IMPACT OF LIMESTONE QUARRYING INDUSTRIES ON THE LIVELIHOOD OF THE SURROUNDING POPULATION : EXPERIENCE AT GUNUNG LENGKUN, IPOH, PERAK.

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ABSTRACT

The quarrying industry is one of Perak's major economic base. It plays an important role in contributing towards the construction industry's development by providing materials such as marble, granite, cement etc. Since many of the quarrying industries are operating within close proximity to the surrounding urban land uses (eg. housing and commercial areas, such as in the case of Gunung Lengkun in Ipoh, Perak), it is important that the quarrying activities are being carried out in a safe and environmentally friendly manner in order to create a sustainable urban development area. The study aims to identify the environmental and social impact issues arises due to the quarrying activities by assessing the perception of the communities living close to the quarrying sites. The focus of the study is mainly related to issues on the quality of the environment, family health condition, blasting effect and public safety. The study revealed that the main concerned of the communities are problems related to health condition and public safety. Therefore, the study recommends that the related authorities should continuously enforcing rules and guidelines as well as compliance monitoring to ensure that the quarry operators abide to the regulatory standard measures. This will help in improving the livelihood of the affected communities.

Keywords : Quarrying Operations, Urban Land Uses, Environmental Impact, Social Impact.

1.0 INTRODUCTION

The quarrying industry is one of Perak's major economic base. The impact of its activities is quite significant both to the state's economic growth and to the livelihood of the surrounding population. Its contribution towards the construction industry's development by providing construction material (MGD, 2006) and creating employment opportunities can be regarded as a significant positive impact. Unfortunately it also has a very significant negative impact on the livelihood of the surrounding population. The negative impacts are mostly environmental related issues such as air, sound and water pollution.

The objective of the study is to identify the environmental and social impact issues arises due to the quarrying activities. A household survey was conducted, attempting to :

i. Determine the level of concerns of the communities regarding the environmental and social impacts of the quarrying operations
ii. Identify whether the distance based on the safety zone classification influenced the level of impacts
iii. Recommend measures that would help improve the livelihood of the affected communities

2.0 RESEARCH METHODOLOGY

The location of the residential area will differentiate the level of impact from the quarrying operations based on it's proximity to the quarry sites. Some communities are affected by the dust and sound pollution from the blasting activities while others are more concerned with safety issues such as risk of damages to property and also road safety.

Sampling is done by selecting respondents from each category of the safety zone classification in order to ensure the sample to be more representative of the population. The household survey approach was conducted with the assumption that the impact from the quarrying operations will affect the household living in the same house as a single unit. The perceptions of the respondents (the head of the household or his representative) will be regarded as reflecting the perceptions of all the family members. Since the goal of the study is confined to a particular locality, area sampling is considered as an appropriate method of sampling (Sekaran, 2003).

3.0 DEFINITION OF TERMS

3.1 Social Impact Assessment

Social Impact Assessment (SIA) is a methodology used to analyse, monitor and manage social consequences due to change in policy, program and project of a specific development. SIA has been defined and interpreted in variety of orientations and approaches. However the following definition made by Inter-organizational Committee on Guidelines and Principles for SIA (IAIA) (1995)

represent the most commonly accepted definition: *'SIA is an effort to assess or estimate, in advance, the social consequences that are likely to follow from the specific policy actions (including buildings, large projects, and leasing large tracts of land resource extraction)'* Vanclay (2002).

There are various view points referring to 'social' terminology in SIA. Listed below are some stances about social, IES (1995):

- People's attitudes and preferences toward a proposed activity.
- Social services, and people's need for such services.
- The social scope of 'environment' .
- The social consequences from environmental impacts
- The interactions between people

In order to make SIA study comprehensive, all these view points should be considered as a social dimension in a SIA study.

3.2 Quarrying Operations

According to Part I Section 3 (1) of the Mineral Development Act (1994), the limestone mining process means any operation of excavation or work for the purpose of winning, obtaining or extracting the mineral. Operations at quarry sites include stripping of overburden, drilling and blasting, excavation and haulage, crushing and screening, and transporting quarry products to customers.

4.0 PLANNING PRINCIPLES AND DEVELOPMENT GUIDELINES WITHIN THE VICINITY OF A LIMESTONE HILL

The Department of Town and Country Planning has allocated that limestone hills are a high risk area and should be preserved (TCPD, 1999). Any form of development should abide by the development principles stated :

1. Safety – topographical features should be preserved and blended with man-made products without damaging the stability, balance, harmony and uniqueness of the natural surrounding.
2. Beauty – the natural asset of the hilly areas shown through the scenic views which are appropriate in terms of height, size and function should be well preserved.
3. Components of a hill – flora and fauna, rivers and creeks that can be found in hilly areas possess values of beauty and balance in terms of ecological system is crucial and should be protected.
4. Productive – the unique components should be preserved for its' characteristics that gives identity and history of specific areas.
5. Functional – water reservoir should be well preserved so that it could produce high levels of quantity and quality of minerals in the water.

