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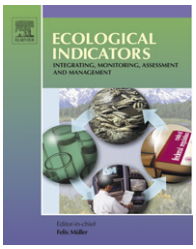

# The development of appropriate ecological criteria and indicators for community forest conservation using participatory methods: A case study in northeastern Thailand

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ABSTRACT

The paper reports the development and evaluation of relevant local ecological criteria and indicators for participatory resource management of community forest. The study site, the Nong Meg-Nong Hee community forest, Maha Sarakham Province, is in northeastern Thailand. Multi-criteria decision-making (MCDM) was adopted as a decision-making tool to evaluate criteria and indicators, using coarse and fine screening, based on local community participation. The criteria and indicators set consisted of 3 principles, 7 criteria, and 41 indicators covering the main attributes of forest ecosystem conservation. Relevant data were processed in a hierarchical framework and used as a template for further assessment, i.e., Principle 1 (forest ecosystem structure and composition), Principle 2 (forest ecosystem function), and Principle 3 (disturbance signs). The two selection phases comprised (1) the coarse screening based on scoring and ranking, and (2) fine screening, using a pair-wise comparison analysis to classify the order of relative weights of the indicators (importance value) and the consistency index (CI) of each criterion. As a result of coarse screening one criterion and 16 indicators were eliminated from the analysis, while the remaining 3 principles, 6 criteria, and 25 indicators were retained for fine screening. Most criteria showed an acceptance value of less than 10% (tolerance consistency index threshold level). The final set of criteria and indicators, based on locally understandable ecological concepts of forest conservation, was ranked in order of importance under each criterion and applied to the study area. We conclude that these techniques are appropriate for selecting criteria and indicators, as they are relatively transparent, understandable and offer an input to participatory decision-making.

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## 1. Introduction

The management of public and private forests is normally challenged by the finite and limited resources and tools available to policy makers, managers and stakeholders endeavoring to implement the principles of sustainable resource management (Brand, 1997; Castañeda, 2000; Andreasen et al., 2001; Dale and Beyeler, 2001; Slosser, 2001; Müller

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and Lenz, 2006; Turnhout et al., 2007). Community forests, defined as a forest area designated and managed by the local community for the sustainable use of resources, confront similar problems. Particularly threatened is subsistence resource exploitation under local cultural and traditional community rules where non-timber forest products constitute an integral part of daily local life. These products may include food, medicinal plants, building materials, fodder, tools, firewood, complementary income, recreation and sites for ancestor worship (Chammarig et al., 1993).

In theory, the concept of sustainable ecosystem forest management could be defined as the integration of scientific knowledge of ecological relationships within a complex socio-political and economic framework, thereby contributing towards the overall objective of protecting long-term ecosystem integrity (Grumbine, 1994; Slocombe, 1998). The criteria and indicators (C&I) approach is currently at the forefront of mechanisms being proposed for sustainable forest management strategies (Prabhu et al., 1996; Brand, 1997), and this approach requires the balancing of a multiplicity of interacting ecological, economical and social values.

To date over 50 different C&I standards have been made available worldwide with more in the process of development (Canadian Wood Council, 2006). These include:

- Montreal protocol (Canadian Council of Forest Minister: CCFM).
- Helsinki processes (Pan-European forest).
- Santiago declaration (non-European nations).
- International Tropical Timber Organization (ITTO).
- FSC principles and criteria for forest stewardship (Forest Stewardship Council: FSC) partially adopted by Royal Thai Forest Department for timber production of Forest Industry Organization.
- Criteria and indicators for sustainable forest management (Center for International Forestry Research: CIFOR).

Naturally, these standards are often aimed at different objectives (e.g., commercial plantations, mixed private forests) and diverse management levels, i.e., international, national, and forest unit level. However, as mentioned previously, community forests often supply goods which are essential for the daily needs of local community life, and even though this type of exploitation is supporting the livelihoods of poor people it is still pertinent to ask: How sustainable and environmentally responsible is this utilization?

There are no clear and simple answers to these questions, as is amply demonstrated by the animated controversy surrounding the proposed 'Community Forestry Bill' in the Thai parliament and society as a whole (Fuller, 1998). Unfortunately, over decades the level of communication and trust between various Thai government agencies and concerned local stakeholders has deteriorated. Most local communities ardently desire full rights to manage and utilize their local forest resources but often government officials and academics lack confidence in the ability of villagers to implement a sustainable resource management approach.

There would seem to be potential to use C&I approaches in such situations, however almost all of the C&I reported in the literature are primarily developed for guiding and facilitating certification of forest management practices (Elliot, 2000) by international organizations (e.g., CIFOR, 1999; CCFM, 2003; FSC, 2004; ITTO, 2005). While several C&I have undergone trials in the tropics (e.g., Burgess et al., 1995; Prabhu et al., 1999) there are few publications on C&I being used at a forest unit level, and for northeastern Thailand, community forest C&I are indeed very rare. There have been attempts by the Regional Community Forestry Training Centre (RECORFT) to design simple guidelines for participatory monitoring relevant to the conditions and changes of community forest resources in Thailand (Fuller, 1998). However, due to the necessity of reconciling both local and scientific values and perspectives, the development of a viable C&I could be viewed as an apparently irreconcilable task (Turnhout et al., 2007). As Fuller (1998), after years working in SE Asia pertinently asks 'For whom and what are the C&I really being developed?'.

In this paper we seek to develop appropriate ecological criteria and indicators that could be used to achieve sustainable community forest management by interested local community forest organization. In order to achieve this within the Thai situation it was necessary to combine, a hybridization of 'hard science' (a more Western oriented rationale) that develops an understanding of the structure and function of ecosystems, and 'soft science' incorporating meaningful community participation. It is to be emphasized that the principal objective of this study is the design and development of indicators that can be understood and readily applied by the community forest committee (participants) in the long term, without frequent intervention from external government or academic experts.

## 2. Methods

Among the three fundamental characteristics of C&I, the social, economical and ecological, it is noteworthy that the ecological indicators are scientifically based (Dale and Beyeler, 2001; Müller and Lenz, 2006; Patrício et al., 2006). However, previous works on ecological indicators (e.g., Adams, 2002; Hughes et al., 2004; Cottingham and Carpenter, 1998), suggest that the design and development of ecological indicators should include initial 'brainstorming' sessions with active local participation. These should cover a broad range of available and potential sources of ecologically based knowledge, both scientifically based and locally sourced, acquired observations and folk 'wisdom'. The various parameters should then be aggregated into an ecological indicator which displays the relevant information. This methodological approach was adopted here.

### 2.1. *Site description*

The study focused on Nong Meg-Nong Hee community forest in Suea Tao Village. This forest is located in Chiang Yun District, Maha Sarakham Province, northeastern Thailand (Fig. 1). It is public land, classified as a broad-leaf dry dipterocarp forest and covers 187 ha. The average annual precipitation was 1009 mm, the average humidity 74.8% and the average temperature 27.2 °C. The soils are predominantly acidic sandy loam. Traditional agricultural practices are rice

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