Ecological Awareness in Environmental Assessment; The Case of Thailand

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Abstract. Environmental Impact Assessment (EIA) is one of important mechanism to develop projects in line of sustainability. This study explored how content of Environmental Impact Statements (EISs) as the outcome of EIA could support project sustainability through the awareness of ecological content. Fifty-nine EISs were investigated. Major findings were that more than 80% of eco-content were in baseline study whereas those data were not used for impact assessment. The losses of ecosystem were mostly proposed for biodiversity level, with descriptive approaches without identification of quantitative losses. Consequently, the measures to control the impacts from projects were far from ecosystem services resulting from project development. To better incorporate biodiversity-based objectives in environmental impact assessments; connections between eco-content and different stages of an EIA are strongly recommended.

Keywords: Ecological assessment, Content analysis, Environmental impact assessment, Thailand.

1. Introduction

In Thailand, Environmental Impact Assessment have been used as project control mechanism since 1978 following National Environmental Quality Act (NEQA). In 1981, EIA has been effective. The transformation has been done from time to time. It was in 1992 that the NEQA was amended [1]. Recently, in 2018, the 2nd NEQA has been amended and announced in the Royal Gazette in which EIA section is focused. The role of Strategic Environmental Assessment (SEA) is firstly established in this Royal Gazette in terms of the EIA projects are required to consider the results of SEA in case they are located at the areas where SEA ever studied.

Ecological data have been long recognized as vital in the preparation of EISs [2]. Ecological studies as a primary component of EIA can and should support project development in accordance with sustainable approaches [2-6], although the traditional view of ecology is one of an empirical nature [7]. According to [3], nearly half of the criteria and indicators of sustainability pertain to ecological dimensions, whereas the remaining is tied to economic and social aspects. [4] insisted that the consideration of ecological impact for the maintenance of biodiversity to new infrastructure projects was crucial to achieve sustainable aims.

The importance of establishing the ecological effects to an area in the initial stages of project development is a viable avenue of research. Inaccurate ecological study at the project level, in particular, the questions how much ecological details should be fixed into the other environmental components, may create consequent problem at the macro level. Therefore, the integrated approaches for ecological aspects in EIA are essential. This study aimed to evaluate ecological content in Environmental Impact Statements (EISs) as the outcome of EIA whether they support adequate data for ecological losses and gains from proposed projects.

2. Material and Methods

Fifty-nine EISs were analysed. They included land development, transportation, industrial, dam/irrigation and power plant projects which were approved after the year 2007 (Figure 1). The number of EISs projects selected were agreed with the number of EISs approved in the same period. From 1992-2016, over 7,000 EIA projects in which around 70% were land development had been produced.

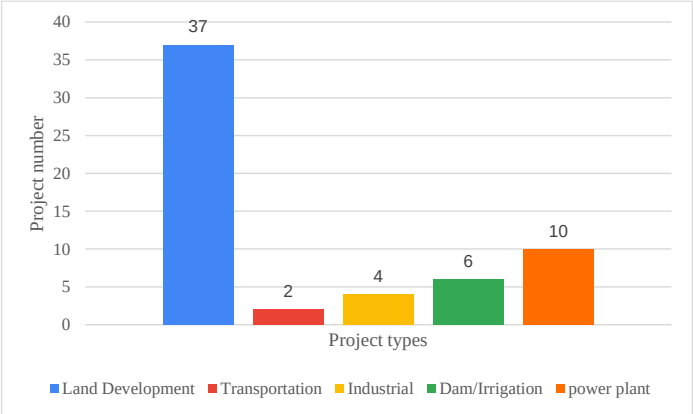

Fig.1. The EISs reviewed

Content analysis was used to investigate the content in the EISs against the correspondence with focus on ecological approach. This method was initiated by [8] and have been used and modified from time to time according to the purpose outcome. Therefore, in this study, the review criteria were adapted to examine ecological content in EISs in the stages of baseline study, impact assessment, and mitigation and monitoring measures. The criteria to review the EISs were based on the literature supported in Table 1 depicts an ecological model geared to indicate the appropriate ecological indicators for each stage of the EIA study

Table 1. Criteria established for content analysis.

Stages of EIA study	Criteria	References
ecological baseline data	to consider levels of ecosystem to identify indicator species to provide data of habitat loss, change and fragmentation	4,9,10,11,12
Ecological assessment	to consider changes at both temporal and spatial scales for species to assess Eco- losses and gains	5,4
Ecological mitigation and monitoring	to consider mitigation hierarchy to consider the coverage of programs	12,13

Ecological resources were separated into terrestrial and aquatic ecology, depending on project location. Based on fifty-nine reviewed EISs, 52 and 49 EISs appeared the contents of terrestrial and aquatic ecology, respectively. Among 59 EISs reviewed, there were four EISs that no data related to ecological aspects. These were land and development projects.

3. Ecological contents in Environmental Impact Assessment

3.1 Ecological contents in baseline and impact assessment

Ecological content in the stages of baseline and impact assessment was considered in quantitative approach by counting the number of pages. As to terrestrial ecology, average number of pages is 10.50 and 1.38 in baseline study and impact assessment, respectively (Figure 2). Eighteen and twenty-three EISs were not found the data of terrestrial baseline and impact assessment, respectively. More than 80% of content were in baseline study whereas those data were used for impact assessment less than 20%. Content of aquatic ecology were in the same direction as terrestrial ecology. Average number of pages in baseline study and impact assessment were 7.31 and 1.68 pages, respectively.

