Ecological Impact Assessment;
the conformance of guidelines and environmental impact statements

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Abstract. *This study aims to analyze environmental impact assessment (EIA) by reviewing formal guidelines and environmental impact statements (EISs) as the products generated by them. Eight project specific guidelines and the ecological content of twenty three project EISs were analyzed applying review criteria. Relationships between guidelines and EISs were evaluated. The results indicated that both aquatic and terrestrial ecological content flow from baseline field data to impact assessment did not differ significantly. Consequently, the interpretation of potential impacts had an insignificant effect on mitigation and monitoring identification. The sequence of content quality from the highest to the lowest was as follows; 'monitoring', 'mitigation', 'impact assessment' and 'baseline data', however, their relationships were opposite. Those indicate a need to develop ecological content, with appropriate treatment between environmental impact assessment and ecological approaches.*

Keywords: Environmental Impact Statements, Ecological Impact Assessment, guidelines, Thailand

Introduction

In 1975, Thailand approved and passed the Improvement and Conservation of National Environmental Quality Act (NEQA). NEQA has been amended since its implementation, most notably in 1978 and 1992. The Act provided a legislative basis for informed environmental policy and planning. When NEQA was amended in 1978, it defined the specific types and sizes of projects and activities that required EIAs. However, the policy amendment did not go into practice until 1981. As one component of the Act, Environmental Impact Assessment (EIA) was included (as recognized in the National Environmental Quality Act (NEQA)). NEQA has been amended since its implementation, most notably in 1978 and 1992. The Act provided a legislative basis for informed environmental policy and planning. When NEQA was amended in 1978, it defined the specific types and sizes of projects and activities that required EIAs. However, the policy amendment did not go into practice until 1981. The most recent amendment to NEQA was in 1992. The Office of Natural Resource and Environmental Policy and Planning (ONEP) is charged with the responsibility for developing and managing EIA procedures in Thailand under the Environmental Impact Evaluation process. In order to assist proponents whose projects required EIA, ONEP published and distributed a manual of ONEP guidelines for the preparation of Environmental Impact Assessments. All EISs submitted to the ONEP must follow the guideline. The guidelines provide the basic brief, not only for EIA preparation but also for the review of EISs submitted for ONEP. Furthermore, guidelines often include advice on how to develop the Terms of Reference (TOR) for EIA study to support preparation

of EIA reports. These are most useful in the early stages of an EIA when TOR for projects is not yet available. Consequently, guidelines and EISs should be closely integrated since guidelines are the initial reference for EIA preparation.

Ecological Contents in EISs

Ecological data have been long recognized as vital in the preparation of EISs (Rosa and Sanchez, 2015; Termorshuzen et al., 2006; Wegner et al., 2005; Treweek, 1999; Wathern, 1999; Linehan and Gross, 1998). However, a review of EISs submitted to the ADB revealed that ecological impact assessment was one main weakness in EISs (ADB, 2000). Ecological studies as a primary component of EIA can and should support project development in accordance with sustainable approaches (Briggs and Hudson, 2013; Kotwal et al., 2008; Mortberg et al., 2007; Fuller, 2007; Wathern, 1999; Sadler, 1999), although the traditional view of ecology is one of an empirical nature (Potschin and Haines-Young, 2006). However, many factors affect the ecological studies designed for EIAs. Those bring to the aim of our study. That is to investigate the quality of ecological impact assessment in the stages of EIA study which starts with ecological contents adopted in the guidelines whether are sufficient for an EIA study through the association with ecological contents presented in the EISs. The correlation of the ecological specification between them point out the rule of the guidelines whether they give adequate direction for an EIA study. Elucidating this relationship can illustrate the strengths and weaknesses of ecological studies that dictate the plan developed for project initiation through to completion. Total of twenty-three projects and guidelines appropriate to each group of project EISs as shown in Table 1 were characterized, according to their particular nature and significance, to investigate the ecological content in the EIS against correspondence with ONEP established guidelines.