The Department of Mineral and Geoscience have classified the slopes of limestone hills as a basis for safety zone demarcation in the surrounding areas of a limestone hill (MGD, 2001). This is to ensure the safety of the surrounding people who lives in the nearby area of the limestone hill. The classification of safety zone mentioned is divided into three categories (Table 1):

Table 1 : Safety Zone Classification

Slope Category	Very Dangerous Zone	Dangerous Zone	Safe Zone
Very High Hazard Rating	2.0 x height of cliff face	2.0 – 3.0 x height of cliff face	More than 3.0 x height of cliff face
High Hazard Rating	1.5 x height of cliff face	1.5 – 2.5 x height of cliff face	More than 2.5 x height of cliff face
Low Hazard Rating	1.0 x height of cliff face	1.0 – 2.0 x height of cliff face	More than 2.0 x height of cliff face

Source : Mineral and Geoscience Department, 2001

5.0 CASE STUDY : GUNUNG LENGKUN, IPOH

Gunung Lenkun, located approximately 11 km from Ipoh city centre is under the jurisdiction of Ipoh City Council. Currently it has six aggregate quarries operating

within close proximity with the surrounding residential areas. The distribution of land uses within the surrounding of Gunung Lengkun are as follows (Table 2) :

Table 2 : Distribution Of Land Uses Surrounding Gunung Lengkun

Type of Land Uses	Area (Ha)	%
Residential	12.50	16.92
Religious Institution	0.22	0.30
Commercial & Services	3.25	4.40
Open Space & Recreation	2.49	3.37
Vacant Land & Others	55.42	75.01
Total	73.88	100.00

The table shows that 75% of the surrounding area are vacant land, followed by residential (16.92%), commercial and services (4.40%) and open space and recreation (3.37%). The residential areas are Taman Chandan Desa, Kampung Kepayang and Taman Bersatu.

5.1 Distribution of Land Use Activities Based On Safety Zone Classification

Gunung Lengkun can be classified into the high risk slope category based on the surface of the plain and the existence of operational quarrying activities that produces limestone products. Analysis carried in the area of Gunung Lengkun found only 21.08% of the land use activities in the area is within the safe zone specified. On the other hand, 42.5% of the land use activities are allocated within the very dangerous zone and 36.42% are in the dangerous zone (Table 3). Out of 12.5 hectare of the residential areas, 48% of the housing area surrounding Gunung Lengkun is exposed to danger due to its location within the very dangerous zone.

Table 3 : Distribution Of Land Use Activities Based On Safety Zone Classification

Type of Land Uses	Very Dangerous Zone		Dangerous Zone		Safe Zone		Total Area	
	Ha	%	Ha	%	Ha	%	Ha	%
Residential	6.00	8.12	5.00	6.77	1.50	2.03	12.50	16.92
Religious Institution			0.22	0.30			0.22	0.30
Commercial & Services			0.25	0.34	3.00	4.06	3.25	4.40
Open Space & Recreation	1.06	1.43	1.43	1.94			2.49	3.37
Vacant Land & Others	24.34	32.95	20.00	27.07	11.08	14.99	55.42	75.01
Total	31.40	42.50	26.90	36.42	15.58	21.08	73.88	100.00

6.0 FINDINGS

6.1 Demographic Profile

A total of 153 respondents were selected from the surrounding residential areas, according to the following proportion, Very Dangerous Zone (53.6%), Dangerous Zone (24.2%) and Safe Zone (22.2%). Most of the respondents have been living in the respective areas for more than 13 years (35.9%), 9 – 13 years (22.9%), 5 – 8 years (18.3%) and less than 5 years (22.9%). Distributions of respondents with respect to their number of household size are 21.6% with more than six persons, 54.9% between 4 – 6 persons and 23.5% between 1 – 3 persons.

6.2 Community Perceptions and Preferences

Perceptions and preferences of the community affected by the quarrying activities were analysed based on the degree of impact. It was done by determining the proportion of respondents, who agrees that whether the impacts are either most significant, significant, less significant, insignificant or most insignificant.