The outcome of ecological impacts assessment was found that those 41 EISs indicated no- impacts. Sixteen and three EISs were specified low negative impacts and only negative impacts without significant level specification.

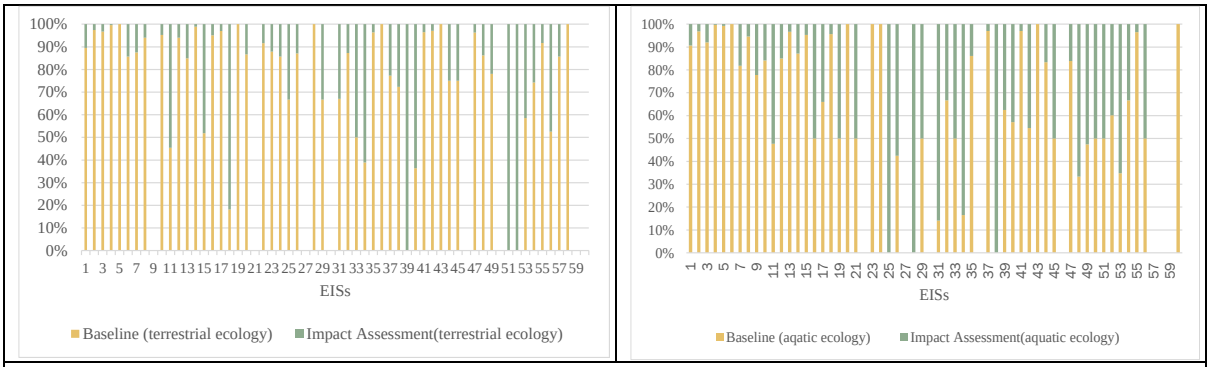

Fig. 2. Content of ecological baseline and impact assessment

3.2. The consideration on ecosystem losses

Ecological losses and gains from proposed projects are basic concept for ecosystem services. According to the EISs reviewed, the losses of ecosystem were mostly proposed for biodiversity level, however, the contents were widely indicated. These were the same as the losses of habitat and species (Figure 3). They indicated the losses of ecosystem in descriptive approaches without identification of quantitative losses or the types of ecosystem losses. These details could be not used as the initial consideration of the effects of projects on the losses of ecosystem in order to further identify or assess how gain of eco-compensation in mitigation measures.

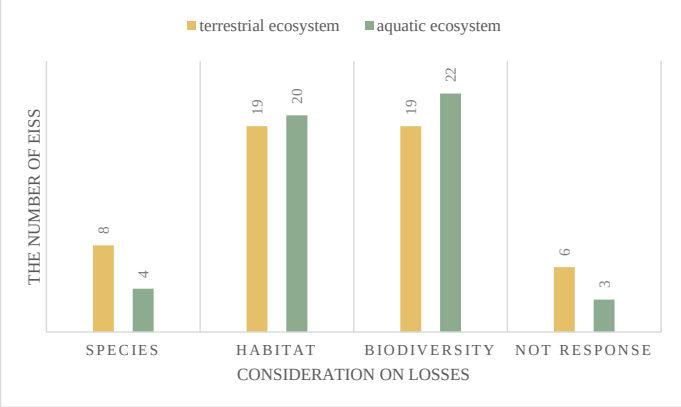

Fig. **3**. The assessment of eco-losses in EISs

3.3 The measures to control the impacts

Mitigation and monitoring measures are the main tools to control the impacts from proposed projects. Mitigation hierarchy is the best practice for sustainable project development [13]. Mitigation hierarchy comprises avoidance, reduce, rehabilitation and compensation and, presently, compensation of ecosystem in the approach of ecosystem services is recognized as the highest level of mitigation [12].

Mitigation was mostly found for avoidance (Table 2). The examples were to strictly comply with mitigation of physical resources such as air or water quality, to prohibit any burning activities and catching any wild animals, to control activities within the projects' area, to maintain wastewater treatment, to avoid the discharge of treated water

Mitigation for reduction was to control any erosion causing by project activities, to clean up construction areas, to establish the areas for appropriate activities, to install wastewater treatment or instrument to screen the fabric from outside and grease and oil from the project areas, to establish good sanitation and accommodation for workers, recycling the unused raw materials onsite. Whereas rehabilitation focused on planting around project sites, to release local aquatic animals. Only one EIS

proposed mitigation for terrestrial compensation. It was reservoir project in which the appropriate ecosystem was proposed for its compensation.

Monitoring programs identified in the EISs with specific reference to ecology were negligible. Only fourteen EIS proposed monitoring for aquatic ecology, indicating the almost complete absence of effective ecological monitoring approaches. Those monitoring were activated at the same time of water monitoring. The examples were to monitor plankton and benthos. No EISs were indicated only terrestrial ecology.

Table 2. Mitigation and monitoring in EISs.

Measures	Terrestrial ecology	Aquatic ecology
Mitigation	26	26
Avoidance	22	23
Reduce	16	21
Rehabilitation	15	3
Compensation	1	0
Monitoring	8	14

4. Conclusion

The evidence presented here also provides insight into aspects of environmental research that have been overlooked, particularly ecological issues. In the case of tropical countries experiencing rapid development, such as Thailand, improvements in environmental assessment tools are crucial to assure sound environmental measures are put in place. 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 EISs. These 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. To better incorporate biodiversity-based objectives in environmental impact assessments; connections between eco-content and different stages of an EIA are strongly recommended. Moreover, the eco-dimension in EIA study should be expanded. These points can help to achieve the goals of sustainable development.

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