Table 1 Details of EIS project types and guidelines

Groups	Specific sectoral guidelines	EIS project types	EISs
I	Airport project guideline	Airport project	7
	Power plant project guideline	Power Plant project	
II	Real estate project guideline	Real estate project	12
	Hotel project guideline	Hotel and apartment project	
	Hospital project guideline	Hospital project	
III	Mass transit systems and expressway project guideline	Mass transit systems and expressway project	4
	Gas & oil project guideline	Gas and oil pipelines project	

Ecological contents which comprehend minimum content needed for ecological impact assessment for both guidelines and EISs were examined. The extent to which the guidelines and EISs met the criteria was assessed subjectively on a zero to five point scales (0-5); where 5 indicated the guideline clearly met the criteria and was of the highest standards; a score of 1 indicated that the

treatment was inadequate; and a score of 0 indicated that the EIA stage was absent in the case reviewed. The level identified depend on whether the information relevant for the specific purpose. The quality scores in each aspect of review categories of guidelines and EISs in each group were, then, averaged. The relationships between the guidelines and EISs in meeting the review criteria were ascertained by statistical correlation. This is necessary to measure the association of scores quality.

Results and Discussion

Flow of ecological content in EISs

Table 2 shows the appearance of terrestrial and aquatic ecologies within different stages of the EIA. Percentage calculation from total EISs was indicated. It was found the declining in aggregate frequency along the sequence of steps. Generally, the generation and interpretation of ecological data and subsequent impact assessment did not differ significantly. This result is likely due to the fact that the EIA guidelines clearly indicated how the different components of the assessment should be dealt with at both stages of the EIA preparation. The results evaluated the completeness of ecological types transferred to the stage of impact assessment from ecological baseline. For negative impact occurrences, nearly all frequencies were less than half of the appearance in baseline stage, excluding the aquatic ecology of group II projects. When negative environmental impacts were detected, all were present at negligible level. The results of ecological impact assessment did not exhibit significant effects on mitigation and monitoring programs. The frequency of negative impact inclusion in impact assessment did not closely relate to mitigation. Mitigation and monitoring were proposed exclusive of the results of impact studies. In this study, aquatic ecology and subsequent mitigation and monitoring regimes of group I were the most important ecological concerns included in the EISs.

Table 2 Flow of ecological content; unit: percentage(number)

EIS structures	Projects I		Projects II		Projects III	
	Terrestrial ecology	Aquatic ecology	Terrestrial ecology	Aquatic ecology	Terrestrial ecology	Aquatic ecology
Baseline data	71.43 (5)	100 (7)	100 (12)	83.33 (10)	100 (4)	100 (4)
Impact assessment	71.43 (5)	100 (7)	100 (12)	91.67 (11)	100 (4)	100 (4)
Negative impact	42.86 (3)	57.14 (4)	33.33(4)	66.67 (8)	25.00 (1)	75.00 (3)
Mitigation	14.29 (1)	71.43(5)	25.00(3)	66.67 (8)	25.00 (1)	25.00(1)
Monitoring	14.29 (1)	57.14 (4)	0	16.67 (2)	25.00 (1)	0

Ecological level consideration

In this part, we identified the ecological levels that provided in baseline EIA data and impact assessment. Our results determined that the guidelines did provide general criteria for baseline investigations, but did not establish protocols for different levels of the ecosystem (Table 3). Although

the guidelines did not identify any specific elements of the ecosystem to analyze, an EIS should provide adequate details to address ecosystem health at the onset of the study and over time. The results found that the EISs provided little detail in regards to the different ecologies representative of the project areas. Ecological data included in the EISs were derived from the baseline data, but these data were not included in part of impact identification and evaluation. For example, baseline data addressed species, populations, and habitat ecology, but impacts were assessed by moving points to community and ecosystem. Study at the bioregional level was least represented and completely absent in the ecological impact assessment. Compared with baseline data, decreased ecological specificity was present.

In general, the guidelines delimited the levels of the ecosystem that should be addressed, and the EIS did not adequately follow these guidelines for almost all project groups in both baseline study and impact assessment. However, the best output was only at a general level. Furthermore, the amount of attention paid to ecosystem level study was greater in the baseline data than the impact assessment. Therefore, questions regarding whether ecological data could be further used as beneficial tools for impact assessment were raised. General approach indicated in the guidelines did not provide clear direction for assessors. The guidelines, themselves, should focus on more effective approach for each stage of ecological impact assessment, particularly biodiversity studies.