6.3 Community Perceptions on Impact of the Quarrying Activities

Overall, respondents in all three zones state that issue regarding health is most significant (60.8%) in their life. This is followed by air and sound pollution (22.8%) and impacts towards the safety level (10.5%). Meanwhile, social interaction

issues are considered as insignificant in relation to the impacts brought by the quarrying activities so as the impacts that could reduce the aesthetical values of the surrounding community is most insignificant to the respondents (Table 4).

Table 4: General Perception of Residents towards the Impacts Of Quarrying Activities on Their Life

Types of Impact	Very Dangerous Zone	Dangerous Zone	Safe Zone	Overall
Health (dust borne illness etc)	(53) 64.6	(21) 57.0	(19) 55.9	(93) 60.8
Safety (traffic & property damages)	(12) 14.6	(2) 05.4	(2) 05.9	(16) 10.5
Air & Sound Pollution	(13) 15.9	(11) 29.7	(11) 32.3	(35) 22.8
Interaction & Social Problems	(3) 03.7	(1) 02.5	(2) 05.9	(6) 03.9
Decreased Aesthetic Values	(1) 01.2	(2) 05.4	(0) 00.0	(3) 02.0
Total	(82) 100.0	(37) 100.0	(34) 100.0	(153) 100.0

6.4 Perceptions on Impact Based on Safety Zone Classification

Analysis also shows that respondents in all three zones believed that the most significant impact from the quarry operation is towards health: they are Very Dangerous Zone (64.6%), Dangerous Zone (57.0%), and Safe Zone (55.9%). Respondents living in Very Dangerous Zone (15.9%), Dangerous Zone (29.7%), and Safe Zone (32.3%) are also concerned with the significant impact on air quality such as air (dust) and sound pollution. 14.6% respondents in Very Dangerous Zone perceived issue regarding safety as significant impact to their livelihood (Table 4).

Analysis shows that other issues were of low concern to the respondents. The issues are (1) Safety: Dangerous Zone (5.4%), and Safe Zone (5.9%), (2) Interaction and Social Problems: Very Dangerous Zone (3.7%), Dangerous Zone (2.5%), and Safe Zone (5.9%), and (3) Decreased Aesthetic Values: Very Dangerous Zone (1.2%), Dangerous Zone (5.4%), and Safe Zone (0.0%) (Table 4).

6.5 Perceptions of Communities Located in the Very Dangerous Zone

Analysis shows that communities in the Very Dangerous Zone is more concerned with issues regarding health and environmental pollution compared to issues pertaining social problems and aesthetic values (Table 5). Perception of 64.7% of the respondents stated that impact regarding dust borne illness is most significant while 48.7% considered decreasing aesthetic values as most insignificant impact to their livelihood (Table 5).

Table 5: Perception of Communities in the Very Dangerous Zone

Types of Impact	MS	S	LS	IS	MIS
Health (dust borne illness etc)	53 (64.7)	9 (10.9)	11 (13.4)	4 (04.9)	5 (06.1)
Safety (traffic & property damages)	12 (14.6)	28 (34.2)	25 (30.5)	16 (19.5)	1 (01.2)
Air & Sound Pollution	13 (15.9)	33 (40.3)	17 (20.7)	7 (08.5)	12 (14.6)
Interaction & Social Problems	3 (03.7)	6 (07.3)	16 (19.5)	34 (41.5)	23 (28.0)
Decreased Aesthetic Values	3 (03.7)	5 (06.1)	14 (17.1)	20 (24.4)	40 (48.7)

MS Most Significant
S Significant
LS Less Significant
IS Insignificant
MIS Most Insignificant

6.6 Perceptions of Communities Located in the Dangerous Zone

The same issues as mentioned previously are also of high concerned expressed by the communities in the Dangerous Zone. Most respondents (56.8%) has expressed that impact on health is most significant. For the air quality issues 29.8% respondents considered it as most significant and another 37.8% as significant impact to their livelihood. Meanwhile, 51.4% stated that decreasing aesthetic values as most insignificant impact (Table 6).

Table 6: Perception of Communities in the Dangerous Zone

Types of Impact	MS	S	LS	IS	MIS
Health (dust borne illness etc)	21 (56.8)	9 (24.3)	4 (10.8)	1 (02.7)	2 (05.4)
Safety (traffic & property damages)	2 (05.4)	14 (37.8)	14 (37.8)	3 (08.1)	4 (10.8)
Air & Sound Pollution	11 (29.8)	10 (27.0)	9 (24.3)	3 (08.1)	4 (10.8)
Interaction & Social Problems	1 (02.7)	2 (05.4)	5 (13.5)	21 (56.8)	8 (21.6)
Decreased Aesthetic Values	2 (05.4)	2 (05.4)	5 (13.5)	9 (24.3)	19 (51.4)

MS Most Significant
S Significant
LS Less Significant
IS Insignificant
MIS Most Insignificant

6.7 Perceptions of Communities Located in the Safe Zone

The percentage of respondents in the Safe Zone indicating impact on health as most significant is 55.8%, showing that health issues is the utmost concerned of residents in not one but all three zones. The respondents are also concerned with the quality of the environment where 32.2% stated it as most significant impact and another 26.6% as significant impact. Issue regarding aesthetic value is considered as most insignificant impact by the respondents (79.5%) (Table 7).

