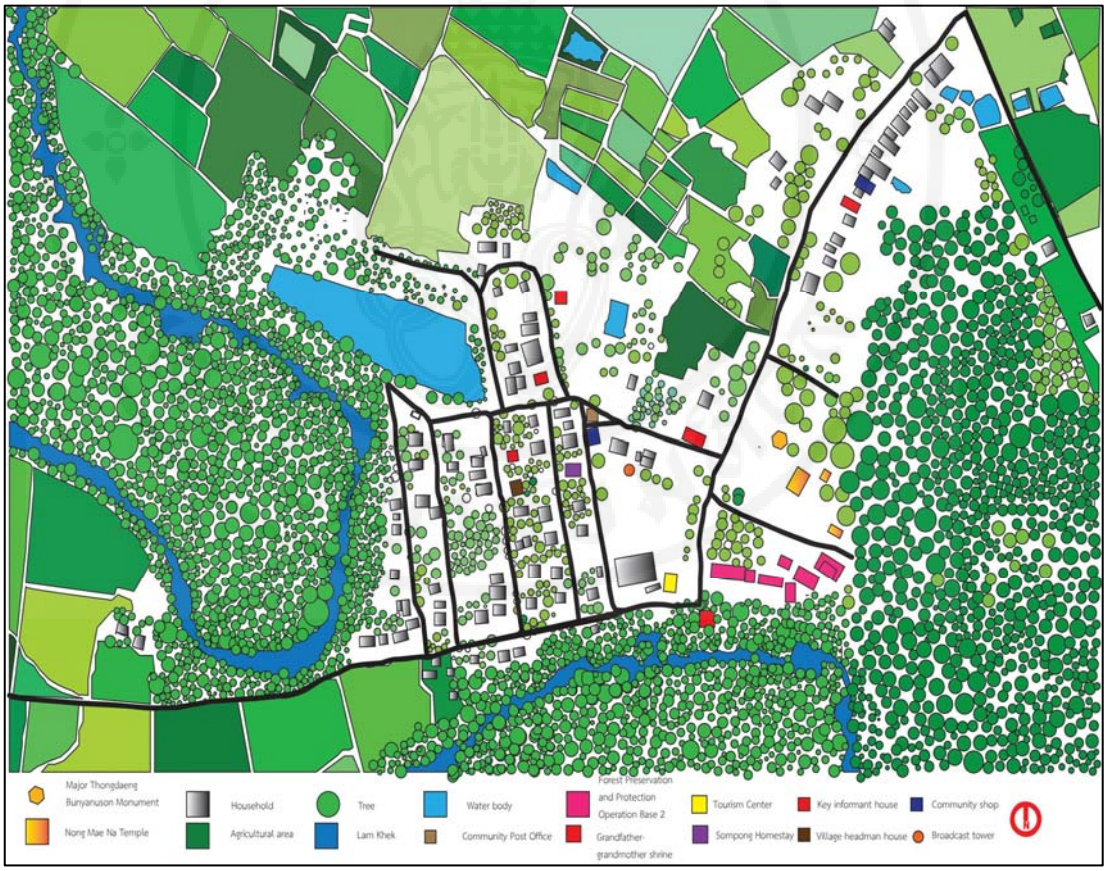


**Figure 2.6** Community Map

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### 2.6.5 Cultures and traditions

Due to its short history and the fact that the community members came from different areas, the cultures and traditions shared by all the community members consist of merit-making, e.g. merit-making during the New Year's day, religious events, Songkran, and Loy Krathong. There are some local traditions. The first is merit-making at the grandfather-grandmother shrine on the full moon day of the sixth lunar month. At the event, Buddhist rituals are performed: giving a food offering to monks in the morning and giving a sacred offering to the grandfather-grandmothers. There will be a medium who contacts the spirit that hosts the ceremony for the auspicious moment of community members. Another is making merit at the Major Thongdaeng Bunyanuson Monument from 19-20 February each year. The event features a food offering to monks and worship at the Monument. The community has community savants, including local/herbal healers, leaders for religious rituals and community traditions, and mediums.

### 2.6.6 Local resources

Ban Nong Mae Na is rich in natural resources, as it connects to the Thung Salaeng Luang National Park. This abundance in resources is reflected through a variety of endemic plant species, such as Khok Non Lettuce, Put Yai, KaemKhao, eagle wood, pink ferns with black stalks, pink and blue ginger, and red rose. Apart from the endemic plant species, over 18 kinds of wild mushrooms are found, e.g. big Termitomyces mushroom, Mycorrhiza mushroom, and Russula emetic. There are approximately 163 bird species and over 135 butterfly species. They are important tourism resources for the community. A highlight is freshwater jellyfish (*Crasapedacusta sowerbyi*), which is a rare species. It looks like clear jelly with an umbrella-like shape, with a size of approximately 2-3 cm. During their lifetime, their shape is like polyps, which live together in a colony. They live underwater at the roots of water plants, under rocks or tree stumps. The colonies are not visible with the naked eye. They can be seen only during the dry season, from March to April, when they develop the velum structure, which makes them possible to be observed with an umbrella-like shape and long tentacles around the edge of the umbrella. The tentacles have a lot of poisonous needles. Freshwater jellyfish live in Lam Nam Khek in Kaeng

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Bang Rachan, Kaeng Song, and Kaeng Sam. Apart from the local resources, Ban Nong Mae Na has a tourism resource base connecting to the Thung Salaeng Luang National Park and tourist attractions surrounding the National Park, such as NongKhamek, a scenic spot at KhaoTakhian Ngo, and the Songkran Waterfalls.

**2.6.7 Background of tourism in the community**

Originally, agriculture was the main occupation of the local people. Since the popularity of ecotourism, there have been a increased number of tourists coming to the community to learn about natural areas. The Thung Salaeng Luang National Park is a beautiful area and has been popular among ecotourists, for hiking and camping in natural areas. Community members gain extra income from providing a carrier service for tourists to the National Park. However, the length of community tourism is short, which lasts approximately two months in a year. The carriers are from both Ban Than Tawan and Ban Nong Mae Na, as both communities are located near the National Park and many major attractions.

Later, they realized that the carrier service does not provide a secure income and the tourism season, when carriers are needed to support tourism activities, is short. Moreover, during the starting period of the village settlement, agriculture was not adequate to meet demand, resulting in some members from Ban Nong Mae Na and Ban Than Tawan encroching onto protected areas. They collected forest products, hunted wild animals, especially hill mynas for sale, and illegally-cut scent wood. This led to a continual conflict between the two communities and Thung Salaeng Luang National Park. National Park officers had to arrest them and perform monitoring to ensure forest conservation, which was a crucial issue at that time.

The use of the eco-tourism concept to serve as a tool for national park conservation was very popular. The Thung Salaeng Luang National Park and agencies concerned were interested in utilizing the concept to reduce conflicts between them and local communities and reduce the destruction of natural resources and the enviornment in the local areas. Therefore, the project on studying ecotourism capacity originated in 2001. The study results revealed the community's tourism capacity and ability to expand community-based ecotourism. Ban Nong Mae Na's distinct tourism capacity consisted of its location, which is near valuable natural tourist attractions,

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historical resources related to fighting against communist insurgents, and agricultural lifestyles that could be developed to be a tourist attraction. It was also found that members working as carriers had experience in tourism. They could be good local tourist guides, as they had knowledge about natural conditions based on local wisdom, and they could provide interesting narratives (Ouithavon, 2012). Therefore, in 2012, the project was continued to study management of community-based ecotourism in Ban Nong Mae Na to empower the community to manage tourism and create partcipation among the Thung Salaeng Luang National Park, Ban Nong Mae Na, and Ban Than Tawan, with joint commitment to preserving and monitoring the ecosystem, monitoring to identify any illegal use of conservation areas, and expanding economic opportunities for the communities by gaining extra income from tourism. Following the completion of the project, the Nong Mae Na-Ban Than Tawan Forest Lover Group was established with joint tourism management plans in 2012. Since that time, Ban Than Tawan has terminated its role in tourism management, but Ban Nong Mae Na is still active in this role with continuous operations. The name of the group was changed to "*The Nong Mae Na Forest Lover Group*." An interview indicated that the major causes of the termination of Ban Than Tawan's role was that the fact that Ban Than Tawan lacked leaders for coordination with leaders from Ban Nong Mae Na and the fact that major attractions are located closer to Ban Nong Mae Na. Therefore, the tourism management responsibility mainly went to Ban Nong Mae Na. In addition, Ban Than Tawan's interest was agriculture; it had projects on promoting the cultivation of additional cash crops, such as coffee, to provide extra income for the community. However, some members of Ban Than Tawan run homestay businesses in 2-3 houses, and network with the tourism group at Ban Nong Mae Na in the form of referring tourists for overnight stays.

### 2.6.8 Importance of the community

The fact that tourism resources of Ban Nong Mae Na are rare and endemic reflects that their resources are vulnerable and are at risk of being threatened due to tourism growth. An interview about the impacts of tourism shows that community members have concerns about the reduction of jellyfish, disturbances to butterflies, disturbances to their lifestyles due to tourism work, and conflict among tourism

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leaders as a result of tourism growth (Interview, 2013). From these issues, the community was interested in searching for the right tool to reduce and monitor the impacts of tourism.

At the same time, the researcher was interested in developing information processing to enable the community to think in a systematic fashion, address issues on their own, and use information to logically address the issues; and to promote the appreciation of the environment. The needs were key common issues shared by the community and researcher, in terms of the development of instructional models by indentifying environmental carrying capacity to reduce and monitor the impacts of tourism based on information about useage; develop a cogitive process for the community; and encourage loving and cherishing of their tourism resources. This will enhance their wisdom for management of the environment in terms of tourism and other dimensions on their own. The learning management aims towards sustainable tourism development in the end.

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# CHAPTER III
# RESEARCH METHODOLOGY

This study utilized participatory action research, which was a key basis for collaboration between the researcher and the community to achieve learning about information use and critical thinking, which would lead to effective tourism resource management and unleash the community's potential through practice with a true understanding about problems (Wongwanich, 2008: 35). This research was approved by the Office of the Committee for Research Ethics (Social Sciences), Mahidol University, with the Project Code: MU- SSIRB 2012/ 305.1310. The study process consisted of (1) Study area selection; (2) Identification of participants, (3) Procedures, (4) Tools and examination of tool quality, (5) Data collection and analysis, and (6) Report preparation. The study process consisted of (1) Study area selection; (2) Identification of research participants, (3) Procedures, (4) Tools and examination of tool quality, (5) Data collection and analysis, and (6) Report preparation.

## 3.1 Study Area Selection

The researcher was interested in encouraging tourism communities to learn about utilizing information to manage environmental issues stemming from tourism and to develop a cognitive process, which is the source of problem-solving strategies. This was based on the underlying belief that if communities are able to think in a systematic and logical fashion when they consider tourism management-related information, this will encourage the formulation of management guidelines equipped with adequate capacity for maintaining the environmental system in a timely manner in line with changing circumstances.

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Based on interest, the researcher searched for a tourism community to serve as the study area focusing on two key characteristics: (1) A tourism community characterized by community-based tourism (CBT) focusing on cooperation of

community members as well as natural resource and environmental conservation (Suansi, 2003) and (2) A tourism community at risk of damage as a result of its vulnerable resources, with a large number of tourists, and facing issues due to inadequate tourism management. Based on interviews with the Community Based Tourism Institute (CBT-I), a review of documents, and the researcher's experiences, the Nong Mae Na Community, Nong Mae Na sub-district, Khao Kho district, Phetchabun province was identified as an important area due to its vulnerable resource, which is freshwater jellyfish (*Crasapedacusta sowerbyi*), a species found at only six places in the world. The community also has rare animal and plant species, as it is a tourist attraction close to a conservation area – the Thung Salaeng Luang National Park. In addition, it has continual experiences with tourism operations. The number of tourists coming to the community was so big that it could pose risks to the environment. Discussions with some leaders of the community before the research was conducted revealed that the community was interested in research and would like to deal with issues stemming from tourism, as described in the Background section.

Thus, this study area was purposively selected to jointly create learning by identifying the community's environmental carrying capacity, which could monitor threats resulting from the growth of the number of visiting tourists.

## 3.2 Identification of Research Participants

Accessing participants was a key to this participatory action research, as it involved collaboration between the researcher and community members who were interested in learning and saw the opportunities to utilize knowledge to address the community's environmental issues. Participation was on a voluntary basis and did not financially incentivize them. The following section describes the voluntary participation.

**(1) Accessing the research participants –** The researcher planned field visits to inquire about

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Local needs for, and interest in, identifying common issues shared by the researcher and community members. Before the field visits, the researcher studied

documents concerning the area and made inquiries with network organizations that had worked with the community, such as the CBT-I, Khao Kho Tourism Business Club, the Nong Mae Na Sub-district Administrative Organization, and researchers who were familiar with this community. This aimed to gather their ideas that assisted in selecting groups or individuals that could liaise with other community members. Based on the information and opinions gathered, the researcher realized the importance of the Ban Nong Mae Na Forest Lover Group as a group composed of many members that drove development in the field of tourism and other fields in collaboration with outside agencies. It was recognized as a group that aimed to create learning with community members to apply the knowledge to manage environmental problems resulting from tourism. Thus, the researcher believed that this tourism group was consistent with the researcher's desire.

After identifying which group to contact, the researcher sought "*key informants*" to reach the group and community area. Various sources of information pointed to the President of the Ban Nong Mae Na Forest Lover Group. He played a role in liaising with external networks and a role in managing the tourism group. The researcher contacted him to request access to the community area to meet with members of the Ban Nong Mae Na Forest Lover Group. However, he indicated he would like a network trusted by the community to certify my identity first because the community had not known or been familiar with the researcher. Then, the researcher asked for cooperation from the CBT-I, a network organization trusted by the community. The CBT-I assigned an officer to liaise with the community and introduced the researcher to the tourism group. The first official meeting between the researcher and the community took place on 20 October 2012, which involved a discussion about cooperation in development of the project. The researcher met and talked with the tourism group leaders only. They stated that they were just representatives who would listen to the initial details of the project, and then they would hold a meeting with group members to deliver the information and conduct a survey about the levels of their interest in the project. As for communication about the project, at first, the researcher asked about current environmental issues caused by tourism development. The community reflected their concerns about the decline in the number of jellyfish, disturbance to butterflies from tourists' behavior, and disturbance

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to normal community lifestyles as a result of tourism jobs. These were main issues that were widely discussed and showed their concern about current situation.

From the discussion, the researcher formulated the idea to present the community with the benefits of participation in the project – the community would be equipped with knowledge and understanding about addressing its current problems; reduce dependence on the outside; and learn to develop a new tool – environmental carrying capacity – which the community could implement by itself and could apply to mitigate the impacts of tourism. The researcher explained the approach focusing on collaboration between the researcher and the community on a voluntary basis. The researcher stated that if the community felt uncomfortable during the collaboration, it could halt its cooperation, and this would not have an adverse effect on the community.

During the discussion, the leaders seemed to be interested in the project, but they did not immediately agree with the invitation. The Group President said, "*What you've said is interesting. I'll discuss this with other members to see about their ideas and see if they are interested in this project. I'll contact you later.*" The leaders' interest in the project resulted from the thought that joining the project would help reduce environmental problems resulting from tourism and their idea that if the project did not exist, the support for managing the problems would not be responded to by the community. This was confirmed by the tourism group's marketing assistant: "*Just let us think about how much beneficial the project is. If we participate in the project, we have to spare our time. If it's worth doing it, I think we should do it. If it is not worth it, I don't know why we have to do it, right?*" The researcher believed that the leaders understood the project details and the researcher's expectations, but they just wanted to consider this matter with other group members before accepting or rejecting it.

From the situation, the researcher was not able to determine if the community would accept the project; however, the above activity established initial interactions with them and reflected the efforts to get space that was in line with the needs of the study. One obvious thing was the community's cautiousness when interacting with external researchers. This was evidenced by their request to verify the identity of the researcher by means of a network that the community trusted, meeting with the leaders before the meeting with the group members, and consideration of the

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benefits of the project with the tourism group members. An inquiry made later revealed that the reason why the leaders were careful about working with an external researcher was their past experiences in interacting with a diversity of academics and the fact that it had a long experience in operating tourism activities (approximately 13 years) and accumulated knowledge from exchanges with scholars and tourists. This made them aware of projects coming to the community to a certain extent. In addition, some projects in the past caused the community trouble, from which they gained no benefits and they felt they wasted their time doing different things, e.g. gathering questionnaires and interviews. After the current project was run in the community, the Group President said to the researcher, "*At that time, I didn't know you well, so I had to be careful. I had a lot of bad experiences. For some projects, I wasted my time and had a bad mood. Villagers got nothing from them. Sometimes, they had to accommodate people from outside. I am not OK with this type of project.*"

The community was originally a disaster-prone area, both in terms of fighting and natural disasters, which resulted in community members being wary of being exploited by outsiders. Accordingly, networking was crucial for the community. To accept or reject a project might depend not only on project benefits but also on the sense of networking. Developing a relationship with the community to gain its acceptance and then its collaboration was not easy; it relied on sincerity and regular involvement in community activities. Realizing this importance, the researcher focused on continual field visits, before the project was accepted.

**(2) Building trust** –Soon after informing the tourism group leaders about the project details, the researcher was invited to join Kathin (a Thai traditional ceremony where robes are presented to monks at the end of the Buddhist Lent) in the community from 11-15 November 2012. At the event, the researcher met many community members, who were both members and non-members of the tourism group. The most important activity that encouraged the community members' positive interaction with the researcher was building a refectory for monks at Nong Mae Na Temple, which created close relationships through collaboration. The activity resulted in greater mutual trust as evidenced by the invitation to the researcher to have dinner at a tourism group leader's house. The dinner was joined by group members with a close relationship. Their conservations with the researcher saw closeness and trust.

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Some came to handshake with, or teased, the researcher during dinner. Some used a new term to address the researcher, from "*ajarn (teacher) to "phi*" (elder brother). On the day the researcher left the community, the researcher was given passion fruit and local vegetables from the tourism group leaders' houses, as souvenirs. This was different from the first meeting with the researcher, when they did not give the researcher any souvenir or tell the researcher to see them again.

One thing that confirmed a stronger relationship between the researcher and the tourism group leaders after the Kathin event was that the researcher was allowed to stay overnight at S. Homestay. The Homestay's owner gave the researcher the home and motorcycle key for use while staying there. Normally, the place served people from networks that were important to, and had a close relationship with, the tourism group. In addition, for dinner with the tourism group leaders, which took place every day during field visits, it was the researcher who prepared food. This improved our intimacy and friendliness.

An informal conversation with some leaders revealed that before the researcher came to the community, the tourism group leaders had not eaten together for some time, but the researcher did not know the reason for this distant relationship. Another important activity for the researcher was talking with community members at the community shop in the evenings after they finished their work on the farms. The community shop was a gathering point where community members met and shared information about the community. Here, the researcher gained knowledge about conflicts within the community– the issues of the cooperative shop and community members' points of views about the tourism group. The researcher also gained a better understanding about the community context, which served as data for verifying data from conversations with tourism group leaders.

Under our increasingly close interactions, the researcher was invited to attend a worship ceremony at the Major Thongdaeng Bunyanuson Monument on 24 February 2013. During long holidays, the researcher was invited to visit the community. It took approximately six months to establish trust, based on which the researcher was accepted as a friend to the community and the tourism group. An observation was that during the development of the interaction to seek the community's cooperation, the tourism leaders checked the researcher's sincerity

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through various processes, by taking these into account – the researcher's involvement in community events not as a guest or a tourist, listening to their opinions during conversations at dinner, and an absence of coercive or demanding conservations with regards to the research project. Subsequent conversations with some group leaders revealed that they perceived the researcher's strong determination, good friendship, and respect for them, as a younger guy. A tourism group leader said, "*I think you are friendly. You visit us, but you also cook for us. It's good when you come. It's a time for gathering to have dinner together. It's fun to talk and we get heavily drunk every time…laugh…*" or "*Other academics sometimes teach us to do this and that. We've done this for a long time. If we weren't good or if we knew nothing, it would have failed a long time ago.*" At that time, as a result of good interactions with the group leaders, the researcher felt confident about clarifying the research project to the tourism group members.

**(3) Gaining acceptance by the community** – This was a result of the community's trust in the researcher to join community activities regularly. The researcher was contacted by the Group President to explain details of the project to the members of the Ban Nong Mae Na Forest Lover Group on 1 March 2013 at the Nong Mae Na Village Meeting Hall, Nong Mae Na sub-district, Khao Kho district, Phetchabun. The meeting was attended by 15 board members. What was presented in the meeting included: (1) The project objective focusing on generating mutual learning that led to the use of information for decision-making about the formulation of tourism management guidelines to reduce impacts of tourism by means of carrying capacity appraisal; (2) Benefits from participation in the project, which consisted of the development of information collection and management, systematic practice in terms of tourism and other aspects, a better environment, and the image of a conservation community consistent with the community-based tourism management model focusing on eco-tourism activities, and monitoring of the results of tourism activities in the area to understand the situations of problems, problem intensity degrees, and problem management; (3) Implementation – Project participants would be the major actors, in terms of seeking and using information, identifying issues, designing activities, implementing activities, and developing conclusions of the activity implementation. The researcher played a role in jointly thinking, implementing, and receiving the

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results of the implementation. An important thing was the emphasis on voluntary participation based on happy learning from conducting activities in the project. They were informed that if they felt uncomfortable or unhappy with their participation in the project, they could immediately halt their participation; (4) Budget – They were informed that the project had no remuneration for their involvement in the project, but it had a budget for expenses needed to drive the project implementation.

Last, the researcher's expectation was presented, which was the desire to have the 15 board members volunteer to take part in the research project. However, only six of them whose real names were kept confidential in accordance with the research ethical code interested in it. The six under alias include: (1) Mr. S, President; (2) Mr. K, Advisory President; (3) Mr. L, Executive Vice President; (4) Mr.Sm, PR Vice President and Marketing President; (5) Mr. D, Assistant Secretary; and (6) Mr. Sw, Secretary (as of 2012).

Informal inquiries with board members who did not join the project revealed a similar reason for not joining the project – their routine workload. In this tourism group, despite having a position in the board, they had to perform other duties as assigned by the group. Core leaders, who played a role in formulating implementation guidelines and management plans and implementing with other agencies within and outside the community, consisted of these six people. The group's treasurer said, "*Mostly, I take care of my responsibilities. As the treasurer, I'm interested in accounting and incomes and expenses related to the group. I'm not involved in other matters. The heads or the representatives of the group are Mr. S and the other five people working with you. They are the core leaders. Those who want to anything related to the community have to contact them*." The group's auditor said,"*Mr. S came to talk to us first. He asked if we were interested in your project. The group members agreed, but mostly we let the core leaders do this type of work. This is common practice anywhere else. This isn't strange. If they want any help, they'll contact us. If we're available, we'll help them*." This suggested that not all of the 15 board members were leaders. The non-leader members' roles were based on their responsibilities assigned by the group. The six participants were the core leaders, who played a role in formulating guidelines for tourism management, as well as driving and developing the community's tourism. Moreover, they played a key role in

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coordinating cooperation with external organizations that would support development work for the community and public benefit work within the community. Thus, they automatically became the community leaders. This resulted from the fact that the official leader – the village headman–was limiting his role due to his health problems, and the six leaders had a network with external academics from different places, so they were provided with opportunities for self-development through academic works so that they were recognized in terms of ideas and knowledge by most community members. This was evidenced by a community member saying, "*Mister S. and his colleagues have helped the community with many things. When I have any problems or questions, I approach him. Sometimes, if I ask him to come to help me, he comes.*"

The Ban Nong Mae Na Community was familiar with governance characterized by giving orders similar to a military regime, which was the original form of governance during the village startup, and characterized by having a commanding chief. Therefore, when the tourism group had a meeting to inquire about opinions about the project, most members viewed that the project would benefit the tourism group and the community. However, in terms of roles and duties, the group leaders had to be responsible for project implementation. In addition, the group leaders' volunteering to participate in the project was related to their interest in working for the general public. An observation was that for big or small problems, e.g. water pipes, disputes between individuals, contacts with government agencies, and encroachment on conservation areas, local people consulted with the tourism group leaders. They asked them to coordinate work and take corrective actions. Accordingly, the study of tourism problems or management of tourism-related problems was something that the participants were interested in learning about and solving together.

This reflected the importance of the six people, who voluntarily participated in the project, as the core leaders of the Ban Nong Mae Na Forest Lover Group and important representatives due to their power to give orders and make decisions on the management of the tourism group. In addition, they were trusted by the community members to be the community's representatives to take action. Most community members believed in their knowledge and ability and believed that they would protect the community and the tourism group.

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## 3.3 Procedures

The project consisted of two phases: (1) Cooperation establishment, and (2) Learning, which are described below.

**3.3.1 Cooperation establishment phase** – This phase dealt with building cooperation between the researcher, as the researcher, and the participants, to adjust the ways of thinking and collaborating, as well as to build the cooperation between the participants. Based on some disagreements among them during work, which affected their interaction, choosing a good time for discussions was important. Observations and inquiries showed that dinner was a good time to have a discussion because it was the time by which people finished their daily work and they could help prepare food. It was also a good time for a long discussion. Many participants agreed that this atmosphere did not occur very often. A participant said (D) , "*Lately, we've hardly eaten dinner together. Maybe, each of us is busy.*" An informal conversation found that the situation was the result of a disagreement between the leaders of the first generation (senior) and those of the second generation during work. Besides, there were not many activities or projects in which they worked together. The disagreement was worsened by the conflict over the community shop and the election of the members of Sub-district Administration Organization at that time. The researcher believed that the conflict between the participants should be cleared up before the project started, as this would affect idea sharing and co-working.

Apart from the dinner atmosphere, which was a factor in good cooperation, one factor the researcher noticed was their interest in issues of the community and tourism group. They had public mind, and with their role, they had to pay attention to take corrective actions to stabilize their position as leaders. Hence, the researcher raised issues related to tourism in order to build cooperation, result in an exchange of opinions, and encourage synergy based on the desire to solve the problems. The participants' conflict with community members from opposing the community shop was raised as the main issue to identify the need and importance to have cooperation among the group leaders. This activity was carried out from 2-4 March 2012 and 17-18 March 2012, when the researcher asked the participants to have dinner together, persuading them to think and talk about environmental issues from

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tourism they had faced and inquiring about the results of corrective actions. The discussion revealed that the problems that they were concerned about included: (1) The reduction of jellyfish, as a result of sediment and turbidity in water bodies, the invasion of exotic plants or animals species, and agricultural chemicals; (2) Municipal solid waste, which was mainly caused by community members' improper behavior rather than tourism, (3) Conflict between the group members as a result of a feeling that some lacked a sense of responsibility, (4) Disturbance to normal lifestyles as a result of tourism services, (5) Lack of co-working of the group leaders; and (6) Poor communication about the benefits to the tourism group members.

The researcher noticed a positive change in their interactions during their conversation, as well as their effort to reach a mutual understanding about the issues on which they had disagreement. The issues included – some board members' animal poaching (actually, they were friends of the second generation of group leaders who did this), negotiations about returning money to the group after borrowing it for personal use, violation of rules of the tourism group members, and the first generation of the group leaders' adjustment of prices of services to meet the demand of the networks outside the tourism group. Although this was not a formal discussion, it gave both parties a chance to clarify relevant facts and express opinions to each other, and it improved their relationships. Actually, the participants had an intention to discuss the issue of disagreements, but there was no proper forum or intermediaries and there was fear that the conflict would be more severe after the discussion on the issues. The researcher was only the point that linked the participants through issues they were interested in addressing. When this activity was completed, the interaction between the participants changed in a positive direction, as witnessed by a statement from a participant (Sw.) during an informal conversation: "*For a long time, we didn't talk in such a way. I'm glad that now they're working together. Lately, they have worked individually.*" Another participant (Sm.) stated "*This is the nature of people here. When they are free, they have a fight with each other. But when a problem occurs, they gather to help each other.*" To maintain this relationship, later, the researcher tried to bring the issue of disagreement between leaders of both generations to be the subject for a formal discussion. This was well responded to by the participants because there were a significant number of issues that had to be clarified. During this period,

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the researcher encouraged the participants to outline these issues by drawing charts to practice data classification. The researcher collected data about the participants' knowledge and understanding about the impacts of tourism and environmental carrying capacity during the discussions. Apart from restoring interactions between members, the cooperation establishment phase led to the review of the participants' existing knowledge and encouraged their cooperation through the awareness of importance of the issues and responsibilities as the tourism group leaders.

**3.3.2 Learning phase** – This phase supported processing and careful thought about information. The key activities for promoting learning for the participants consisted of: (1) Identifying environmental situations based on new information, (2) Formulating guidelines for addressing environmental problems of interest to them, and (3) Formulating guidelines for systematically addressing environmental problems, each of which is described below.

**(1) Identifying environmental situations based on new information** – This aimed to encourage the participants to learn about searching for new information to confirm and investigate the situations surrounding the environmental problems they had discussed earlier. An important activity was a community survey, which occurred subsequent to the projection of common issues from the previous conversations to repeat and scrutinize these issues. The researcher asked the participants if the issues were complete and were in line with current conditions. Their responses showed uncertainty, as earlier there had been no official survey of changes in the community. They realized the changes when they experienced actual conditions while working or from conversations with community members. A lack of a survey resulted from the participants' heavy workload. A participant (Sm.) said, "*I have other jobs to do. But I realize that there are issues when we take visitors into the boat or when other villagers tell me about it.*" Then, the researcher asked them about the community shop and if there was any change in the conflict between community members and the tourism group. Their answers were not as clear as they should have been. "*I'm not sure. It may remain the same or get better. I hardly talk about this much with anyone. I'm afraid there will be an issue again.*" (D.) In a conversation, raising cattle in the upstream area was mentioned, so the researcher asked for more information. They said this could be

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true, but they did not know a lot of details about this matter. Therefore, this conversation persuaded them to observe more about cattle raising in an upstream area, at the mouth of the river, Khlong Huai Sai. A participant (Sm.) said, "*It's a good idea to take a look there. I thought I would go to Huai Sai many times. I've heard villagers raise cattle there.*" When the participants started to show their interest in surveying the area around the cattle-raising spot, the researcher persuaded them to survey the whole picture of the community to serve as data for tourism management and confirm or change the picture of the issue identified earlier together.

The activity helped the participants with their review of existing information as to how much it matched reality. In the meantime, the researcher persuaded them to identify interesting information through planning of gathered information, surveys, summarization, organization, classification, and comparison of gathered information. In addition, the researcher expected that they would conduct the surveys together. Instead, they actually divided the tasks, reasoning that this would streamline their work. They said their schedules did not match; scheduling and conducting the survey together might cause delays. A participant (S.) said, "*We can't wait for each other. Otherwise, this won't be finished. Dividing responsibilities would be more suitable.*" Apart from differences in schedules, familiarity was a key issue. This was because the participants were used to allocating responsibilities when they worked together on tourism or other matters. Despite separating responsibilities, the researcher told them to be confident that the researcher would explain the information gathered to other participants in detail.

The encouragement of the participants to take notes during the community survey was rejected because taking notes was seen as being an inconvenient and unfamiliar process. They thought they could store and remember details without recording them. In addition, some of them were old, and some had difficulty in writing, so recording could not be utilized, as intended. They just classified information together through charts and rotated to draw charts with comments. More inquiries about recording revealed that, normally, they hardly did homework as they were supposed to do, and what they recorded were mostly telephone numbers, mailing addresses, fertilizer formulas, or issues that they thought they would not be able to remember and would be important for their work or everyday life. In addition, the

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information to collect was something they were familiar with and could go back to observe if they forgot it.

Although what happened did not meet the researcher's expectations, it was the nature of the participants. However, this affected the timeline of the process. The activity took 15 days, and an appointment was made for summarizing the data together on April 20, 2013.

**(2) Formulating guidelines for addressing environmental problems of interest to them** – This aimed to encourage the participants to analyze information in order to identify environmental problems to address, to plan the formulation of the guidelines to address environmental problems of interest to them, and to take actions. The focus was on allowing the participants to expand their knowledge and practice solving environmental problems in a systematic fashion. Key activities consisted of identifying issues of interest to them to address and solving issues of interest to them. Identifying issues of interest to them to address dealt with outlining the picture of the issue based on the information gathered from the community survey and experiences of the participants. There were two more issues, including raising cattle in an upstream area at the mouth of Khlong Huai Sai and a lack of young visitors to learn from the tourism group. When all the problems were reorganized, they consisted of: (1) Issues that had already been addressed – getting rid of exotic fish species, management of sediment and turbidity, municipal waste management, and communication of benefits to the tourism group members; and (2) Issues that had not been addressed yet – agricultural chemicals, the community's understanding about the working of the tourism group, conflict within the tourism group as a result of job division and disagreement amongst the group leaders, cattle raising in the upstream area, and the lack of youth who came to learn about working of the tourism group.

As for the issues that had already been addressed, the participants reiterated that they would not deal with them again. For them, the results of the corrective actions were at a satisfactory level. Some problems took time for evaluation, such as planting *"Homonoia riparia Lour"* to solve the problem of sediment and turbidity in water bodies due to the belief that it would help reduce bank erosion for Lam Nam Khek. And for the issues that had not been addressed yet, they were related to the relationship between man and man rather than man and the

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environment. An observation was that the management of the relationship and the adjustment of roles of the participants might not be consistent with the changing social conditions. This was evidenced by a discussion with them on planning or considering the guidelines for dealing with issues of their relationships. It was noticed that they were not interested in tangible guidelines, and they viewed that it was difficult to manage diverse opinions of community members and member groups. The data collected from community members and the tourism group members identified that the participants were accustomed to giving orders, rather than providing other people the opportunities to share ideas. An absence of management or interest in formulating the guidelines for addressing the issues might be caused by their negligence and their belief that they were able to control or order others. The actual circumstances they were facing changed their way of thinking, as evidenced by the fact that community members were dissatisfied with the participants because they had stopped setting up the community shop initiated by a businessman or the group members' non-compliance with rules. The researcher raised the issues during the discussions, which led to the identification that the community did not depend on leaders as they had done in the past. Providing no opportunity for community members and group members to express ideas or to participate in management might result in disagreement. The adjustment of participation levels might help resolve the issue of interaction. It was evident that the majority of the participants did not agree on many points with the researcher. Then, the researcher challenged them, Actually, you're afraid you aren't able to do it. It isn't the case that you don't want to do it. Now, do you feel confident that you can give them orders? or You can start doing it bit by bit, starting from inquiring about problems or letting them express their ideas or participate in decision-making.

In addition, the researcher went back to the issue of disagreement on working between the first and second generations of the group leaders, which basically stemmed from a lack of participation. Challenging and raising the issues they were facing made them interested in extending into of the issue of relationships. This was evidenced by their selection of issues to deal with, which were composed of: (1) Cattle raising in the upstream area, (2) the community's understanding about the working of the tourism group, (3) Allocation of jobs that disturb their lifestyles, from tourism

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services, (4) Conflict from disagreement within the group leaders, and (5) Lack of youth who came to learn about working of the tourism group.