Table 3 Ecological levels treated in baseline content and impact assessment; unit : scores

Ecological levels	Baseline content						Impact assessment					
	Guidelines			EISs			Guidelines			EISs		
	I	II	III	I	II	III	I	II	III	I	II	III
Bioregional	2.00	2.00	2.50	1.18	1.09	1.44	1.67	2.00	2.00	0	0	0
Ecosystem	2.33	2.00	2.50	1.65	0.98	1.59	2.00	2.00	2.00	1.08	0.99	1.38
Habitat	2.33	1.00	2.50	1.88	1.41	2.03	2.33	1.00	2.50	0.90	1.10	1.36
Community	2.33	2.00	2.50	1.91	1.09	1.73	1.67	2.00	2.00	1.09	0.97	1.00
Species population	2.00	3.00	2.50	2.33	1.05	1.82	1.67	2.00	2.00	1.01	0.48	1.22

Note: Level 1 to 5 determined as deficiency (1), inadequacy (2), satisfaction (3), adequacy (4),completeness (5)

Overall quality of ecological impact assessment

Results in Table 4 indicated that the quality means for ecological impact assessment observed in the guidelines and EISs was greater whereas their relationships were lesser at the later stages of the EIA studies. Compared with the ecological level treatments, more concise details of ecological scales were shown in baseline stages. However, these did not confirm the overall quality of EIAs. Furthermore, the results showed incongruence in ecological content. The lack of adequate ecological study could be improved by the integration of ecological approaches in EIAs.

The scores for ecological impact assessment according to the review criteria for existing data were lower than in part of impact identification and evaluation, excluding group I EISs. These

differences were markedly noticeable in the guidelines but insignificant in the EISs. The EIA concept outlined in the guidelines includes the basis for implementing a quality EISs. However, these did not concur with the ecological perspectives supported by them. The content inconsistencies from the baseline studies to the impact assessment were following. First, an ecological assessment may not consider the results of an ecological baseline study. Traditional assessment by descriptive methods was responsible for the poor transfer of information. This was particularly problematic in EISs. Secondly, the overall biological concept of an ecosystem, particularly in regards to biodiversity, was overlooked by the EIA field studies, due to unclear instruction in the guidelines or by the assessors themselves. This lack of understanding, misinterpretation and inadequate guidance directly affected the quality of the ecological baseline studies and impact assessment as a whole.

The results of ecological impact assessment, however, had little effect on mitigation and monitoring programs. It should be noted that ecological impact projections tended to present a biased view in that few impacts were regarded as potentially significant. As a consequence, the results of impact assessment were a minor consideration in defining mitigation programs. These observations reflected inadequacies in the EISs, but it cannot be denied that EISs do provide valuable information in defining monitoring requirements. Average quality scores confirmed the need for ecological improvement in the EIA studies. Improved content quality at the first stage of assessment and the ecological relationships treated in the following stages were primary concerns for the overall quality of results.

Table 4 Average quality level of ecological impact assessment; unit : scores

Stages of EIA	Average level of consideration in guidelines				Average level of consideration in EISs			
	I	II	III	Average	I	II	III	Average
Ecological baseline	1.95	1.56	2.19	1.90	1.93	1.13	1.92	1.66
Ecological assessment	2.34	2.48	2.56	2.46	1.53	1.64	1.96	1.71
Ecological mitigation	2.63	3.33	2.33	2.76	2.68	2.08	3.70	2.82
Ecological monitoring	2.73	3.00	2.38	2.70	3.34	3.01	2.43	2.93

Conclusions

The evidence presented here also provides insight into aspects of environmental research that have been overlooked, particularly ecological issues and the importance and relationships between guidelines and EISs. In this way, potential environmental problems can be circumvented and ecosystems made sustainable. The results of this study clearly demonstrate the need to evaluate the current guidelines for EIAs and EISs. Enhancement of applied approaches and subsequent recommendations can not only apply to development projects that have the potential to cause environmental alterations, but also have relevance to country and regional environmental policy,

natural resource acquisition and sustainability, and provide a holistic approach to environmental management and protection.

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