

# Towards a Sustainable Quarry Industry in Malaysia

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## INTRODUCTION

The quarry industry plays a very important and essential role in the development of the country. The Industry guarantees adequate and continuous supply of raw materials to the construction, building and manufacturing sectors for the economic development of the country.

Two main types of quarries in Malaysia are limestone and granite quarries.

Limestone is used as raw material for cement, lime and in the manufacturing of paper, paint, plastic, rubber and glass. Limestone and granite are also used to produce aggregates, dimension stones and ornamental stones. The demand for these natural resources is projected to increase in tandem with the economic development of the country, which aspires to attain developed status in the year 2020.

As the guardians to develop these essential and non-renewable natural resources, the quarry industry and the responsible government agencies are re-examining their business operations and relationships in a fundamental way. The quarry industry are exploring and implementing the concept of Sustainable Development, seeking to integrate their pursuit of economic growth with social development and environmental consideration and protection. The government agencies trusted with the responsibilities among others, are reviewing and implementing the policy, strengthening the legal instrument and implementing the strategic planning and management of the resources. Both parties are working together to develop the human resources and educate the communities on the industry.

## LIMESTONE AND GRANITE RESOURCES

Limestone is a sedimentary rock embracing carbonate rocks or fossils. It is composed mainly of calcium carbonate (primarily in the form of mineral calcite) or combination of calcium and magnesium carbonate with varying amount of impurities, the most

common of which are silica and alumina. Limestone containing less than 5%  $MgCO_3$  is termed as calcite limestone whilst those containing more than 40%  $MgCO_3$  as dolomite. Limestone containing a mixture of calcite limestone and dolomite is referred to as dolomitic limestone.

Granite is an igneous rock which was formed by slowly cooling pockets of magma that were trapped beneath the earth's surface. It is composed essentially of feldspar and quartz with minor amount of biotite and accessory minerals of chlorites, muscovite, hornblende and pyroxene. It is usually medium to coarsely crystalline and nearly always massive (lacking internal structures), hard and tough. It includes rock types such as syenite, gabbro, anorthosite, diabase and basalt.

The country is blessed with abundant reserve of limestone and granite rocks resources. Extensive limestone resources are located in the states of Perak, Pahang, Kelantan, Kedah and Negeri Sembilan. It was estimated there is over 10 billion tonnes of limestone resources and over 8 billion tonnes of granite resources throughout the country.

## BENEFICIATION AND USES OF LIMESTONE AND GRANITE

There are various types of rock aggregates produced by over 300 quarries in Malaysia with limestone and granite being the most common. For year 2006, Malaysia produced 33.0 million tonnes of limestone where 21.2 million tonnes were used in the manufacture of cement and 60.0 million tonnes of granite.



Quarrying for aggregates

The uses of limestone depend largely on their physical or chemical properties or both. Physical properties consideration are dominantly important if the stone is to be used 'as is', such as for aggregate or dimension stone. Chemical properties considerations are important if the stone is to undergo changes from one form of matter to another, such as in the manufacture of cement or lime.

Uses of limestone can be generally classified into six main categories:-

- Aggregate
- Dimension stone
- Agricultural application
- Lime
  - precipitated calcium carbonate (PCC)
  - ground calcium carbonate (GCC)
- Cement
- Others
  - industrial application
  - chemical and pharmaceutical
  - other value-added products

The uses of granite depend largely on their physical properties. Granite has been extensively used as aggregate, dimension stone, flooring tiles in homes and commercial buildings and also monuments. Large granite boulders are used in shore and river protection works, namely riprap, jetty stone, armour, backfill and breakwater block.

## TOWARDS A SUSTAINABLE QUARRY INDUSTRY

According to World Commission on Environment and Development, Sustainable Development is development which meets the needs of the present without compromising the ability of future generations to meet their needs. Sustainable development implies economic and social growth together with the protection of environmental quality, each reinforcing the other. The essence of this form of development is a balance and stable relationship and integration between human activities and the natural world, which does not diminish the prospects for future

generations to enjoy a quality of life at least as good as our own.

In view of this, the quarry industry and the government agencies responsible need to respond to the challenges of sustainable development. As such, we need to know and understand the issues and work towards implementing the protection of environment and encouragement of sustainable growth concept in the industry. Followings are some of the pertinent issues and matters of concerned and efforts pursued in ensuring this noble concept be fully adopted in the quarrying industry :-

i) **The need to protect existing and future rock resources to ensure continuous supply of rock materials at reasonable prices.**

Rock resources need to be safeguarded as the country requires adequate and continuous supply of rock aggregates for the construction sector and raw materials for the rock-based industries. In safeguarding rock resources, priority should be given to resources of existing quarries, including resources in areas adjacent to the quarries. These resources are usually the cheapest to be extracted and beneficiated which in turn would also benefit consumers. At the same time, new rock resources relatively close to development areas also need to be identified. Effort should be initiated to have detailed planning measures, by having a complete overview of all rock reserves, leading to a strategic planning that will provide adequate supplies of rocks to meet needs, optimise the usage and conserve as far as possible. To facilitate these, Department of Minerals and Geoscience have conducted some studies on rock resources for the States of Perak, Selangor, FT Kuala Lumpur, Pahang, Johor, Terengganu, Negeri Sembilan, Sabah and Sarawak. The reports of the study would serve as a guide for the states to formulate policies and strategies aimed at ensuring the orderly and sustainable development of the rock resource industry in the respective states.