The participants asked for the researcher's commitment to supporting proper methods for managing their relationships. This was because they were worried by conflict with community members in the case of the community shop. As for their background, most of them were able people but were not successful in their hometown. Therefore, maintaining power and their association with the tourism group was important to their identity and pride in their life. This resulted in them being careful about interactions; they viewed that if there was any mistake, this would lead to the disintegration of the group or non-acceptance by the members. The researcher gave them a promise and told them that their interest in expansion of the participation was a good thing and should be done bit by bit. In addition, the researcher said that they should not expect that that an activity would be finished within a short time, but that was okay because it served to create a mutual understanding with the community members and the tourism group members, which would lead to self-adaptation to current situations. As for the issue of agricultural chemicals, they did not address it even though they were aware of hazard or the levels of damage to the environment. This was because the participants use agricultural chemicals, and there were many people involved in this issue. Therefore, the participants thought this exceeded their capacity to address this.

During the conversations, the researcher persuaded the participants to jointly formulate the solutions to problems of their interest by seeking carrying capacity. This was not successful because of their inadequate knowledge and understanding about carrying capacity, which resulted in them failing to imagine the linkages to problem-solving. In addition, they were interested in the problems they had selected only. Thus, the researcher had to link the identification of environmental carrying capacity to the problems that they were interested in, which resulted in their tendency to research into the issues.

Solving issues of interest to them consisted of two activities – solving the problem of cattle raising in the upstream area and the production of the community documentary. Solving the problem of cattle-raising in the upstream area was the first activity that the participants were interested in carrying out. They learned about this

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problem from other community members, so they planned to survey the area, where they finally found 40-50 cows. From an inquiry, they learned that the cows were raised by a community member, so they contacted him to negotiate about taking the cows out of the area. The negotiation with the cattle owner failed; he had a relationship with some board members of the tourism group. This issue, plus the conflict over the community shop, made the participants avoid taking actions that might result in violence.

The key factors in the failure in the negotiation consisted of: (1) Non-clarity about land title deeds. Originally, there were people who conducted farming in the area, and they were in the process of requesting the land title deed for farming. This was why the Thung Salaeng Luang Community and the Sub-district Administrative Organization could not manage this fully; (2) Failure to clearly identify the impacts of the cow's excrement on Lam Nam Khek. Data collected by the participants made them interested in switching from the use of rule enforcement to the use of empirical evidence and community members' opinions to address the issue. This tested the expansion of participation by allowing community members to express their opinions about problem-solving to reduce the risk of conflicts among members of the tourism group.

Their need led them to ask the researcher about checking, or searching for, empirical evidence to present to community members. The researcher proposed examining water quality using a simple test kit that they could utilize themselves, whereby coliform bacteria were the indicator. Although it was a simple test kit, the participants needed to know how to use it and understand the importance of the selected indicator. The researcher also gave an explanation about using caution towards the indicator – it might be other wild animals' excrement. In this part, the participants expressed their desire to learn about this test kit, and they dealt with the caution towards the indicator by collecting water samples at the spot near the herd of the cattle. Thus, this activity consisted of a sub-activity – education about using the simple test kit for water quality in which the researcher was the speaker. At the same time, there was discussion about the approach to provide practice-based knowledge. The researcher had to provide them with explanations, demonstrations, and recommendations during their practice activities.

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This activity contributed to the use of new information and new management guidelines. The researcher stressed that the participants needed to take corrective action step-by- step, which consisted of reviewing the problem, analyzing the problem, management planning, taking actions, and reflecting the results. This aimed to encourage information classification, use of data to consider the feasibility of management, identification of alternatives and guidelines for addressing the problem, and reflection of the results of learning through activities.

The participants were also interested in learning about other water quality indicators. They asked the researcher to consider indicators needed for managing the environment in the community or daily life, such as the examination of fish ponds and water bodies for domestic use. A participant (D.) said, "*We need to learn about this anyway, so I'd like you to teach us other indicators that may be useful, so that it's worth spending time on learning this. I've seen people check fish ponds. Is it okay to learn about this?*." This is in line with the researcher's desire to support new tools for the community to use during the identification of environmental carrying capacity.

**As for the production of the community documentary**, when the problem solving activity concerning the cattle-raising in the upstream area was completed, it was followed by the preparation of a community documentary. This activity occurred during the analysis of the issue of a lack of understanding about the functioning of the tourism group as a result of the participants' objection to the community shop. A participant (K.) said, "*The issue started when the group opposed the community shop. We didn't think it was right. The community has a cooperative shop already. The community shop belongs to a single person. It isn't right to use the name 'the community shop.*" The issue became more widespread because the person who proposed to set up the shop was the community's major creditor, so a certain number of community members were his supporters. Based on a discussion, the tourism group's disagreement with the setting up of the community shop resulted in the group being regarded as personal benefit-oriented. Community members believed that the tourism group's work was for the group leaders' benefit. Given this situation, the participants were worried and they had no clear way to address this. They clarified this matter to some community members that they could talk with, but the situation did not improve significantly. A participant (S.) said, "*We've explained this, but people*

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*care about their own interest, even those who treat us well. But I understand this, it is a matter of money where people choose their own benefit.*"

The researcher told the participants that they needed to communicate bit by bit or create a mutual understanding and added that the problem could not be solved within a short period of time. In the issue, the researcher saw some learning points, including linkage to related issues. One issue selected was building cooperation with the youth group. It was evident that youth group is characterized by neutrality without a clear group boundary or conflict with other groups. Based on the researcher's experience, young people can approach different groups and areas within the community easily.

Despite being aware of this channel, the researcher could not define this for the participants. Instead, the researcher pointed out this channel to them during the discussions, by asking them: What would you like to communicate with community members. Most of them wanted the community members to understand the tourism group's roles in conservation and maintenance of natural resources and the environment. This reinforced their interests or desires. The researcher asked them, Who are the people who have no problem with any groups or who can go anywhere in the community?. This linkage helped them to identify the people. Some of them (L.) mentioned the youth, saying, "*I think they are the young people. I don't think the president of groups can get along with all groups. I think the young people can.*" Therefore, the researcher recommended incorporating the issue of a lack of youth working with the tourism group into the issue of communication about the tourism group's functioning. The activity needed to create collaboration with, and support by, the youth to understand the tourism group's functioning.

During one of the conversations, a participant asked if there was a model approach. The researcher told them about management of the e-waste data collection project that the researcher took part in. In the project data collection could not be carried out by outsiders because community members were afraid that the outsiders would find fault with them or monitor toxic waste separation in the community area. Therefore, the researcher had young people collect data by making a community documentary about self-protection during the waste separation process. In addition, the researcher had them interview local people about their work and collect data on toxic

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waste in each house. This activity was very effective. Telling these participants this project experience had a great impact on their interest levels. They started to analyze the feasibility of such implementation, which led to a community documentary that involved collaboration between young people and the participants. This activity was different from the aforementioned e-waste management project. In the e-waste management project, the research team shot the documentary film and worked with the young people. However, in the community activity, the participants' main role was working with young people to create mutual familiarity and encourage young people to join activities with the tourism group. In addition, the participants had an approach to extend the benefits of the documentary film into public relations for the community tourism. They were also interested in learning the steps of making and editing documentaries so that they could do this in the future by themselves.

Considering their common needs, the participants indicated their desire to have a speaker to educate them about the process with an emphasis on practice rather than lecture. This activity dealt with learning about making a community documentary through practice, the process of which was supported by a facilitator and the researcher. The session was held from 18-21 June 2013, in which the participants formulated an implementation plan and coordinated cooperation with interested young people.

**(3) Formulating guidelines for systematically addressing environmental problems** – This encouraged the participants to address problems in an integrated manner in a wider dimension and placed emphasis on the integration of a variety of information to address problems for the area as a whole in a systematic manner. An important activity was seeking environmental carrying capacity stemmed from linking the carrying capacity concept to the issue of disturbance to lifestyles by tourism and the issue of community members' lack of understanding about the tourism-related work of the tourism group leaders. An analysis of the issues indicated that these issues stemmed from the increase in the number of tourists, which increased their workload. As for the analysis, they were encouraged to utilize charts to show the sources and routes of the problems.

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The first issue discussed was that some group members did not provide services as assigned. This led to conflict between group members as a result of

increasing workload to them. The situation might arise from workload allocation that could not ensure that each group member would be responsible for work assigned. The information that the participants gathered from conversations with community members showed that most of them were absent from tourism services because of work in their farm and some wanted free time to relax.

The researcher asked during the discussion if this issue occurred all the time. They said this occurred sometimes – during festivals, long holidays, and farming seasons. The researcher was aware of a key factor in this issue – the increasing number of tourists. When the researcher asked the participants about this, they agreed that the seriousness of the situation varied according to the number of tourists. Discussions about this issue changed the way they looked at the issue. Originally, they thought the key issue was the group members' lack of a sense of responsibility. This conversation tried to encourage them to identify the sources and routes of the problem through pictures to show that the increase in the number of tourists caused the conflict and increasing workloads. The researcher also raised issues to change their views about the issue by asking: I really want to know if you still want to be involved in tourism work after you finish working on the farm and you are tired ?. Answers from the discussion found that they often felt bored and wanted to take a rest and have personal time. The researcher tried to point out that other tourism group members felt the same way. Moreover, the area context showed that Ban Nong Mae Na was a fertile area suitable for agriculture. The agricultural calendar showed that community members conducted farming all-year-round, and their main income was generated by agriculture, so tourism was not their top priority. With this regard, the researcher tried to set linkages to make the participants understand and deal with the root of the problem, which was the number of tourists and ineffective management. The next problem – disagreement between the first generation and second generation of leaders about tourism services – was included in this discussion. It was found that this problem resulted from a lack of real participation.

Although the researcher tried to install a new management tool for the community by looking at the benefits of the use of the carrying capacity concept – supporting learning about the collection, processing and identification of information to identify the carrying capacity levels. Adopting the concept was mainly based on

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their level of interest. An inquiry found that they were interested in implementing this together, but they lacked relevant knowledge and understanding. In addition, they wanted to gain knowledge about this concept first. This was the origin of educating them about the carrying capacity concept, which was an important sub-activity. For this educational activity, the researcher invited the tourism group leaders from Ban Salak Khok, Ko Chang district, Trat province, to share their opinions about the concept. In the view of the researcher, the concept was selected because it was the monitoring-focused management concept that was more flexible than any other concept of the same group, e.g. limit of acceptable change (LAC) or a visitor impacts management (VIM). It was also believed that the community could learn about, and evaluate, it by itself.

After gaining knowledge and an understanding about this concept, they started seeking carrying capacity. Earlier, it was clear that the participants worried if they would be able to run the activity. The researcher explained that carrying capacity would depend on their capacity and information that participants understood and added that the researcher would support and visit them to move the process as usual to reduce their worry in the operation. This consisted of a number of sub-activities, as follows:

**(3.1) To create an understanding about the implementation guidelines** – After the participants understood the carrying capacity concept, the researcher asked them to discuss planning the identification of carrying capacity because it was a new tool for the community and they did not know what form it would take. Thus, the activity started with participants' explanation about their understanding of the carrying capacity concept. The researcher played a role in elaborating on some content that the participants did not understand clearly enough, e.g. looking at numeric carrying capacity in terms of the number of tourists or misunderstanding about identifying the carrying capacity levels to find channels to expand the capacity. In addition, the researcher compared the phrase carrying capacity to the phrase area capacity and tourism group capacity for tourism management, which was found to help build a better understanding about the concept so that they were able to identify a meaning shared among them. This was the operational definition of the community carrying capacity. It was evident that the use of words that convey the

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meanings of a concept helped create an understanding more easily. A participant (Sm.) said, "*If it is simple like this, I can understand it.*" or (S.) "*It's the same as making tourism have a low impact, right? I think it's like finding ways to deal with problems.*"

Understanding the concept through the ability to identify this definition facilitated scoping the study. This was because the shared definition could more easily reflect the impacts to which the participants were interested in identifying indicators. At the same time, this helped to visualize the concept more clearly. In addition, while identifying the indicators, the researcher asked, What do you fear will be ruined by tourism? or What issues do you think will cause problems with you or tourism resources or community members?. It was evident that the picture of the indicators was similar to the issues previously discussed, but one thing that facilitated identifying these indicators was the review of these issues, which could be done through individual activities. This part would establish indicators with more comprehensive details, in terms of existing problems or potential problems from tourism. The participant (Sm.) said, "*The problems that interest us or the problems that we are interested in monitoring are indicators, and they are issues that we are interested in studying and seeking appropriate guidelines to manage.*"

After the participants were able to identify indicators, the researcher discussed the classification of the indicators. This step was not very complicated because the participants applied a pattern of categories that was similar to that explained by the speaker during the educational program on carrying capacity. During the discussion about the projection of problems during the cooperation establishment phase, the participants learned about the classification of information. The indicators that they identified consisted of environmental, social, facility and management indicators. Meanwhile, the researcher tried to have the participants identify pictures or work flows through charts. As for the chart development, the researcher asked them about remembering or understanding about different points and found that most of them understood or remembered them via pictures, especially pictures that were linked to some important phenomena. When they retrieved the points, they thought of them as pictures. Although this was interesting and useful, in practice, it was really difficult to draw the charts. Letting them draw the charts without any support or assistance might make it difficult. A participant (D.) said, "*How can I*

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*draw it? You need to help me. Otherwise, I have no idea how.*" Therefore, the researcher allowed them to review the process, starting from identifying indicators. The researcher said, This starts with : What indicators are there? Where does each of them come from? When they are gathered as a group, what do they consist of? After that, you have to summarize each step and think about what you really want at the end of the discovery. If the researcher's support had not been offered via providing direction, it would have taken a longer time or it would have been unable to help organize their thinking. They possessed good technical skills and experiences as a result of their continual participation in academic activities. Guiding or starting the process would facilitate running the process on their own. When they were asked about the practice, most of them said it involved the review of previous processes and made them see the overview of seeking carrying capacity. However, they viewed that they needed a facilitator to start the process, reasoning that if they had not been guided into the starting point, it would have taken a longer time. A participant (Sm.) said, "*Actually, we can do it. But when you told me how to start, it made things easier. It would have taken a long time if we had developed this on our own. When you wrote it, we understood what we are doing.*" The fact that the participants understood the overall picture of the work helped identify that the destination of the discovery was the formulation of management guidelines to maintain the indicators identified together.

**(3.2) Planning information collection** – The researcher identified a total of 13 indicators. Before planning information collection, individual indicators were reviewed. For the indicators for which numbers could not be identified, the focus was on optimal management guidelines. Environmental and managerial indicators were mostly related to management guidelines, as it was impossible to identify numeric measurement methods or link the number of tourists to the impact level. What could be identified was the damage caused by the use of the resources, including the sources of the damage. As for physical and facility indicators, they were mostly numerically identifiable, as they could be counted and compared against carrying capacity. In terms of planning, the researcher played a significant role in encouraging them to identify the approach to collect information by linking methods consistent with their characteristics and experiences. The approach to collect information did not entirely come from the participants. However, for adult learning

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management, it was important that the researcher, as the learning supporter, realized channels that would develop the process for using the information and the thinking process for the participants to some extent and filled in missing points, such as factors in organizing the management system. The researcher wanted the participants to extend the participation from bringing information into group meetings to the formulation of conditions with other tourism group members.

**(3.3) Collection and processing of information –** The participants collected information using indicators and methods jointly planned. They performed information processing during initial information collection before discussing it with the researcher. The information processing considered the possibility of impacts against the issues and suitability of management that would reduce or mitigate the problems. For this part, the participants could consider this by themselves, especially in physical and facility aspects, which relied on the method of counting the number of tourists using the physical and facility resources.

Collecting the information involved forecast of situations, inquiries, testing, and group discussion. The researcher visited the participants periodically during this time. When they had a problem with collecting information or had any questions when the researcher was not in the field, they contacted the researcher via phone. The researcher's supporting role in this part was not significant; the researcher just linked the group discussions and conducted a review to identify missing indicators or missing points of carrying capacity in individual tourism activities. This was because most of the information they collected was known well by the researcher, and the researcher felt confident that they would be able to process and understand the information by themselves.

**(3.4) Planning the reduction in the impacts of tourism and testing** – When the information gathered was processed, a group discussion was held to formulate the guidelines for managing the information. The activity was conducted from 18-20 December 2014, when the information that was jointly processed was used to formulate the management guidelines and classify the guidelines according to these 13 indicators. In this part, the participants obtained management guidelines in the form of management measures, persons in charge, and monitoring. It was evident that they did not have international criteria as a reference to the excess of environmental

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carrying capacity. Instead, they developed the criteria by formulating the management guidelines they believed would not affect the environment from tourism. When the formulation of the mitigation plan was completed, the participants made an appointment with the tourism group members to ask for comments on the plan and ask the group members to implement it together in order to examine its effectiveness within three months (February-April 2015).

Although the participants provided the group members with the opportunity to express their opinions, an observation revealed that there were not many arguments or questions. The group members agreed with the participants and gave them decision-making power. Some group members asked about penalties for non-compliance. It was evident that most group members gave the leaders the decision-making power; they were accustomed to giving orders, so there were not many arguments. A tourism group member said, "*I had to agree with this. They've spent a lot of time on doing it. I think that it must work. They have better knowledge than I do. How can I tell them to do this and that? If I was mistaken, I would be in trouble.*" As for some indicators, the participants asked the group members to share their opinion about it beforehand during the information collection process, such as the workloads and the number of tourists in individual activities, so this did not conflict with their needs.

After the three-month trial period to identify the effectiveness of the mitigation plan, the participants made an appointment with the researcher to discuss the results of actual plan implementation. It found that some indicators could not be examined because there were no relevant situations or no tourists during that period. There were only a few issues that were revised, and after the revision was completed, the tourism impact mitigation plan became a measure of the Ban Nong Mae Na Forest Lover Group. For the researcher, the project ended. As for the participants, they had to conduct monitoring. Seeking carrying capacity took approximately a year and a half, from the time when the educational program on carrying capacity was held from 23 January 2014 to May 2015.

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## 3.4 Tools and Tool Quality Examination

The researcher developed three types of tools: (1) The form for observing the research participants learning, information processing, (2) The semi-structured questionnaire on learning from participation in the project, and (3) The form for evaluating the instructional model's effectiveness, which was given to experts to assess the research participants' knowledge and understanding about the impacts of tourism and environmental carrying capacity, appreciation of the environment, and application of information from the tourism impact mitigation plan and operations of the participants.

The data collection tools, consisting of the observation form, semi-structured questionnaire, and evaluation form, passed content validity by five experts possessing the following qualifications: (1) Holding a Ph.D. degree; (2) Having knowledge about tourism, community-based tourism, and education, and (3) Having experience and expertise in tourism, community-based tourism, education, and carrying capacity. The item objective congruence index (IOC) was checked based on the following scoring criteria:

1. Certain that the item objective congruence exists.

0 Uncertain if the item objective congruence exists.

-1 Certain that the item objective congruence does not exist.

After that, the scores from the experts were calculated to find the IOC index value using the formula of Rovinelli & Hambleton (1977: 49-60), which is

$$IOC = \frac{\sum R}{N}$$

When IOC = Value of the item objective congruence index

R = Scores from each expert

$\sum R$ = Summed scores from the experts

N = Number of experts

The value of the IOC index ranged from 0:00 to 1:00. In this study, the questions with an IOC index value of 0.5 or higher were selected, and they were revised based on the experts' recommendations before they were applied.

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## 3.5 Data Analysis

All of the data collected was checked for credibility before analysis. The data was compared and cross-checked with other data collected through various methods, such as data derived from interviews, charts, experts' evaluation forms, and field notes. Data triangulation was performed against data from the village leaders, community savants, tourism group members, community members, and facilitators in each activity. This study involved asking for opinions and presenting data to the tourism group members and other community members. Thus, this helped with cross-checking, in a way. The verified data were analyzed with the objectives of the research , which are as follows:

**(1) Instructional model** – The authenticating conclusions technique (Schutt, 2015: 330-331) was employed to analyze data gathered during operations. The collected data were categorized by their typology into three groups including information processing skills, types of knowledge, and factors influential to the participants' learning. They were also analyzed to find the relationship between situations and information processing so that the steps of learning for the participants could be defined, which brought about an optimal instructional model.

(**2) The effectiveness of learning of styles** – In this part, data was collected using the form for evaluating the instructional model's effectiveness. Six experts appraised the effectiveness of the instructional model through their knowledge and understanding about the impacts of tourism, carrying capacity, appreciation of the value of the environment and information, as well as the application of information through management plans of the participants after learning management based on the model. The evaluation form used for data collection consisted of two parts. The first was for quantitative data, based on the 4-point rating scale– 1 (least), 2 (little), 3 (high), and 4 (most). The second was for additional comments, with open-ended questions.

The data analysis involved descriptive statistics, which consisted of frequency, percentage, mean, and standard deviation. The criteria for identifying the learning effectiveness levels from translation of mean values consisted of lowest (1.00-1.75 points on average); low (1.76-2.50 points on average); high (2.51-3.25 on average); and highest (3.26-4.00 on average).

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As for additional comments and recommendations from the open-ended questions, their substantive matters were summarized. In conjunction with the quantitative data, this data served to provide additional explanations.

**(3) Analyzing the factors that influence the learning success** – The collected data was analyzed using the authenticating conclusions technique. The researcher classified the data in a taxonomy of factors according to data characteristics and gathered evidence, assigned meanings to the groups of factors, and provided explanations to link to the success of the instructional model.

## 3.6 Reporting the Implementation Results

The report of the implementation results described above is outlined below.

**(1) Report on the instructional model** – This contained details of project activities included in the operation process and details of the extraction of steps from all project activities. This would lead to the description of the instructional model, which reflected the participants' learning styles and key skills in information processing, guidelines for learning management, as well as requirements for applying the learning styles in other areas.

**(2) Report on the learning effectiveness of learning styles** – This part was reported using descriptive statistics in terms of knowledge and understanding, appreciation of the environment, and application. This was based on the participants' tourism impact mitigation plans, and the experts' comments on the participants' learning on information processing and critical thinking.

**(3) Report on the factors that influenced the success of the instructional model** – This aimed to reflect the key factors that could encourage the development of the instructional model.

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# CHAPTER IV
# RESULTS

This chapter discusses the results of the study, which aimed to innovate an instructional model of information processing for environmental decision by tourism communities, evaluate the effectiveness of community learning through the learning output, and analyze the factors that influence the learning success, as outlined below.

## 4.1 The innovation of an instructional model of information processing for environmental decision by tourism communities

### 4.1.1 Participatory Action Research Process

The synthesis of the participatory action research process revealed that this tourism community's learning styles for information processing by identifying environmental carrying capacity for tourism development consisted of seven stages: synergizing cooperation to treat collective environmental problems, collating environmental situations based on existing experiences and beliefs, assessing the actual environmental situations with newly acquired information, planning management guidelines for selected environmental problems, appraising the environmental carrying capacity for holistic environmental management planning, putting the plan on a trial use, and adopting the plan and its adaptations according to the changing situations as a collective rule, which are outlined below:

**Step 1 : Synergizing cooperation to treat collective environmental problems**

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Building cooperation was found to be crucial, which was classified into the researcher-participant cooperation and participant-participant cooperation.

The researcher-participant cooperation was necessary for the participatory action research. Accessing the community needed relative or peer networks that had conducted research in the area before. The community members were cautious about interacting with outsiders because the community was originally established for the sake of national security after it had served as a battlefield between the government and the Communist Party of Thailand. Therefore, caution is an important characteristic that has been inherited, even today. A community member said, "*My father was a veteran. He placed an emphasis on putting trust in other people. He said some veterans died because of their trust in some villagers, believing that the villagers were just ordinary people. Often, after giving them help, they found that they were the opponent*." Creating a group or network guaranteed their feeling of safety. The entry of outsiders into the community, such as non-local soldiers, who had no kinship relationship with community members, or outlaws, forced them to depend on each other and be cautious at the same time. Being a remote area that had not been accessed by law enforcement, the community consisted of a diversity of members in terms of ideologies, beliefs, cultures, and customs.

Building trust between the researcher and participants was a delicate matter. It took approximately six months to create a friendship, brotherhood or comradeship. If this had failed, the participatory action research would not have been successful. A participant (S.), said "*The Ministry of Tourism (and Sports) asked us to join the Community Tourism Network. At that time, there was an election of the president of the network, with the aim to form the network tangibly. I asked the Thailand Research Fund if it had knowledge about this matter. Learning that it hadn't, we didn't join the network.*" When the researcher gained their trust, the researcher successfully persuaded them to be the research participants.

The participant-participant cooperation was important because in the participants' point of view, community-based tourism (CBT) had to be conducted collectively and focus on environmental conservation. A participant (D.) said, "*When we first formed our group, we promised to help conserve the forest. Tourism is not our main focus. Mostly, we've helped with forest protection.*" Group discussion manifested that environmental conservation could not be done by a single person. The environment was public property; environmental damage or benefits were related to

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everyone in the community. A participant (S.) said, "*A single person can't deal with conservation work. If we didn't take care of the environment, would people in next generations see the natural environment?*" Another participant (Sm.) said, "*We need to help each other. When the environment is good, everyone benefits from it. When it is polluted, everyone is affected. Everyone needs to help solve environmental issues and conserve the environment*." They also reflected the need to exchange knowledge or different forms of assistance in the management of environmental issues. One participant (D.) said, "*It is collective work. It needs many people to help take care of and monitor the work being done. Despite gathering, we aren't able to do the work. We need people from the National Park or people like you to help us do the work.*"

Thus, it could be concluded that synergizing cooperation to treat collective environmental problems was the first important phase. The researcher had establish acceptance and trust in the form of a network with the participants and attached great importance to participant-participant cooperation. The community already understood that this was collective work that needed comprehensive consideration in terms of development or conservation. As such, sincerity and long continuous field visits were needed to result in the community becoming interested in learning how the use of information could improve the community's environmental work and deciding to participate in the research.

**Step 2 : Collating environmental situations based on existing experiences and beliefs**

This stage involved the synthesis of a process in which the participants jointly decided what task they would conduct first, which was a group discussion to restore the relationships among the participants who had worked together and a review of environmental management guidelines in the past. This aimed to allow the participants to see the picture of environmental problems more clearly together. A participant (Sw.) said, "*Mentioning work we did together so that we won't forget so many things we did together in the past is a good idea.*" In the group discussions, the participants reviewed what their old approaches, and then they became interested in using information to identify more efficient approaches by appraising environmental carrying capacity. A participant (Sm.) said, "*I've heard about this, but I don't know*

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*what to do. We can discuss what we've done to see if it can be applied together with this.*" At this phase, the participants began processing information in three ways: recalling and retrieving existing information into thinking; reasoning and making observations about approaches used in the past; and classification of information. The details are as follows:

**(1) Recalling and retrieving existing information into thinking** – The participants recalled information, the first piece of which was natural resource and environmental issues. They discussed the decline of freshwater jellyfish – the community's important tourism resource that was their great concern but had been addressed. Another issue was waste, which they had coped with by collecting waste collection fees from community members, having the Sub-district Administration Organization manage the increase in the amount of solid waste, and turning solid waste into income, which resulted in some households collecting glass, plastic, metal and paper to sell.

In addition to environmental issues, issues raised by the participants in their group discussion included social issues. They consisted of allocation of tasks and responsibilities of the tourism group members and the fact that community-based tourism disturbed the tourism group members' normal ways of life. A tourism group member said, "*Sometimes, I want to take a rest. I feel tired after working on the farm and I have to row a boat to serve tourists.*" They also discussed the issue of benefit sharing; most members agreed that the share was too little compared with the number of tourists within a year. A tourism group member said, "*I think the share is small. There've been a lot of tourists, but I don't know why the share is very little.*" The person in charge of the revenue had evidence of income and expenditures and was ready to show it to the group members if they had any doubts. The issue of relationships within the tourism group resulted in the group leaders feeling discouraged. A participant (Sm.)said, "*I feel bad. Sometimes, I wonder why I have helped these people. They are not responsible for their task. They are just trouble.*" The estranged relationship between the community-based tourism predecessors and successors was another issue raised in group discussion. The frequency of dinner gatherings for wrap-ups and discussions in the community reduced, which they worried about and wanted to change. A participant (S.) said, "*If you ask if it is*

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*important, I can say it's very important. If this issue still exists, I think all will quit the work. It's better to transfer it to the Sub-district Administrative Organization.*"

The participants' recollection and retrieval of information resulted in shared issues and conversation that went in the same direction. Participatory observation during discussion showed that the participants were interested in, and exchanged opinions about, issues presented by each of them. For example, a participant (L.) said, "*Solid waste is also an issue. Although it isn't serious, it is considered to be an issue. Write it down."* Another (Sm.) said, "*I think we should write down all ideas if we think they are issues. We'll discuss if they are and how serious they are later.*" This activity encouraged the participants to *recall and retrieve existing information* and conduct activities together, which optimized their recollection. A participant (Sw.) said, "*I got a chance to think. If I hadn't thought about it, how could I have recalled it? I couldn't recall some issues, but when someone mentioned them, the picture of the issues came up. This activity helped me. Sometimes, I forget them.*" This activity also urged the participants to take interest in their common issues.

The recall and retrieval of existing information revealed the way their existing information was processed and the way they solved problems. Their actions to solve environmental problems arose from their recognition that situations changed or became abnormal by retrieving their existing information to make comparison with the current situations they witnessed. In this comparison, the participants selected criteria for comparison on their own, e.g. seasons and numbers in the case of a reduction of freshwater jellyfish. A participant (S.) said, "*During drought, from March, we must see freshwater jellyfish. This year, we saw some, but fewer.*" Other comparative criteria were distance or visibility. A participant (K.) said, "*In the past, when we paddled towards Kaeng Song, we saw something white moving. Today, even when we go closer to it, we can hardly see it.*" Another said (L.), "*It's more difficult to see them. Sometimes, we row a boat all day long but don't see any of them, even though normally, it is the time we can see them.*"

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Whether or not the recognition of existing changes or abnormalities would lead to problem-solving depended on their recognition of the value of resources or the consequences of changing situations. For example, in the case of freshwater jellyfish –

the community's main resource – if it was destroyed or degraded, it would affect the community's tourism and image. A participant (S.) said, "*Most people want to see them (jellyfish). They don't exist elsewhere. If people come here but don't see them, they'll feel disappointed.*" The participants' management of this issue existed in various forms, including building check dams, reducing and limiting the quantity of alien species that they believed would affect freshwater jellyfish, and planting *Homonoia Riparia Lour* (krai nam in Thai). The solid waste issue, or other issues, had not been managed often, while some issues had not been managed at all. This phenomenon reflected that the recognition of value or consequences of damage would encourage the participants to pay attention to the problems and to process the information or circumstances to identify their causes and management guidelines with greater depth.

**(2) Reasoning and making observations about approaches in the past** – In terms of natural resources and the environment associated with the reduction in jellyfish, the participants jointly forecast that the issue might be caused by water turbidity as a result of sediment transported from farms in upslope areas. Other issues comprised agricultural chemicals, which most community members used to increase agricultural productivity, as well as alien fish species, such as common carp and sucker catfish, which were believed to eat the fetus of other fish or freshwater jellyfish.

The solution to the reduction in freshwater jellyfish; therefore, focused on the issue of turbidity. The participants coordinated cooperation with the Thung Salaeng Luang National Park to construct check dams, which were made by putting sand in fertilizer sacks to trap sediment from agricultural plots at the natural drainage canals from which water flowed into Lam Nam Khek. In addition, participants planted khrai nam to reduce erosion at the point of embarkment and agricultural plots along Lam Nam Khek, from Kaeng Bang Rachan for approximately 7 kilometers. The reason why they chose the plant was that it originally grew along Lam Nam Khek River and its roots secured the riverbank. A participant (Sm.) said, "*Khrai nam grows well. Even during high tides, it doesn't die. It has a lot of roots. We think it can secure the riverbank well, so we tried planting it.*" It could be propagated by putting cuttings into Lam Nam Khek. As for the agricultural chemical issue, they did solve it. With

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regard to the problem of exotic fish species, in collaboration with the Department of Fisheries, they campaigned to encourage community members to catch sucker catfish to make compost and catch common carp for consumption.

The results of actions taken to deal with the reduction of jellyfish through water turbidity management suggested that the check dams could trap sediment well, but their disadvantage was the fact that they needed repair during the rainy season. A participant (D.) said, "*They (check dams) are somewhat helpful. I've seen a lot of soil in front of the check dams, so we need to help to conduct dredging. A disadvantage is they are easily broken. We need to repair them regularly.*" The survival rate of khrai nam was low, and its effectiveness in reducing bank erosion could not evaluated because it took a long time for the kraki nam planted to become mature. A participant (D.) said, "*Some survived, but some died. Although they survive, it takes us a long time to know if they can help. We must let them grow up.*" Based on their observations, they came to the conclusion that khrai nam had a low survival rate because some community members used its saplings as spots for locating fish traps, which resulted in it falling. During the rainy season, flood waters might move the saplings away. With regard to alien fish species, the number of sucker catfish and common carp decreased, based on interviews with some community members. The only problem that was not solved was agricultural chemicals because it was hard to solve, and most of the participants used agricultural chemicals, too.

Although the participants worried about the reduction in freshwater jellyfish, the corrective guidelines were practical for them. An interview identified that freshwater jellyfish did not increase as they had expected, but the activity they had conducted still continued. This reflected actions at the level where the participants and the community members could take by themselves. There were other factors that might be associated with a reduction of freshwater jellyfish, such as global warming or the vulnerability of this resource. A community member said, "*They may disappear because of other factors, such as global warming or their vulnerability. We don't know about some other reasons.*" The participants confirmed that they had tried to address this issue with their full capacity. A participant (S.) said, "*At first, our group worried about this, but then, we thought visitors don't come here to see only jellyfish. In fact, we also have something else. We have a lot of butterflies. The forest is*

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*abundant. It doesn't mean we haven't taken care of the jellyfish, but we've tried many ways, but this hasn't improved. This is all what we've been able to do. We don't know what more we can do.*"

Another issue pertaining to natural resources and the environment was community solid waste. A conversation identified that it was caused by community members, rather than tourism. A participant (Sw.) said, "*Waste from tourism is not a big problem because we take care of it. Mostly, it comes from our community members. This is my observation.*" They were hardly worried about it because there were groups responsible for solid waste, e.g. the Nong Mae Na Sub-district Administration and the Nong Mae Na Forest Lover Group. In addition, certain types of waste could be sold; for example, paper, plastic bottles, metal**,** and glass bottles. Observations of actions in the community supported this idea. Community members' bags used for solid waste collection were seen. It was also witnessed that there were some community members who went around the village and within tourist attractions to gather solid waste. Solid waste was also collected on important days and the village's Development Day.

As for social issues pertaining to irresponsibility for assignment, disturbance to local people's lifestyles due to tourism, and management, especially the management of conflict between two generations of the group leaders, the participants did not have tangible solutions. They just mediated the conflict and solved current problems. As for communication about the distribution of benefits among them, they did not think it was a serious problem because relevant evidence was clear, and in the future, they would focus on presenting income and expense documents with relevant evidence to reduce members' doubt.

