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Ecological Input Assessment and EIA: A Study on EIA Report for Quarry Projects

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ABSTRACT

The Environmental Impact Assessment (EIA) was introduced as mandatory in Malaysia since 1988 as a measurement tool to achieve sustainable development. This study attempts to assess the EIA reports for quarrying activities which have been submitted to the Department of Environment. There are 19 scheduled activities requiring an EIA prior to project implementation. As the ecological input is an important part of the EIA report, these studies have tried to analyze the ecological quality of input in four EIA reports prepared for quarrying activities in Peninsular Malaysia. The results show that all aspects of the report comply with the review and sampling methods although there are deficiencies which may be remedied. Four EIA reports show weaknesses in the acquisition of the latest available data. For the preparation of the existing environment sections, the consultants do not feel inclined to make sampling on rock habitat, aquatic habitats and flora and fauna. The insulation measures suggested are not only exhaustive but also ineffective. The residual impact on the ecology is briefly mentioned in all the reports. Generally these EIA reports are found to have many shortcomings in the quality of ecological input and can be improved. Thus, a suggestion with a comprehensive approach and the cooperation of all parties is needed to sustain and complement the EIA.

Keywords: Compliance, Ecological Input, EIA, Environmental Impact Assessment, Quarry Projects, Sufficiency.
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1.0 Introduction

The development of economic activities based on the operating growth is the key to progress in this era of globalization. The pace of events is important to meet the present needs. However, uncontrolled economic growth is difficult to realize the sustainable development. The sustainable development is important to optimize exploiting the environmental resources. Sustainable development means a balanced progress. It refers to the equal distribution between the resource development and the conservation of biological diversity and the environment. The use of the environment by the previous generation should be implemented without compromising the needs of the future generations (World Commission on Environment and Development, 1987). A balanced development could be realized

through the assessment methods on the environmental impact as a whole, because it is a mechanism that ensures the preservation and proper use of resources (Treweek 1999).

Present advances in technology and information have accelerated the desire to establish a viable state through biological resources, geology and rock. These resources are used for diversity and design requirements for the development of other sectors. Limestone activities involve a wide area. The process of blasting, drilling and dredging significantly affect the quality of the environment. These activities threaten the harmonious ecological balance that is prevalent. The awareness and community initiatives to ascertain prosperity and environmental sustainability for future generations have led to the necessity of careful planning or a preliminary assessment to identify the effects of development projects on the environment. The evaluation is focused primarily on the ecosystem of the affected areas before making a decision by the concerned personnel.

The evaluation as a catalyst for the development before the project is undertaken is known as the Environmental Impact Assessment (EIA), which has become a mandatory requirement in some western countries before implementing the resolution of the project.

2.0 Literature review

2.1 Requirements of EIA

According to Section 34A of the Environmental Quality Act 1974 and the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Regulations 1987, a development project in this category of prescribed activities is required to prepare the EIA report. This report is prepared prior to submission to the Director General of the Department of the Environment for consideration and approval before any project is undertaken (DOE, 2000).

Section 34A also requires the EIA report to be submitted in accordance with the EIA guidelines of the Department of Environment. The Handbook of Environmental Impact Assessment Guidelines issued by the Department of Environment is a general guideline of environmental impact assessment for all developmental activities. These guidelines are then forwarded for the second (1995) and third issues (2000). Since 1992, more specific guidelines for the prescribed activities are provided by the Department of Environment to strengthen the effectiveness of the EIA procedure. For example, there are additional guidelines of the Environmental Impact Assessment for Mines and Quarries for quarrying activities. The EIA format should follow the guidelines and must ensure that all information required in the guidelines have been included in the EIA report.

In addition, there is the need to fill the form of public involvement in the initial assessment, although it is optional. However, in a detailed report of the public involvement, this is mandatory (DOE, 1995). The public involvement is required in the process of detailed evaluation during the formation of TOR (*Terms of Reference*). TOR is a summary of a list of significant impacts on the environment but no significant impact has been assessed during detailed appraisal. In the early stages of EIA, most of the EIA consultants were allowed to appoint a project proponent to prepare the EIA reports. However, since 1994, to improve the quality of the EIA report, EIA consultants registered with the Department of Environment only are allowed to conduct an environmental impact assessment.