It is important to keep urban development at a safe distance from

existing quarries and their adjoining reserves in order to safeguard these resources. Some rock resources could accordingly be sterilised. Safeguarding of rock resources of existing quarries should not however preclude the economic utilisation of the adjoining land as long as the usage is compatible to quarrying activities. For example, the land could temporarily be used for agriculture. Zoning and other land use tools should be able to produce an effective mix of uses that reflect local economic, environmental, and political values.

ii) **To ensure that quarrying activities are carried out in an environmentally friendly, safe and sustainable manner.**

The environmental and social impact of quarrying activities may be felt both on and off a quarry area from a short term to a longer period. The impacts are physical, affecting land, water, air, wildlife and vegetation, and economic, affecting the supply and demand, revenues, employment, and so on. There are also health and safety implications for both individuals and communities.

At the same time, concern over adverse environmental impacts has grown for a number of reasons, including the increase in the scale of operation resulting in the increase in traffic volume. This is compounded by the situation where the development is getting nearer to the boundary of the quarry land. The environment has been a major issue for quarrying industry for many years and its profile is increasing. Similarly, issues pertaining to occupational safety and health are getting prominence. The quarry industry in Malaysia has generally demonstrated ongoing improvement in occupational safety and health and environmental(OSHE) management. The industry is now seriously directing their attention towards their own OSHE performance and the potential impacts of their operation. A competently prepared OSHE management system is a useful tool, which may assist quarry management to meet both current and

future OSHE requirements and challenges. Modern equipment designs and technologies also enable the quarry operators to improve management of safety and health and also protecting the environment.

Considering that the quarry industry involved a multitude of matters, such as land, revenues, machineries and equipment, explosives, environment to the safety of operation, various laws and regulations were enacted by the State or Federal Government. It is pertinent on the part of the authorities to effectively regulate, control and guide it toward a sustainable industry. Some study on the following laws enable the authority to identify the strength and weakness with respect to the sustainability of the quarry industry in Malaysia :-

- National Land Code, 1965
- State Quarry Rules
- Environmental Quality Act, 1974
- Explosive Act, 1957
- Occupational Safety and Health Act, 1994
- Factories and Machineries Act, 1967
- Mining Enactment, Cap 147
- Town and Country Planning Act, 1976
- National Forestry Act, 1984

Abandoned quarry sites are constant reminders that quarrying without control and proper rehabilitation results in serious problems and hazards to the public, lessen the value of land and generally interferes with community development. It is important to know the post quarrying land use as early as possible so that rehabilitation works could be carried out progressively if necessary. For example if the eventual land use is for agriculture then steps should be taken to store the overburden soil for future reclamation works. A possible solution on the issue of ensuring rehabilitation could be through the establishment of a quarry rehabilitation fund to be used by the State Authority to rehabilitate the abandoned quarry sites.

### iii) To optimise the usage of rock resources

Rock resources should be fully and appropriately utilised so as to maximise the financial benefit to both the quarry operator and to the state. Waste material should be minimised.

The feasibility of using the currently produced limestone aggregate and the new deposits to produce higher value products viz. quicklime, hydrated lime and precipitated calcium carbonate (PCC) should be seriously examined. Some rock deposits are of dimension stone quality. The feasibility of exploiting these resources for dimension stone should be carried out as it is about 20 times the value of aggregates.

In the crushing and screening processes for the production of rock aggregates, quarry dust is also produced. These fine materials are mainly utilised in the manufacture of premix asphalt and ready-mix concrete. Nonetheless some quarry dust still remains unsaleable hence their usage should be promoted for producing manufactured sand and cement bricks. Manufactured sand, produce from the screening of quarry dust, should be utilised as a substitute for the depleting natural sand resources.

### iv) To promote the recycling of rock products

Demolition of buildings would create construction waste whilst resurfacing of road would generate old asphalt. Disposal of these wastes is problematic due to the shortage of land fill sites. A possible alternative is to promote recycling of this waste for use as a substitute for rock aggregates as this would correspondingly reduce, albeit by a small amount, the usage of new rock resources. These practices are in line with the concepts of sustainable development and are also widely adopted in developed countries.

## CONCLUSION

Sustainable quarry industry is vital in ensuring that the industry remains important and grew hand in hand with the development of the country and meets the need of our future generation. It is an effective and continuous concept of development which require all stakeholders, the government authority and the industry to work together to foster an industry culture of best practices in all aspects of the quarrying activities. This shall ensure that the industry continue to contribute to the well beings of the environment, social and economy of the country as a whole. ■

## REFERENCES

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