The participants were encouraged to make an observation about their actions, in which they had to think about the reasons for the actions, the selection of particular management guidelines, and the decision not to resolve some issues. A participant (D.) said, "*As for problems with people, we haven't resolved them. Why haven't we solved them? Or, have we been afraid that it would become worse?* " Their statements revealed that they knew that most of the problems they had addressed were not related to man-man interactions. They focused on management between man and the environment. The key reasons for this phenomenon were the fact that they did not

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pay adequate attention to involving tourism group members or community members in thinking or taking actions; they were unfamiliar with the people involvement method due to their experience in serving as leaders that focused on giving orders rather than listening to opinions of other members; and they were not sure about management of a man-man relationship – they were afraid that the management might result in a more complicated situation. Therefore, reasoning and making observations about their implementation encouraged a clearer picture of their problems and actions in the past. This resulted from the fact that they had an overall picture of the problems, they created motivation to solve issues that had not been coped with, and they realized what they lacked or had inadequate knowledge about. For example, in the case of jellyfish, they might have sufficient knowledge and understanding about their life cycle and the actual cause of their declining numbers. In the case of participation, they started to realize that no actions had been taken to deal with this issue because of their familiarity with giving orders and a lack of management guidelines as a management model. It can be said that reasoning and making observations about their past actions helped them to review their exiting information, which would reveal their limitations and knowledge they possessed and would then facilitate their search for necessary knowledge.

An important observation from the information processing to seek ways to manage the issues was that growing khrai nam was the only guidelines proposed and implemented by the participants themselves. The guidelines stemmed from their prior experience and wisdom as a result of their observation in actual conditions that khrai nam along Lam Nam Khek had a lot of roots and that areas with khrai nam did not experience soil erosion. The decision to select the guidelines came from linking important characteristics of khrai nam to those of some widely-known plants that people were encouraged to plant for the reduction of topsoil erosion, such as vetiver grass. A participant (Sm.) said, "*Vetiver grass helps with sediment and soil erosion. The reason why it can help is it has lots of roots. I think khrai nam can help because it also has a lot of roots. We can't plant vetiver grass along Lam Nam Khek because of floods. We should use the plant that originally grows here. It should have a better survival rate.*" This knowledge derived from training and working in conjunction with organizations that supported activities to reduce the run-off from agriculture in

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highland areas. A participant (D.) said, "*I used to work with the Land Development Department, which provided training. I used to help the Royal Forest Department and royally-initiated projects with reforestation. The activity was effective.*" Their adoption of the plant method was characterized by adaption of a familiar method or similar method to a new situation.

As for their earlier management, most of them worked with networks working on the problems, and most approaches they adopted were related to organizations they worked with. For example, as for the water turbidity issue, they constructed check dams and used budget monies allocated by the National Park. Their management of alien fish species involved cooperation from the Department of Fisheries. What resulted reflected that their management guidelines were recommended by organizations they consulted with or networks they worked with. Partly due to the fact that they had relied on academics and organizations outside since the time the tourism group was set up and that they were currently working with various networks, they were used to consulting with the organizations and adopting their concepts or guidelines to solve problems rather than processing their own information or experiences. In this part, the researcher saw opportunities for problem-resolving, as well as funding and knowledge support systems. The phenomenon manifested that information processing to identify management guidelines was not independent, but involved their interactions with organizations from outside. The participants' information processing was only involved with considering if the guidelines were practical, cost-effective or effective. In addition, the past management was not integrated as a result from the fact that they applied management guidelines from outside organizations, as mentioned.

This resulted in the evaluation of the success of the management guidelines being not very important for the participants. For them, support in terms of personnel or budget was crucial in their decision-making about the guidelines for problem management. It can be regarded that management strategies were heuristic strategies, which integrate common sense or beliefs about problem management into the guidelines of organizations that supported the research participants or community in problem management. This might or might not be able to help resolve the issues, but at least this drove problem management or activities that made participants feel

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that they showed their responsibility and attempt to resolve environmental problems on a continual basis based on their roles and responsibilities. When they were asked what they would do if there was no supporting organization, they said they would "*do-think-learn*" at the same time – experimenting based on experience and appraising changes. If novel management guidelines did not exist, they would continue applying the old ones to achieve knowledge crystallization or new understanding to explore new ways of handling the issues. A participant (Sm.) said, "*We studied what we've done, like farming, in which we perform experiments. We learn that putting a certain amount of fertilizer yields a certain amount of products. We keep doing this so we know what to do to produce good results.*" This showed that their main learning channels were practices that formed experiences – their intrinsic knowledge. Their statements confirmed the exploration of a management approach called "*heuristic searching*" – searching for approaches based on what one thinks can be continually implemented until they develop sufficient knowledge for acquiring the ideal solution at that time. Without a better approach, the participants continued using the existing approaches.

The phenomenon supported the view that the participants might use information derived from their experience and ideas from outside in the case when some of their management-related knowledge was incomplete or when they were unable to identify the actual causes of problems. Nonetheless, although operations to resolve the problems were based on external ideas and methods, once they started their implementation, this resulted in their learning about problem management based on their real experiences and support for their thinking in implementation. Since most participants were implementers, despite receiving support in terms of finance, advice, or implementation guidelines, their implementation had to involve initial thinking and planning for the implementation, e.g. budget allocation, duty allocation, monitoring, as well as opportunities for internal interactions and interactions with external networks. This part encouraged elaboration which enhanced procedural knowledge. That is, it would equip them with increased implementation methods or guidelines accumulated in their long-term memory. At the same time, it supported declarative knowledge about issues they were dealing with, such as the knowledge that water turbidity had a potential impact on the stream ecosystem or alien fish species affected the decline of some indigenous species. A participant (Sm.) said, "*After working continually, we've*

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*learned something. As for tourism, we used only our experiences. After continuing to work on it, we've learned more. The more we do, the more we learn. I think we become more skillful. Similarly, as for environmental issues, including, sediment and sucker catfish, after working on these issues, we knew that they have an environmental impact.*" In addition, an inquiry about how they could remember the substantive matters revealed that most of them remembered them with situations: what they did, the purpose of what they did, and results of what they did. The picture of the situations was important for encoding information to retain it in long-term memory. The picture of situations related to individuals, moments, activities, and implementation. A participant (D.) said, "*I remember this based on what I have done. Sometimes, I can't recognize it. I recall people who I worked with, places, or activities I did. This makes me recall what I did and what happened.*" This was retrieved via the picture of a situation. Identifying a picture of a situation facilitates their encoding and retrieval of information because most of them retrieved and remembered a situation via the picture of their past experiences. Creation of learning was in line with practices, rather than other approaches. It can be said that "*elaboration rehearsals*" expand knowledge. The more one practices, the more one will learn.

Discussions about the participants' experiences moved the process along and prepared them for reviewing environmental issues to stimulate their attention and interest in problem solving. At the same time, being aware of the participants' management guidelines and learning styles helped the researcher strengthen learning that was in line with their characteristics. This case reflected that experiences were important, so learning through practice and elaboration rehearsals were consistent with their learning nature. This would then help them remember substantive matters and methods and opportunities to create an understanding so that new management guidelines were generated. In addition, learning support, giving advice, and support were necessary, based on their familiarity. This included creating learning opportunities to practice summarizing low-complicated information, which would then develop into summarizing highly-complicated information in the next steps.

**(3) Classification of information** – This dealt with management of information derived from discussions during activities. Asking each participant to record details from conversations and to summarize details of information arising from

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discussions was not successful. This was found to be inconvenient for most of them because of the problem of eyesight and writing, as well as the feeling that this was burden. A participant (K.) said, "*I'm old. My sight isn't good. Is it better to have a younger one write instead?* " Therefore, summarizing via the group process was proposed, in which a representative was selected to record and others helped summarizing information from the conversation. Summarizing information helped the participants understand the guidelines for information classification and facilitated their information retrieval. They were asked about the convenience of recognizing and understanding the information before and after the classification. A participant (D.) said, "*Classified information is easy to remember and understand. When I recall it, I think of respective aspects.*" Another participant (Sm.) said, "*It helps me see the overall picture of the problem, rather than keeping writing without a goal.*" In the activity, the researcher helped support information classification, by providing them with advice on classifying problems by aspects, summarizing reasons, and summarizing previous practices. When they were asked if they could run the activity on their own in the future, they said a model would help them to conduct the activity on their own. The summary of information is outlined in Table 4.1.

**Table 4.1** Problems, Causes of Problems, and Management of the Participants

| Problems | Problem characteristics | Actions in the past |
|---|---|---|
| 1. Natural resources and the environment | | |
| 1.1 Reduction in jelly fish. | - Sediment and turbidity. | - Constructing check dams and planting khrai nam. |
| | - Agricultural chemicals. | - None. |
| | - Alien fish species. | - Campaigning for catching them to make compost and eat. |
| 1.2 Community solid waste. | - Solid waste from community and tourism. | - Collecting solid waste on the Village Development Day and collecting it for sale. |

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**Table 4.1** Problems, Causes of Problems, and Management of the Participants (cont.)

| Problems | Problem characteristics | Actions in the past |
|---|---|---|
| 2. Social impacts | | |
| 2.1 Irresponsibility for assignments. | - Members were not responsible for assignments because of work on the farm. | - Some of them were given a warning. |
| 2.2 Disturbance to lifestyles. | - Members wanted to take a rest and have leisure time after they finished their work on the farm. | - None. |
| 3. Management | | |
| 3.1. Conflict between group leaders. | - Difference in thinking and a lack of actual participation. | - None. |
| 3.2 Communication of benefits. | - Communication of benefit sharing with evidence. | - Clarifying to group members. |

It can be concluded that during the stage of collating environmental situations based on existing experiences and beliefs, the participants recalled and brought information into the cognitive process to understand. Searching for causes and reviewing practices in the past based on local wisdom, external knowledge, and learning from practice, as well as information processing allowed them to identify common issues and a need to utilize clearer information to enhance problem-solving. Group discussion in this stage involved filling in information to provide a broader picture of the problems. A participant (S.) said, "*This added more issues. I didn't think about communication with members, but Mr. Sm. came up with the issue, so I had a chance to look at the issue.*" This allowed some participants who did not realize, understand, or were uncertain about some issues to develop a better understanding about them. This encouraged them to search for reasons and offer comments during the discussion and summarize the issues together to serve as a basis for next steps. Reviewing practices in the past allowed them to understand their nature of learning and to be prepared to support and promote mutual learning, by focusing on allowing them to think and take action in all activities on their own.

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**Step 3 : Assessing the actual environmental situations with newly acquired information**

Environmental situations appraisal was an important stage, which consisted of three sub-steps – Validation of information recalled and retrieved in earlier steps, identification of how to access new information, and integrating old and new information, each of which is described more fully below.

**(1) Validation of information recalled and retrieved in earlier steps** – The participants realized the need to collect new information. First, they viewed that they needed to validate information and ideas summarized based on their past experiences because the situations were fluid and dynamic. Receiving and neglecting news within the community resulted in a need to examine the information to ensure a clear and updated picture of the issues. A participant (D.) said, "*I know that events in the village have always changed, so it's better to do fieldwork to get rid of doubts*." The impetus of the search for additional information might come from their needs or their attention to, and interest in, issues they thought were important to themselves or their group. In this research, the participants were interested in gathering information about matters they thought were important, e.g. conflict within the community in the case of the setting up of the community store or raising cattle in the upstream area.

In their search for new information, the participants considered "*types of information*," consisting of both primary and secondary information. With regard to secondary information, they compiled it from the Ban Nong Mae Na Sub-district Administrative Organization. This type of information was organized methodically, and its substantive matters were official, the information described the characteristics or overview of the community. When they were asked about "*the level of necessity of this type of information*," they said it was necessary for checking figures or the number of something that was of interest to them, such as the number (amount) of villagers, occupations, household incomes, community funds in the community, and public utilities within the community. As for the primary information, the participants themselves searched for it to address problems, e.g. cattle raising in the upstream area, the degree of conflict between the tourism group members and community members in the case of the community shop, as well as the workload or disturbance to the group members' lifestyles due to tourism services.

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Their *"criteria for information selection"* were formulated in response to their needs. Secondary data was gathered because it was convenient to collect and utilize since collection of this type of data did not take time or money, and it was already available from local researchers, which they could easily access. They utilized this type of information to confirm or change their existing information. As mentioned, this type of information had a reliable pattern and contained substantive matters that they expected would meet academics' needs or create credibility in the eyes of community members and the researcher if it was presented at a tourism group meeting or group discussion. A participant (S.) said, "*This type of information is more systematic. If I tell this to other people, it is reliable. If information comes from our field research, people aren't likely to believe it.*" The fact that they valued this type of information stemmed from their relationships with academic agencies and outside organizations that were their networks, which encouraged them to learn about processing and to attach great importance to the type of information.

As for primary information, they selected the type of information when the information in which they were interested was not available at agencies or information available was not updated or could not clearly reflect issues of their interest. Thus, searching for the information on their own was important. The opportunity to access information influenced their decision regarding what new information they would search for. A participant (Sm.) said, "*When we want to search for some information, mostly we have a way how to get it in our mind.*" This identified that if some information was not selected, it did not always mean its importance was not realized. The fact that it was not chosen might be due to some uncertainty about the information. This was voiced by a participant (Sm.), "*I don't know what to do. We don't discuss this often because despite discussion, we can't make it come true.*" This allows researchers or learning managers to know to how to encourage communities to try to search for information using various methods. Hence, this is crucial to the opportunities to gain a variety of information by having knowledge about how to access various forms of information.

Concerning "*strengths and weaknesses of each type of information*," secondary information helped participants to reduce their time and workload for data collection and encouraged them to systematically organize information, as evidenced

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by the fact that the applied the information pattern to assist in organizing and summarizing statements from group discussions. As for the significance of this type of information, it was important as a model for information management rather than information that provided an understanding about some pictures of issues. This was because the participants had adequate prior knowledge or understanding about the information. At the same time, sometimes secondary information did not cover all issues in which they were interested. A lack of careful consideration or the failure to link the information to actual circumstances did not support learning or result in phenomenal changes, nor did it provide an understanding about issues in current conditions. This was because the information was usually outdated because it was prepared within a timeframe for a fiscal year or for the needs of the agency that owned the information. The participants were well aware of this issue. An interview identified that in the case when the new information and their old information conflicted, most of them were more likely to believe their old information because it was felt that they were in the actual situations and witnessed on-going changes, as they were in the local area and real situations.

However, the strengths of primary information were that it encouraged the participants to think of additional issues compared to those from old points of view and it enabled them to see the causes of problems more clearly, by identifying actual circumstances using their own experiences. This allowed the participants to expand their knowledge, based on their practices, encouraged them to plan and learn about other issues, and assisted them in processing methods and retrieving prior experiences. On the other hand, it might result in boredom and excessive workload, as evidenced by a statement of a participant (L.): "*It (searching for primary information) is good, but doing it too often is not okay. Too much of it may make me not want to do it in the future.*" A researcher or a learning manager should be aware of this and create a balance between happiness and workload from learning. Sometimes, research participants do not need to learn everything as researchers or learning managers wanted. The most important thing for research participants is learning that does not make them reject learning by themselves. This was witnessed from the participants' telling about their experiences in academic work in which sometimes they were involved in complicated projects or excessive workload, so they lost their interest in

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issues studied and lost their desire to do relevant activities. In learning management, it should be ensured that this issue will not occur.

In terms of "*the scope of information,*" the participants usually considered only issues of interest to them. When they were encouraged to expand the scope of information to see a more integrated picture or confirm the existence of problems more clearly, they extended it to "*the scope limited to the issues*" only.

During information selection, the participants learned the importance of information; they were able to weigh and rank it as "*main information or minor information*." For them, primary information was the main information they valued because they were exposed to and processed it through their direct experience, while they used secondary information as their minor information or as something to enlarge certain pictures to confirm or refer to their thinking, rather than to create an understanding about problems. The creditability level of the secondary information was lower than that of the primary information.

**(2) Identification of how to access new information** – After selecting new information, the participants conducted planning to define the sources of information, methods, and job divisions. Such planning helped reduce duplication of information and workload, shortened time spent on searching for information without a clear direction, and encouraged the participants to know what they wanted and what they had to do. This would support the retrieval of their past experiences and enhanced "*procedural knowledge*" related to their experience or prior knowledge, as evidenced by the fact that their responsibilities were similar to that applied to the tourism group and most methods they adopted were those they could implement on their own or had known or implemented earlier, such as observation, inquiry, and access to sources of information. A participant said (S.), "*Mostly, I think about what I have done or I ask other villagers. Fieldwork is the easiest. We can adopt the one that is not complicated.*" What occurred reflected the benefits of planning, which resulted from encouraging them to process their existing information and retrieve it for planning for implementation. At the same time, the planning showed "*accessibility and how to obtain information*" from knowing sources of information and coordination to obtain information from organizations involved (in the case of secondary information). It also encouraged them to process guidelines or methods of seeking information that was

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new to them or did not exist in reports, which contained secondary information. This was witnessed by the fact that the participants formulated guidelines for searching for new information to identify environmental issues by means of methods they jointly developed, such as by inquiry, observation and conversation with community members and tourism group members, in order to gather their thoughts about the conflict, tourism service workload, disturbance to lifestyles due to tourism, raising of cattle in the upstream area, solid waste, and other issues that tourism group members and community members were interested in sharing with the participants. This activity dealt with processing to create new paths to access new information on their own and processing to seek knowledge because the generated knowledge was remembered and retrieved in the form of information collection and explanation about the occurrence of environmental issues in other situations.

The researcher's observation was the "*job division*" for working together in the tourism group was a factor contributing to systematic planning. This was because job division for identifying information had to involve group discussion to share workload. Fair and acceptable workload sharing for the participants involved details of work, implementation methods, and people in charge. This encouraged the participants to do systematic planning based on requirements in various situations. During group discussions, planning also helped the participants to identify reasons for accepting or rejecting an assignment or explanations about their suitability for work they expect could do. Additional inquiry about how they got the planning pattern or planning-related knowledge revealed that most of them had learned about such planning from working with government agencies and recommendations and training provided by academics who supported systematization of planning through tourism work. Thus, the participants applied the analogy method to handle new issues or new work. This also confirmed that information processing did not happen from within the participants in the form of intellectual abilities; environmental and social conditions or social interactions also encouraged the development of information processing. This was in line with the concept of intellectual development in adults, which believes that the intellect of adults develops based on problem-solving or working during adulthood, which is called "*crystallized intelligence.*" Thus, it can be said that more practice by the participants led to increased learning and higher intellectual levels.

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The researcher intended to involve participants in searching for information that they planned together to allow them to see the process of accessing information and actual situations at the same time in order to create discussion or conversation about information on a similar basis. Division of tasks for identifying information did not meet the researcher's needs. This was due to their limitations in terms of work patterns and timing, as mentioned – it was not easy for them to find a time when all of them were available to gather information together. Therefore, this delayed information gathering. A participant (K.) said, "*We can't do it together. It's slow. We can hardly find a time when all of us are available. The plan is good enough.*" As stated, although this work pattern did not meet the researcher's goal, it was what they believed was practical – they realized limitations of other ways. It can be considered that if the participants practiced so much that they were sure about the processes they had used, this would help them to make comparisons or learn about limitations of other ways. This supported their "*conditional knowledge*" about tasks, which made them learn about factors contributing to achievements.

The participants' implementation involved communication and planning for seeking information together. After information gathering was completed, their plan revealed that they intended to analyze and summarize the information together. This action supported "*participatory access,*" which resulted in them having identification skills and sharing ownership of the information. This would serve as a basis of their thinking and collaboration in the next activities.

As for the participants' operations, additional issues were identified to the ones they helped to identify earlier. The new issues consisted of: (1) Raising cattle in the upstream area and (2) Involving young people in learning about the tourism group's work. However, the old issues became clearer as a result of the new information. In the case of conflict between tourism group members and some community members, the participants realized the main cause of the issue – the community members' lack of understanding about the tourism group's work. A participant said (D.), "*Additional problems are cows on Huai Sai Tai and involving young people in learning about the tourism group's work to ensure that the group will have successors and that young people will spend their free time in a useful way.*" Another said (Sm.), "*Many villagers say we work for the benefits of the group. I think*

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*this is a dangerous belief. Conflict may be caused by this belief. This is based on my inquiry with them.*" The participants started to use evidence more in order to support the occurrence of the problems, although information interpretation still contained personal feelings or beliefs. On the other hand, information that they selected aimed to meet their needs or beliefs with supporting empirical evidence. The phenomenon was witnessed by the fact that the issues that they had identified for the first time did not dramatically change. As for the additional problems, the researcher had heard about them. It can be asserted that the participants were interested in identifying information or continuing activities that were consistent with the results they wanted to achieve. This adult learning style is not abnormal, and it is the actual reason for decision-making about operations for learning in adults.

**(3) Integrating old and new information** – The participants merged new and old information to "*fulfill information*" that was incomplete or missing to formulate the picture of the issues they had jointly identified based on their prior experiences being more detailed and comprehensive and changing old information to become more accurate and meaningful facts.

To integrate information, the participants summarized and organized information using a prototype that they considered to be reliable, e.g. documents from agencies. The organization was characterized by identifying important parts, providing pictures of what they were interested in, and doing simple classifications, under which all problems were treated equally. This activity allowed the researcher to have a better understanding about the nature of their learning in relation with their disinterests or dislikes of writing or recording. The researcher had to bring this problem into the adjustment of strategies for creating learning. This aimed to ensure that information processing was in line with their personal characters, which focused on elaboration rehearsal rather than recording.

It could be concluded that in the stage of assessing the actual environmental situations with newly acquired information, the participants reviewed existing information and accessed new information by surveying situations in the community to compare the new and old information and confirm the situations with the new information. The results included the participants' more systematic access to information, the use of evidence that helped them explain or confirm situations to enlarge the picture of problems they had

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identified earlier, the use of tangible evidence, as well as the offering of reasons that were different from personal beliefs or opinions.

**Step 4 : Planning management guidelines for selected environmental problems**

The participants brought environmental situations, confirmed by surveys and collection of updated information, into the process of planning management guidelines. This stage consisted of many steps, as follows:

**(1) Analysis of information to select issues** – The participants formulated "*initial criteria*" to screen the group of issues of interest to them. One criterion was their "*interest in new issues.*" It was evidenced that the participants were not interested in continuing to address problems they had dealt with because they were in the process of monitoring the results. A discussion identified that the participants were satisfied with the management results, to a certain extent. A participant (L.) said, "*I'm waiting to see if what we've done will work. Now, we have to wait. If we do many things at the same time, this will increase our workload. We don't have time.*" The participants learned quite a lot from their practices, so they became interested in learning to address issues that they have never addressed before in order to create procedural knowledge or management patterns. Addressing many issues simultaneously might affect the participant's workload. "*Task difficulty-easiness*" was a criterion for issue selection, as evidenced by the participants' reflection about their need to address the issue of cattle raising in the upstream area as the top priority problem. A participant (S.) said, "*As we've discussed, cattle raising must be addressed first. I guess we can address this issue. I've heard they're people in our village who raise the cattle. I think we can resolve this issue.*" Based on additional inquiry, apart from management guidelines or difficulty-easiness levels of management, one factor involved in identifying the significance of an issue was its importance to resources or to what community members or the participants attached great importance to. As for the cattle raising issue, the participants realized the impacts of cow dung on streams. More importantly, they believed it could disturb or damage the freshwater jellyfish, the number of which had steadily decreased. Important evidence that supported the formulation of criteria related to the impacts of the issues on resources or on what

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community members attached great importance to was manifested through the question: What is the second important issue next to the cattle raising issue? Their answer was the community members' lack of understanding about the tourism group's work. This issue had an extensive impact on the participants and the tourism group, and it was an "*immediate issue"* for the participants, as evidenced by a participant's statement (D.): "*The next problem is the community shop. It has a great impact, and we've fully suffered from the impact.*" Another issue was conflict between group leaders, which had an immediate impact on the tourism group management and co-working.

Formulation of the criteria for issue selection was also involved "*having information supporting the fact that the issue was an actual issue*," as evidenced by a participant's statement (S.): "*It's evident that this is definitely an issue, so I think it's important. The number of group members reduced after we quarreled with other villagers about the community shop.*" In addition, "*the benefits from implementation*" was an important factor in defining the criteria, as evidenced by the lack of youth to learn about the tourism group's work. When asked about the urgency of this issue, the participants said it was not very urgent compared to other issues, but they realized the benefits of involving youth in the tourism group. Particularly, this would increase the number of group members and service providers, which would facilitate management, and would enhance the appreciation for the tourism group and conservation of community resources so as to produce the next generation of successors. A participant (Sw.) said, "*It isn't an urgent issue. But if children come to help us, we'll have more people. It's easier to ask a favor from children than from adults.*" An important piece of evidence that supported this factor was the fact that they decided not to choose agricultural chemicals as the next important issue, even though it had never been addressed before. They regarded that they, themselves, used agricultural chemicals, so did other community members and people from other communities located near Lam Nam Khek. They thought that addressing this issue might result in conflicts with a lot of people. After assessing the benefits from the management, they did not think that it was worth addressing the issue. Furthermore, they also did not think it was easy to address the issue. A participant (Sm.) said, "*I also use chemicals. Many people (using chemicals) are my relatives. It's better not to talk about this issue to avoid*

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*arguments.*" Establishing criteria for issue selection might relate to their experiences or prior knowledge that some issues were difficult to cope with despite continual actions from organizations. This resulted in them failing to solve this issue. Details of initial problem screening of the participants are presented in Table 4.2.

**Table 4.2** Issues Selected by the Participants

| Issues | Interest in implementation | Supporting reasons |
|---|---|---|
| 1. Raising cattle in the upstream area | √ | There was a group of people benefitting from raising cattle in the upstream area, which was not acceptable. The participants believed that the issue could be addressed by the community if there was cooperation and clearer evidence that cattle raising had an environmental impact on Lam Nam Khek. |
| 2. Community members' understanding about the tourism group's working | √ | There was conflict in the community as a result of a misunderstanding between the community members and the tourism group, which affected cooperation in the community. In the past, there might have been a lack of communication and discussion of this issue. |
| 3. Conflict among the group leaders | √ | The participants wanted to deal with this issue to prevent it from spreading and to maintain cooperation and interaction within the group to help drive the tourism work and work for the public interest of the community. |

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**Table 4.2** Issues Selected by the Participants (cont.)

| Issues | Interest in implementation | Supporting reasons |
|---|---|---|
| 4. Disturbance to lifestyles due to tourism | √ | The problem resulted in conflict within the tourism group, and the tourism group had no clear guidelines as how to handle such problems. |
| 5. Lack of the youth to learn about the tourism group's work | √ | A lack of young people to learn about the tourism group's work resulted in conflict within the tourism group and succession of group's ideologies and goals, which need to be instilled in the youth. |
| 6. Agricultural chemicals | X | The participants ignored addressing this issue because it involved many areas along Lam Nam Khek. At the same time, the participants also used agricultural chemicals themselves. |

*"The researcher"* was another factor that encouraged the participants to decide to choose issues that they had not addressed before, especially those related to the person-to-person relationship – which was the issue of participation enhancement. An inquiry identified that having a trustworthy or reliable intermediary triggered the participants' interest in dealing with issues that they wanted to address, but were not sure about their management guidelines. The participants believed that the researcher was able to support them in addressing issues smoothly and jointly addressing the issues in the case when situations were controllable. They regarded that this reduced risks involved in their actions where they lacked some knowledge or were uncertain about situations.

It was evident that the participants were interested in resolving the issues of cattle raising in the upstream area, community members' understanding about the tourism group's working, conflict among the group leaders, disturbance to lifestyles due to tourism services, and the lack of youth to learn about the tourism group's work.

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However, they did not deal with all of the issues. The issues were brought into the analysis to "*identify their causes*" and "*try formulating management guidelines*."

Concerning the cattle raising issue, the participants conducted "*information rehearsals*" to identify major points. A conversation identified that they started to realize the need for the use of evidence or empirical data in the management. One of the participants (S.) said, "*The man (raising cattle in the upstream area) told me to find evidence to prove that cattle raising affects water. I think I can find evidence to confirm this. If I can, he will agree with us.*" The review identified planning new management guidelines to replace the old ones that were unsuccessful. A participant (D.)said, "*Do you think we can find anything to confirm that cattle raising has an impact on water in Lam Nam Khek. I want a method that shows clear evidence.*" In addition, new information as a result of unsuccessful management in the past led the participants to attach great importance to consideration about the issues to seek management guidelines that were effective and could reduce the risk to their failures.

The participants' information analysis focused on "*comparison of advantages and limitations*" of actions. This activity helped the participants to understand "*the relationship of sub-elements of information*" that assisted them in realizing clearer channels for management, by searching for empirical information to identify the issues. A participant said (Sm.), "*It's like we help summarize critical issues we've already identified and those we haven't. Perhaps, doing this helps us identify what we have to start with and what to do.*" In addition, it identified the need for networking. A participant (Sw.) said, "*I think we need to ask for help from other villagers or people from the Royal Forest Department. If we have empirical evidence, we should tell them. Or, we should make them realize they have to help us. Most villagers use water from Lam Nam Khek, too. It flows down to us. As for the Royal Forest Department, we can ask them if this (raising cattle in the upstream area) is illegal. If it is, it's easy to address the issue. No one can have objections.*" This also identified a need for problem-solving with compromise. A participant said (S.), "*I don't want to have a conflict with them (other villagers). We haven't dealt with the old arguments yet. If a new one occurs, we'll have too many conflicts.*" One of them said

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(K.), "*We need to be patient, as this relates to others in the group. They are relatives. Our actions need to avoid conflict*."

This kind of analysis allowed the participants to "*form management guidelines*" that were different from the old ones, under which they relied upon their feelings or asked authorities to address issues. Their implementation needed "*new information*" about water quality monitoring, which the participants had no knowledge about. They were asked the question, "*If no water quality monitoring method from outside is available, what will you do?*" They said they would apply the old guidelines – imposing regulations, filing complaints with authorities, or relying on technical networks. It was identified that "*new knowledge from outside*" was still important for the participants as a management tool to help them achieve the objectives of their management. The external knowledge had to support participants in taking actions on their own, and it had to be in line with their needs and characters. In this regard, participants voiced a need for learning that suited them, which was "*friendliness-based learning.*" A participant (Sw.) said, "*I want it (learning) to be relaxing. It shouldn't be too serious. We don't know difficult terms*." Another recommendation was "*learning through teaching how to do*." A participant (Sm.) said, "*You can lecture and explain each topic and teach us how to do each. Is it okay? I think it's easier than just listening to your lecture. You can demonstrate it and I'll follow you, and you can monitor us.*"

A researcher or learning manager should try to understand learning based on the limitations of the research participants or communities. The ability to understand new information or new methodologies must not exceed research participants' capacity. It is noted that if "*missing knowledge or information***"** is not fulfilled, planning management guidelines using new methods or information cannot be achieved.

As for the issue of the community members' lack of understanding about the tourism group's working, the participants knew that its main cause was related to "*communication*" with other community members that provided them with an understanding about different characteristics of work for the general public, especially conservation. In this case, the participants conducted an analysis, under which they segmented major elements of the issue. The comparison of information could not help

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them to develop management guidelines because it involved a single form of communication – conversation or talk. The participants always communicated this matter, but it was not satisfactory. This might be considered to be "*hampering access to new information*" that might result from old information or prior experiences.

The participants gathered additional information from conversations with community members, but it could not make management guidelines clear. It is possible that, some information had some limitations. Interpretation of new information gathered did not change the opinions or views about the problems. The role of "*a researcher or learning manager*" as a "*scaffold*" may help research participants fully use their capacity to lead to the formulation of solutions by *"extending old information to new understanding."* The fact that there were no prototypes for managing some issues would result in the failure to reach the *"scope of knowledge."* This was witnessed by the researcher's questions that stimulated them to understand their communication had been conducted with certain groups or people only. At this point, the researcher identified that their communication did not reach all groups and asked them what other groups of people within the community they could reach. Then, they mentioned the youth and use of the media. Thus, expanding the scope of knowledge and ideas assisted them in taking into account the involvement of the youth in preparing materials comparable to television or radio, which could go broadly. This supported arranging characteristics of sub-elements of issues, and the analysis was conducted through "*the questioning-answering process.*" However, even though this allowed them to see the expansion of issues, they could not form new management guidelines. "*The formation of new management guidelines"* in the form of a community documentary film, which focused on collaboration between the participants and the youth, aimed to create motivation to work with the tourism group. This would respond to the lack of youth to work with the tourism group.

Linking the issues of the lack of youth and conflict with community members upgraded information analysis, by identifying nodes between the two issues, merging different information, and synthesizing the information to develop new management guidelines. This activity helped to identify that in some cases, other pieces of information might be needed in the analysis. As for analysis of information to identify new management guidelines that they were unfamiliar with, apart from

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skills in information processing and the researcher's learning support, one important thing was the "*courage to change.*" They possessed the courage to implement changes, from experiences in working with academics from the outside, and risk-taking characteristics. They had confidence that the researcher could lead them to actions and success. Furthermore, they adjusted their management pattern based on the knowledge they obtained from regular training, field visits, and work with external organizations or academics. As a result of these changes, they witnessed empirical results that what their actions created benefits, reduced some problems, and expanded their learning boundary due to a more variety of management schemes, which would become accumulated knowledge to retrieve in right or similar situations. A participant (Sm.) said, "*We should try. At least, it can be an experience so that we know this is a practical or impractical method. We can apply it in the future. I think we can gain some knowledge.*"

As for disturbance to lifestyles due to tourism services, when situations and sub-elements of the issues were segmented and linked to identify their root cause, it was identified that this problem stemmed from "*excessive carrying capacity for tourism.*" The analysis of this issue contained more details and higher analysis levels than other issues, by using charts to systematically identify the cycle of the problem. This was a result of "*the expertise from elaboration rehearsal*" in information processing that accumulated a wide variety of guidelines or analysis methods; "*the identification of the overall picture of the issue*" from accumulated experiences in tourism management; and "*the immediateness of the issue,*" under which the impacts of the issue had a direct influence on tourism work and relationships within the group. "*The support for ideas from researchers or learning managers*" was a factor that encouraged the participants to conduct analysis more profoundly, by focusing on the researcher's question after listening to the summary of the issue: "*Does the problem always occur?*" This question triggered their thoughts about the cycle of the problem or the time when they witnessed the problem. They identified that the problem usually occurred when the village welcomed 50 visitors or more at a time. When there were not many tourists, the problem was not very serious. Another important factor was seasons. During the cultivation or harvest seasons, the problem became more severe. This question helped reveal key sub-elements of the issue more clearly. It can be said

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that researchers or management learners should search for answers that support systematic thinking or critical thinking that will upgrade research participants' analytical thinking and provide evidence of the upgraded analytical thinking, as shown in Figure 4.1.