2.2 Content of EIA Report

Generally, the content of the initial assessment is almost like a detailed evaluation report (Figure 1). However, the content of the detailed report is only for projects that have been identified through the initial assessment report but the significant effects on the environment require further study. Part of the explanation is the advent of the project explained in the early section of the EIA report. The report gives a description of the development project. This section includes a description of the project with

technical data, maps and diagrams as well as a summary of the characteristics of the economic, technical and environmental information as required (DOE, 2000). For the selection of projects, policies need to be given about the economic, technical and environment characteristics which could be used or otherwise, and will be discussed and evaluated.

The description of the existing environment, based on EIA guidelines, may include physical, chemical, biological or socio-economic progress of the projects and should be translated in the form of qualitative and quantitative data. In addition, the boundaries of space and areas that are sensitive or unique in terms of scientific, socio-economic and cultural needs are also considered.

Figure 1: Preliminary and detailed EIA report format

Preliminary EIA	Detailed EIA Report
<ul style="list-style-type: none"> ▪ Introduction ▪ Title of the Project ▪ The project proponent ▪ Reality needs ▪ Overview of Project ▪ Project options ▪ Description of the existing environment ▪ The impact of possible significance ▪ Mitigation measures ▪ Residual impact ▪ Summary ▪ Data source, consulting and public involvement ▪ Reference 	<ul style="list-style-type: none"> ▪ Introduction ▪ Title of the Project ▪ The project proponent ▪ Reality needs ▪ Overview of Project ▪ Project options ▪ Description of the existing environment ▪ The results of the preliminary assessment ▪ A detailed assessment of the impact ▪ Mitigation measures ▪ Residual impact ▪ Reevaluation of the impact ▪ Summary ▪ Data source, consulting and public involvement ▪ Reference

Source: DOE 2000

2.3 Ecological aspects of EIA requirements

The emphasis on ecological input in EIA was unclear until the introduction of the National Policy on Biological Diversity (National Policy on Biological Diversity) in 1998 (MOSTE, 1998). One of the strategic policies was to enhance sustainable use of biological diversity in EIA report for development projects. Prior to that, the emphasis on the biological diversity was not related directly to the EIA. Though the idea of this EIA was outlined in the Third Malaysia Plan (1976-1980), the main objective was to assist environmental planning for new projects or for developed projects that have been carried out. Biological components include animal and plant life, the distribution and the presence of species diversity and community habitat (Figure 2).

To describe the biological component, books on EIA guidelines also emphasize the importance of taking into account the level of species, habitat and habitats as a global community. Bird life is one of the aspects emphasized here, as well as community wildlife areas and wildlife rock. These guidelines state that the border areas of geology, wildlife and vegetation between the project and the sensitive ecological areas nearby are also important.

In addition, it stresses that attention should be given to the production of new habitat caused by construction and expansion of the original community (DOE, 2004).

Figure 2: Biological Components Emphasized in the EIA Guidelines

Aspects	Detailed Description
Species and population	Terrestrial plants Terrestrial wildlife Other terrestrial fauna Rock / wildlife aquatics Other rock / wildlife aquatics
Habitat and Community	Terrestrial habitat Mainland community Aquatic / rock habitat / estuary Aquatic communities Community life rock / estuary

Source: DOE 1995

2.4 Quarrying activities and EIA

A good projection of the economy witnessed a rapid development of various sectors such as industrial, construction and housing including quarrying activities. Quarrying activities reveal some shortcomings due to the arising problems mainly involving the environment. Therefore, some components of the ecosystem, such as the atmosphere, hydrosphere, lithosphere and biosphere would be threatened. Improper practices have caused environmental problems.

Quarrying activities in Malaysia are progressing due to the construction sector using a mixture of stone and limestone. As a result, it would affect the environment. When activities are not carried out properly, particularly biological and physical factors, gives rise to environmental problems. In some circumstances, factors such as air pollution, noise pollution, dust emissions or dust, slitting and slope stability cannot be overstated. Destruction of forest ecology for quarrying activities in the long run may also threaten the ecological balance and the flora and fauna communities. Several issues associated with quarrying activities are noise from blasting rocks, fragmentation and disintegration and transport in the quarry; the risk of dust explosion resulting from the activities, solving environmental and transportation problems; site environment exposed would cause erosion and siltation and sediment formed when a stream is nearby; destruction of wildlife habitats and flora and fauna communities.

Through these issues, efforts to reduce environmental problems should be the main agenda of the legal requirements and institutions involved in coordinating the initial planning of the activity. The approval of the EIA report by the Department of Environment is ranked second after the approval of business license is obtained. Thus the EIA report is a gauge that takes into account the environmental impact of a project before it is implemented.