Table 7: Perception of Communities in the Safe Zone

Types of Impact	MS	S	LS	IS	MIS
Health (dust borne illness etc)	19 (55.8)	9 (26.6)	3 (08.8)	3 (08.8)	0 (0.0)
Safety (traffic & property damages)	2 (05.9)	12 (35.9)	14 (40.6)	3 (08.8)	3 (08.8)
Air & Sound Pollution	11 (32.2)	9 (26.6)	10 (29.4)	2 (05.9)	2 (05.9)
Interaction & Social Problems	2 (05.9)	1 (02.9)	6 (17.6)	23 (67.7)	2 (05.9)
Decreased Aesthetic Values	0 (0.0)	3 (08.8)	1 (02.9)	3 (08.8)	27 (79.5)

MS Most Significant
S Significant
LS Less Significant
IS Insignificant
MIS Most Insignificant

7.0 Recommendations

Research findings show inconspicuous difference towards the impacts experienced by the community living in all three different zones surrounding the quarry industry of Gunung Lengkun. Residents living in the Safe Zone experienced the same impacts brought by the quarrying activities so as the residents living in the Very Dangerous Zone and the Dangerous Zone.

This shows that the existing Safety Zone Classification guideline is only applicable to prevent/lessen the risk of damage due to rock fall or rock blasting. However, issues and problems related to the quality of air and sound pollution has yet to be solved.

Therefore, it is suggested that these actions should be taken by the responsive authorities:

1. Long-term measures directed to prevent negative impacts of quarry industry on the environment and the surrounding community. This involves conducting a detailed study focusing on identification of pollution impacts level on the community based on distance between their residence and the location of the quarry. This can help the development of a more specific and effective regulations/guidelines to prevent the negative impacts.

2. Short-term measures to reduce the negative impacts and to improve the livelihood of the surrounding community. The measures are :

    - Dust emission control: (1) Control emission of dust from quarry operations by using water sprays and dust extractors and (2) Control emission of dust from moving lorries by wetting and cleaning lorry routes.
    - Rock blasting control: sound pollution from rock blasting operations can be reduced by adopting controlled blasting techniques and implementing Standard Operational Procedure. This can help improve safety and at the same time reducing vibrations from blasting effect.

- Monitoring: the related authorities must carry out regular compliance monitoring to ensure that specific regulatory standards and conditions are met by the quarry operators. Immediate action should be taken for any non-compliance. Impact and mitigation monitoring is also necessary to compare predicted and actual impacts and hence, determine the effectiveness of mitigation measures.

8.0 Conclusion

It is acknowledged that the existence of the quarrying industry is important in contributing towards economic growth of the country. Without the industry, there will be shortage of construction and building materials, hence slowing down the development process and the urban growth. At the same time, the quality of the environment and the livelihood of the surrounding community should also maintain at good level. This is to ensure their rights for clean air, dust and noise free environment, thus living a healthy and no worries life. Therefore, the study recommends that the related authorities should continuously enforcing rules and guidelines as well as compliance monitoring to ensure that the quarry operators abide to the regulatory standard measures.

REFERENCES

DMG (Department of Mineral and Geoscience). (2006). Directory of mineral-based industries, 2005. Ministry of Natural Resources and Environment, Malaysia.

DMG (Department of Mineral and Geoscience). (2001). Demarcation of safety zones in the vicinity of limestone hills. Ministry of Prime Industry, Malaysia.

Institute for Environmental Studies, (1995). Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, Journal of Environmental Impact Assessment Review 22, pages 11-43.

Mineral Development Act, (1994). Ministry of Prime Industry, Malaysia.

Sekaran, U. (2003). Research methods for business – A skill building approach (4th edition). New York: John Wiley & Sons.

TCPD (Department of Town and Country Planning). (1999). Garis panduan Perancangan: Pemeliharaan topografi semula jadi dalam perancangan dan

pembangunan fizikal mengikut Akta Perancangan Bandar dan Desa 1976. Ministry of Housing and Local Government, Malaysia.

Vanclay, F. (2002). Conceptualising Social Impacts, Journal of Environmental Impact Assessment Review 22, pages 183-211.