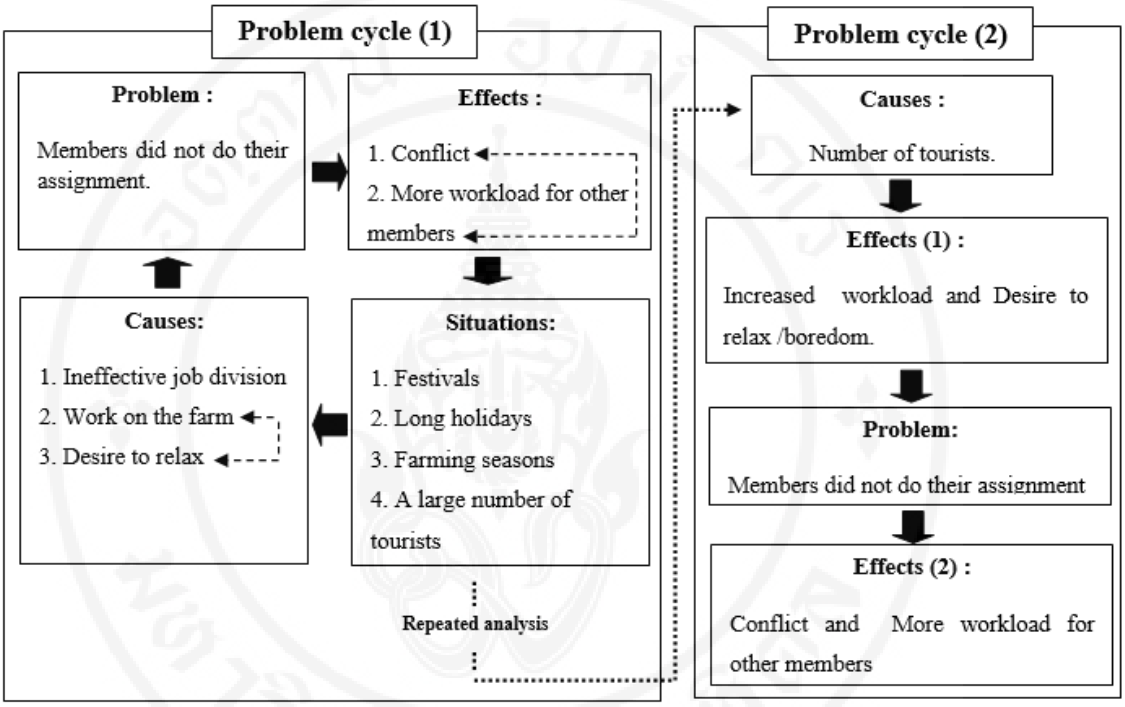


**Figure 4.1** Analysis of the Issue of Disturbance of Lifestyles due to Tourism Services

Figure 4.1 illustrates that drawing the path of this problem in the form of cycles helped the participants discover the actual cause of the problem and establish a deep understanding that encouraged "*change in the meaning of information.*" Originally, the participants believed that that the major causes of the issue were the group members' irresponsibility, ineffective job division, and ineffective control measures. A participant (Sm.) said, "*Apart from irresponsibility, we are wrong too. We can't control them, or we have poor management.*" Superimposing the cycles of the problem based on the participants' analysis revealed that the main cause was related to the excessive number of tourists during some periods, especially during festivals or cultivation or harvest seasons. This was followed by other issues identified

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– increased workload and conflict of group members who were tourism service providers as a result of irresponsibility of some group members.

The change in the definition of the information effected "the change in problem management guidelines." Originally, the participants were interested in formulating the guidelines by imposing rules or regulations or punitive measures for members who did not comply with the agreement. However, when they learned about the actual cause, as a result of giving new meanings to information, their interest shifted to controlling the number of tourists. This change resulted in linking this issue to the environmental carrying capacity principle in order to develop guidelines for management of the issue they wanted to address – controlling the number of tourists. However, at this stage, the participants were not interested in continuing to address the issue after information analysis due to inadequate knowledge about the environmental carrying capacity concept. Initially, there were a lot of sub-elements to address, which meant a lot of workload. A participant said (Sm.), "*If the number of tourists has to be limited, we need to take a look at many issues. We need to look at everything related to our tourism work, which involves many things. I think we can discuss this later.*"

In the analysis of the conflict among group leaders, it was identified that there was transfer of information brought into the analysis of the issue of disturbance of lifestyles. The participants regarded that this issue was largely caused by tourism management and the group leaders' common characteristics that were problematic. This issue was analyzed by means of "*comparison of information*" – the comparison of two generations of group leaders. The conclusion was that the conflict derived from differences in opinions about "*development levels.*" The first generation of group leaders focused on growth while their counterpart focused on maintaining the current level without creating excessive workload for group members. A participant (S.) said, "*I want our work to progress. It's about development. If we do it, we can learn and can grow more, too.*" Another (Sm.) said, "*I think the existing work is a lot. Now, our community is quite renowned. We would rather manage what we have handled poorly in the past.*" In addition, this involved "*the level of participation*," which caused issues, which were related to the fact that the first-generation group leaders gave orders and the second-generation leaders took actions, as well as the "*level of acceptance of abilities or capacity for implementation of both parties*".

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From the analysis of the information, the root cause of the problem was different opinions, which were reflected through their tourism-related operations. Thus, the participants perceived that this issue was similar to the issue of disturbance to lifestyles due to tourism work, which involved a need to address many sub-elements. This was why they did not choose this issue to address. In this stage, participants were interested in planning management guidelines for the issues of cattle raising in the upstream area, community members' understanding about the tourism group's work, and a lack of youth to learn about the tourism group's work. As for the issue of the disturbance to lifestyles due to tourism work and conflicts among group leaders, they were not interested in planning management guidelines.

The decision to address the problems was related to "*the complexity of the problem*s," which had a relationship with the levels of their knowledge and understanding that could be applied to cope with the problems, the levels of workload, and the levels of sub-elements of the issues. The issues that were of interest to them did not comprise many sub-elements; they believed that they could address the issues they had chosen. This identified that the "*appraisal of environmental carrying capacity*" started when they selected five interesting issues by looking at potential undesirable consequences in existing conditions using old and new information. This dealt with a forecast of risks of adverse effects. However, under the concept of excessive carrying capacity, it did not mean that they would address all the issues. Instead, they took into account the degrees of complexity of the problems, as described above. In the next stage, participants tried formulating the management guidelines for the issues that they had selected.

(**2) Formulation of management guidelines for issues of interest to them** – Analysis of information to select interesting problems to try formulating their management guidelines generated two activities – 1) Solving the problem of cattle raising in the upstream area and 2) the community documentary film, which was utilized to address the lack of young people to learn about the tourism group's work and community members' lack of understanding about the tourism group's work. To formulate management guidelines based on the nature of activities, "*learning new information*" was important. Due to the fact that the participants did not have any prototypes for implementation patterns, learning new information helped to "*expand*

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*the scope of knowledge*." It was evident that the guidelines for organizing both activities were important. That is, they were guidelines for expanding knowledge and guidelines for tackling problems.

As for the guidelines for knowledge expansion, "*participation in expanding the scope of knowledge*" provided the participants with the opportunity to identify their needs and the approaches to expand knowledge about water quality measurement and the production of the community documentary film. Informed of "*the purpose of expanding the knowledge*," the participants were able to link new information from the knowledge expansion to address the problems. This was evidenced by the fact that the linkage of water quality measurement and documentary production to address the problems affected their "*interest in learning new information*." A participant (Sw.) said, "*As we've told you, we want this kind of training and we must be interested in it. It is what we want. If we didn't pay attention to it, you would swear at us quietly.*" Another (L.) said, "*This (information) is used for water quality measurement. How could I do it unless I studied it?*" Formulating the guidelines for knowledge expansion aimed to fill in the gaps of their missing information to enable them to take actions as planned.

Their planning to address issues reflected the use of information for "*the purposes of management*." For example, as for the issue of cattle raising in the upstream area, the participants disseminated the results of water quality measurements to community members to create an alliance for management. In the case of the community documentary film, it aimed to create an understanding about the tourism group's conservation work, to use the youth as a connecting point, and to disseminate information to community members. Having clear purposes of utilizing information supported the formulation of clear management guidelines and provided details of activities.

**(3) Operations to address environmental issues** – Resolving the cattle raising issue and making the community documentary film encouraged the participants to "*expand the scope of knowledge*" using new information through operations that had never been used in their prior experiences. The operations were related to:

**(3.1) Understanding of new information** by linking new information to what they knew – Practices examining water quality with test kits,

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which were conducted on 1 May 2013, reflected their understanding about new information by "*creating linkages*" of information with "*their existing knowledge*." This was because they did not understand details of water quality indicators, which consisted of coliform bacteria, dissolved oxygen, nitrate, phosphate, and water hardness. From observations and inquiries, they understood only acid-alkaline, which was based on their experiences in constructing fish ponds and the use of daily household items, such as batteries. Thus, the adjustment of learning strategies was important, and the indicators were communicated through what they already knew. For example, the hardness of water was explained by using groundwater to test for hardness. They were aware that if groundwater is boiled, there will be white slag, which is suspended sediment – this is different from rain or bottled water. Other examples consisted of mixing urea fertilizer with water to test for nitrates and to explain about nitrogen in the form of fertilizer, which they could understand; using acid or soapy water to test for pH values; and using detergent and fertilizer accelerating flowers to determine the amount of phosphate and compare it with bottled water and water from Lam Nam Khek. This made it easier for them to understand about things and realize that "*comparison of information*" with something or some phenomena they had good knowledge about to identify abnormalities of something they wanted to test would equip them with a better understanding about the indicators and water quality measurement. A participant (L.) said, "*Now, I understand this. If fertilizer is in water, its color will change as the document says.*" In the case when it was difficult to find documents for comparison, the researcher gave them a similar explanation. For example, the explanation for the dissolved oxygen was that to breathe, human beings need oxygen, as do aquatic creatures. The oxygen aquatic creatures need, however, is oxygen in water. In the case of coliform, the researcher described that the indicator was small bacteria that are found in warm-blooded creatures, such as human beings, cows, buffalos, and other wild animals, but not in aquatic creatures or amphibians and that the bacteria are found in feces from these creatures. This resulted in them understanding that normally, they are not found in water bodies. In this activity, it was found that they understood part of content knowledge, which consisted of the importance of the indicators and the knowledge

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that the values exceeding the standard values means a hazard and contamination in water.

As for the community documentary activity, understanding about information for this project might be somewhat different from the practices for water quality measurement using test kits. This was because this was new information that the speaker failed to link to the participants' prior knowledge. Accordingly, this type of learning from information processing focused on learning through practices. In the meantime, exposure to a variety of "*repeated patterns*" helped to shape their understanding about the principles of information that were of interest to them. Many community documentary films were shown to the participants and the youth so that they understood documentary-related principles and the use of community documentaries for social communication. Understanding new information still involved "*comparison of information,*" which was not a comparison with criteria or what they had known before but a comparison of communication and implementation. This created an understanding through the principle that would establish "*top-down processing*," whereby they understood the principle before sub-components of community documentary production. A participant (Sm.) said, "*I think what helped us to understand how to make it (a documentary film) was you, who showed us many forms of documentary films, so we started to see how to start it if it is our own documentary and what it will look like.*" This was an important difference from other operations, in which they understood sub-elements from practices before understating the principle of what they were interested in. This type of understating is characterized by "*bottom-up processing*." If they were able to compare something to what they had known, they would focus on "*bottom-up processing.*" If they failed to do it, "*top-down processing*" would be important for their understanding about the new information.

In addition, "*learning by doing*" was the best channel for them to understand information, and repeated practices helped them to effectively remember operational methods related to the principle of information. This was evidenced by their skills used in their practices, as well as explanations or communication about cautions or operational methods among them during practices (both water quality measurement and community documentary production). However, "*difficulty or*

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*complexity*" of information was a limitation that could affect their understanding of information. Despite repeated practices, they might not be able to possess a better understanding within a short time because some information needed a basic understanding about other issues. This was witnessed as part of the cattle raising issue – the participants did not understand about its causes or the details of measurement units of contaminants in water or some mechanisms, such as change from nitrite to nitrate from the document attached to the test tests, despite repeated practices. In the community documentary production, they were not able to edit the documentary film on their own because it needs computer knowledge or skills, which they lacked and could not be gained within a short time. They solved this problem by "*choosing information to understand*" as best as they could. No matter how many times explanations were repeated, if there was nothing that linked to their existing knowledge or enhanced their skills, their new understanding could not be achieved. Researchers or learning managers have to understand imperfections about developing an understanding of new information and accept the levels of understanding about information that research participants have potential to understand. It can be seen that choosing to understand part of information resulted in the use of *"procedural knowledge"* in substitution for missing understanding about information. This was evidenced by the fact that even though the participants did not understand all of the content of the information, they were able to achieve their goals or handle problems that they were interested in. Therefore, they could ignore information that was unclear to them, and the information would become "*Unnecessary Information*" for them. A participant said (D.) "*It's too hard, but although I don't know this, I can do it. This is enough for me.*" An observation identified that the participants were interested in processes or methods, rather than content and paid attention to how to make the end results accurate. These included washing equipment with distilled water every time they changed to new substances or new water samples; washing and collecting equipment to avoid effects on the accuracy of measurements; and developing the documentary plot based on the principle recommended by the speaker. This encouraged them to attach great interest to procedural knowledge in substitution for incomplete content knowledge. At the same time, this was consistent with learning by doing, which was the most important channel or method for the participants. Actions

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or practices were not too difficult for them to understand or perform. Procedural knowledge supported them in understanding conditional knowledge or limitations that would result in a measurement failing or being inaccurate. It can be said that whenever the participants had sufficient procedural knowledge, they could extend their understanding to their knowledge about factors or limitations to their achievement and support enhancement of content knowledge.

"*Mutual knowledge transfer*" during operations was important for shaping an understanding about information. A participant (D.) said, "*If we help doing and learning, it will be easier. Like me, I'm not skillful, and Phi Sm. gave me advice, so I can do it. It's easy for me. Sometimes, I don't dare to admit I can't do something, but it's good to have people in the group to tell me how to do it.*" In addition, this encouraged "*participation*" among the participants and between the participants and the youth and supported "*being the model savant*" to the youth. Mutual knowledge transfer contributed to "*information review*s" by transmitting to the young people information about the community's history and natural resources, such as plants, birds, butterflies and jellyfish, which were evident during the community documentary activity.

**(3.2) Reliability of the information** – In the activity aimed to solve the cattle-raising problem, during the water quality measurement process using the test kit, the participants put chemicals they knew in water and tested for color changes against the changes made to bottled water or normal water. The activity encouraged their confidence in the information gathered and created their trust in the operational method because they could see actual changes made using the test kit. For them, information reliability was related to their empirical experiences and consistency with their prior knowledge. In the community documentary production activity, "*credibility of information*" was a result of the nature of information and communication via a person that they trusted. This was witnessed by the speaker's describing the experiences of many communities that utilized documentary films to address their issues. In this case, secondary information might have an advantage in cases where the participants were not able to find a way of proving things on their own. They considered information in terms of the medium and the medium sender. However, there was a note of caution due to biases as a result of the interactions

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between the medium sender and the participants. Thus, their mechanisms for judging the credibility of information consisted of belief-based credibility or secondary information related to the characteristics of information, the message sender and information owner, as well as empirical credibility, which relied on documented evidence.

**(3.3) Utilization of information** – Information encouraged the participants to "*change the problem management pattern*" as evidenced by activities to solve the cattle raising issue. They shifted from complaints being filed with local authorities to the use of evidence, which they presented to other community members to involve them in the problem-solving process. This supported the "*expansion of participation*" and "*use of empirical information*" to end beliefs that differed from community member to community member. The participants presented the potential effects of cattle raising in the upstream area on Lam Nam Khek to the community members on 6 June 2013 and requested their signatures to jointly manage the issue. The operation showed that the use of empirical information and dissemination of the information that indicated the problem encouraged the community members to realize the importance of the problem and to support their implementation by signing to remove the cattle herd from the upstream area. What occurred was the realization that in addition to participation, clear information that settled the issue reduced the conflict of ideas of community members and the cattle-raising group and was a key factor in effective actions taken by local authorities. Although they changed the pattern to deal with the problem, they still adhered to the mainstream guidelines – using documented evidence to request local authorities to take action, which the participants had a good understanding about. It can be said that the management of the problem was based on their prior knowledge or experiences, but one difference was that the information was not only photos or forecasting of problems, but information that was powerful for identifying potential risks to natural resources and the environment so as to result in problem solving, in the end.

As for the production of the community documentary, there were changes in terms of information and management patterns. This was because this type of communication, about the conflict, was new to the participants and was done via a non-person medium. The participants were not able to carry out the activity

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solely on their own because they were not familiar with the necessary technology, such as filming and film editing. However, they selected information to communicate about the tourism group's work through the youth's participation. They were involved in selecting scenes or images to develop the presentation outline with the researcher and speaker and in using existing information to develop the presentation outline of the documentary. In this case, conversation using existing information and collection of new information, consisting of photos and motion pictures, generated "*repeated planning.*" The original planning did not provide for systematic job division due to a lack of understanding of documentary production-related information. It was identified that the use of the information in this activity supplemented the use of a documentary as new information for problem solving. If the participants understood the information related to this activity, this could contribute to systematic and detailed planning that could result in the achievement. A participant (D.) said, "*At first, we did not know how to do it. We planned what we thought we could do. How many children will be involved? Who will manage this? A while later, we started working and we had a better understanding, so we did planning again. We had to think what, where and who to shoot. It was helpful. If we had known what information we needed or understood how to produce a documentary, we could have been able to do more detailed planning. It's normal.*"

As for the use of new information in the form of the community documentary to communicate with the community members about the tourism group's work, it was evident that review of situations related to the documentary contents helped to provide opportunities to resolve the conflict. This dealt with "*observation about new information*" as to whether this would result in better management. The participants expressed that they were not sure if the information would help resolve or aggravate the problem. They worried that other community members would be dissatisfied or view that this was intended to create the group's positive image or seek an alliance to fight with the opposition, which might worsen the current situation. Therefore, they changed their plan. Originally, they intended to show this documentary film to all community members. They shifted the target group to schools, interested people, and parents of children who joined the documentary production activity. They transferred the film onto CDs for distribution.

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The participants focused on expanding the understanding about the tourism group's work in small circles, which might support the group and voice the group's concerns. A participant said (K.), "*We discussed it with each other and agreed that if we showed the film community-wide, it would seem we are challenging them (cattle-raising group). So, we decided to distribute CDs to schools, parents of children who joined our group, and the SAO and let them spread this. It's better to start small. The documentary may be somewhat helpful, but it may trigger their anger.*" This reflected that the observation about the new information adjusted their thinking and methods in line with the new situation and needs of information users. This showed that they "*restrained themselves from reacting to an idea*." The community documentary reduced conflict concerning the community shop to a certain degree. A participant said (L.), "*It can't solve the entire problem, as far as I know. But, I think there are people who talk about this documentary. Teachers show it to students in schools. People say it's good.*" The result of the activity showed that the participants were satisfied with the spread of the documentary by itself, rather than the old plan where all community members were the target group.

The understanding about the contents of the information related to the situation and observation about the information influenced the adjustment of the process or procedural knowledge in line with the participants' situation. As for the youth, the community documentary production activity created participation and a trial for collaboration between the youth and the participants. This resulted in the adjustment of opinions about some issues, such as the conflict between leaders of the two groups. This was because working with the youth resulted in them gaining new information through working with children in combination with old information about the conflict between them. It resulted in broader viewpoints and acceptance of different ideas between them and even patience with working with the youth, which were unexpected benefits of the activity. An observation revealed that after the community documentary production activity was completed, 7-10 young people regularly joined the tourism group. An additional inquiry identified that a group of young people rowed the boat for tourists and helped the tourism group's work regularly. This showed that the new information could partly resolve the conflict and create opportunities to develop the next generation of leaders, to a certain degree.

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The participants were not able to carry out the activity alone; they were made to realize that "*coordination with knowledge from outside*" was important because the lack of some knowledge could affect the quality of new information they wanted to collect or understand. External assistance or support was also important in terms of encouraging learning for the participants and the community. It encouraged the participants to be aware of this question: "*How can we know what we don't know?*" This was a question to "*metacognition*" inside them. It also encouraged them to realize the need to request reasonable support from outside.

The use of information supported broadening the scope of knowledge that the participants had never had before. At the same time, it helped them to "*recognize the value of information.*" This was because in the activity aimed to solve the issue of cattle raising in the upstream area, empirical information played an important role in solving the issue and provided community members with the opportunity to voice their concerns about the environment and reduce the conflict. Although the empirical information was not very clear in the documentary production activity, use of information to communicate with community members could bring change to society in a more positive direction. The youth joined the activity as planned. In this regard, most participants started to realize the importance and value of information. A participant said (L.), "*I think if information is concrete, we don't need to argue who is right or who is wrong. We just let the information say this. Otherwise, the issue will not be over.*"

The information needed to be collected and presented to the community as a whole, which involved many people. This was different from beliefs, which are something personal. Thus, the use of information helped encourage the transition from leader-based working to "*the extension of participation*." In addition, to use a piece of information, it was necessary to understand it well so that it could help forecast and clearly identify current situations or risks; for example, the levels of conflict from the problem solving, which made them more cautious about addressing the problem. In this part, it demonstrated "*information management with caution.*" When the participants developed a conclusion about the benefits of learning from information, most of them looked at the "*confidence in the use of information*." This meant that they were confident that tangible information was important evidence that

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would help them manage problems in an effective manner and help end doubts or beliefs that were different among the community members.

**(4) Reflection of implementation and monitoring results** – The participants participated in "*evaluating information using water quality criteria*" based on indicators and recording the results. Concerning coliform bacteria, approximately 20 red spots were found scattered on a test strip, which identified that Lam Nam Khek consisted of total coliform bacteria. The dissolved oxygen in 1-meter deep water equaled approximately 8 milligrams per liter, which indicated that the water quality was very good, which was conducive for the growth of aquatic creatures. As for nitrate, its concentration was approximately 0.5 milligrams per liter, which did not exceed the standard value. As for phosphate, its concentration was approximately 0.025 milligrams per liter, which did not exceed the standard value. In terms of total hardness, 1 CC of Hardness Solution 3 turned blue, which equaled approximately 100 milligrams per liter. As for pH values, the test result showed a light green color, which identified a pH value of approximately 6.5, which was conducive for the growth of most aquatic creatures. The participants understood that the overall water quality remained good, but it was contaminated with coliform bacteria. They presented the contamination results to the community members, and they agreed that cattle should be removed out of the upstream area.

The participants submitted a list of signatures of community members who supported the removal of cattle out of the upstream area, photos, and the results of the water quality measurement to local authorities. After that, there was a dialogue between the participants who represented the community members and the cattle-raising group, in which the representatives from the Nong Mae Na Sub-district Administrative Organization and Thung Salaeng Luang National Park served as the mediators. The result of the dialogue was that the cattle-raising group agreed to move the cattle out of the area and promised not to bring their cattle back. The cattle owners sold almost all the cattle and gave some to their relatives to raise in private areas.

As for the community documentary activity, the conflict concerning the community shop and other issues still continued. However, the documentary encouraged more talks among community members and helped to alleviate the issue of community members' lack of understanding about the tourism group's work, to a

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certain degree. Meanwhile, the researcher asked the participants about proactive actions, in which there might be a project or a chance when they could distribute the documentary film CDs to all community members. Most of them stated they did not want to continue the actions because the situation was improving and they wanted to maintain the situation. This was because they were not sure if more activities would result in misunderstanding of other issues or current issues. Over time, after the community activities were conducted, the situation started to get better, or at least, they could coexist, which was considered to be successful to a certain extent. As for the impacts on the youth, it was identified that young people who participated in the community documentary activity were eager to learn about the tourism group's work. After this activity was completed, they joined the tourism group's work on a regular basis. While the participants thought that the knowledge that the children gained from this activity was not adequate for actual work, they thought this activity motivated them to learn more from the tourism group and from the work performed. This activity was a good starting point for learning between the participants and the young people interested in joining the tourism group. A participant (Sm.) said, "*The children must have been interested in our work. We provided them the opportunity, but they weren't courageous enough. When they started to learn from the group, they became more active. I wanted to expose them to our work so that they got an idea what it's like.*" The activity helped to broaden some viewpoints of the participants, who originally did not think young people could play an active role in working with the tourism group. However, after working with the youth, they saw their potential and the guidelines for developing the youth group, involving them in their work, and paving their future to ensure their continual work with the group. This reflected the participants' vision, based on the fact that they involved the youth in boat trips provided for tourists to allow them to get familiar with the work and learn with adults whenever they had a chance. In addition, they had the children join meetings on the tourism group's work and help the group. For example, they collected items, cleaned, and collected solid waste in tourist attractions with adults in the group on a regular basis. It can be seen that the community documentary activity was the starting point that prepared the youth for becoming their representatives in the future.

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As for the results of learning from the implementation, the participants reflected the "*expansion of the scope of knowledge*" from having procedural knowledge about water quality measurement and production of the community documentary. A participant (Sw.) said, "*This helps me know how to measure water quality and what it is used for.*" Another (L.) said, "*I understand the process of producing community documentaries, which I've never known about before*." Moreover, this activity encouraged "*memorization,*" which they were not keen on. However, when they needed to present this information, they needed to memorize but only substantive matters. For example, they memorized information about contamination with coliform bacteria, but they did not pay much attention to other indicators. With regard to the community documentary production, they memorized only important parts. For example, in terms the community context, they memorized years or major events. As for matters they had experience in or knowledge about, memorization did not occur. This type of memorization limited their memory space and reduced the risk or error of information. It was noted that the participants' memorization might differ from recitation in a classroom, which might or might not be accompanied with an overall understanding. For them, memorization had to be coupled with understanding. This was because they needed to present this new information to other community members, and they had to anticipate questions from the audience. This was witnessed by their memorization of contamination with coliform bacteria. In front of the community members, they had to elaborate that coliform bacteria exist only in warm-blooded animals, to reflect that cattle raising could cause such a problem, and they had to explain the harm of coliform bacteria to human beings and possible impacts on aquatic creatures.

Water quality measurement involved the collection and recording of details of the information to make a summary and to equip it with credibility. It could be considered that "*public presentation*" encouraged the participants to memorize and record, and it might deal with the "*levels of importance of information utilization.*" In the community documentary activity, despite memorizing some issues to convey to the youth, the participants did not make them understand the information they memorized and they hardly conducted recording. They had just few concerns about errors or questions as they did in the activity aimed to solve the cattle raising issue. This

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reflected that the more important a presentation was, the more interested the participants or community would become in information management. In this case, the activity they carried out with the youth had a superior status, and failing to answer questions did not affect problem management, for them.

As for implementation results monitoring, they planned monitoring for both activities. The activity aimed to solve the cattle raising issue involved monitoring the removal of cattle out of the area, which exposed the participants to empirical information as to whether the cattle-raising group complied with its commitment. An additional survey after the activity was completed revealed that the cattle-raising group relocated its cattle from the upstream area. The participants conducted monitoring during the first two months, between July and August 2013. It was evident that there was no breach of the agreement during the monitoring period. The monitoring of the community documentary activity found that the collection of data through additional conversations with the youth's parents revealed that the information was passed from person to person by oral communication and the documentary CDs were borrowed to watch at home. The participants discussed the issue with other community members for a period. This was witnessed from a participant's statement (S.): "*They (community members) asked for a CD. Some borrowed it from the children's parents who we distributed the CDs to. As far as I've heard, they are interested in it.*" Another (D.) said, "*I think the situation has improved a lot. People have talked with each other more.*" However, such relationships needed close situational monitoring, to which the length of time decided could not be specified. This reflected that the activity supported "*monitoring of additional information*" after the end of the monitoring activity and created the "*guidelines for monitoring*" potential problems.

It could be concluded that during planning management guidelines for selected environmental problems, the participants conducted a review of existing information to select the issues to address, taking into account advantages and limitations; analysis of opportunities, management of alternatives, and the need to learn about new information; planning; appraisal of environmental and social carrying capacity; and monitoring. The method of information processing at this stage consisted of reviewing information, asking key questions, linking the relationship of problems,

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defining the type and scope of information and how to access information, selecting secondary information, and adding information through practices. The results included the participants' change in thinking and practices – they were able to identify novel management methods.

**Step 5 : Appraising the environmental carrying capacity for holistic environmental management planning**

Despite success in finding novel management methods for selected environmental problems a synthesis of actions was taken to address the issues of disturbance to their lifestyles due to tourism work and conflict among the group leaders. These issues were not addressed during the earlier stage because the new information they had received did not form management guidelines for them. In addition, these issues were related to the tourism management system as a whole, which consisted of a lot of details. A holistic environmental planning was needed and the participants' engaged in four keys. The detail are as follows:

**(1) Expansion of the scope of knowledge** – As for the issue of disturbance to the lifestyles due to tourism work, the participants stated that some tourism group members involved in tourism services were not responsible for their assignment, so their workload had to fall on other members and, thus, resulted in conflict with, or dissatisfaction of, other members. A participant said (Sm.), "*We set the boat queues, but some members don't come. Their substitutes are then tired, as they have other tasks to do, too. This is why they have arguments.*" Many times, tourism services resulted in increased workload and reduced personal and rest time after working on the farm. A tourism group member said, "*It's pretty tiring. If we work on the farm and then row the boat, we'll get exhausted.*" Detailed analysis identified that this was a "*systemic problem*," which was related to the overall picture of tourism management. The root cause of this problem was "*excessive carrying capacity*," which was also the cause of the conflict among the group leaders.

Although these issues were important and urgent, the participants did not address them in the earlier stage due to a "*lack of necessary information*" about knowledge and understanding about the principle and method of appraisal of environmental carrying capacity. A participant (S.) said, "*If we let this continue, there*

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*would be more conflict among them. Some good members may stop working for us, but we don't know what to do. Could you please help us?*" Another (Sw.) said, "*Can CC evaluation help? More importantly, how is it used? We've heard about it, but we don't know how to use it?*" The dialogue reflected that the "*expansion of the scope of knowledge*" about the appraisal of environmental carrying capacity was necessary. The participants wanted to know details of its principle and methods. The consequence was an activity aimed to expand their knowledge, in which they took part in designing an instructional model. It can be concluded that the participants were still interested in knowledge transfer in a friendly manner; they did not place an emphasis on heavy contents. Instead, they were interested in learning about models adopted by other experienced communities or examples of implementation guidelines. A participant (D.) said, "*I want the instruction to be as the same of that during the water quality measurement. I want friendly, relaxing instruction. I don't know if CC evaluation can be learned by doing, as the last time*" Another said (L.), "*For a lecture, I think it should give a lot of examples and give us a chance to practice or learn about practices from other areas. It's better than just listening without a goal.*" This reflected the importance of "*procedural knowledge*," which the participants were curious about. In the previous practices, they learned through procedural knowledge, which was related to practices. However, their interest in expanding their knowledge had one addition – their interest in listening to community-based tourism experiences from other communities that performed similar tourism work. A participant (S.) said, "*I'd like people from other communities to share how they have managed their tourism. If their tourism is similar to ours, it's easy for us to apply their idea.*" This type of interest had a connection with their need to have a "*model for management*" because they had not had a pattern for appraisal of environmental carrying capacity to apply. Thus, a prototype for the appraisal was information that was useful for their implementation. The discussion on this subject encouraged planning for self-learning, the idea of which they gained from the activity aimed to broaden their scope of knowledge. This encouraged the generation of "*learning ownership.*"

This activity resulted in their expanded knowledge. Before the activity, they perceived that environmental carrying capacity focused on limiting the number of tourists. A participant (Sm.) said, "*Does it (the carrying capacity concept) involve the*

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*limitation of the number of tourists, as I have heard?*" After the activity, they understood that limiting the number of tourists was part of the principle, but the key was controlling the impacts of tourism. A participant (Sm.) said, "*Based on the examples, I understand that the concept does not only deal with limitations on the number people. It's important to know to limit the number of people and how to minimize impacts, isn't it?*" This showed their assimilation of new information into the old information, which helped expand the scope of their knowledge. Another process found was accommodation, which identified the change from the original understanding that carrying capacity could be increased if they could handle the number of tourists visiting the community or that carrying capacity was potential that allowed them to identify how many tourists they were able to accommodate and what to do if they wanted to expand their development. A participant (S.) said, "*As the speaker's explained, we are implementing the concept. Since we started the tourism work, we've limited the number of tourists to 50 per day, but if the number exceeds that, we can manage this.*" Another (K.) said, "*If we study and know how many tourists our tourist attractions can serve, we can expand it. When we expand it, we'll know what improvements are needed.*" Later, they understood the principle focusing on controlling the impacts of tourism, as evidenced by the summary about their common understanding of the principle: "***It deals with limiting the number of tourists and management that focuses not only on the impacts of tourism but also on the convenience of planning and implementation that promote smooth tourism services.***" Although this definition did not cover the entire principle, it contained substantive matters and changed their original understanding centered round the limitation of numbers or study for development expansion to appropriate management plan to reduce or control the environmental impacts of tourism.

The understanding of the principle provided a link to their prior experiences in terms of environmental impacts of tourism. A participant (Sw.) said, "*I understand that this concept isn't difficult. If the number exceeds the capacity, it is an issue. A boat can accommodate five people. If it accommodates 6-7 people, it will be wrecked.*" This identified that information they knew was important for understanding new information and encouraged a more vivid picture. In this regard, researchers or learning managers have to relate this principle to impacts, especially actual impacts or

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comprehensible impacts from local areas. This will result in processing of new information being more meaningful than the explanation about the general principle.

The use of "*illustrations or case studies*" affected their understanding about the principle. This was witnessed from the fact that the speaker's example about management of boat trips in conservation areas in the Amazon Basin encouraged the participants to value resources and to shift their thinking into new management guidelines they believed would be more appropriate. The use of illustrations or case studies assisted the participants in understanding that the levels of impacts could be defined and managed; they were not something they had to unwillingly allow to happen to the community.

"*Cooperative learning*" helped to create their understanding about the principle, after sharing ideas with each other and explaining meanings that the speaker wanted to convey to the group members. A participant (Sw.) said, "*If you ask me, I understand it based on what I've heard people talk about. But I'm not sure about its meaning. I don't dare to say what it is, but after listening to it a while, I've got some ideas.*" The mutual learning encouraged the participants to identify the definition that was ready to put into practice – "***Tourism that does not create conflict with the community or result in an excessive burden on tourism group members, so they can lead their life normally, and, at the same times, does not result in environmental changes, such as solid waste in the community, reduction of aquatic creatures or jellyfish, or disturbance to butterflies.***" The definition reflected the "*integration of information*" that changed their thinking about management – from the separate management under respective activities and problem-solving that ended in itself to the management under respective components or activities aimed to reduce environmental problems resulting from tourism, overall. A participant (Sm.) said, "*I've gained a better understanding. At first, we managed our own issues separately. When I saw examples given by the speaker, I learned that the activities are related.*" What happened was a result of the explanation of the evaluation of respective aspects, consisting of environmental, psychological, physical, and socio-cultural aspects. When the carrying capacity levels were considered, the respective aspects would be taken into account in the overall management.

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Through the creation of integrated understanding, researchers or learning managers can support research participants or communities to consider things in a holistic way by identifying channels to result in the integration of old and new information using clues. Sample questions were: If you can remember, are the indicators the speaker explained similar to our tourism-related problems?, Are there any similarities or differences between them?, and What are the consequences if we do something exceeding our capacity?, Is it like when we use tourism resources excessively?, What are the consequences?; and Does excessive tourism have an impact?. These questions helped clarify the picture of appraisal of environmental carrying capacity, based on the definition provided by the participants.