The preparation of the EIA report regarding quarrying activities began since the late 1980s. This is because the sectors of construction and business were more encouraging. The acceptance of the EIA report about quarrying activities increased from 1988 onwards. The scheduled quarrying activities recorded the third highest percentage of EIA reports received each year. The increase depicts the maximization of the ecological input manipulation. The lack of seriousness on the part of the developer could be seen by the results of the review indicating inadequate, unclear and failure to comply with the guidelines set.

3.0 Materials and methods

This study is based on a review of the Preliminary Assessment report for quarry projects in some selected areas that have been submitted to the Department of Environment for review and approval. Four reports from the DOE library have been selected to represent the scenario of the quarry project in Peninsular Malaysia, as listed in Appendix A.

The EIA report for the quarry project uses the guidelines outlined in *A Handbook of Environmental Impact Assessment Guidelines* (1988) and *EIA Guidelines for Mines and Quarries* (December, 1995) issued by the DOE. This reference will be used to evaluate the four EIA reports chosen. This is to see whether those reports comply with legal and regulatory requirements that have been provided. This guide also serves as a basis for assessing whether ecological input is sufficient or otherwise, as recommended by the guidelines used.

Since the main purpose of the EIA report is to predict the possible impact on the environment, the comment on the EIA report will focus on the question whether the ecological input given in the EIA report is adequate to meet the needs and role of EIA as predictors of biological impacts on environment. A marking scheme for the EIA report has been prepared as a means of assistance in making the comment. The criterion for the analysis is as listed in Figure 3.

Figure 3: Scoring for EIA reports

Sections in EIA	Aspects to be considered	Compliance (C)*	Sufficiency (S)*
Existing environment	Sampling method The review period Primary data Secondary data Terrestrial habitat Terrestrial fauna Terrestrial flora Habitat rocks Aquatic habitats Aquatic flora Aquatic fauna Wetland Abundance of Species Status of species		
Potential impact	Individual impact Cumulative impact Quantitative impact		
Mitigation Measures	Include ecology in mitigating A description of mitigation Monitoring measures Recommendations only		
Residual impact	Residue ecological impact		
Environmental management plan	Include ecology in environmental management plan		

*Y=Yes and N=No

In this scoring scheme, compliance refers to the preparation of the EIA by the consultants based on the requirements listed in the above considerations. Compliance will be rated as 'Yes' or 'No', while for the adequacy, a scale of 1 to 5 is given. Keys used for the scale are listed in Figure 4.

Figure 4: Key for scales 1 to 5

Scale	Key
5	Issue explained excessively
4	Issue explained adequately
3	An average explanation of issue
2	Brief explanation of issue
1	Statement of issue only

4.0 Result and discussion

This study examines the operation of four quarry projects in several areas in Peninsular Malaysia. This general review describes the project site for quarrying activities. The first quarry project is in Mukim Serendah, Hulu Selangor. The total area of this site is 77 acres. The main activity of the project is to explode and break the rock. The blasting method proposed is based on the Narel United System comprising of 'Narel down line' with a 200 ms detonator and 'Narel surface connector' with 17ms or 42ms. The charge explosion used is made of a mixture of Ammonium Nitrate Fuel Oil (ANFO).

The explosion split system will crush the stone to a size of approximately 850 mm through a second explosion or beating. The stones then undergo three stages of processing - breaking, filtering and storage. The project site is covered with secondary forest which is approximately 1100 feet above sea level. The geological formation at the project site consists of intrusive rocks. The land at the project site is of steep slope. The project site is irrigated by a tributary of the Sungai Punggor. In the project site there are also protected terrestrial animals and birds which normally move into the forest reserve of Batang Kali. Many species such as insects and wildlife will be killed during the felling and clearance of the site and the operation of the quarry activities.

The second review is for the granite quarry project in Mukim Sedenak, Air Bemban Kulai, Johor. This granite quarry covers an area of approximately 71 acres (29 hectares). The quarry site is a slope that has approximately 17.67 million tons of granite deposits. The quarry is also equipped with secondary crushing and screening facilities. It is located 7 kilometers to the south-west of the junction of the Kulai-Air Bemban old road from the North-South Expressway (PLUS), opposite the Road Transport Department (JPJ) Weigh Bridge Station complex. The above area is planted with oil palm and rubber. There are micro-fauna habitat and various other biological species that are affected when the activity is undertaken. Among the animals found in the area include birds and rodents, amphibians and reptiles as well as the habitat of other species such as squirrels and insects. Most of these animals migrate to nearby areas due to noise pollution during the operation of the quarry.