In addition, the definition given by the participants helped them to identify a clearer direction of planning for evaluation and search for information. A participant (Sm.) said, "*I understand that this matter is the same as impacts. We must start at impacts. Is my understanding correct?*" It can be said that understanding through the ability to identify the specific definition for the area or the group of participants encouraged the understanding about "*defining the scope of searching for new information*," based on changing understanding about information or upgraded understanding about new and old information. This was clearer during the selection of information to bring into the planning process to search for information in the next step.

**(2) Selection of information and formulation of guidelines for identification** – The participants classified information that was of interest to them into groups based on the carrying capacity principle, consisting of environmental, social, physical and facility, and managerial aspects. "*Identification and classification of information*" helped the participants to identify information to collect more clearly by linking the impacts of tourism to carrying capacity, especially under respective activities. The participants needed to review details of tourism activities to forecast the impacts or problems, as presented in Table 4.3. In addition, the participants "*justified the selected information,*" which reflected their need to choose the formation and the importance of information, as shown in Table.4.4. It can be concluded that participants' selection of information was involved with "*recognition*." The participants selected information they knew well, and they were confident about their justification for their selection and confident that they could access the information on their own. In this regard, the selection of information that was of interest to them

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focused not only on problems but also on the consistency with their prior knowledge, especially procedural knowledge. The participants indicated that as for information or indicators through which they did not know how to get answers, they were less likely to choose them. Attention supported the selection of information, based on the value put on the selected indicators, although many of them had no clear searching guidelines or had complicated guidelines. Based on an inquiry, if a piece of information was important, they would select it as information of interest to them. Despite lacking some knowledge, they would substitute it with other pieces of information that were easy to access. For example, to address the issue of jellyfish, they might adopt observation by participants or rules or regulations, instead of using a test kit to measure water quality. As for "*accessibility,*" they selected information from the local area that was easy to understand and access. In terms of accessibility, "*experience*" was particularly important. In previous practices, the participants practiced collecting information with a variety of methods, which encouraged the use of tools that were appropriate for themselves. This was witnessed from the use of questionnaires in the community documentary activity to gather opinions from young people and parents. The participants practiced result analysis on their own, with the support from the researcher. The calculation of values was difficult and was not in line with the participants' needs. Although they could implement the questionnaire method, its complexity resulted in them not utilizing it with tourists. They would not measure the water quality using indicators that they did not fully understand, or they would change to another indicator.

As for the formulation of the searching guidelines, the participants conducted it simultaneously with selecting information. As mentioned, the participants selected information that they could access or knew how to obtain. Thus, selection of information dealt with the formulation of guidelines or methods of identification at the same time. However, the participants' actions did not result from belief-based forecasting because the guidelines for searching for information were developed based on discussions among the participants, consideration about practicability, and linkage with situations and conditions of issues. It can be concluded that the participants' major guidelines consisted of meetings, inquiries, observations, counting, trials, and surveys.

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**Table 4.3** Review of Details of Tourism Activities

| Activities | Details | Remarks |
|---|---|---|
| Activity 1 | 2-days and 1 night: long-distance trekking along natural trails (6 km) and long-distance boat trip (7 km). | The tourism group did not focus on the activity and thought it was complicated to manage and needed personnel, bedding, and security management for tourists. (Around 2-3 groups of tourists per tourism season, with each group consisting of 10 persons or less). |
| Activity 2 | Long-distance trekking, but without overnight stay. | Tourists did not pay much attention to the activity. The tourism group viewed that it was a demanding activity and it was difficult to provide personnel to serve tourists. |
| Activity 3 | Long-distance boat trip (7 km, from Islet 1-3). | The customers joining the activity were mostly study-tour groups. For general tourists, this activity was not very popular because it was time consuming. |
| Activity 4 | Short-distance boat trip (between Islet 1 and Islet 2). | It was the main activity of the community area and the most popular activity among tourists. |
| Activity 5 | Excursion on a tractor to see agricultural plots and a long-distance boat trip along Lam Nam Khek (7 km). | The route was not convenient and might be dangerous for tourists because wooden bridges over streams were small. Thus, the activity was removed. |
| Activity 6 | Short-distance trekking (3 km) and a long-distance boat trip along Lam Nam Khek | It was a new activity, and there were no tourists joining the activity yet. |

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**Table 4.3** Review of Details of Tourism Activities (cont.)

| activities | Details | Remarks |
|---|---|---|
| Activity 7 | Visit to agricultural plots in the village. | The activity was designed to accommodate/release the density of tourists. In addition, tourists could see upland agriculture in most of the Khao Kho areas, so this activity in the community was not very popular. |
| Activity 8 | Watching fireflies in agricultural areas. | It was not popular, as most tourists stayed overnight at the Thung Salaeng Luang National Park or a resort. In addition, the night activity featured wildlife spotting in the national park. |

**Table 4.4** Summary of Information Selection and Planning for Information Search

| Indicators | Evaluation methods | Problem conditions |
|---|---|---|
| **Natural resources and the environment** | | |
| 1. Jellyfish | Jointly identify and consider relevant information at the meetings for tourism group members in order to issue appropriate regulations for impact mitigation (this did not involve limiting the number of tourists, but did address misbehavior of local tourist guides and questions about alien fish species). | Many group members caught jellyfish with a bowl to show to tourists or stirred water using a paddle to make them float to the surface, which disturbed them. The reduction of jellyfish might be caused by alien fish species. The issues for consideration consisted of appropriate/inappropriate behavior and potential damage to the resource. |
| 2. Butterflies | | The tourists' excessive disturbance to butterflies at Islet 2, excessively encroaching on butterflies, or catching butterflies to take photos disturbed their normal living. The issues for consideration consisted of appropriate/inappropriate behavior and potential damage to the resource. |

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**Table 4.4** Summary of Information Selection and Planning for Information Search (cont.)

| Indicators | Evaluation methods | Problem conditions |
|---|---|---|
| **Natural resources and the environment (Cont'd)** | | |
| 3. Solid waste | Surveying and comparing the magnitude of problems at major spots to identify the causes and characteristics of the problems to bring relevant information to the discussion forum of the tourism group. This aimed to change some materials or equipment to reduce waste (for overnight stays in the forest) and to consider waste management guidelines (this did not involve limiting the number of tourists, but did involve proper management guidelines and control measures). | As for tourists' behavior, e.g. brining food and feeding fish at the temple, local tour guides' behavior, and characteristics of activities (for overnight stays in the forest), there were three key points: (1) Campsite and trekking trails that might result in waste due to activities and result in impacts at a higher level than other areas (impact on the local ecology and the opportunity for management of problems that were continuous burdens), as well as increased workload for the community from increased waste disposal . The issues of consideration were the linkage between identified problems and the importance of the local ecosystem and regulations; (2) Access routes, which resulted in visual pollution due to poor management. The issues of consideration consisted of appropriateness or inappropriateness of situations and risks to other resources due to smoke from burning or leachate flowing into Lam Nam Khek, unpleasant views, and animals' digging behavior; (3) Point of embankment. The issue was not very serious compared with that found in other areas (compared with the level of importance and severity). |

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**Table 4.4** Summary of Information Selection and Planning for Information Search (cont.)

| Indicators | Evaluation methods | Problem conditions |
|---|---|---|
| **Natural resources and the environment (Cont'd)** | | |
| 4. Alien fish species | Surveying and inquiring about removing alien fish species out of the area, seeking information from external agencies, and observing changes. | A large number of alien fish species (common carp and sucker catfish) in Lam Nam Khek could result in a reduction of jellyfish. The solution focused on encouraging local people to catch them for food and to use them to make bio-compost. |
| 5. Water quality | Using the meeting forum of the tourism group members to issue appropriate regulations to minimize the impact, focusing on monitoring potential issues; surveying check dams and land use in the upstream area; and considering the survival rate of krai nam. | Turbidity from farming in slope areas and cattle raising in the upstream area – They constructed check dams with the help from Thung Salaeng Luang National Park and planted krai nam, and they addressed the issue of cattle raising in the upstream area. In this part, they focused on monitoring. |
| **Management** | | |
| 6. Job division | - Making inquiries about workload under respective activities and job characteristics, the number of tourists, seasons, and major festivals from monthly meetings of the tourism group. | Tourism increased workload from routine tasks of their first job, which was agriculture – this was related to seasons, festivals, appropriate job division, the number of tourists, as well as a lack of cooperation or attention to rules jointly set up for some members or some groups, which continually resulted |

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**Table 4.4** Summary of Information Selection and Planning for Information Search (cont.)

| Indicators | Evaluation methods | Problem conditions |
|---|---|---|
| **Management (cont'd)** | | |
| | - Comparing the workload and the number of members who were tourism service providers and related personnel.<br>- Making inquiries with the group members about their willingness and issues relating to working. | in an increased workload for other members. This involved considering situations/limitations in terms of characteristics of jobs and activities to identify if they were appropriate or inappropriate and comparing job characteristics and using members' experiences to consider and monitor the compliance with the TOR. |
| 7. Understanding about management | Group discussions to assess situations, severity levels, and characteristics of conflicts and existing problems to identify the causes, which were facilitated by intermediaries. | Misunderstanding between board committee members, consisting of the pioneer group (1st generation) and the younger group (2nd generation) in terms of goals of tourism activities, the group management concept, and action guidelines. This involved considering circumstances and causes of problems and comparing the performance and results between the two groups. This also involves considering appropriateness or inappropriateness and the risk of damage or impacts of their misunderstandings or different practices on other units of tourism management, as well as other interactions in community activities. |

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**Table 4.4** Summary of Information Selection and Planning for Information Search (cont.)

| Indicators | Evaluation methods | Problem conditions |
|---|---|---|
| **Management (cont'd)** | | |
| 8. Limitations on the number of tourists | - Comparing the number of tourists with the number of facilities and the amount of areas for activities for some activities.<br>- Comparing the number of tourists with the workload, activity management, behavioral control, and safety in activities.<br>- Group member meetings to receive recommendations and develop a conclusion about the number of tourists. | The number of tourists affected the level of damage to natural resources and the environment in cases where it exceeded the carrying capacity. Meanwhile, the number of tourists affected the workload in respective activities and activity management. The issues for consideration were the appropriate number of tourists against respective activities and indicators in the numeric form. |
| 9. Management system | Bringing gathered information into the tourism group meetings to set conditions for activity management to reduce impacts of tourism. | Management in the old system was not clear and lacked evidence about their agreement on the management of respective activities and other relevant items. This involved considering management experiences; comparing expected conditions aimed to solve problems and reduce impacts from tourism |

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**Table 4.4** Summary of Information Selection and Planning for Information Search (cont.)

| Indicators | Evaluation methods | Problem conditions |
|---|---|---|
| **Management (cont'd)** | | |
| | | management; and formulating standard management guidelines recognized by the board committee, group members, and visitors (establishing conditions for tourism management under respective activities). |
| 10. Adjustment of activities and rules | Bringing gathered information into the tourism group meetings to identify ways to adapt activities. | Activities and rules they jointly established were exposed to situations that changed over time and in line with the area context. To comply with management consistent with current situations, the activities and rules had to be reviewed. This involved considering and comparing changing situations with management in current conditions to identify if they were proper or improper and the likelihood of impacts resulting from the adaptation/non-adaptation of the activities and rules. |
| 11. Benefit sharing | Making inquiries with private land owners about remuneration and making inquiries with the tourism group members about their willingness to pay for the remuneration at a reasonable rate. | |

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**Table 4.4** Summary of Information Selection and Planning for Information Search (cont.)

| Indicators | Evaluation methods | Problem conditions |
|---|---|---|
| **Socio-cultural aspects** | | |
| 12. Disturbance to community | Making inquiries with community members about their satisfaction with tourists' visits to different areas of the community (inquiry during the village meetings to receive comments) in terms of positive and negative impacts of tourism. | Tourists' visits and activities in the community could disturb community members in other units that were not involved in tourism management. This involved considering opinions and willingness to welcome tourists and problems and solution guidelines in line with the community members' recommendations. |
| **Physical conditions and facilities** | | |
| 13.1 Tents<br>13.2 Boats<br>13.3 Life jackets | - Counting and evaluating the carrying capacity for tourists.<br>- Checking the quality of facilities. | Checking the adequacy and quality of facilities, if they were in good condition and properly maintain them. This involved considering sufficiency and quality in terms of security. |
| 13.4 Tractors | Using the tourism group meetings to inquire about the number of tractors that were available; evaluating the carrying capacity for tourists that remained safe from excursions; and considering suitable trails for the tractors. | As the tractors were used for farming and other activities, they could not serve tourism activities often. The issues for consideration consisted of the number of tractors that could serve tourists conveniently in terms of safety and appropriate trails for the tractors. |

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**Table 4.4** Summary of Information Selection and Planning for Information Search (cont.)

| Indicators | Evaluation methods | Problem conditions |
|---|---|---|
| **Physical conditions and facilities (Cont'd)** | | |
| 13.5 Size of the campsite | Setting up tents in the actual areas and making inquiries to tourists about the appropriateness (congestion and suitability of the remaining utility space) and comparing the size of the existing campsite without expansion. | Having limited space, the campsite was in fertile forests. It was under the regulations of the Thung Salaeng Luang National Park. The issues for consideration were that they did not want to expand the campsite to avoid intrusion into the fertile forests. It focused on an optimal number of tourists without expanding the campsite, congestion in the minds of the tourists, and the benefits of utility space. |
| 13.6 Size of the butterfly viewing spot | Identifying the right distance for tourists to prevent them from encroaching into the area rich in butterflies (1-1.5 m). | The butterfly viewing spot was small. Tourists were often seen near the areas abound with butterflies, which might disturb them. The issue for consideration was the appropriate distance based on the standard for butterfly viewing compared with the number of tourists. |
| 13.7 Bathrooms | Surveying actual conditions and making inquiries to tourists about the adequacy, cleanliness, convenience, as well as overall experience in comparison with the number of visitors that they could accommodate. | There were two major points concerning the bathrooms: (1) Temporary bathrooms at the campsite and (2) Permanent bathrooms at the point of embankment. The issues for consideration were adequacy, cleanliness, and maintenance in comparison with the number of visitors to identify appropriateness/ inappropriateness. |

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**Table 4.4** Summary of Information Selection and Planning for Information Search (cont.)

| Indicators | Evaluation methods | Problem conditions |
|---|---|---|
| **Physical conditions and facilities (Cont'd)** | | |
| 13.8 Parking lots | Surveying actual conditions in comparison with the time when there was a high density of tourists, the carrying capacity, and tourists' viewpoints. | This area was used for other purposes, too, and it was the community area. This involved considering adequacy and non-disturbance to other activities and interviewing tourists and community members about actual conditions. |

**(3) Appraisal of carrying capacity** – The participants gathered information to establish *"carrying capacity indicators*," which were different from those in general, in which collected information were compared with the benchmarks. This difference was a result of their focus on local, accessible and comprehensible information. They had 13 indicators, and their action was characterized by "*doing-thinking*." This was because their field visits affected their perception of actual phenomena that would be compared with the conditions that they had expected. The doing-thinking method helped them to remember information better. This processing method was in line with the learning style of adults, who do not want to memorize or record information.

The carrying capacity indicators, developed based on the information gathered by the participants, was the heart of this appraisal. As mentioned, their appraisal aimed to establish the criteria for identifying the levels of their needs or desirables images, which can be regarded as defining the acceptable levels of development. Their criteria consisted of the following key characteristics:

**(3.1) Establishment of qualitative information-based criteria** – This involved the development of criteria using "*phenomenal comparisons"* in terms of appropriateness, based on the participants' experiences. This was evidenced by the establishment of criteria that took into account tourists' and tourism group members' inappropriate behavior (disturbing freshwater jellyfish and butterflies). The criteria were derived from the participants' prior knowledge and

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observations, and they were flexible because an absence of a clear boundary. When the participants found behavior or situations that might be improper, they would add criteria accordingly. In addition, *"substitute information"* encouraged more criteria. In the case of water quality, the participants did not measure water quality directly. Instead, they used the water quality at the check dams to identify the turbidity levels. Protection against cattle raising and improper land use in the upstream area helped ensure there would be no contamination with undesirable substances in water bodies. This also included an investigation into the number of alien fish species by community members to address the issue of jellyfish. It could be considered that information that the participants actually needed was too difficult to measure. However, development of evaluation criteria for their regular jobs reduced their workload.

Although the criteria were ambiguous, they supported "*reasoning based on information,*" which they were able to collect or understand, which was more appropriate than speculation or assumption. An additional inquiry revealed that the participants could justify the criteria they had developed. Concerning butterfly indicators, a participant (D.) said, "*If we allow tourists or our people to catch the butterflies, they might be injured or their wings may be torn. I think this disturbs them, which is not good.*"

As mentioned, the criteria developed based on qualitative information involved "*information of actual phenomena*." The participants included key characteristics of the levels and causes of the impacts and the appropriate solution guidelines. This resulted in the criteria and guidelines overlapping. The participants said they were not interested in clearly separating the criteria from the management guidelines because the end result of their actions was the reduction of environmental impacts from tourism. A participant (Sm.) said, "*This is the result of our actions. I don't think we need to classify them. We just use them to reduce the problems, don't we? They help.*" Even though the information that they used as evidence for establishing the criteria consisted of certain features that were not academically acceptable, in the researcher's point of view, information gathering without a clear boundary encouraged the participants to "*monitor situations*" and "*adjust the criteria in line with the situations*." This helped the participants to search for, and think about,

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the information through situational changes to adjust the criteria in accordance with actual conditions.

**(3.2) Establishment of quantitative information-based criteria** – This was mostly concerned with the development of physical and facility indicators that were countable or measurable, for example, boats, life jackets, tractors and bathrooms. This type of information assisted the participants in gaining a better understanding about the carrying capacity principle as it was straightforward and easy to understand. This supported the explanation that if they were able to link their operations to the information that could be compared to what they had known, they would have a better understanding about the information. This also supported the explanation that good information was not necessarily complicated to search for or process – good information just had to be able traceable to enhance the participants' understanding about the carrying capacity principle for operational trials in the sub-elements.

Furthermore, a better understanding about the carrying capacity principle would help "*upgrade analytical thinking*," as evidenced by the identification of the campsite carrying capacity of Activity 1, with an overnight stay in the forest. The participants accessed the information through trials, in which there was "*integration of information*" in terms of the accommodation of tents; avoidance of disturbance to, or area expansion by clearing, the surrounding forest; and consideration of congestion in the minds of the tourists from the use of utility space. This resulted in the criteria becoming more realistic and responsive to the need for area use and environmental conservation. As for the carrying capacity of the butterfly viewing spot at Islet 2, the participants carried our trials and integrated information to formulate carrying capacity criteria – the appropriate butterfly viewing distance was 1-1.5 m from the areas abound with butterflies. They also made inquiries with tourists about congestion as a result of activities by tourists. They would conduct a trial in cases when information was complex but still comprehensible for them. Their trial was characterized by learning by doing, which encouraged them to get closer to reality. Apart from upgraded analytical thinking as a result of a better understanding about the principle, this identified the "*transmission of information from tourists.*" An inquiry made with the participants revealed that they did not intend to merge

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information for the indicators for the campsite and the butterfly viewing spot at Islet 2. However, they did it after they received a recommendation about topics to ask tourists. This resulted in their actions being more comprehensive, and this helped to confirm that a prototype for implementation was still important, as evidenced by the transfer of the tent-setting up method to apply to the butterfly viewing spot at Islet 2.

Although the establishment of criteria based on quantitative information encouraged the participants to gather empirical information, upgrade their analytical thinking, and access information using new methods, as described above, the use of the criteria was related to types of information. Some information was abstract or numerically immeasurable. The summary of this implementation is presented in Table 4.5.

**Table 4.5** Summary the Physical and Facility Carrying Capacity

| Physical conditions and facilities | Number | Proportion | Carrying capacity |
|---|---|---|---|
| 1. Tents | 10 | 2-4 persons/tent | 20-40 persons |
| 2. Boats | 20 | 4-5 persons/boat | 80-100 persons |
| 3. Life jackets | 150 | 1 persons/ life jacket | 150 persons |
| 4. Tractors | 10-15 | 6-8 persons/ tractor | 90-120 persons |
| 5. Campsite | 8 | 2-4 persons/tent | 16-32 persons |
| 6. Butterfly viewing spot | - | - | 25-30 persons |
| 7. Bathrooms | | | |
| 7.1 At the campsite | 2 (temporary) | - | 8-10 persons/group |
| 7.2 At the point of embarkment | 4 (permanent) | - | Not identified |

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**(3.3) Establishment of mixed information-based criteria** – This dealt with the development of criteria to define the number of tourists in respective activities, which involved both qualitative and quantitative criteria to assess

the carrying capacity. It was witnessed that the participants "*integrated information*," particularly information about physical conditions and facilities, management, as well as natural resources and the environment that assisted them in synthesizing the carrying capacity in respective activities and were important for this operation. In Activity 1, the participants combined the indicator for the campsite carrying capacity (8 tents per 32 persons) with that for the butterfly viewing spot carrying capacity at Islet 2. In a discussion, the group members agreed that this should not exceed 30 people at a time. When the indicator was considered with the activity management indicator (personnel), it was considered to be a limitation because it was characterized by uncertainties, depending on seasons, and involved people from the national park to guide the way. This information was upgraded to be "*management conditions*," which resulted in a need to divide the groups of tourists into a small group (1-10 people per time) and a big group (11 or more people). In addition, they involved natural resources and environmental indicators, which consisted of freshwater jellyfish, butterflies, and waste management for environmental protection. In Activity 1, the participants also considered the indicators expected to have a relationship with the activities. If any indicators dealt with limitations, they would serve as specific conditions to help with decision-making about serving tourists. Consideration of this type of information involved transferring the pattern of information consideration to Activity 2, 3 and 6.

The participants used "*reasons to manage the complexity and diversity of information*." In Activity 4, which was a short-distance boat trip and the tourism group's highlight activity, the participants were able to identify three groups of tourists: small, medium and large groups. They used their experiences and expertise in this activity to expand their understanding about information management. They organized this activity at different stations under appropriate time spacing. They were able to provide details about the criteria they developed to manage complexity in detailed and logical manners. Primarily, this thinking resulted from their tourism management experiences. Linkages to different situations helped them to access management using justification. In addition, the activity needed special attention and details, as it was a highlight activity. Thus, attention was important for comprehensive thinking for the participants. The failure to have careful consideration and to handle diverse situations would affect management and result in the carrying capacity

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becoming less than it should be. The action delivered the criteria establishment and concept to Activity 7.

As for Activity 5 and 8, the participants used information to "*anticipate problems*" to prepare for future problems. In this case, "*adequate information*" resulted in the improved reliability of their forecasting as well as attractiveness of explanations and reasoning. They cancelled Activity 5 because the route was inappropriate and dangerous for tourists, and they had never run Activity 8. This issue was particularly interesting – if they could take actions through their understanding about the carrying capacity principle and had sufficient supporting information, the appraisal of environmental carrying capacity would encourage "*planning for management*" before starting new activities or new tourist attractions that they jointly owned. This would reduce the impact from tourism to the area, and this dealt with monitoring based on information, as shown in Table 4.6.

**(4) Integration of information for the formulation of a holistic management plan** – The participants "*summarized information*" by establishing criteria for carrying capacity appraisal. Key issues concerning the information were extracted and presented. The criteria establishment was conducted in parallel with the carrying capacity appraisal. Thus, when the participants completed setting the criteria, this meat they completed identifying the "*overall picture of management*" based on information they had collected and compared. Although there were criteria for carrying capacity appraisal for respective activities or indicators, the researcher observed that they used all the information to set "*scenarios*" to help expand their understanding about situations and enlarge the picture that was of interest to them or the picture they wanted to achieve. The scenarios encouraged them to "*integrate all information*" to formulate proper management plan to a desirable level, which was considered to be the "*formation*" of management based on a variety of information under the goal of reducing the impacts of tourism. At the same time, the plan created "*obligations*" to implement plans by stakeholders in the community. This supported the "*expansion of participation in management*." This was considered to improve management, which was equipped with many alternatives, and management using information in a systematic fashion. This part is shown in Table 4.6.

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**Table 4.6** The Management plan in Line with Carrying Capacity

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Natural resources and environment** | | |
| 1. Jellyfish | (1) Do not allow catching jellyfish using a bowl.<br>(2) Do not allow stirring the water using a paddle.<br>(3) Ask tourists to cooperate not to disturb jellyfish. | Tourism group board committee. This did not use any budget monies and was in the implementation process. |
| 2. Butterflies | (1) Do not allow tour guides to catch butterflies.<br>(2) Ask tourists to cooperate by not to disturbing butterflies (catching/approaching butterflies too close). | |
| 3. Solid waste | **Point 1: Campsite and trekking trails**<br>(1) Before any activity, ask tourists to cooperate to drop garbage in black plastic bags provided.<br>(2) Change solid waste management to reduce solid waste (change from plastic to natural and recyclable materials).<br>(3) Monitor tour guides' cooperation. | - Tourism group board committee<br>- Tourism group members<br>This did not use any budget monies and was in the implementation process. |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Natural resources and environment (Cont'd)** | | |
| | **Point 2: Access route to Kaeng Bang Rachan.**<br>(1) Change from landfill and burning to transporting waste out of the area.<br>(2) Hiring people to take charge of this on a regular basis.<br>(3) Tourism group members carry out development activities on important days or upon appointments. | - Tourism group board committee<br>- Tourism group members<br>- Temple and SAO |
| | **Point 3: Points of embarkment**<br>(1) Members waiting for boat rowing work together.<br>(2) Cleaning with other villagers and other agencies. | - Tourism group board committee<br>- Tourism group members<br>- Temple and SAO<br>- Schools and community members<br>This did not use any budget monies and was in the implementation process. |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Natural resources and environment (Cont'd)** | | |
| 4. Alien fish species | (1) Work with the Department of Fisheries to catch alien fish species to make bio fertilizer.<br>(2) Monitor the decline of alien fish species and increase in jellyfish.<br>(3) Provide community members with information about problems stemming from alien fish species. | - Provincial Fishery Office<br>- Nong Mae Na SAO<br>- Community members<br>This was in the implementation process. It did not use any budget monies, but received knowledge and equipment support from the Department of Fisheries. |
| 5. Water quality | **Check dams management**<br>(1) Check the conditions of existing check dams to gather information to submit to the Thung Salaeng Luang National Park.<br>(2) Increase locations for check dam construction.<br>(3) Conduct investigation before the wet season. | - Tourism group<br>- Community members<br>- Thung Salaeng Luang National Park<br>This started in December 2015 with funding support of 25,000 baht from the Thung Salaeng Luang National Park. |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Natural resources and environment (Cont'd)** | | |
| | **Planting khrai nam along Lam Nam Khek**<br>(1) Coordinate with communities fishing in Lam Nam Khek to request them to cooperate not to use seedlings for casting a net in the river.<br>(2) Planting khrai nam on the Development Day of the tourism group.<br>(3) Coordinate with the SAO and schools to involve community members in activities on important days.<br>(4) Prepare seedlings for the project (cuttings). | - Nong Mae Na SAO<br>- Provincial Environmental Office<br>- Tourism Group<br>- Ban Nong Mae Na School<br>It was implemented from October to November 2015, and yearly monitoring was conducted, with funding support of 5,000 baht from the Nong Mae Na SAO. |
| | **Prevention of encroachment on the upstream area (cattle raising)**<br>(1) Conduct monitoring by observation during the provision of tourism services.<br>(2) In cases when no tourism services are provided in the area, the group committee will ask for volunteers to conduct an observation.<br>(3) Conduct the activity at least once every three months (more than once, if needed). | - Tourism group board committee<br>- Tourism group members<br>- Community leaders<br>- Thung Salaeng Luang National Park<br>This was in the implementation and yearly monitoring processes and did not use any budget monies (survey during the provision of tourism services). |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Management** | | |
| 6. Job division | (1) Ensure that the levels of resources used will not exceed the carrying capacity and have mutual agreement.<br>(2) Make inquiries with tourism group members about workload and activity management based on the evaluation results.<br>(3) Make inquiries with tourists about activity management.<br>(4) If there is an issue related to applying evaluation results to workload and management, a meeting has to be conducted to make an adjustment based on facts and participation. | - Tourism group board committee<br>- Tourism group members<br>This did not use any budget monies and was in the implementation process. |
| 7. Understanding about management | **Understanding among board members**<br>(1) Decision-making must involve consultation and opinion sharing by both groups of board members.<br>(2) The goal of the management of the group management and tourism is higher growth.<br>(3) To audit the recorded number of tourists, the amount of money must be checked against the number of tourists after the end of the week.<br>(4) Monthly wrap-up. | - Tourism group board committee<br>This did not use any budget monies and was in the implementation process. |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Management (Cont'd)** | | |
| | **Understanding between the tourism group board committee and group members**<br>(1) Decision-making must be participation-based.<br>(2) Monthly wrap-up meeting. | - Tourism group board committee<br>- Tourism group members<br>This did not use any budget monies and was in the implementation process. |
| 8. Limitations on the number of tourists | | |
| 8.1 Activity 1 | (1) Limit the number of tourists to 30 persons/ group/time.<br>(2) Apply environmental impact control measures in terms of animal resources and solid waste.<br>(3) Define the spacing period to serve tourists at 2-3 days.<br>**Conditions of activity management**<br>(1) Normal case: Small group (1-10 persons/group/time), which does not need a group meeting; and a big group (from 10 persons), which needs a group meeting for consideration first.<br>(2) Special cases (tourism season/harvest season, or festivals), which needs a group meeting for consideration first.<br>(Major indicators: Size of the campsite, butterfly viewing spot, solid waste management, and workload). | - Tourism group board committee<br>- Tourism group members<br>- Nong Mae Na SAO<br>This did not use any budget monies and was in the implementation and monitoring processes. |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Management (Cont'd)** | | |
| 8. Limitations on the number of tourists (Cont'd) | | |
| 8.2 Activity 2 | (1) Limit the number of tourists to 30-50 persons/ group/time.<br>(2) Apply environmental impact control measures in terms of animal resources and solid waste.<br>(3) Consider running this activity case by case. **Conditions of activity management**<br>(1) Small group (1-30 persons/group/time).<br>(2) Large group (31-50 persons/group/time), which takes into account the group's readiness, seasons, the necessity to serve the group of tourists, and other factors.<br>(Major indicators: Size of the campsite, butterfly viewing spot, solid waste management, and workload). | - Tourism group board committee<br>- Tourism group members<br>- Nong Mae Na SAO<br>This did not use any budget monies and was in the implementation and monitoring processes. |
| 8.3 Activity 3 | (1) Limit the number of tourists to 120 persons/ group/time (60 persons/ group/time x 2 rounds).<br>(2) Apply environmental impact control measures in terms of animal resources.<br>**Conditions of activity management**<br>(1) 1-30 persons/group: Run the activity together. | |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Management (Cont'd)** | | |
| | (2) 31-60 persons/group: Divide them into two groups to rotate to the butterfly viewing spot (the first group visits the butterfly viewing spot on the departure trip and the second group on the return trip).<br>(3) 61-120 persons/group: Divide them into two groups. The first group rides the boat in the morning and visits the village and agricultural plots in the afternoon. The latter visits the village and agricultural plots in the morning and rides a boat in the afternoon<br>(Major indicators: Butterfly viewing spot and workload). | |
| 8. Limitations on the number of tourists (Cont'd) | | |
| 8.4 Activity 4 | (1) Limit the number of tourists to 120 persons/ group/time (if they come at the same time).<br>(2) If they do not come at the same time, the group members will not row a boat more than four rounds/day.<br>(3) Apply environmental impact control measures in terms of animal resources.<br>**Conditions of activity management**<br>(1) Small group (1-30 persons/group/time): Run the activity together. | - Tourism group board committee<br>- Tourism group members<br>- Nong Mae Na SAO<br>This did not use any budget monies and was in the implementation and monitoring processes. |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Management (Cont'd)** | | |
| | (2) Medium group (31-60 persons/group/time): Divide them into two groups with 30 minute spacing.<br>(3) Large group (61-120 persons/group/time): Divide them into small groups and rotate them at stations.<br>To serve medium-large groups, a group meeting must be conducted first.<br>(Major indicators: Number of boats, butterfly viewing spot, and workload). | |
| 8.5 Activity 5 | (1) Limit the number of tourists to 90-120 persons/group/time.<br>(2) Request a permit for each visit from, and pay remuneration to, private areas.<br>(3) Apply environmental impact control measures. **Conditions of activity management**<br>Similar to Activity 4.<br>(Major indicators: Number of boats, butterfly viewing spot, workload, and disturbance to the community). | |
| 8.6 Activity 6 | Similar to Activity 2.<br>(Major indicators: Butterfly viewing spot, waste management, and workload). | |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Management (Cont'd)** | | |
| 8.7 Activity 7 | (1) Limit the tourists to 90-120 persons/group/time.<br>(2) Inform the community.<br>(3) Request a permit for each visit to private areas, including remuneration to these areas.<br>**Conditions of activity management**<br>If the number of tourists is more than 60 persons/group/time, a meeting has to be held first for planning.<br>(Major indicators: Disturbance to the community and workload). | |
| 8. Limitations on the number of tourists (Cont'd) | | |
| 8.8 Activity 8 | (1) Limit the tourists to 20 persons/group/time.<br>(2) Seasonal.<br>**Conditions of activity management**<br>Take care of safety and the tourists.<br>(Major indicators: Disturbance to the community, workload, and safety of tourists). | - Tourism group board committee<br>- Tourism group members<br>- Nong Mae Na SAO<br>This did not use any budget monies and was in the implementation and monitoring processes. |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Management (Cont'd)** | | |
| 9. Management system<br>10. Adjustment of activities and rules | Overall management<br>(1) Establish a working group to control tourism activities based on the evaluation results.<br>(2) Officially inform the group members of the regulations and guidelines as part of a mutual agreement.<br>(3) Investigate 3-month management results to summarize operational problems among members.<br>(4) Review rules that are issues among members.<br>(5) Maintain the group's control standards. | - Tourism group board committee<br>This did not use any budget monies and was in the implementation and monitoring processes. |
| | **Control of the activities**<br>(1) To serve tourists, consider the results of carrying capacity appraisal for respective activities that they have jointly identified.<br>(2) Involve tourism group members in considering serving tourists, or provide them with the information.<br>(3) If there is a change in the number of tourists, collect adequate data or evidence and request a vote for a resolution by the tourism group. | - Tourism group board committee<br>- Tourism group members<br>- Nong Mae Na SAO<br>This did not use any budget monies and was in the implementation and monitoring processes. |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Management (Cont'd)** | | |
| 11. Benefit sharing<br>12. Disturbance to community | **Benefit-sharing and reduction of disturbance to the community**<br>(1) Inform community members via the broadcast tower in the case of a visit by a large group of tourists.<br>(2) Request a permit for each visit to private areas, including remuneration to these areas.<br>(200 baht/time).<br>(3) Ask community members to inform the community or owners of agricultural plots of each visit. | - Tourism group board committee<br>- Community committee<br>This did not use any budget monies and was in the implementation and monitoring processes. |
| | **Strengthening the community's participation**<br>(1) Serve as the coordinator for village development.<br>(2) Explain details about income and benefit sharing to the community.<br>(3) Seek cooperation in participation, such as traditional events and efforts to manage problems in the community; and support working of other groups in the community.<br>(4) Show the community documentary to allow the community to understand the tourism groups' roles. | - Tourism group<br>- Nong Mae Na SAO<br>- Community leaders<br>- Community members<br>This started in November 2015 and yearly monitoring was conducted. The budget of the tourism group amounted to 5,000 baht. |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Physical conditions and facilities** | | |
| 13. The quality and quantity of facilities (boats, life jackets, trekking equipment, bird viewing guide, butterfly viewing guide, tractors, and size of the campsite) | (1) Conduct quality and adequacy monitoring before the tourism season starts.<br>(2) Make inquiries with the group members who are service providers about the quality and adequacy and observe their prudence and maintenance behavior.<br>(3) Ensure that the levels of resource use will not exceed the carrying capacity.<br>**Details and carrying capacity:**<br>(1) 10 tents, each for 2-4 persons. The total carrying capacity is 20-40 persons.<br>(2) 20 tents, each for 4-5 persons. The total carrying capacity is 80-100 persons.<br>(3) 150 lifejackets, each for a person. The total carrying capacity is 150 persons. | - Tourism group board committee<br>- Tourism group members<br>This did not use any budget monies and was in the implementation and monitoring processes. |
| 13. The quality and quantity of facilities (boats, life jackets, trekking equipment, bird viewing guide, butterfly viewing | **Details and carrying capacity (cont'd):**<br>(4) 10-15 tractors, each for 6-8 persons. The total carrying capacity is 90-120 persons.<br>(5) 8 tents, each for 2-4 persons. The total carrying capacity is 16-32 persons.<br>(6) Butterfly viewing spot. The total carrying capacity is 25-30 persons. | - Tourism group board committee<br>- Tourism group members<br>This did not use any budget monies and was in the implementation and monitoring processes. |

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**Table 4.6** The Management plan in Line with Carrying Capacity (cont.)

| Indicators | Guidelines for management and adjustment of activities | People in charge |
|---|---|---|
| **Physical conditions and facilities (Cont'd)** | | |
| guide, tractors, and size of the campsite) | (7) Bathrooms – two bathrooms at the campsite (temporary), with the total carrying capacity of 8-10 persons/group; and four bathrooms (permanent) at the point of embarkment, with unidentified carrying capacity.<br>(8) Two parking lots, with unidentified carrying capacity. | |

It could be concluded that, in this stage, the participants addressed systemic problems, such as natural resources and environment, management, physical conditions and facilities. That require 4 step, expansion of their scope of knowledge, a selection of needed information as well as the formulation of plan for its identification, a systematic appraisal of carrying capacity and an integration of information for the formulation of a holistic management plan. Their operation expanded participation and reasoning to deal with the complexity and variety of components, as well as management patterns derived from ideas and information that they understood. The overall picture of such learning reflected that they shaped their understanding about environmental carrying capacity by linking it to their actual problems and asking questions about what they expected. Their understanding would support their decision-making, in developing a resilient environmental management plan in the future.

**Step 6 : Putting the plan on a trial use**

In this stage, the participants implemented the management plan for managing tourism in line with the carrying capacity, which involved "*applying information*" into practice. This aimed to identify limitations that they had to improve to create their confidence in environmental management plan and confirm results they had anticipated based on their management plan. This implementation encouraged

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environmental monitoring that focused on new indicators, such as monitoring of the disturbance to butterflies and freshwater jellyfish based on rules and regulations they jointly developed, monitoring of waste management under the new management, monitoring the use of facilities exceeding the carrying capacity, management of workload, and monitoring of disturbance to community members due to tourism. The participants implemented these measures from February to April 2015.

This manifested using "*information for decision-making*" about serving or not serving tourists for different reasons, as evidenced by their refusal to serve a group of people from the Faculty of Engineering, Naresuan University. This group, consisting of 80 people, was interested in Activity 2. When asked about the reason for their rejection, they indicated they had a meeting with the tourism group members and the decision was they would not serve the group, as this exceeded their carrying capacity and they were unable to manage this. A participant (S.) said, "*Eighty came, which exceeds our condition. So, I made an appointment with the group members for a meeting. They were busy with their farming work, so we refused to serve the group of people. We've set this condition, so I don't want to violate it.*" They adjusted their management plan for Activity 4 because they identified that the number of tourists exceeded the carrying capacity at the butterfly viewing point, which occurred during festivals or long holidays. From reviewing and gathering new information, the participants saw that most tourists spent 30-45 minutes to watch butterflies and take photos and that there were not many tourists who spent an hour to learn about the nature. Learning about this situation contributed to the adjustment of the management plan in line with existing conditions. They agreed that during festivals or the peak period of the number of tourists, if the first group of tourists for a boat trip was around 30 tourists, the next group of tourists had to wait for another 30 minutes and they had to be informed of the reason for waiting. This trial alleviated this problem. It could be identified that the use of information for decision-making and implementation based on the developed management plan resulted in their obligations to do monitoring and make adjustment in line with situations on a regular basis.

Additionally, the use of information for management helped with problem identification and decision -making based on evidence to end different beliefs or opinions, as witnessed from their voice about the increased workload from changing

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from foam containers to natural-material containers. Inquiries made with the group of housewives responsible for the information revealed that they did not think this new practice was a problem if they were informed of this in advance. From the trial, most group members agreed that the action could reduce solid waste and operating costs.

It could be concluded that the trial of their management plan confirmed the suitability of the plan or allowed the participants to see what adjustments would be needed in the plan to suit the actual or changing situations. In addition, it encouraged the participants to monitor situations and to make environmental decisions based on information and participation.

**Step 7 : Adopting the plan and its adaptations according to the changing situations as a collective rule**

This stage was synthesized based on the management plan that were tested and improved in line with actual situations. The participants proposed management plan that were optimized based on information in the earlier stage for tourism group members and asked for their opinions about the management plan. This involved "*expansion of participation,*" using the management plan as a medium to enhance the levels of participation– from giving orders as the group leaders to asking for opinions to improve the tourism group. What transpired was a result of "*identification of limitations of past practices.*" The participants understood the roots of problems; they viewed that most of the problems were related to conflict and relationships. The use of a mass of people to solve the problems showed concrete achievements to them. A participant (S.) said, "*As far as I see, most of our problems are person-person problems. The reason why our work has no progress is we have conflict, which I think is very important.*" Another (K.) said, "*We need to involve people. As for the cattle issue, we involved other villagers. It was difficult for us to work alone.*" Another (Sw.) said, "*Kids also have a role. We involved them in making the film. The conflict was lessened partly because of them.*"

What happened identified that "*concrete implementation results*" encouraged the participants to realize the value of using information to change perspectives and practices and create an agreement to adopt the plan as the group's rules. It was evident that the participants tried to adjust their role from giving orders to

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reaching mutual agreements among the tourism group members. In addition, creation of common rules encouraged the group members to understand and upgrade the information to a standard or regulation as the group's tourism management plan.

This operation was not very complicated because the participants communicated with the group members to ask for their opinions about several indicators, such as workload, regulations, and waste management. This resulted in their response to the management plan containing no conflict or disagreement. Meanwhile, it helped create a sense of honor and recognition of other members' potential, by asking for their opinions and acceptance of management plan, and this created "*shared ownership*" of the management plan. A statement of a tourism group member was: "*If you ask me, I think the method works. Mostly, the group leaders give orders. I feel good when they ask for our opinions, which shows they trust us. I think other people think the same. If we accept something, it means we agree with the plan they've proposed. We have to comply with it and don't violate it*."

An observation revealed that the participants "*recognized the value of working with others*" in a wider circle, which was evidenced by their satisfaction with the members' cooperation and with their own changes. Their "*reviews of information,*" especially in terms of operations, encouraged the participants to build participation based on their understanding that environmental problems were public problems. That is, they were problems that affected all of them, so they should cooperate to address them. Their past implementation reflected that the problems could not be addressed by a particular individual or group. A participant (Sm.) said, "*Actually, we've had our members help our work, so our workload has reduced. These problems affect all of us. To solve them, they need to help.*" This generated the "*common awareness of problems*" and "*creation of common awareness to address problems.*" At the same time, participation could alleviate their burdens.

It could be concluded that this stage involved organizing information to return to the root of problems – expanding the level of participation, raising awareness, stimulating the consciousness about environmental problems, and providing the opportunity for the tourism group members to make decisions about approving the regulations they had to comply with in the long term. This aimed to promote mutual understanding and reduce conflict through notification and the

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expansion of their understanding about new information for the tourism group members.

### 4.1.2 The innovative model

From the participatory action research process, the researcher innovated the "***Learn to make an informed environmental decision Model*** or ***L-Informed ED Model***" As shown in figure 4.2

The instructional model was based on the belief that the provision of the opportunity for adult learners to practice processing information to address environmental issues step-by-step, from the basic level to the level of management of systematic problems, will help them to develop an understanding about receiving, selecting, and processing information in a systematic fashion. In addition, this will enhance their knowledge about the environment and patterns for addressing environmental issues in their long-term memory, which expands the scope of metacognition to become more comprehensive, profound, and complex. The goal of learning management is to result in the learners having the process of making environmental decisions using dynamic experiential information to address environmental issues – shifting from using feelings or beliefs based on their experiences to searching for information and tangible evidence; systematically monitoring environmental changes; and expanding cooperation in environmental management to relevant sectors and parties within the community.

The working process of this model consisted of two key parts: (1) Internal mechanisms of the information processing system and (2) Management of learning about information processing to result in the ability to make environmental decisions. The internal mechanisms of the processing started with evaluation of information received to get to know it and the decision to choose to accept it or refuse it. It could be evaluation of the community's interest in issues or contents of information, difficulty in understanding information, and possibility of understanding information. This reflected the formulation of initial strategies to understand the information. Evaluation of information would affect the collection of information to bring it into thinking in each cycle. The community would think to form decisions, which would yield guidelines for understanding information or operational guidelines, and it would

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take actions based on the guidelines. During information processing, the community would create and collect three types of knowledge: declarative knowledge, procedural knowledge, and conditional knowledge. It would transfer the knowledge to accumulate as its knowledge and retrieve it for operations in the next cycle.



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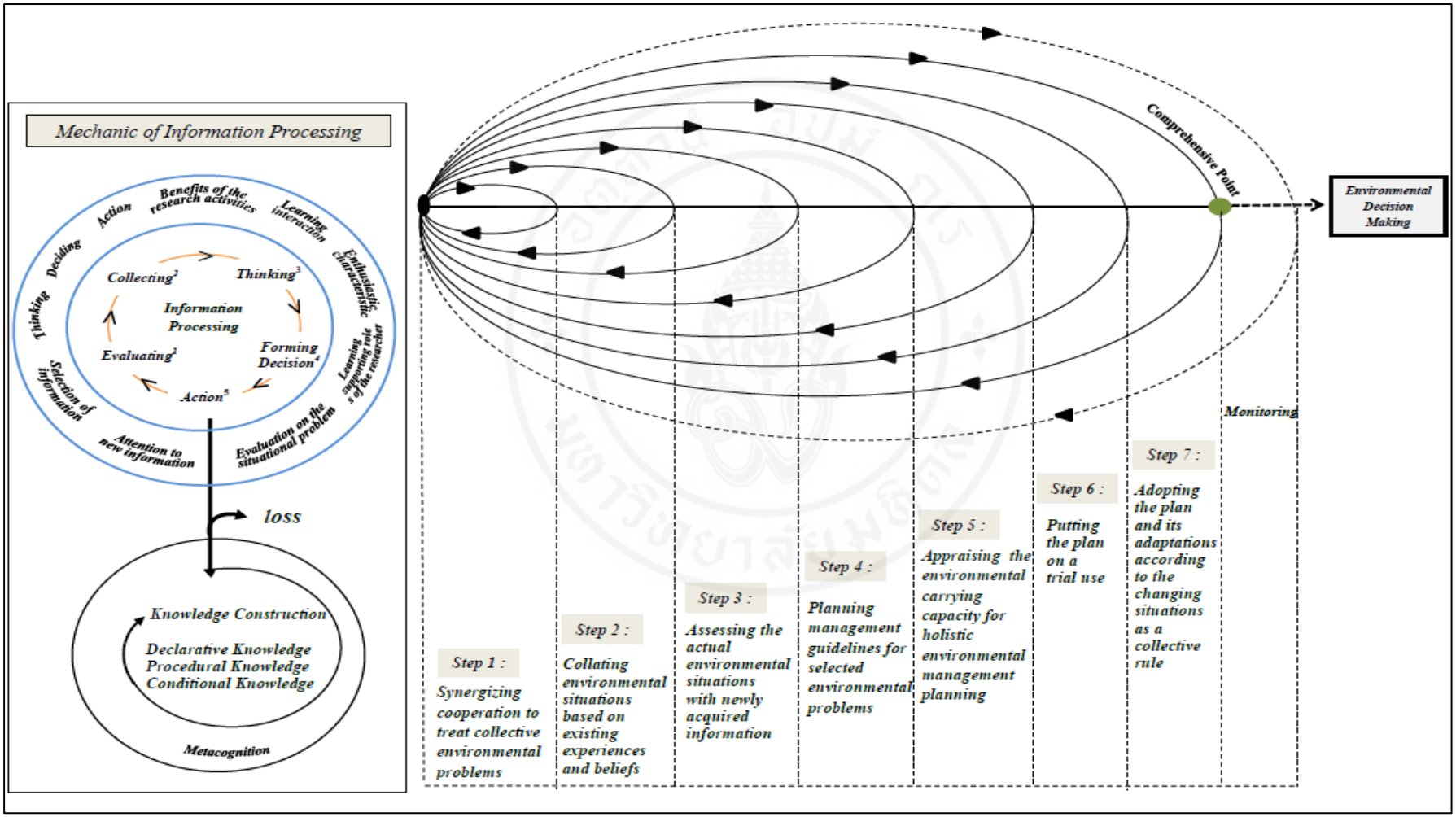


**Figure 4.2** L-Informed ED Model

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The management of learning aiming to enable the learners to make environmental decisions involved the key steps and approaches:

**(1) Synergizing cooperation to treat collective environmental problems** – Its main objective was to show the learners the environmental consequences, that is, all people who benefitted from the environment and were affected by environmental problems. The details of the instructional model and relevant activities are as follows:

**Activities:** Activities included group discussion about the importance of environmental issues and results of activities, use of media, and field visits to survey actual environmental situations of the community.

**Guidelines:** It focused on building an atmosphere of cooperation and friendliness and identifying learners' viewpoints about environmental value and issues together. This aimed to build an interest in environmental issues and environmental quality conservation, as well as an exchange of information among the learners. The discussion focused on information that the community was interested in, paid attention to, knew about, and was a major problem.

**(2) Collating environmental situations based on existing experiences and beliefs** – Its main objective was to encourage recalling and retrieving information to identify actual situations and risks to environmental damage, reasoning, or making an observation about past practices that were involved with solving or mitigating environmental problems of learners. The details of the instructional model and relevant activities are as follows:

**Activities:** Activities included group discussion about environmental situations or problems based on their experiences and the use of charts to identify the locations or characteristics of problems in the community.

**Guidelines:** It focused on making inquiries which resulted in telling, describing, and explaining about environmental situations or problems and outlining problems that could be justified comprehensively.

**(3) Assessing the actual environmental situations with newly acquired information** – Its objective was to use new information to confirm environmental situations or problems and to identify new environmental situations or problems. The details of the instructional model and relevant activities are as follows:

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**Activities:** Activities included survey of the community, identification of new information about environmental situations or problems, as well as organizing and summarizing new information.

**Guidelines:** It focused on stimulating the learners to review if the situations or problems remained unchanged and to identify incomplete environmental situations or problems. This aimed to select information they were interested in surveying and observing, conduct systematic planning for community surveys, as well as draw conclusions and pictures of problems based on new information by means of organizing and linking new information to old information. A variety of information would help the learners to have a better understanding about the phenomena. In the meantime, the learners had to be able to organize, summarize, and link information by themselves in order to understand what they were doing.

**(4) Planning management guidelines for selected environmental problems** – The objective was to analyze information to select problems, formulate the guidelines to address the sectoral problems, conduct operations to address environmental problems, and reflect implementation results. The details of the instructional model and relevant activities are as follows:

**(4.1) Analysis of information to select problems** – This involved searching for the gist of problems, comparing opportunities to address problems based on existing information, and considering interesting problems.

**Activities:** Activities included group discussions to develop criteria and outline the reasons for choosing the issues to address by means of charts.

**Guidelines:** It focused on encouraging the learners to compare information to search for and select issues that were of interest to them using information available. The learners had to consider the relevance of sub-elements that had a relationship with the issues in order to identify the knowledge they had and the knowledge they needed to enhance in order to address the selected issues and develop preliminary guidelines for environmental problem management. The information processing had to start with simple steps to generate interest and give learners encouragement in the case when the information processing was too difficult.

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**(4.2) Formulation of guidelines for addressing environmental problems being of interest to them** – This involved introducing

information that needed to be fulfilled into the process of planning additional learning and utilizing new technology to address the learners' problems.

**Activities:** Activities included group discussion to formulate the guidelines for the learners learning together and outline the guidelines for addressing problems using charts.

**Guidelines:** It focused on involving learners in designing the expansion of knowledge and formulating guidelines for addressing problems in a systematic fashion.

**(4.3) Operations to address environmental problems** – This dealt with seeking simple, necessary and practical knowledge through practices, which focused on expanding procedural knowledge and learning how to link information known to the learners.

**Activity:** Activities included practices using knowledge that supported problem-solving or new knowledge and the linkage of new knowledge to trials to address environmental problems by expanding knowledge.

**Guidelines:** It focused on the learners understanding of new information by seeking a proper amount of practical, necessary knowledge that was not too complicated and by linking that new information to information already known to the learners. It addition, it focused on encouraging learners to realize the benefits of using reliable and logical information and practiced making observations about using new information to manage environmental issues.

**(4.4) Reflection of operation results** – This involved summarizing the results of operations by learners in terms of evaluating changes due to implementation based on the management guidelines and results of learning through operations.

**Activities:** Activities included group discussion to evaluate performance and reflect learning that occurred in themselves, organizing and summarizing of the picture of knowledge expansion, group discussion to forecast situations, and formulation of monitoring guidelines for environmental issues.

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**Guidelines:** The focus was on allowing the learners to analyze and evaluate their performance in terms of strengths, limitations, and opportunities to enhance their capacity for learning. Particularly, the focus was on allowing the

learners to identify the importance and benefits of using information to manage environmental issues and encouraging them to be interested in developing their capacity for systematic or integrated management of environmental issues and taking into account the success of using information for problem-solving. This would encourage them to become interested in operating in the next cycle despite having to deal with more complex information.

**(5) Appraising the environmental carrying capacity for holistic environmental management planning** – This aimed to deal with systemic problems, with an emphasis on information integration and management of problems in a wider dimension and on the viewpoint about information integration to address problems. The details of the instructional model and relevant activities are as follows:

**(5.1) Expansion of the scope of knowledge** – This aimed to encourage the learners to analyze necessary information to broaden the scope of knowledge about appraisal of environmental carrying capacity in order to adjust their understanding about the carrying capacity principle and expand knowledge in order to identify definitions based on their understanding in line with the community's current situations.

**Activities:** Activities included group discussion to analyze and formulate the guidelines for broadening their knowledge about environmental carrying capacity, lecture and provision of knowledge about the principle, and exchange of information and learning with other communities.

**Guidelines:** The focus was on encouraging the learners to realize the importance of systematic problem management, self-analysis to identify the knowledge necessary for addressing problems, and participation in knowledge design and expansion. In addition, the creation of knowledge and understanding about this principle focused on case studies, illustrations, and exchange of information with communities having similar experiences in tourism management. This aimed to allow the learners to identify definitions based on their understanding and attach great importance to asking questions about how they were operating. This would help them to identify gaps in knowledge, develop a plan for the expansion of knowledge, and manage problems they were interested in during each cycle.

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**(5.2) Selection of information and formulation of search guidelines** – This dealt with allowing the learners to introduce their understanding about the principle to classify information to establish indicators in the study and give reasons for the indicator selection.

**Activities:** Activities included group discussion to review situations and tourism activities, use of charts to establish indicators for individual activities, discussion about reasons for the indicator selection, and justification for the indicator selection.

**Guidelines:** The focus was allowing the learners to review current situations to conduct analysis to identify the causes of problems, make observations, and give reasons for selecting information as the indicators, by focusing on information that the learners had already known, were interested in, and were able to access. This supported the learners in arranging indicators based their understanding about the environmental carry capacity principle, formulating the ways of accessing information based on indicators, and focusing on systematic information management.

**(5.3) Operating carrying capacity appraisal** – This allowed the learners to operate carrying capacity appraisal based on information they had selected based on their knowledge, attention, and accessibility. This supported processing and integrating qualitative and quantitative information based on the guidelines they jointly developed to identify acceptable levels of development or impacts from tourism.

**Activities:** Activities included collection of information based on the indicators and group discussion to process information to establish criteria for determining the acceptable carrying capacity levels.

**Guidelines:** This focused on encouraging the learners to access information by means of practices using a variety of methods, including counting, experimenting, inquiries, observation, and use of secondary information from local authorities. In addition, it focused on identifying conditions and limitations related with the identifications of the levels of carrying capacity and management, as well as establishment of criteria based on information to logically assess the levels of carrying capacity. Learners' variety of methodological knowledge would encourage

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the retrieval of information in line with operations in each cycle and the generation of new methods or knowledge to be applied to deal with new issues.

**(5.4) Integration of information to formulate management guidelines** – This involved combining the results of the processing of information under respective components in order to identify the picture they want to achieve from tourism management and form systematic management guidelines. This supported summarizing, organizing, and selecting issues concerning the information to use, and creating obligations to monitor the management guidelines they jointly formulated.

**Activities:** Activities included group discussion to formulate systematic problem management guidelines based on information and tourism group meetings to solicit primary comments and suggestions for the formulation of the management guidelines.

**Guidelines:** The focus was on helping the learners to integrate, summarize and organize information processed in order to formulate management guidelines, develop simulation scenarios to consider unexpected events, identify preventive guidelines, select key points of information to address environmental issues, form systematic management guidelines, and enlarge the picture of management, which covered holistic management. Another focus was on expanding the participation of relevant sectors and creating obligations to monitor the implementation of management guidelines they jointly formulated.

**(6) Putting the plan on a trial use** – This aimed to allow the learners to apply information in the form of guidelines for environmental problem management to monitor actual use. This would encourage the use of information for decision-making about improving, changing, or maintain the guidelines for environmental problem management in line with current situations of the area.

**Activities:** Activities included group discussion to plan the guidelines to evaluate the implementation of management guidelines, observation and surveys to gather information in order to monitor the implementation of the guidelines, meetings to make inquiries to tourism group members about improving and changing the management guidelines, as well as the use of charts to summarize the implementation results.

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**Guidelines:** It focused on encouraging the learners to use information for decision-making to confirm, improve or change the guidelines for environmental problem management and for expansion of participation in the sectors concerned. It identified the importance of monitoring the change in situations and results of implementation based on the environmental problem management guidelines they established, with positive attitudes towards their own operations. Realizing that they had to take actions attentively and regularly resulted in them being interested in using reasons and systematicity to address problems and appreciate the value of information, which was a major motivation for them to work as best as they can.

**(7) Adopting the plan and its adaptations according to the changing situations as a collective rule** – This aimed to allow the learners to expand their participation in management so as to create a co-ownership of the environment and appreciation for co-working, which would lead to a common consciousness for addressing environmental problems by the tourism group members.

**Activities:** Activities included tourism group meeting to summarize the results of the project implementation and adopting the plan and its adaptations according to the changing situations as a collective rule of the tourism group members to comply with, based on the group discussions, to formulate monitoring guidelines in the long run.

**Guidelines:** It focused on encouraging the learners to participate and have rules that came from the tourism group members' consensus and that were accepted in order to achieve actual practices. Situations in the community, as well as daily situations, should be taken into account if they were not conducive to learning, such as conflicts in the community, workload, illness, or poor health. This might be a major obstacle to learning and success in each cycle, and learning might take a much longer time. Necessary steps should not be skipped. If the community's operations experience failure, community members should help identify the causes of the failure and solution guidelines. They should be reminded that elaboration rehearsals resulted in clearer knowledge and understanding. Passing through each step was like enhancing their wisdom to handle steps that were difficult to implement. However, the learners must not repeat the process or method for operations excessively, as this might bring the community boredom and result in them giving up.

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## 4.2 The evaluation of the effectiveness of community learning through the learning output

The assessment of the participants' learning through the instructional model was conducted by six qualified experts, who had experience in carrying capacity research and expertise in tourism and/or community-based tourism. They evaluated the holistic environmental management plan of the community in four dimensions: (1) Knowledge and understanding, (2) Appreciation of the value of the environment, (3) Application of the carrying capacity principle, and (4) Additional recommendations, each of which are described below:

**4.2.1 Knowledge and understanding** The participants' overall knowledge and understanding was at a high level ($\bar{x}$= 3.23, SD = 0.45). As for the mean values under respective factors, their knowledge and understanding about environmental impacts of tourism were at the highest level ($\bar{x}$= 3.67, SD = 0.52), followed by the linkage between environmental impacts of tourism and environmental carrying capacity appraisal ($\bar{x}$= 3.33, SD = 0.82) and the environmental carrying capacity ($\bar{x}$ = 3.17, SD = 0.45), respectively. The knowledge and understanding about the process and method of environmental carrying capacity appraisal was at the high level ($\bar{x}$ = 2.83, SD = 0.75), which was the lowest mean value among the factors under the same aspect.

As for additional comments about knowledge and understanding, four key issues were identified: (1) Knowledge and understanding about environmental impacts of tourism were not comprehensive. The participants focused on managerial study and numerally appraised the carrying capacity. The control measures or guidelines under the defined carrying capacity levels were not clear and their effectiveness could not be ensured. (2) The process and method of appraisal of carrying capacity should focus on the ecosystem carrying capacity, rather than their personal opinions. (3) The appraisal criteria that the participants applied did not meet international standards. The participants jointly developed these criteria, which were somewhat inaccurate. Therefore, they should enhance their knowledge and understanding about the collection of a variety of information and select international criteria or standards that

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are academically recognized and are in line with their interest, and (4) There was no evidence to confirm that environmental carrying capacity, as defined by the participants, had a linkage to the levels of environmental impacts of tourism.

Despite some limitations, the experts believed that the community environmental management plan was beneficial for the conservation of tourism resources. For example, the rotation of activities to reduce the congestion of tourists, time spacing for serving tourists, or refusal to serve tourists would reduce environmental impacts of tourism, to some extent.

**4.2.2 Appreciation of the value of the environment –** The participants' overall appreciation of the value of the environment was at the highest level ($\bar{x}$= 3.50, SD = 0.46). As for the mean values under respective factors, their attention to the environment was at the highest level ($\bar{x}$ = 3.67, SD = 0.52), followed by attention to the relationship between environmental problem management and tourism development ($\bar{x}$ = 3.50, SD = 0.55) and monitoring of changes that will affect the environment ($\bar{x}$ = 3.33, SD = 0.82), respectively.

As for additional comments about the appreciation of the value of the environment, three key issues were identified: (1) Attention to the environment – The participants were interested in affected resources, e.g. butterflies, jellyfish, water bodies and fish, as well solid waste. They did not pay attention to resources that had not been affected yet or were intangible; for example, the cleanness of the environmental system. (2) Attention to the relationship between environmental problem management and tourism development – Some of the experts suggested that there was a lack of clarity of planning in line with the desirable development levels. (3) Monitoring of changes. It was more likely that the monitoring results would lead to actual practices, because the community members had been involved in plan formulation and key people to be in charge had been concept clearly identified.

**4.2.3 Application of the carrying capacity** – The participants could apply the carrying capacity principle at a high level ($\bar{x}$= 3.00, SD = 0.34). As for the mean values under respective factors, the participants could apply with the plan at the highest level ($\bar{x}$ = 3.33, SD = 0.52) on the most, followed by having the guidelines for

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management of environmental management ($\bar{x}$ = 3.17, SD = 0.41) and the systematic establishment of goals and responsibilities ($\bar{x}$ = 3.17, SD = 0.75), respectively. The opportunity to receive support from organizations outside the community ($\bar{x}$= 2.67, SD = 0.52) had the lowest mean value among other factors under the same aspect.

As for the additional comments about the application of the carrying capacity concept, six key issues were identified: (1) Adjustment of the concept in line with the community context was made without any explanation to warrant the consistency between the environmental management plan and the community context. In addition, local wisdom was not researched and used to reduce impacts of tourism. (2) Despite having practical guidelines for ensuring the environmental carrying capacity will not be exceeded, which limited the number of tourists per group and established a rotation of activities, there were no clear indicators to link the number of tourists with the magnitude of environmental impacts of tourism, rendering caution that these controls might not be effective, as expected. (3) The obligations to actual practices should be established by means of meeting and signing MOUs between the community and relevant local organizations in a formal manner. (4) Some of the experts suggested that responsibilities in the group were defined, but no clear, tangible goals for the implementation were defined. They also suggested that the participants' skills in efficiently substituting one another need to be enhanced. (5) There was an opportunity to receive support from organizations outside the community. The environmental management plan should be formulated as a strategic plan with clear goals, operation methods and monitoring and evaluation. (6) It was not clear that the participants have learned to create alternatives and make a decision based on information. So far, the participants used information that was available on easy to find locally. But the information was rather superficial. The participants should be encouraged to search for more profound and complex information.

Despite critiques on the simplicity of the information and others, the most of experts, regarded that the environmental management plan was suitable for the community, could be extended or applied to communities with similar conditions, and could be further developed if strong leaders were involved. Despite being unclear, the plan reflected the participants' intention and was believed to be practical at the area level. Details on the evaluation is presented in Table 4.7.

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**Table 4.7** The evaluation of the environmental management plan

n = 6

| Issues | Evaluation | | | | Mean | SD | Interpretation |
|---|---|---|---|---|---|---|---|
| | Highest | High | Low | Lowest | | | |
| • **Knowledge and understanding** | | | | | | | |
| 1. Environmental impacts of tourism | 4 (66.7) | 2 (33.3) | - | - | 3.67 | 0.52 | Highest |
| 2. Environmental carrying capacity | 1 (16.7) | 5 (83.3) | - | - | 3.17 | 0.41 | High |
| 3. Process and method of environmental carrying capacity appraisal | 1 (16.7) | 3 (50.0) | 2 (33.3) | - | 2.83 | 0.75 | High |
| 4. Linkage between environmental impacts of tourism and environmental carrying capacity appraisal | 3 (50.0) | 2 (33.3) | 1 (16.7) | - | 3.33 | 0.82 | Highest |
| 5. Conditions and limitations of application of environmental carrying capacity | 2 (33.3) | 3 (50.0) | 1 (16.7) | - | 3.17 | 0.75 | High |
| Overall knowledge and understanding | | | | | 3.23 | 0.45 | High |

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**Table 4.7** The evaluation of the environmental management plan (cont.)

n = 6

| Issues | Evaluation | | | | Mean | SD | Interpretation |
|---|---|---|---|---|---|---|---|
| | Highest | High | Low | Lowest | | | |
| • **Appreciation of the value of the environment** | | | | | | | |
| 1. Attention to the environment | 4 (66.7) | 2 (33.3) | - | - | 3.67 | 0.52 | Highest |
| 2. Attention to the relationship between environmental problem management and tourism development | 3 (50.0) | 3 (50.0) | - | - | 3.50 | 0.55 | Highest |
| 3. Monitoring of changes that will affect the environment | 3 (50.0) | 2 (33.3) | 1 (16.7) | - | 3.33 | 0.82 | Highest |
| Overall appreciation of the value of the environment | | | | | 3.50 | 0.46 | Highest |
| • **Application of the carrying capacity case** | | | | | | | |
| 1. Application of the concept in line with the community context | 1 (16.7) | 4 (66.7) | 1 (16.7) | - | 3.00 | 0.63 | High |

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**Table 4.7** The evaluation of the environmental management plan (cont.)

n = 6

| Issues | Evaluation | | | | Mean | SD | Interpretation |
|---|---|---|---|---|---|---|---|
| | Highest | High | Low | Lowest | | | |
| • **Application of the carrying capacity case** (Cont'd) | | | | | | | |
| 2. Having practical guidelines for ensuring the environmental carrying capacity will not be exceeded | 2 (33.3) | 4 (66.7) | - | - | 3.33 | 0.52 | Highest |
| 3. Creation of obligations to practice | - | 5 (83.3) | 1 (16.7) | - | 2.83 | 0.41 | High |
| 4. Systematic establishment of goals and responsibilities | 2 (33.3) | 3 (50.0) | 1 (16.7) | - | 3.17 | 0.75 | High |
| 5. Opportunity to receive support from organizations outside the community | - | 4 (66.7) | 2 (33.3) | - | 2.67 | 0.52 | High |
| 6. Opportunity to review performance and solve problems from practice | 1 (16.7) | 5 (83.3) | - | - | 3.17 | 0.41 | High |

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**Table 4.7** The evaluation of the environmental management plan (cont.)

n = 6

| Issues | Evaluation | | | | Mean | SD | Interpretation |
|---|---|---|---|---|---|---|---|
| | Highest | High | Low | Lowest | | | |
| • **Application of the carrying capacity case** (Cont'd) | | | | | | | |
| 7. Reflection of learning to create alternatives and decision-making using information | - | 4 (66.7) | 2 (33.3) | - | 2.67 | 0.52 | High |
| 8. Having appropriate guidelines for management of environmental management. | 1 (16.7) | 5 (83.3) | - | - | 3.17 | 0.41 | High |
| Overall application | | | | | 3.00 | 0.34 | High |

**4.2.4 Additional recommendations by the experts**

**(1) Attention to information** The participants paid considerable attention to information for their implementation. Through their observations, information collection, and participation by several parties, they gained information that was useful for developing the environmental management plan. Their operations involved collecting data by utilizing a variety methods, which consisted of surveying, counting, comparing information, and making inquiries about opinions. However, most of the information were opinion not empirical data, and their collection of information might not be so systematic. The experts recommended the use of the number of tourists in respective activities as evidence of impact reduction as a result of the management plan.

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**(2) Consideration of information and systematic thinking** The participants were trained to consider information in a systematic manner. They shared responsibilities use data collection based on the skills or readiness of their follows, consulted each other,. Skills, they could benefit form perspectives from other people. Some information regarded expertise, opinions from the community or tourism group members alone might be a risk to affect the quality of the information from an academic standpoint. For example, management of freshwater jellyfish needed information from the outside and sophisticated technical information to support their decision-making about the formulation of management guidelines to help conserve the resources in an effective manner.

**(3) Awareness of, and attention to, environmental impacts of tourism** The participants realized environmental impacts of tourism through the indicators that they jointly established. However, some of the experts viewed that their attention to the socio-economic impacts was not clear enough. The experts recommended that management practices promote the involvement of tourists in environmental conservation through public or voluntary activities and environmental interpretation.