The third review is the quarry project in Mukim Labu, Seremban, Negeri Sembilan. This project covers an area of 14.12 hectares or 30.0 acres and is located to the north-west of Seremban. The project area is also adjacent to the Kuala Lumpur-Seremban highway via exit in Seremban. The rock blasting activities are carried out daily. The maximum amount of blasted rock is 7000ms. Many existing plants in this project area have been cleared. The natural vegetation in most areas of the project site has been replaced with oil palm. In addition, there are small bushes and grasses that do not have the richness and diversity of species. In practical terms, the area has been affected by nature plants and animals have long left the area. There are several tributaries of Sungai Tertib Dua located in the vicinity of the project.

The fourth review is for quarry projects at Mukim Renok, Gua Musang, Kelantan. The project area is located at kilometer 24 from Gua Musang town. The area is accessible via road through Felda Chiku and Felda Perasu. The quarry operations include rock blasting, the production of land cover, road networks and 'platforms', the destruction of rocks and the construction of a weighing bridge. The area surrounding the site is irrigated by several rivers, viz., Sungai Asap flows to the west of the project site, while Sungai Chemeh flows towards north and east of the project site. The river then flows into Sungai Asap in the north of the project site. Sungai Chemeh also flows to the south of the project site. Sungai Chiku flows to the south of the project site.

Generally, limestone plants and secondary plants grow at the site. There are also oil palm estates, rubber plantations and orchards. The limestone hills are usually covered with some significant edaphic plants such as *streblus ilicifolius*, *monophyllaea*, *ficus* and *donax*. The proposed site is also inhabited by some important wildlife including tigers (*panthera tigris*), wild boar (*sus barbatus*) and deer (*cervus unicolor*). Some bird species are also identified. There are several areas suitable for big bats which need to be controlled in the caves such as Gua Musang and Gua Batu Boh.

These reports have been reviewed for explaining quarrying activities under the Activities List (Activity 14), associated with the operation of the quarry for domestic, residential, commercial and industrial purposes. According to the *EIA Guidelines for Mines and Quarries, 1995* published by the Department of Environment (DOE, 1995), quarrying activities is a process of deepening open pit or open cast mine. Quarrying activities at the proposed site undertake a number of techniques like exploding, digging, dividing and extracting for rock breaking. These techniques depend on the security structure of either granite rock or limestone. Dynamite will be used to blow up the granite formed by quartz, feldspar and mica minerals. Dredging techniques are more widely used for natural limestone land. The use of techniques and tools in quarry operations has a huge impact on the ecological balance of the area developed.

The four EIA reports reviewed include only the quarry operations in Peninsular Malaysia. These EIA reports describe project sites which are hilly and rocky used for mining and commercial purposes. The scoring listed in Figure 3 is the result based on compliance and adequacy of the ecological input in the EIA report. Figure 5 shows the scoring formula discussed to determine the quality of the ecological input in the review of EIA reports.

Figure 5: Summary of overall scoring			
Sections in EIA	Aspects to be considered	Compliance*	Sufficiency*
Existing environment	Sampling method		
	The review period		
	Primary data		
	Secondary data		
	Terrestrial habitat		
	Terrestrial fauna		
	Terrestrial flora		
	Habitat rocks		
	Aquatic habitats		
	Aquatic flora		
	Aquatic fauna		
	Wetland		
	Abundance of species		
	Status of species		
Potential impact	Individual impact		
	Cumulative impact		
	Quantitative impact		
Measures Mitigation	Admission ecology in mitigating		
	A description of mitigation measures are monitored		
	Recommendations only		
Residual impact	Residue ecological impact		
Environmental management plan	Admission ecology in environmental management plan		

*Y=Yes and N=No

Overall, not many parameters can be used to measure the aspect of compliance from the perspective of ecology. This is because in the EIA report quarrying activities do not emphasize the ecology and environment in detail. To evaluate which EIA report has fully complied with the parameters considered

and the highest score for each of these considerations, the conclusion in the EIA report prepared is rated either good or otherwise.

Figure 6 shows the scoring summary for the 22 parameters analyzed for each EIA report under review. 22 parameters in consideration aspects that have been analyzed will be given adequacy evaluation scale from 1 to 5.