**(4) Appropriateness of the environmental management plan** Overall, the plan was appropriate, with clear indicators and concrete management measures and supported the participants in learning about carrying capacity. However it should be operationalized for a certain time period to assess its strength and some of the experts viewed that the size of the tourist groups was in appropriate. They suggested that a small group should consist of a maximum of 10 people and a large group should consist of a maximum of 30 people. The results of the use of the plan should also be monitored for further improvements. In addition, the participants' role in working with external organizations and in using local tourism resources should be assigned, which would lead to sharing and learning through collaboration among tourism operators, tourists, and the community, thus possibly reducing impacts.

In conclusion, the experts' assessment of the participants' learning through the participants' environmental management plan revealed that their appreciation of the value of the environment improved the most, followed by their knowledge and understanding, and their application their learning in each aspect was at the highest to high levels. The levels implied that the experts saw that this project helped to develop

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the participants. They started to pay attention to empirical information, rather than speculation, and provide opportunities for other sectors or other community members to have more involvement in environmental management. However, they could not comply with all recommendations made by the experts due to their old learning styles, levels of management experiences, learning capacity, attention to existing problems, workload, and other limitations, such as conflicts between the community and the tourism group.

## 4.3 Factors influencing the success of the instructional model

The factors that influenced the success of the instructional model were classified into two groups: the learning environmental factors and the information processing learning structural factors, which are described below.

**(1) The learning environmental factors** – They were the environment, which allowed the participants to achieve learning. The factors consisted of the participants' recognition of the benefits of the research activities, the learning interactions among the participants, the continued enthusiastic characteristic of the participants, and the learning supporting roles of the researcher.

**(1.1) The participants' recognition of the benefits of the research activities –** They realized the benefits of rehabilitation the relationship among the group members. They were interested in working together to reduce the gaps in their relationship that resulted in internal problems and demonstration to work together. A participant (Sm.) said, "*Actually, the reason why I was interested in doing the activity was that my friends and I thought if we worked together for some time, our conflicts could be lessened. So, we tried doing it, and then the situation has become better.*" *As for realizing the benefits from external networks*, they attached great importance to having external network, for technical knowledge, budget, problem-solving for the tourism group, and extension to other networks. A participant (S.) said, "*Without people's help, it would be difficult for us to work. We are not able to do something on our own. Some agencies, although they don't help us in terms of technical knowledge, they have provided financial support to us.*" The tourism group

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originated from the cooperative network between the community and academic networks. Thus, the success in tourism and problem management was always related to networks. The researcher's access to the community confirmed that the participants attached great importance to recruitment and cooperation with networks. In addition, they realized the benefits of solving environmental issues. These environmental impacts stemmed from tourism and other activities that affected the environment and tourism resources, especially the reduction of jellyfish, the interactions between the tourism group members and community members, disturbance to lifestyles due to tourism activities, and conflicts within the tourism group.

**(1.2) The learning interactions among the participants**

Exchange and learning among themselves enabled the participants to assess the environmental carrying capacity. They shared ideas and argued when they had disagreements throughout the collaboration process. This encouraged them to search for evidence and reasons to support their ideas and helped group members who had an inaccurate understanding. This helped improve their knowledge support them to achieve a common understanding and define what they were interested to operate and include in their plan. Interaction among them helped the transfer of knowledge within the group. During, the practices of water quality measurement by using a test kit, explanations and demonstrations in a friendly atmosphere and easy language led to collaborative interaction, which allowed participants with an inadequate understanding to expand and organize their knowledge. The knowledge circulation enabled them to do some tasks that they had not been able to do or to describe issues that were of interest to them. Interaction led the participants to decide a job division to suit each participant's potential. Based on an observation, the participants could be classified into three groups: leaders, followers, and supporters. The first group was characterized by leadership in learning. They could provide explanations and reasons, conduct planning, and ask questions about implementation. They could summarize ideas shared by group members. Group members respected their way of thinking and decision-making about implementation. They had a unique characteristic – they were always interested in learning new things, had critical thinking skills without letting themselves be influenced by the dominant ideas from the community and outside of knowledge, and had integrity for principles based on their understanding. It was

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witnessed that planning to collect information, operations, and knowledge transfer often came from this group. They were considered to be thinkers or planners who paid attention and attached great importance to learning and new knowledge. On the other hand, the follower group consisted of dependent learners. They were compliant practitioners and wanted additional explanations from the leader group about the issues they did not understand during the learning process. In addition, they were ready to comply with the leaders group's thinking and planning. Discussions revealed their faith in the leader group's knowledge and thinking skills and their lack of self-confidence in their knowledge compared with the leader group. Although many issues had conflicts, they finally agreed with the leader group's explanation and reasons. However, observation identified that the follower group played a crucial role in practices and they were the core group that took actions. They could be considered to be practitioners, who were interested in learning and gaining knowledge, to some extent, but were not keen in thinking because they believed that there were people who were more suited than them in terms of learning and understanding.

The third group was the group of supporters, who did not pay attention to learning, new knowledge, or issues as they were supposed to do, but wanted to be accepted by the group or to have people in their circle. This group liaised with networks within the community and was responsible for creating an understanding or public relations for the group. Sometimes, the group assisted in operations. The success in operations relied on these three groups, to which roles and responsibilities were assigned. Whenever one of the groups was missing, conflict about thoughts and practice guidelines would usually occur or operations could not be finalized. This was witnessed from situations when the thinkers or practitioners were absent from the community area to work (as workers in Bangkok) or when they had family problems. It was witnessed that without them, the implementation of the project and activities that required decision-making would slow down. This supported the idea that they had to coexist to carry out knowledge-based tourism management. Job division also supported sharing and learning among them and the transfer of knowledge based on their roles and responsibilities.

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**(1.3) The continued enthusiastic characteristic of the participants** – Their attention to environmental problems was important for the start

of their operations. This was evidenced by the fact that at the beginning they did not pay attention to appraise the carrying capacity. Only after they started with problems they were interested in, there was movement of activities, focusing on control and mitigation of existing problems. Their operation started with attention to sectoral problems or management of each problem with extended knowledge about environmental carrying capacity appraisal, they paid interest to tackling problems as a whole by devising a comprehensive environmental management plan. The participants' prior experiences influenced the expansion of the scope of knowledge. This was witnessed from practices of water quality measurement that linked their understanding about water quality indicators with what they already understood. But their production of the documentary was not successful due to a lack of experiences. Prior knowledge encouraged procedural knowledge, which transferred characteristics of usual practices to new situations. This was recurrently witnessed throughout the research problems and burdens, which consisted of family problems, health problems, workload, and conflicts with other group members were considered to be a major drawback of their enthusiasm toward to their operations. This made their attention and commitment to the operations decreased. Encouragements form their group follows prevented them to withdraw from the operations.

**(1.4) The learning supporting roles of the researcher –** It was witnessed that **the participants' trust of the learning manager or the researcher** affected their efforts. A participant (D.) said, "*If I don't love you, I would have stopped doing the activity a long time ago.*" Some participants paid attention to the work they were not interested in or had no skills in, or even when they were busy. They complied with the guidelines they jointly developed because of their trust or view that the learning manager was their friend. Frequent meetings and inquiries about the work encouraged the operation progress and solved obstacles in the operations. The learning manager's assistance supported learning, especially for thinking to process the information, organization of the information, classification of the information, creation of the path to link new information with existing information, expansion of knowledge from operations, discussions to reflect the results of implementation, and identification of strengths and weaknesses of the implementation. The assistance supported learning in the form of motivation, guidance and facilitation

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to enable them to take actions with self-confidence. In terms of information analysis and synthesis the participants were given support in accordance with their potential based on the goals of the environmental carrying capacity appraisal.

**(2) The information processing learning structural factors** – They influenced the formation or the layout of learning management. This involved the characteristics of management and information processing using the theoretical basis to support learning management. They consisted of characteristics of information processing, and metacognition, as follows:

**(2.1) Information processing** (*include an evaluation on the situational problem, attention to new information, selection of information, thinking, deciding, action*) – Their *attention to new information* was important to their intention and learning from it to lead to problem management, as evidenced during the water quality measurement, community documentary production, and training in environmental carrying capacity appraisal. Even if this information was new to them, they tried hard to process it to build an understanding, practice, and share and learn together. *Linking new information to what they knew* would encourage them to learn about new contents faster. When they tried to understand the contents of the water quality indicators, they linked it to the information known to them, which equipped them with a better understanding about the information. A participant (L.) said, "*If you gave explanation by relating it to what we know, it won't be difficult. I can understand it. If something is very distant from me, sometimes, I can't imagine it.*" *As for elaboration rehearsals*, they encouraged the participants to remember procedural knowledge to apply it to address problems and supported them in storing it in their long-term memory. This was evidenced by their improved ability to manage information as a result of elaboration rehearsals, in terms of summarization with charts as well as organizing, analysis, and synthesis of information that were more profound and took shorter time due to their skills.

*Analysis of information* was important for acting upon the information gathered. If the participants could not classify sub-elements of information, they would not be able to clearly understand the information. This was because classification of the sub-elements helped them to identify details related to problems, understand the path or cycle of the problems more clearly, and identify the

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actual root causes of the problems. This was evident through their development of the cycle of the issue of the disturbance to lifestyle due to tourist services, in which the participants realized that the actual problem was related to system management and the number of tourists that exceeded their carrying capacity. This assisted in clarifying the information. *Information synthesis* enabled the participants to merge new information to develop a new management model. It was evident that the new management guidelines they implemented were new management guidelines that combined new information. This equipped them with the *ability to provide definitions* that reflected a meaning or concept based on their understanding. If they failed to identify definitions based on their understanding, they would not be able to identify the direction of their implementation, and their learning might depend on the learning manager rather than themselves.

In addition, as for *learning step-by-step***,** learning from the easy step to difficult step, encouraged the learners to utilize sophisticated information and integrate the guidelines for carrying capacity appraisal as a whole in a systematic fashion. It was evident that the participants could not start with systematic problems; they started with an assessment of individual problems in order to accumulate adequate expertise and knowledge to conduct an appraisal of the whole picture, which merged a variety of information. This way of learning reinforced the participants' self-confidence in operations step-by-step, and this matched the right person to the right job. Switching the order of steps might affect their operations. It was witnessed that at the beginning of the project, when the researcher talked with them about carrying capacity appraisal, that they were not able to formulate implementation guidelines because they had no declarative and procedural knowledge, which needed to be fulfilled gradually. *Realizing the value of information* inspired the participants to make decisions based on information they had searched for. For example, they could utilize the results of water quality measurement and the production of the community documentary to address the cattle-raising problem. This made them feel confident that the use of information could deal with the issues of disturbance to lifestyles from tourism services and conflicts between group leaders. If the value was not apparent, their operations could not be further mobilized.

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*Selection of information for appraisal* relate to understanding of information was important for the selection of information as indicators based on their knowledge and experiences. Concerning information collection and processing, most of the information they chose was the information they knew about and could explain. It was evident that their appraisal guidelines focused on local information or information from their operations. Although learning about environmental carrying capacity appraisal was new to them, when they conducted it, with unfamiliarity, they chose information they had experience with or good understanding about. This was evidenced by their refusal to use the water quality test kit; they indicated they could measure water quality by themselves. They did not understand all the details of water quality indicators, but they selected information in the form of rules or regulations to minimize the impact on freshwater jellyfish. The selection of information they understood well allowed the processing and management to be effective and guaranteed success in their appraisal.

*Access to information* affected the selection of information. The participants selected information they could access with simple methods that they could then apply on their own without creating a burden or disturbance, such as the risk of conflict or risk to life and property. This was witnessed by their caution about information that created conflict between the tourism group and community members or refusal of information about local politics, inappropriate local land use, sales of the land ownership of community members, and use of agricultural chemicals. In addition, they did not select information that was complex or might be difficult to access, such as information about water quality indicators and opinion surveys of community members and visitors with questionnaires. Methods to access information were also a factor in defining indicators in the appraisal. As mentioned, they needed to know how to access information before choosing it as indicators. As for some indicators, although they were important the participants would not choose it, or they would select other relevant information, if the indicators were difficult to access. It was seen that *use of substitute information* was important if a piece of information was too complicated to gather or difficult to access, such as the number of visitors and the damage levels to animal resources, e.g. butterflies. The participants had no clear information about how an increased number of tourists could affect the cycle of

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butterflies or freshwater jellyfish. Hence, they used substitute information, which was related to the behavior of utilization among tourists and group members who were service providers, who were vulnerable to disturbance, instead of direct impacts on what they were interested in studying. If they could not find substitute information for information that was difficult to access, this might result in the loss of some key indicators.

**(2.2) Metacognition** – *As for declarative knowledge*, the participants were able to explain the basic principle of environmental carrying capacity by defining terms and operations. This resulted in their knowledge and understanding that the level of carrying capacity was a tool for reducing environmental impacts of tourism. In addition, this expanded their knowledge about appraisal into a wide range of quantitative and qualitative information and allowed them to establish criteria based on information to compare the desirable picture of management in the current conditions. Thus, declarative knowledge helped the participants to classify the composition of indicators, appraisal, and formulation of management guidelines that were consistent with the appraisal based on their understanding about the principle. This was witnessed by the selection and processing of information, as well as the environmental management guidelines they jointly established, based on the carrying capacity principle. If the participants could not access declarative knowledge, they could not put the information into action.

*Procedural knowledge* – It was evident that implementation on their own provided them with various patterns for management and processing of information. This helped them to see the environmental carrying capacity appraisal more clearly step-by-step. Having procedural knowledge and a model for collecting, organizing and evaluating information could shorten their implementation period and supported the use of a greater variety of information as indicators in the appraisal. Without procedural knowledge, they had to spend more time on trials or had gained incomplete information in line with their goals. This was related to experiences and the levels of accumulated expertise in the project implementation step by step, as well as the transfer of patterns that were similar or had been implemented earlier for collecting information, processing information, and formulating management guidelines.

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*Conditional knowledge* – Knowing key conditions for assessment in the dimension of knowledge about selecting information, accessing information, how to use information, limitations of information, and practices enabled the participants to develop their own implementation guidelines and provided them with details that consisted of the current situation. It was witnessed that there were conditions for the environmental management guidelines that they jointly developed. If the participants did not have knowledge related to factors or limitations to the implementation, this would affect the chances of success in the appraisal, the duration of the appraisal, and details of the guidelines established.

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# CHAPTER V
# DISCUSSION

This chapter presents five key issues pertaining to the study, which consist of the learn to make an informed environmental decision model (L-Informed ED), application of the information processing theory to the community: advantages and limitations, international environmental carrying capacity to actual local conditions, stepping through participatory action research, and transition of the researcher's knowledge through participatory actions, each of which are described below.

## 5.1 The L-Informed ED Model

This tourism community assessed its environmental carrying capacity in line with the nature of its learning. Its operations supported the expansion of the scope of its knowledge about environmental impacts of tourism and environmental carrying capacity, as well as the development of skills in systematic information selection, collection, processing and organization. This resulted in environmental problem management guidelines and served as an implementation model that the community could apply when situations changed in the future.

The L-Informed ED supported the community in learning about information processing, which is an important part of the cognitive domain. Good information processing helped the community to achieve the goal of environmental carrying capacity appraisal on its own and supported the preparation of environmental management guidelines based on assessment results, in a logical way. The instructional model consisted of seven key steps: synergizing cooperation to address collective environmental problems; collating environmental situations based on existing experiences and beliefs, assessing the actual environmental situations with newly acquired information, planning management guidelines for selected environmental problems, appraising the environmental carrying capacity for holistic

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environmental management planning, putting the plan on a trial use, and adopting the plan and its adaptations according to the changing situations as a collective rule. Each step was important for the community's thinking and processing of information.

After the end of the assessment cycle, the community's knowledge about principles, methods, conditions, limitations of the evaluation, and actual application were expanded. The community reached the comprehensive point of environmental carrying capacity appraisal, which supported the community in receiving, selecting, and searching for appropriate information which would then be processed to determine if it changes were needed in monitoring or management guideline improvement in line with dynamic situations.

This instructional model was consistent with other cognitive instructional models, such as the advance organizer model of Joyce & Weil (1996: 265-278), which encouraged the learners to link new learning to their knowledge base. This was witnessed during the organization of the board concept and structuring of knowledge. However, this instructional model was somewhat different from the advance organizer model. The advance organizer model focuses on using the universal concept or the learner transfer theory, which is characterized by understanding a board picture based on deductive reasoning. Instead, this instructional model focuses on searching for information based on actual practices to create an understanding about the environmental carrying capacity principle based on inductive reasoning.

It was evident that under the advance organizer model instructional model, lecturing served as the main method of transferring knowledge. The teacher emphasized on explanation about viewpoints or substantive matters and his analysis to transfer to the learners. This instructional model focused on encouraging the community to gain knowledge from its own practices or exposure to the real situation. Although it was different from the advance organizer model, it was consistent with a similar to the memory model, especially during the stage of creating linkages and using imagination of the memory model, which focused on operations to create a relationship of information to what the learners were familiar with or easily recognize (Khammani, 2011: 231-232).

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As for information management and recognition, this instructional model involved the use of charts as an important tool. The learners were encouraged to

identify key elements of what they were interested in studying and to link those elements to identify the problem cycle, which would encourage the learners to understand the essence of environmental problems. This was consistent with the graphic organizer instructional model. Ellis (2001) believed that the graphic organizer instructional model would facilitate declarative understanding by means of segmenting the elements of information, reducing text that might confuse the learners, and supporting the formulation of learning strategies for the learners. The memory model and graphic organizer instructional model focused on transferring the overall substantive matters to the learners by means of lectures. On the contrary, this instructional model supported learning from practices. If they needed to transfer knowledge, they would focus on important parts that were practical for assessing environmental carrying capacity. Under this instructional model based on the information processing theory, synergizing cooperation to treat collective environmental problems was an additional step. It was not explained or highlighted in conditions of this theory. The information processing theory focused on individuals' learning, while environmental issues were public issues that could not be addressed by a single person. Thus, synergizing cooperation to treat collective environmental involved roles and was important to decision-making about learning through information processing for environmental carrying capacity appraisal of the community. This stage involved issues that the participants recognized. The theory believes that the quality of individuals' learning stemmed from their relevant experiences or knowledge. This stage supported the retrieval of information from memory to identify channels to fulfill knowledge or link new learning to what they recognized. In addition, this stage dealt with reviews of the community's prior knowledge or experiences.

As for assessing the actual environmental situations with the newly acquired information, planning management guidelines for selected environmental problems, and appraising the environmental carrying capacity for holistic environmental management planning, they expanded the scope of their knowledge and assessed environmental carrying capacity under respective issues of interest to them. This manifested learning through the community's attention. In addition, this encouraged the recognition of details of information through operations and expanded

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the scope of knowledge, in terms of information processing, assessment criteria, and implementation methods. The step of appraising the environmental carrying capacity for holistic environmental management planning involved the selection of related information, by selecting indicators for environmental issues, tourism management, and what the community understood. Their preparation of environmental problem management guidelines manifested information organization and integration, as well as the community's ability to manage systemic problems in a logical way using accumulated knowledge and skills from systematic operations. As for the step of implementing the plan on a trial basis and the step of adopting the plan and its adaptations according to the changing situations as a collective rule, they involved application and improvement before the community's actual use. They were equipped with monitoring and updating in line with the situation. This reflected metacognition, which meant that the community would have declarative knowledge, procedural knowledge, and factor knowledge, which resulted in achievements. This could be regarded to be encoding to store the knowledge in memory for retrieval at a later time (Mayer, 1984: 30-33).

The heart of the L-Informed ED focused on using information of the community. Originally, the community relied on beliefs and experiences. This instructional model expanded its learning gradually – it expanded learning based on the learners' potential. As the operations were conducted by the community, the learning would be expanded according to the levels of difficulty of operations, from simple to complex. This was witnessed by the movement of operations – from management of problems being of interest to them to management of holistic problems or systemic problems, which was related to the overall environmental management and community-based tourism management. In addition, elaboration rehearsals were crucial because they expanded the community's understanding so as to achieve profound understanding, more complex and diverse management, and a shift from experience-based information to comprehensive empirical information. Under the instructional model, if common rules for environmental problem management guidelines were established, it would encourage long-term monitoring. The monitoring encouraged the community to have elaboration rehearsals, which would ensure the

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continuous expansion of learning and the scope of knowledge based on dynamic environmental situations.

## 5.2 Application of the Information Processing Theory to the Community: Advantages and Limitations

**5.2.1 Advantages of applying the theory to the community –** Learning management encouraged systematic thinking and understanding about the causes of problems through logical information linkages. The community could extend their perspectives about issues more comprehensively and profoundly. They could pause some thinking and change their practices as a result of an understanding about key complications. For example, to solve the cattle-raising issue, they utilized new information and methods to deal with different opinions of the community members and utilized new information to build participation in addressing this issue. In the case of the production of the community documentary, they integrated information into management practices, which linked the issues of community members' lack of understanding about the tourism group's work and the lack of the youth to work with the tourism group. As for the issues of disturbance to lifestyles due to tourism services and the conflict among the group leaders, they could be linked to provide an overview of the problems – systemic problems that involved integration of information relating to overall tourism management. The community's implementation demonstrated the addition of more detail for gathering information and formulating problem management guidelines. The community's ability was a result of information processing to achieve careful decision-making and more comprehensive empirical information. This was in line with Kaewthep (2010: 44-47), who indicated that if communities possess good and systematic thinking, this will help improve their wisdom of searching for proper ways to address problems that they can implement when situations change. In this regard, Prasertsan (2011: 8-14) explained that encouraging communities to train themselves in systematic thinking supports the linkage between sub-elements of problems. This would allow the community to

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understand about the root cause of problems and consequences of the problems, which have connection as a cycle. This would help with the community's decision-making about terminating the problem cycle more effectively.

The important starting point of learning management is consistent with this theory. The community started with problems that they paid attention to and recognized. The community's knowledge and experience regarding environmental and tourism management were considered to be adequate to identify impacts, understand situations, and select problems to address rationally. This learning management approach was crucial because "problems in their attention" were the community's key lessons, in which the community had to learn about information processing and take actions to resolve problems. Khammani (2011: 84-85) stated that according to the information processing theory, learners are able to learn something well if the topic is of interest to them. If they learn something new, which they are not able to link to their prior knowledge or do not have basic knowledge about, it may be difficult for them to access relevant information and learn about. For example, in the case of the community documentary film, the participants were not able to produce it on their own. Applying this theory to the community had to take into account this subject. This is because individuals' practices that are of interest to them can motivate them to continue their practices and expand opportunities to expand their attention to other problems, as a result of their self-confidence and expanded skills in problem-solving. Starting at the issues that they were not interested in or had previous experience about might negatively affect their learning. Apart from achievements in learning management, prior experiences or knowledge could be explained in terms of information encoding – selecting and receiving information that the community knew and was familiar with. It was evident from the fact that most information that the community employed to assess environmental carrying capacity was information that it was familiar with to a certain extent or the information the community was confident would be accessible and comprehensible.

A key focus in the theory is remembering the content of what one learns about, as it is important in long-term memory (LTM). This theory searches for techniques to help learners understand the contents and store them in their long-term memory, as much as possible. This was witnessed from the explanation by Khotrakun

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(2005: 253-258), Elliot et al., (2000) and Santrock (2001: 286-288), who stated that learning mostly involves memorization, a review and organization of information, as well as idea expansion. In this regard, it was suitable for the community to expand its ideas through operations that were concerned with addressing environmental issues and cognitive operations. Classification of information using charts and systematic information linkage helped the community to recognize components of problems and equip them with a better understanding about problems. Most individuals memorize things via pictures. Therefore, the use of images as materials for information management encouraged the participants to remember the pictures of elements that they jointly formed, as well as the pictures of methods or steps for information classification. Operations in different activities, the collection of information, and plan formulation helped expand their thinking so that they could identify the linkages between environmental impacts of tourism and environmental carrying capacity and understand the environmental carrying capacity principle better. This was achieved by means of identifying their own capacity, area management capacity, and development of management guidelines that were in line with the defined capacity. Theoretically, this recognition involves the elaborative operation process, which aims to create an understanding and recognition of what they have learned about. Other forms of recognition from processes are not clearer from practices because the community's main channel to acquire understanding was practices.

Elaboration rehearsals and repetitive thinking provided the community with a clear understanding about the carrying capacity principles and practices. In addition, they allowed the community to understand that elaboration rehearsals helped increase details of their practices and to understand about their practices better. This was witnessed from the analysis using thinking charts, where details of the participants' writing improved through their practices from the start of the process. As for water quality analysis, elaboration rehearsals during training allowed the community to carry it out on its own. This is consistent with the explanation by Leachy & Harris (1985: 122-124), who stressed the importance of elaboration rehearsals as something that helps learners to remember substantive matters better. However, as for tasks that were too difficult for the community and tasks that the community had no basic knowledge about, elaboration rehearsals in limited time were

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not successful, as witnessed in the case of the production of the community documentary. In addition, using carrying capacity to create learning from information processing for the community was in accordance with a theory – environmental carrying capacity is a process that must be monitored on a regular basis. After the researcher or learning manager left the area, the community had to monitor the management of its tourists regularly, which would result in automatic practices and elaboration rehearsals.

The community's operations at the end of the learning cycle consisted of strategy construction, in which all operational results were recorded as knowledge or experiences from operations to deliver as models to be used in new situations in the future. Santrock (2001: 275-277) regarded that this strategy is a key to this theory, and the most important thing is that this learning strategy leads the learners to practice metacognition. In this research, it was a process about how to learn or how to address environmental issues that were of interest to the community. Complying with the instructional model, the community expanded its metacognition about principle-related knowledge, procedural knowledge, and conditions or limitation-related knowledge that were so extensive, complicated and profound that it was able to address systemic problems and new problems by means of new method in an intriguing fashion (Khotrakun, 2005: 227-228).

Supporting good thinking resulted in logical and systematic practices. Originally, the community solved problems using the heuristic method. Not able to guarantee the success of its problem-solving activities, this method just helped them to feel that they took some actions to address problems. Learning management that involved information processing by means of methods under the theory, such as organizing information, classifying information, creating linkages using charts, planning implementation, asking and answering questions to develop critical thinking, as well as expanding the scope of knowledge from problem-solving activities would enable the community to understand the root causes of problems and to define conditions for environmental management under respective tourism activities. This shifted the management strategy to the sub-goal and/or mean-end, as a result of problem analysis and implementation planning by the community (Minkler & Wallerstien, 2003: 5).

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**5.2.2 Limitations of applying the theory to the community** – The theory is derived from the concept of applying information processing of the computer to the human being (Child, 2007: 191). Therefore, some factors were not explained or set as cautions, such as illiteracy, writing ability, and the desire to avoid writing. In this part, due to the theory's low level of flexibility, it is difficult to provide a complete explanation for the characteristics of learning or compliance with the theory. The researcher faced the problem about using worksheets and writing-based or recording-based activities, which the community was not able to conduct, as they were unfamiliar with its nature of learning. This might be related to the issue of increased workload. When worksheets were first used to detect traces of learning, the researcher perceived the participants' uneasiness and anxiety so that the researcher had to adjust the activities by inserting worksheets or writing-based or recording-based activities into the operations. The learning manager has to take this issue into consideration and should not force the community to do the activities, as it will create negative experiences in learning for the community.

Practices that were not in line with individuals' nature and circumstances of learning resulted in failure. This is in line with what Mayer (1996: 151-161) described. He stated that this theory is characterized by transferring knowledge from the teacher to the learner, as an information processor. The teacher's transfer of knowledge is similar to a computer, which receives information and sends it to the processor based on the program's instruction. Therefore, this theory is perhaps well-suited for experimental research and action research in the classroom, in which factors can be controlled. The community's learning involved various factors that were controllable. Creating motivation encouraged the community to control its own learning, which was related to a friendly atmosphere of learning, success of learning through activities, and acceptance by group members that learned together.

In addition, this theory focuses on upgrading individuals' learning, while the community's learning was co-learning in several situations. Mutual sharing and learning could expand the definitions of environmental impacts and environmental carrying capacity. The information processing theory should consider the influence of learning from the interactions between learners.

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This theory mainly aims to retrieve information quickly and recognize it for a long time. Applying this theory to the community did not require speedy processing, lengthy recognition or explanation about academic declarative knowledge. It focuses on information processing to create a variety of perspectives and increase the depth of interesting issues from information, which may not be consistent with the main goal of the theory.

Another important thing is that the community's learning mostly relied on information derived from its experiences and expertise. Some of its learning was characterized by insight or emergence of ideas. Despite making inquiries with the participants about the origin of their ideas, the researcher failed to access or explain relevant mechanisms very clearly. The issue is consistent with the explanation by Neisser (1976) and Mayer (1996: 158), who noted that human beings' information processing is difficult to describe, and describing information processing as separate mechanisms may not be realistic, and there is no supporting evidence that information processing of the human being is similar to that of the computer.

Lastly, it can be seen that the theory could not change the community's learning style within a short time but it did help support its thinking and information processing, which could be added into the old learning style to result in its operations or environmental problem management guidelines being more detailed and practical.

**5.2.3 Prerequisites for applying the theory to the community** – To apply the information processing theory to the community, key issues that needed to be taken into account are described below.

(1) When applied to a community, the focus of this theory should be on the contents that are of interest to the community because of the diversity in the natures of learning among adult learners, who are interested in learning through practices (Knowles, 1998: 65). Development according to the theory, the may involve the instructional model synthesized from this study as learning management guidelines in terms of principles and processes. The substantive matters or issues have to be consistent with the local area and its specific interests.

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(2) Learning should start from an easy level and then proceed to more difficult levels, and the cognitive process should support thinking from shallow to

deep levels in order to create a motivation to learn and an attention to ensure ongoing learning in the process. If the community's operation failed during the starting period, its attention to learn would reduce or stop. Chutopama (2011: 114-115) described that successful learning in each stage or assignments will result in learners feeling confident and paying attention to learning during the next parts. In addition, maintaining a variety of ideas of the community is important. A learning manager has no role (or authority) in judging the quality of thoughts or cognitive thinking of the community, but establishing a system and linking thoughts can result in systematic problem-solving.

(3) Learning management in line with the theory needs supplementary activities related to information processing and organization to achieve suitable search methods and information processing techniques for the community. The community's careful and diverse thinking relies on comparing an adequate diversity of information to visualize the phenomena or create an understanding about problems and solutions.

(4) Transferring knowledge from a learning manager to the community should place an emphasis on systematic elaboration rehearsals, and operations should pass on important knowledge, which includes contents to teach – environmental impacts of tourism and environmental carrying capacity, management of information for development of information processing skills, as well as relevant guidelines in terms of instructional prototypes or procedural knowledge.

(5) Procedural adjustment may occur in the research field. A learning manager needs to understand the learners' nature and keep pace with situations to adjust learning management strategies, while adhering to the goal of learning management, such as changing worksheets to similar activities.

## 5.3 International environmental carrying capacity to actual local conditions

Assessing the environmental carrying capacity conducted by the community is discussed below.

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**5.3.1 Focus on self-learning and self-management** – The process started with environmental and tourism-related problems, which were systemic problems and dynamic. Thus, the carrying capacity principle should be utilized to reduce or resolve current situations. The starting point of the assessment is in accordance with participatory action research, which focuses on allowing individuals to understand problems and solve problems by themselves on the basis of cooperation between the insiders and outsiders (Sutthinarakorn, 2013: 52-54). This is also in accordance with the community-based research, which believes that intelligence stems from practices to resolve ones' own issues with full awareness and thinking before taking actions (Sanankong, 2004 : 33-34).

This assessment was different from that conducted by academics possessing advanced knowledge about environmental impacts of tourism and carrying capacity, who could establish issues that were of interest to them in assessment and conduct their study immediately. The community' operations had to start with issues that it thought were important and accumulate an understanding about the principles and management guidelines from practices.

The community's operations were flexible due to the lack of a clear operational pattern. It focused on practices, coupled with an accumulation of relevant knowledge and understanding, to adjust viewpoints and methods accordingly. It changed indicators, measurement methods, and information collection methods, which were dynamic throughout the assessment process. Perhaps, the flexibility contributed to learning and development of the ways of thinking and implementation method. Kaewthep (2010: 59-61) has attached great importance to problem-solving to sharpen intelligence, rather than successful problem-solving that does not generate learning or changes within oneself. This is consistent with the idea of Praphutthanitisan (2003: 22-23), who believed in the power of change from the inside that originates from learning through community members' co-practices. Ounvijit et al., (2011) studied carrying capacity for tourism of the Ban Tham Pla Community, Chiang Rai province. Through similar processes, the researcher provided recommendations about community development to allow the participants to become active participants rather than passive participants. In addition, the participants believed that adjustment approaches to create the community's collective ownership, trials and practices, and improvement of the

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use of criteria and indicators for carrying capacity they had developed was a major mechanism to ensure efficient monitoring for changes in tourism resources and the community's environment. This was because the community would be able to understand and use what it recognized or was interested in studying. This conceptual basis is consistent with that of Fernando et al. (2004: 79), who supported learning for the community and tourists, as well as parties involved, viewing that it is a key factor in effective carrying capacity assessment.

**5.3.2 Different conceptual basis, different methods, and different results** –Differences in terms of the process for carrying capacity assessment resulted from different "conceptual basis." The community's definition of carrying capacity focused on workload and management. Therefore, its operations were most likely to deal with the issue of tourism management. However, this is found in academic research. For example, the research report by the Faculty of Forestry (2005) focused on assessment to achieve natural resource conservation rather than other aspects in the process, so its focus was on carrying capacity of the ecosystem. This is consistent with the critique by Coccosis & Mexa (2004: 40-41) who regarded that the results of carrying capacity assessment are related to the major science or conceptual base adopted by the researcher for formulating assessment guidelines.

The findings of the community-based carrying capacity assessment supported by Thailand Research Fund (TRF), Phase 1 (Ounvijit et al., 2011 and Thithichamroenphon et al., 2011) were different from those from this research. Under the TRF project, the guidelines for defining indicators, measurement, and criteria were developed by external academics, despite the cooperation between communities and external academics. This was witnessed from field and laboratory water quality measurement, air quality monitoring, use of the proportions for calculation for comparing against the standards from the outside, as well as the completeness of components of carrying capacity. However, in this research, the researcher provided an opportunity for the community to search for its own tools and standards that it could operate on its own and understand, in terms of measurements that it had defined. This was the reason why the guidelines and methods, as well as the assessment results from this research, were different from those in similar research. At the same time, it

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emphasized that the difference in the conceptual basis and level of knowledge and capabilities between the researcher and the participants affected the assessment process and results.

**5.3.3 Viewpoints about information from the assessment** – The qualified experts suggested that the assessment in this study was too flexible, the information they used was unclear because it focused too much on common opinions, the information collected was not adequately profound, and ecological indicators based on academic principles were missing. They viewed that the process did not show the linkage between the carrying capacity assessment and the indication of the reduction in environmental impacts of tourism, which was an interesting comment. The information that the community searched for was tangible, comprehensible, and easy to find locally. This might result in the community being "addicted to" familiar information which then may result in the failure to develop patterns and methods for collecting more difficult and detailed information. However, seeing some benefits of the operations, these experts viewed that the operations could create opportunities for continuous operations and encourage elaboration rehearsals so as to achieve good skills. This might develop the community's potential so that it achieved increasingly academic assessment as a result of its knowledge, understanding, and practices in line with the goal of the carrying capacity principle.

Practices that focused on information, methods, and criteria at the same level of those of academics might provide the community with assessment results, but might fail to allow it to use the results for management. This was because the level of the community's knowledge and understanding was not adequate for conducting implementation on its own after the academics left the community, which was the heart of this research. The research aimed to put the assessment process into practice to promote monitoring of environmental changes. This issue is crucial because a significant limitation of carrying capacity is the fact that it is not put into practice. At the same time, the community's operations were consistent with certain characteristics presented by Coccosis & Mexa (2004: 59-60), who suggested tailoring operations to local conditions, social characteristics, and local cultures.

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In addition, the community's evaluation process reflected the management of the dynamism of information. That is, the community adjusted the process, indicators, guidelines, and measures in line with the situations in the community. Its operations at the beginning were mainly conducted by the tourism group due to conflict with other groups. When the situation changed, the community tried to expand its cooperation to other members or other relevant issues. It could be seen that a flexible and simple assessment might result in actual operations in the local area, adjustment to actual situations, and monitoring mechanisms based on the goal of the carrying capacity principle (Shelby & Heberlein, 1986: 11-18).

**5.3.4 Avoiding external criteria but creating experience-based criteria** – The carrying capacity assessment showed acceptable levels of changes from various activities and usages of tourism. However, the community did not implement the principle of limit of acceptable change (LAC) because LAC involved systematic steps. Stankey et al. (1985: 1-4) indicated that LAC consists of nine key steps: identify area concerns and issues, define and describe opportunity class, select indicators of resource and social conditions, inventory of existing resource and social condition, specify standards for resource and social indicators for each opportunity class, identify alternative opportunity class allocation, identify management actions for each alternative, evaluate and select a preferred alternative, and implement actions and monitor conditions. The community complied with all of these steps, except for 'define and describe opportunity class,' 'identify alternative opportunity class allocation,' and 'evaluate and select a preferred alternative.' The community tried to define the levels of changes or its own standards rather than examining actual conditions for comparison against the external standards to identify if the carrying capacity was exceeded. However, the acceptable levels of changes relied on past experiences rather than recognized standards as the indicators for defining the magnitude of changes.

Thus, the community's assessment involved a variety of criteria and subjectivity since its acceptable levels of change were formed by criteria for comparison against preferable community conditions. The community did not conduct a study for comparison against external criteria, but it did form criteria that group

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members agreed upon. The criteria stemmed from experiences or existing or past conditions that the community believed would “not cause any problems.” As for carrying capacity in general, criteria or standards are crucial, and they must be reliable and academically recognized. This also involved the community’s level of knowledge, understanding, and capabilities. As for ecological factors, the carrying capacity levels did not reflect the tolerance of resources, but did reflect the levels of attention or tolerance in the mind of the community. This was witnessed by the control measures for butterflies and jellyfish. It also employed some criteria across aspects, such as the limits of carry capacity, which it used for expanding the campsite to maintain the ecosystem. It applied physical assessment to ecological assessment. As for some research works by experts, such as by the Faculty of Forestry (2005), UNEP (1999), and Kurhade (2013), their criteria or standards were specific. This manifested that the community’s carrying capacity reflected current conditions rather than a desirable environment system. At the same time, it did not show the limits of carrying capacity in line with actual conditions or resources. Instead, it was carrying capacity in line with the situation.

**5.3.5 Carrying capacity** was classified in ranges rather than single numbers – Numeric carrying capacity was classified in ranges, and qualitative criteria varied to circumstances. The defined figures were used to assist the community in making decisions about accepting or refusing visitors and in formulating guidelines for conserving resources at risk. This was unlike carrying capacity used by academics, whereby numbers have a direct relationship to the impact levels so carrying capacity can be clearly defined.

In the community, the levels of utilizing the local area were not very destructive because the environmental system recovered during the seasons, which partly resulted in carrying capacity in linking to the natural system, season cycles, and the cultural system, including harvest and agricultural products. This phenomenon contributed to the acceptable levels of environmental impacts, and the community used this advantage to conserve the environment. It is in line with the concept of Hammitt & Cole (1998 : 155), who viewed that the level of environmental impacts of tourism depend on the tolerance factors of the ecosystem and the level of resilience of

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the system. Season cycles or factors, apart from those used in the study, were factors that contributed to the ecosystem recovery.

Although the carrying capacity assessments by academics are more valid and more systematically explainable than the community's assessment, when a situation or tourism-related factor changed, this might not be able to be addressed in a timely manner if the community just waited for academics to make adjustment accordingly because of their workload and complex methods, which needed time. The community was able to make improvements and address current situations more conveniently. The community's carrying capacity was the screening carrying capacity, the heart of which the participant was a carrying capacity maker. In this regard, Coccosis & Papripiaris (2000: 31) called adjustable, practical carrying capacity effective carrying capacity. This is in accordance with some parts of the assessment from this study.

**5.3.6 Opportunity to put this into practice** – Carrying capacity conducted by the community had to be used to solve local issues. In this assessment, the community put the carrying capacity principle into practice, as evidenced from the community's refusal to serve a large group of tourists and the tourism group's joint decision-making and operations in the case when shared opinions were needed based upon conditions they had developed together. This was a key aspect of participatory action research. This was also found in the research by Vechpong (2010: 122-124), who applied the participation method to develop the youth to do the community's eco-tourism work. This produced the group of youth doing eco-tourism work for the community. The work by Changsab (2008: 181-183) revealed participatory actions, as a result of the promotion of behaviors of conserving environmental sanitation at residences in the Khlong Toei community. There were 16 projects that were completed. The fact that the community members worked together to develop environmental problem management guidelines for the tourism group reflected the nature of ownership in terms of work and thinking. Based on the perspective of Kaewthep (2010: 19), local folkway-based implementation results in creating knowledge from research or practices and putting the knowledge into practice.

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**5.3.7 Integrated management** – Assessing the community's carrying capacity involved a combination of methods. Despite classifying and managing the assessment under respective aspects, the community linked these aspects to other aspects for considering the carrying capacity and management guidelines. For example, it applied physical knowledge to the physical environment aspect and applied knowledge about facilities to support management. Its experiences and practices helped it to become aware of imperfections of management. Management of separate aspects might not be appropriate due to the fact that tourism services involved different indicators. Accordingly, the investigation of the community carrying capacity involved various indicators. It supported aspects that were being studied or could be applied in the case when an operation could not be conducted academically or when the linkages to other aspects were found to be able to facilitate management. This finding was different from the finding in research reports about assessment of carrying capacity in other aspects, such as the reports by the Thailand Institute of Scientific and Technological Research (1988), Wongphakdi, Pukngam & Tanakanjana - Phongkhieo (2009), Huiqin & Linchun (2011), Zacarias, Williams & Newton (2011), University of Hawaii at Manoa (2008). After synthesis, these reports suggested the research investigated respective aspects and involved clear measures for respective aspects. However, this may be an unexpected benefit of the process, which is line with holistic management. Fernando et al. (2004 : 275-283) viewed that assessing carrying capacity focused on involvement of related people and/or stakeholders in the local area to create integrated identification of carrying capacity for tourism to on-going process, which should create the learning process, environmental ethics for the community, area managers and tourists, as well as various measures for area management.

## 5.4 Stepping through participatory action research

This research created changes in the research participants, community members, the youth group, and tourists, each of which are described below.

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**5.4.1 Research participants** – They changed in terms of their cognitive process, as evidenced that they thought before taking actions and they thought about how to search for what they had wondered about in a more systematical manner. Originally, they thought and took actions immediately. This was witnessed from the process of planning for information collection and operations. In addition, systematic planning, information collection, and operations were extended to other issues, e.g. trial for planting lettuce. In the process, they recorded its growth, searched for information about fertilizer formula and pesticides, and conducted a calculation of the break-even point. Despite being uncomplicated, this reflected changes. In addition, they started to learn how to manage information based on an analysis of advantages and disadvantages about introducing government supporting projects into the community – they accepted some and rejected others. Their decisions were based on information and reasoning.

As for knowledge about the environmental impacts of tourism, after the carrying capacity assessment, the community could provide explanations using their own understanding. They could provide examples of events or phenomena to support their ideas confidently. As for their knowledge about carrying capacity, it was evident that the community had a good understanding about adjustable management tools, and it was able to discuss operations in sequence and to identify limitations of the assessment and application.

Although they originally paid attention to the environment, the community's carrying capacity appraisal that it conducted generated the mechanisms for monitoring changes and results of the management guidelines, to identify how much they were in line with the situation. The community carrying capacity also established responsibilities about environmental impacts through continual environmental monitoring.

**5.4.2 Community members and the youth** – Their changes occurred in their opinions about the tourism group and the participants. Young people were often involved in the operations, training, or activities of organizations that supported the community. This demonstrated the provision of opportunities for the youth to play a more active role in working with the tourism group.

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**5.4.3 Tourism group** – The tourism group accepted members' ideas and it allowed members to share ideas about serving tourists. Originally, the major role in decision-making belonged to the group president. Later, the group adopted a process of consultation between the committee board members and the group members, with an increased level of participation. They relied on the decisions of the president or the group leaders in some cases. More importantly, the community provided for the election of the new president of the tourism group with an attempt to reduce the conflict between the two generations of leaders. A second-generation leader became the new group president, and the first-generation leaders become the group advisors. This change tightened the relationship within the community and the tourism group.

## 5.5 Transition of the researcher's knowledge through participatory action

The researcher was considered to be a supporter and manager of learning for the community. In the meantime, the researcher learned a wide range of issues through this study, which is described below.

**5.5.1 Mutual trust** – This was a key factor in encouraging community members to express their opinions straightforwardly, ask questions, and express their disagreement during the process. It also boosted the awareness of common ownership of the work – they were ready to accept both good and bad impacts in the form of a good friendship in the academic world and the real world.

**5.5.2 Trust and respect** – The researcher had to believe that the community would conduct operations successfully, without judging that the operations were unreasonable or unsystematic. At the same time, the researcher needed to respect community members' opinions, beliefs, and practices, especially when there were irrelevant subjects raised during discussion, any unexpected situations, or errors. The researcher was responsible for fostering their intelligence, helping to identify solutions, and respecting their limitations in terms of workload and personal life,

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which might result in delayed work. The researcher did not use coercive measures or aim for the researcher's success.

**5.5.3 All people in the process were important** – Whether the minority or majority, with high or low potential, they had to be treated equally and kindly. All opinions were treated as being useful and important for collaboration.

**5.5.4 Flexibility –** It was vital to the flow of the process. Many times, too strict adherence to academic concepts affected procedural movement, natural learning, and innovation. This flexibility was flexibility in line with the nature of the community's learning.

**5.5.5 Adhering to the core of research** – The researcher had to develop questions, analytical thinking, synthesis, and systematic data collection. Any levels of data had to lead the community to scrutiny. The research had to be research for development, and the development had to create knowledge.

**5.5.6 Shared learning, not teaching** – The researcher had to change the role from teaching or controlling to creating learning, whereby the whole community learned from the researcher and the researcher learned from the community.

**5.5.7 Interpretation of phenomenon had to be comprehensively conducted** – This aimed to decrease the researcher's bias or expectation. The researcher had to carefully study phenomena hidden in speeches, actions and gestures expressed by the community to open the viewpoint beyond the research framework. This aimed to identify other phenomena that could affect the community's learning.

**5.5.8 Out of the framework** – The researcher had to step out of the academic research framework. The researcher had to focus on the gist of the research to train in the cognitive process and processes and on the benefits from work to move learning process forward.

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**5.5.9 Reduction of expectations and acceptance of actual conditions** – From experiences, once the researcher had an expectation, the researcher tried to manage to make the community follow the researcher's expectation. In fact, planning was possible, but it should not be expected that it would be accepted. The researcher understood the community better. At the same time, this helped to strengthen the community's potential in line with what the community actually consisted of and praised some of its achievements. The researcher had to discover the causes of failures and explain everything that moved in the process.

**5.5.10 Suchness** – Local work should not be considered to be more special than other work, and other kinds of work should not be considered to be more special than local work. Comparing two things in a different context and getting obsessed with localism or communityship should be avoided. Many times, what the community was thinking about was what it was able to carry out or recognized based on its prior experience. This way of thinking would allow the researcher to not to excessively favor processes or have a bias in the process, so that actual pictures from the field would be presented.

**5.5.11 Composed mind to achieve concentration and happiness** – This aimed to prepare for chaos in operations, situations, and diverse ideas of the community and stakeholders. This allowed both the researcher and the community to be happy from learning. The happiness from learning is the power that creates changes in people and equips them with intellectual weapons in line with the goal of participatory action research.

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# CHAPTER VI
# CONCLUSION AND RECOMMENDATIONS

## 6.1 Conclusion

Community-based tourism has environmental, economic, social, and cultural impacts. Allowing the circumstances to continually grow without systematic management over the long run may result in unsustainable tourism development. The carrying capacity principle has been popularly applied to manage environmental impacts of tourism, particularly to control the volume of utilization of resources from tourism activities.

Although the carrying capacity principle was well-suited for addressing environmental impacts, one thing that should be taken into account is the knowledge and understanding of those who will implement or apply this principle. Based on reviewed literature, this principle is mostly implemented by academics outside a community; local community members implement or utilize measures or management guidelines that they have developed. Although this encourages communities to have tangible management guidelines based on the academically-conceptual basis, which is a benefit, one thing that should not be ignored is consideration of implementers or users' knowledge and understanding and consistency with actual area conditions. Environmental situations and tourism are dynamic, and often the details of management guidelines need to be tailored to circumstances. If communities fail to operate on their own or lack understanding about the carrying capacity principle, they need to rely on external academics, who may fail to keep pace with changes or create learning about issues for the communities.

To enable communities to assess carrying capacity on themselves, one on key factor is creating learning, especially about systematic information processing for communities so that they understand the principle and can design the guidelines for assessing, selecting, searching, and identifying information that is of interest to them and necessary for assessment, as well as utilizing assessment results for the

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formulation of management guidelines to address environmental problems. Thus, the author was interested in studying “the learning of a tourism community in information processing through environmental carrying capacity appraisal,” which mainly aimed to innovate an instructional model of information processing for environmental decision by tourism communities, to evaluate the effectiveness of community learning through the learning output, and to analyze the factors that influence the learning success. This study was based on the belief that if the community learns about information processing to create an understanding about the carrying capacity principle in a systematic fashion and systematic information management through joint-operations, this will enable it to assess carrying capacity on its own, to formulate effective environmental problem management guidelines that are in line with local circumstances, as well as to upgrade information processing, information management and intrinsic potential to monitor and formulate management guidelines in a logical way. Thus, this will allow it to reduce its dependence on outsiders and to adjust management guidelines in line with the dynamism of the environment and tourism in the long run.

This involved participatory action research that was conducted in Mu 6, Ban Nong Mae Na Nong Mae Na Sub-district, Kao Kho district, Phetchabun province. Proving community-based tourism, the community had freshwater jellyfish and ecological resources as the main resources. Six leaders of the Ban Nong Mae Na Forest Lover Group volunteered to participate in this research. This research was comprised of two major phases: the phase of cooperation establishment and the phase of learning. The second phase consisted of key activities: identifying environmental situations based on new information, formulating guidelines for addressing environmental problems of interest to them, and formulating guidelines for systematically addressing environmental problems.

Two parts of data were collected: (1) Data relating to learning about information processing, which was collected by recording operations, recording of the expression of ideas by the participants, and using observation forms and questionnaires on processing information of the participants during operations, and (2) Data on investigation of the effectiveness of the instructional model, which was

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collected by evaluation forms by qualified experts. The data collection tools were checked in terms of quality by five qualified experts.

All the collected data was tested for credibility before analysis. Data was cross-checked against with other data by means of method triangulation; the data included interviews, charts, evaluation forms from the qualified experts, and field notes. In addition, the data was cross-checked from different sources of data by means of data triangulation; the sources included village leaders, community savants, tourism group members, community members, and facilitators in respective activities. Furthermore, the study involved making inquiries and presenting data to tourism group members and other community members – these helped with reviewing the data. The validated data was then analyzed. The analysis of data on the instructional model and factors influencing the success of the instructional model utilized the authenticating conclusion technique, while the analysis of data on the learning effectiveness of the instructional model relied on descriptive statistics.

The research revealed that the participants' operations could be used for synthesizing the L-Informed ED model, which consisted of seven steps – synergizing cooperation to treat collective environmental problems, collating environmental situations based on existing experiences and beliefs, assessing the actual environmental situations with newly acquired information, planning management guidelines for selected environmental problems, appraising the environmental carrying capacity for holistic environmental management planning, putting the plan on a trial use, as well as adopting the plan and its adaptations according to the changing situations as a collective rule.

The instructional model was based on the belief that the provision of the opportunity for adult learners to practice processing information to address environmental issues step-by-step, from the basic level to the level of management of systematic problems, will help them to develop an understanding about receiving, selecting, and processing information in a systematic fashion. In addition, this will enhance their knowledge about the environment and patterns for addressing environmental issues in their long-term memory, which expands the scope of metacognition to become more comprehensive, profound, and complex. The goal of learning management is to result in the learners having the process of making

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environmental decisions using dynamic experiential information to address environmental issues – shifting from using feelings or beliefs based on their experiences to searching for information and tangible evidence; systematically monitoring environmental changes; and expanding cooperation in environmental management to relevant sectors and parties within the community.

To achieve the goal of learning, learning managers have to attach great importance to building cooperation among learners and between them and learners. This is an important starting point to build motivation for learning. Initially, they should encourage learners to use information based on their experiences and gradually shift to empirical evidence that learners can justify selecting, receiving, and searching for on their own. Learning managers need to provide the opportunity for learners to practice and conduct elaboration rehearsals for environmental issues of interest to them and support the expansion of operations to achieve holistic environmental problem management. This aims to result in learners developing their information management skills, expanding their metacognition level, and gradually accumulating knowledge. Furthermore, learning managers need to encourage learners to pay attention to expanding the scope of new knowledge required for operations, to use information that learners are able to understand and manage on their own, and to appreciate the value of information that is practical to address problems during operations, which will bring success to learning management. One major note of caution about learning management is that learning managers should not apply a coercive measure or force ideas on learners despite being necessary for addressing problems if learners are not ready or do not realize the importance of the knowledge. Instead, learning managers should build learners' interest and allow them to express their need to learn. They need to apply principles or methods under the principles in accordance with local knowledge and learners' understanding. Learners' lack interest in substantive matters will deprive them of effective learning and the opportunity to learn as a result of encoded negative experiences in learning. The failure to link academic knowledge to locality of learners cannot support learners in operating with an understanding and in relying on themselves.

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In this research, after the research participants were exposed to the instructional model, changes occurred in terms of their knowledge and understanding

about environmental carrying capacity. Concerning declarative knowledge, before they participated in the learning management, their knowledge and understanding about carrying capacity were related to “defining the number of tourists as the number of people per activity.” Some misunderstood the principle. For example, some viewed that if they knew carrying capacity, it meant they learned about the limit of tourism so as to expand the carrying capacity. The participants limited the number of tourists for each activity at 50 people/group/time; however, they could not justify fixing the number with clear supporting reasons. After undergoing learning management, they could give their own definition for the term ‘carrying capacity,’ in line with area conditions and situations. They shifted their perspective to mitigating environmental issues arising from tourism and identifying carrying capacity that integrated a variety of information, i.e. numbers, opinions, and measures for limiting environmental impacts of tourism that were adjustable to local information. Although environmental carrying capacity that the participants operated involved a variety of information and they could not specify their operations clearly, the operations encouraged them to have guidelines or management measures that were suitable for their locality and that they could justify formulating.

As for procedural knowledge, after they conducted operations on their own, they understood the process of assessing environmental carrying capacity. This was witnessed through their design, collection and processing of information, identification of alternatives for management, as well as trial uses and adjustments in line with actual conditions. In addition, they could arrange key steps of carrying capacity assessment and apply them in the future. As for factor knowledge, the participants could summarize key issues that affected their assessment. The issues consisted of workload, which affected their attention to the assessment or details of the assessment results; situations of the group – for collaboration, a lack of preparedness would create a slim chance for success; continuity and key people in charge; completeness and difficulty of indicators, which involved expertise and experience from elaboration rehearsals; transfer of knowledge to later generations of people – if the knowledge was not transferred, it would not be used for management; and burden of regular monitoring – if there were new management guidelines that were less

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complex, but practical and satisfactorily effective for them, they were ready to adopt them.

As for information collection and management, they shifted from using feelings or experiences to using information that could show evidence and clearer methods by accessing information by means of counting, trials, and inquiries. Management of information by using diverse methods helped to result in carrying capacity assessment being more detailed and practical and in line with area conditions and situations, as a result of their gained skills in summarization, organization, classification, linkage, analysis, and synthesis of information and what they saw clearly from operations

In addition, the participants conducted planning before starting to implement any activities, which encouraged systematic thinking and searching for procedural knowledge before beginning operations. As for classification and creation of the path of linking information using charts, they employed the methods throughout the operational process, which helped them to identify reasons and provide better descriptions as they had seen pictures they had formed and summaries they had prepared together. The expansion of knowledge from practices and elaboration rehearsals was a key learning method for the participants. They mainly learned through practices, and elaboration rehearsals assisted them in remembering and understanding information better. It was evident that they spent shorter time for similar work or they conducted elaboration rehearsals so that they could explain information of interest to them in a logical way. However, concerning elaboration rehearsals, difficulty of work needed to be taken into account. This was because for some work, elaboration rehearsals did not support understanding about new information, as there were components that had to be understood first, such as editing the community documentary.

As for the appreciation of the value of the environment, this encouraged the participants to understand the relationship between environmental factors or environmental components, to have management guidelines that that were in line with area conditions, and to provide more-sensible reasons for their actions. Based on the fact that environmental or environmental carrying capacity issues involved many groups of people and in practice, this could not be addressed by a particular individual,

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and the expansion of participation reduced the participants' burden of maintaining resources in the community. This was witnessed by involving the youth to work with the group and by allowing tourism group members to express their opinions.

As for management, the participants had developed management guidelines based on the results of carrying capacity appraisal, which consisted of 13 key indicators relating to natural resources, the environment, management, and physical conditions and facilities. They put these into practice. They rejected tourists that exceeded the carrying capacity.

From the operations, the participants and tourism group members changed their pattern of receiving tourists. That is, the decision-making about this matter shifted from the group president to the group leaders and involved group members' opinions based on conditions defined in the management guidelines. In addition, the solid waste management method changed, from burning to removal out of the tourism areas. The president of the tourism group was changed to a second-generation group leader. New board members were elected, who focused more on participation. The youth was provided with the opportunity to work with the group, and group members were allowed to participate in decision-making, which began with expressing opinions about all issues related to tourism management.

The tourism group used the community documentary to promote tourism for the community. At the same time, the group conducted monitoring of impacts from and on tourism, which involved group meetings to discuss these issues during the tourism seasons. Based on monitoring, the conflict between the community and the tourism group diminished and their overall relationship changed into a better direction.

Concerning their learning effectiveness in terms of knowledge and understanding, according to the qualified experts, the participants' overall knowledge and understanding was at a high level. Although their assessment process and methods, criteria, and impact control measures were not perfect, this was a starting point of creating a good protection system, e.g. rotation of activities to reduce congestion, time spacing for receiving tourists, or refusal to receive tourists. This would help reduce the impacts of tourism to a certain extent. The participants' overall appreciation for the value of the environment was at the highest level. The experts viewed that the participants' operations and environmental problem management

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guidelines consisted of monitoring environmental changes. This manifested the value of the environment and likelihood of actual implementation, as witnessed from their participation in the formulation process and defining of key people in charge. With regard to the application of the carrying capacity concept, overall, they applied this concept at a high level. Most of the qualified experts regarded that the problem management guidelines they jointly prepared were well-suited for the community characteristics, could be extended or applied by communities with similar conditions, could be further developed if strong leaders were involved, and were practical at the area level.

The first group of factors that influenced the learning success was learning environmental factors, which contributed to the continuity of this learning management. They were composed of the participants' recognition of the benefits of the research activities, in terms of enhanced mutual understanding, external network of support, and environmental problem solving; the learning interactions among the participants, in terms of sharing and learning within the group, job division, and transfer of knowledge; the continued enthusiastic characteristic of the participants, in terms of attention to environmental issues, problems and daily burden, prior experiences of the participants; and the learning supporting roles of the researcher, in terms of the frequency of meetings and trust.

The second group of factors was the information processing learning structural factors, which encouraged the generation of outlines or characteristics of learning management. They were comprised of information processing factors, which involved an evaluation on the situational problem, attention to new information, selection of information, thinking, deciding, and action. They were related to attention to new information, elaboration rehearsals, analysis, synthesis, ability to provide definitions, appreciation of the value of information, systematic learning, use of substitute information, understanding about information, access to information, selection of information to assess factors, and the subsequent metacognition that relate to declarative knowledge, procedural and conditional knowledge.

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## 6.2 Recommendations from the study

Recommendations are presented in two parts: recommendations for further study and recommendations for applying the study results for the use by agencies and communities.

### 6.2.1 Recommendations for further study

(1) Monitoring the individuals' learning development was not clear enough, because their operations were mostly joint operations as the whole group and there was job division in operations. That is, assessment-related workload was assigned to the participants according to their characteristics or capabilities. The development of learning through information processing on an individual basis should be studied in order to identify similarities and differences of information processing and to identify how the influence of the group is related to individuals' information processing.

(2) There should be study on scaffolding characteristics that do not conflict with guidelines for participatory action research (PAR), in terms of patterns and methods for learning enhancement, as well as characteristics of learning managers as scaffolds. This is because in this environmental carrying capacity assessment, there are some indicators that the community should include; for example, psychological indicators, and there should be more ecological factors that can identify or directly link environmental impacts of tourism to reveal the characteristics of using information in relation to indicators more clearly. The community should be encouraged to compare different assessment methods, both international and local ones, to allow the participants to clearly identify the advantages and disadvantages of respective methods – they may develop a new method. In addition, there should be encouragement of the use of information, for carrying capacity assessment, that is not limited to local information or information recognized by the participants.

(3) The encoding process should be studied in detail to create a clearer understanding about the community's process of encoding and forgetting information and to support learning management that results in encoding for adult learners.

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(4) Encouraging the participants to learn in line with the learning guidelines under the information processing theory and carrying capacity principle in

all dimensions is difficult. They should be developed in the dimensions that are in line with their potential and interest. In addition, the study of specific topics, e.g. receiving information, information processing, and encoding should be encouraged in order to gather in-depth details and to identify which part of information processing, under the theory, best promotes the community's learning and which method helps the community's learning to be more effective.

(5) There should be support for the study of brain science that can examine the mechanisms for receiving, processing, encoding, and processing speed of information of the community in conjunction with the use of participatory action research in order to integrate scientific and social science data that can promote the understanding about the information processing theory when it is applied to adult learners in a local context.

(6) Participants who are different in terms of experiences in the community, area situations, and community potential should be selected in order to reveal such differences and understand the channels for developing information processing for the community through carrying capacity assessment in diverse situations. This will support study to develop this theory.

**6.2.2 Recommendations for applying study results for agencies and communities**

(1) The results of this research should be extended or presented in a wide circle to allow agencies to understand and accept communities' potential and provide support that is in line with their nature and learning. They should focus on supporting them, rather than forcefully teaching or managing them to comply with a generally-used pattern. In addition, they have to consider encouraging communities to realize the importance of information so that they use information that is logical and explainable to help with decision-making about addressing environmental issues. At the same time, they should encourage communities to process information in a prudent and comprehensive fashion and to reflect on information in a systematic and logical manner.

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(2) The research results should be utilized to motivate tourism communities in other areas to pay attention to learning about information processing to

assess environmental carrying capacity. Communities' interest in this kind of implementation will contribute to their potential development and expanded knowledge about carrying capacity assessment on their own.

(3) The study results should be synthesized to develop a handbook on organizing the said activities or a handbook on community-based tourism management, which relevant agencies can use as guidelines for organizing activities.

(4) Learning managers should not start implementation with a carrying capacity assessment. Instead, they should start with problems of interest to research participants. This is because if research participants do not recognize or understand the carrying capacity principle, they will feel it is difficult and will not pay attention to the implementation. Learning managers should create the linkage of problems of interest to research participants to the assessment so that they can effectively move the assessment process forward.

(5) Interested agencies and communities can apply the pattern of this research, in terms of the process and/or methods, to jointly implement and create cooperation to mobilize carrying capacity assessment to formulate management guidelines, conduct monitoring, and mitigate and resolve environmental impacts of tourism on their own.

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# APPENDIX

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# RESEARCH TOOLS

**1. The form for observing the research participants learning, information processing**

| No. | Information processing method | Characteristics of the method | Cycle in which the method was identified |
|---|---|---|---|
| 1 | Collecting information through senses. | | |
| 2 | Retrieving original information. | | |
| 3 | Linking things with new information. | | |
| 4 | Using information for elaboration. | | |
| 5 | Defining problems, asking questions, or making observations. | | |
| 6 | Establishing assumptions, estimating, and answering based on logic. | | |
| 7 | Formulating guidelines for searching for information. | | |
| 8 | Method of accessing new information | | |
| 9 | Self-regulation to access new information. | | |
| 10 | Explaining key characteristics and elements of information. | | |
| 11 | Analytical thinking and explaining patterns of the relationship of information. | | |

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| No. | Information processing method | Characteristics of the method | Cycle in which the method was identified |
|---|---|---|---|
| 12 | Classifying information. | | |
| 13 | Scrutinizing information. | | |
| 14 | Reflecting on information in different angles. | | |
| 15 | Reflecting on information to establish a clear understanding. | | |
| 16 | Formulating criteria for judging information. | | |
| 17 | Using criteria to evaluate information. | | |
| 18 | Considering the reliability of information. | | |
| 19 | Ranking information. | | |
| 20 | Assessing the value of information. | | |
| 21 | Developing a clear conclusion. | | |
| 22 | Using information to review the conclusion. | | |
| 23 | Using information to explain the causes of phenomena or situations. | | |
| 24 | Using information to compare and contrast phenomena (at least two points each). | | |
| 25 | Synthesizing information to link it to issues or new information. | | |
| 26 | Transferring information. | | |
| 27 | Sharing information. | | |
| 28 | Appling information | | |
| 29 | Using information to define a | | |

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| No. | Information processing method | Characteristics of the method | Cycle in which the method was identified |
|---|---|---|---|
| | variety of alternatives. | | |
| 30 | Using information for decision-making. | | |
| 31 | Using information for systematic planning. | | |
| 32 | Explaining results of, and reasons for, information processing. | | |
| 33 | Referring to information to identify additional reasons to those in existing information. | | |

**2. The semi-structured questionnaire on learning from participation in the project**

| No. | Question guidelines |
|---|---|
| 1 | How did you know which information you needed? |
| 2 | How did you know which method you needed to use for searching for the information? |
| 3 | How did you organize the information you had searched for? Why did you organize it in that way? |
| 4 | When you organized information, did you have any questions or was there anything you did not understand? If yes, what did you do? |
| 5 | Did sharing opinions with your co-workers allow you to understand the information better? |
| 6 | Did you use prior knowledge? Why did you use that information? |
| 7 | Did you use new knowledge? Why did you use that information? |
| 8 | What did you learn from conducting carrying capacity appraisal? Did it meet your expectations? |
| 9 | Were you able to conduct carrying capacity appraisal as you had planned? What were you not able to do? How did you address the issue? |

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| No. | Question guidelines |
|---|---|
| 10 | How did you know that the results of carrying capacity appraisal you had conducted were appropriate? |
| 11 | How did you know that the Plan for Mitigating Environmental Impacts of Tourism was complete and practical? |
| 12 | In the future, if you would like to update the results of carrying capacity appraisal, what will you do? |
| 13 | Is your understanding about the impacts of tourism before and after the project different? If yes, how? |
| 14 | Is your understanding about carrying capacity before and after the project different? If yes, how? |
| 15 | How much are you satisfied with the Plan for Mitigating Environmental Impacts of Tourism? How? |

**3. The form for evaluating the instructional model's effectiveness**

| No. | Issues | Opinion levels | | | | Remarks |
|---|---|---|---|---|---|---|
| | | Highest | High | Low | Lowest | |
| 1. | How well did the Plan for Mitigating Environmental Impacts of Tourism reflect knowledge and understanding about the matters? | | | | | |
| 1.1 | Environmental impacts of tourism | | | | | |
| 1.2 | Environmental carrying capacity | | | | | |
| 1.3 | Process and method of environmental carrying capacity appraisal | | | | | |
| 1.4 | Linkage between environmental impacts of tourism and environmental carrying capacity appraisal | | | | | |
| 1.5 | Conditions and limitations of application of environmental carrying capacity | | | | | |
| 2. | How well did the Plan for Mitigating Environmental Impacts of Tourism reflect the appreciation for the value of the environment about the matters? | | | | | |
| 2.1 | Attention to the environment | | | | | |

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| No. | Issues | Opinion levels | | | | Remarks |
|---|---|---|---|---|---|---|
| | | Highest | High | Low | Lowest | |
| 2.2 | Attention to the relationship between environmental problem management and tourism development | | | | | |
| 2.3 | Monitoring of changes that will affect the environment | | | | | |
| 3. | How well did the Plan for Mitigating Environmental Impacts of Tourism reflect the applicability of the concept of carrying capacity for tourism? | | | | | |
| 3.1 | Application of the carry capacity concept in line with the community context. | | | | | |
| 3.2 | Having practical guidelines for ensuring the environmental carrying capacity will not be exceeded. | | | | | |
| 3.3 | Creation of obligations to practice. | | | | | |
| 3.4 | Systematic establishment of goals and responsibilities. | | | | | |
| 3.5 | Opportunity to receive support from organizations outside the community. | | | | | |
| 3.6 | Opportunity to review performance and solve problems by practice. | | | | | |
| 3.7 | Reflection of learning to develop alternatives and decision-making using information. | | | | | |
| 3.8 | Having appropriate guidelines for management of environmental management. | | | | | |

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Comments and suggestions

- Based on the assessment of carrying capacity for tourism and formulation of the Plan for Mitigating Environmental Impacts of Tourism, do you think the research participants **have practiced scrutinizing information and systematic thinking**? Please provide an explanation and comment.

……
……

- Based on the assessment of carrying capacity for tourism and formulation of the Plan for Mitigating Environmental Impacts of Tourism, do you think the research participants **have attached great importance to the use of information**? Please provide an explanation and comment.

……
……

- Based on the assessment of carrying capacity for tourism and formulation of the Plan for Mitigating Environmental Impacts of Tourism, do you think the research participants **have recognized and attached great importance to impacts of tourism on the environment and community**? Please provide an explanation and comment.

……
……
……
……

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- Do you think the assessment of carrying capacity for tourism and formulation of the Plan for Mitigating Environmental Impacts of Tourism are appropriate? Do you have any additional suggestions for further improvements?

……

……

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# BIOGRAPHY

| | |
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