Figure 6: Scoring summary of EIA reports					
Sections in EIA	Aspects to be considered	Report EIA			
		J1	J2	J3	J4
Existing environment	Sampling method	4	4	4	4
	The review period	3	3	4	4
	Primary data	3	2	4	3
	Secondary data	3	2	4	3
	Terrestrial habitat	3	2	4	3
	Terrestrial fauna	3	2	4	4
	Terrestrial flora	3	2	4	3
	Habitat rocks	3	3	4	3
	Aquatic habitats	3	0	2	4
	Aquatic flora	3	2	2	3
	Aquatic fauna	2	2	0	2
	wetland	0	2	0	2
	Abundance of species	1	2	3	2
	Status of species	1	2	3	2
	Potential impact	Individual impact	0	2	2
Cumulative impact		0	0	2	2
Quantitative impact		0	0	0	2
Measures Mitigation	Admission ecology in mitigating	2	3	3	3
	A description of mitigation	2	3	3	3
	measures are monitored	0	2	0	2
	Recommendations only				
Residual impact	Residue ecological impact	3	2	2	3
Environmental management plan	Admission ecology in environmental management plan	3	0	3	4
Total		45	42	57	63

There is no specific reference to decide the percentage of success between compliance and non-compliance. Therefore, to determine the percentage required for the success of the EIA report, the researcher has arbitrarily chosen 50% = 55 marks as the dividing line between compliance and non-compliance. Table 6 shows the success level of the EIA report based on the percentage score. Report J1 and J2 depict the status of failure while J3 and J4 indicate the level of pass.

Generally, it can be concluded that the development projects that require an EIA, should refer to skilled and experienced experts who possess knowledge of technology and changes of the environmental conditions.

This is especially for those who are conducting research in the field. The weakness in the EIA report by the consulting company may be due to lack of experience, expertise and skills in preparing the report. However, there is still room to overcome these drawbacks. The weaknesses in the ecological input of the EIA report are highlighted in Figure 7.

Figure 7: Summary of weaknesses in ecological input EIA report reviewed

Sections in EIA	Weaknesses Identified
Description of the proposed quarry activity	Description of no full compliance with the guidelines set by the DOE
The data required to identify and assess the impact	There are no detailed data on habitat rock There are no detailed data on terrestrial habitats, flora and fauna and aquatic life Data is not site-specific Obsolete data
Existing description	Failure to provide the quantity and level of ecosystems, habitats and species Failure to give a detailed description of the present status Mostly relying on secondary sources A comparison between the date of the review and the date of preparation of the report shows time taken is too long
Biological impact	An unclear report on the cumulative / complex impact No description about the impact on the biological area within the radius of 3 miles of the project site Failure to quantify the impact
Mitigation Measures	No explanation about the effectiveness of mitigation measures proposed and the percentage of environment is only a suggestion; no expert to handle has been appointed
Residual impact	There is no detail description of the residual impacts on the biological environment
Environmental management plan	The plan need to be systematic, comprehensive and practical
Requirements of the Environmental Quality Act 1974	No confirmation of specific legislation to control air pollution Disputes between the state government and the DOE to address the problem of air pollution and water

5.0 Conclusion

To enhance the validity of the EIA report, proposals and a comprehensive approach are put forward. The precision of the methods, steps or procedure advocated should realize sustainable development through the proper premise and channel. All decisions made should also be reviewed from time to time. Studies and surveys carried out on the proposals can be classified into three main parts, namely 'patch-up', Pre-EIA and post-EIA (Wood, 1995; Canter, 2000).

The implementation of the ISO (International Organization for Standardization) is a good move, especially for the management to create various standards in the form of generating development. It is estimated that more than 120 countries adopt this standard. ISO is a voluntary non-governmental organization. However, standards related to health, safety and the environment have long been practiced in some countries, particularly their work procedures.

Through the system of ISO standards, an organization should take into account environmental issues in their daily operations. In such circumstances, there is no organization that ignores environmental issues in the functioning of their company (Cooper 1995).

Apart from the implementation of ISO Management System, there are two other management methods that could be used. They are the Assessment Strategic Environmental (SEA) applied by

Therivel and Partidario (1996) and the Environmental Performance Review (EPR) pioneered by Stokke (1992).

EIA is to avoid the deterioration of the environment by providing proper information about the impact of a specific project in decision making. Generally, EIA was used to evaluate individual projects but not on the policy in the early stages, allegedly giving more influence on the decisions made. Therefore, as an alternative measure, the SEA is used to evaluate the effect of the policies, plans and programs (PPP) on the decisions made. For the EPR, this method is used to assess to what extent the performance of the policy, legislation, plans, programs, procedures and EIA reports are related to the environment.

Based on the recommendations and proposed methods, the preparation process of the EIA report is more complete. In addition, proposals recommended would help to realize the concept of sustainable development, involving all parties to minimize the impact on the ecological or biological system input in the development activities undertaken.

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