

# Economic and Environmental Issues of Quarrying

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**Abstract:** The expansion of construction activities, to meet the development needs of the society, has immensely boosted the demand for construction raw materials in the economy. Quarry industry produces the major raw materials for construction industry. Heavy demand has caused over exploitation of natural resources and lead to environmental and health problems. The major environmental and socio-economic problems related to quarrying revealed during this study include, destroying the natural topography and vegetation, ruining biodiversity, dust pollution, noise pollution, illegal stone extraction, deleting ground water levels. At the same time quarrying being an economic activity has created positive and negative socio-economic effects in the economy. The study attempts to give a descriptive explanation of the environmental and economic issues of quarrying. The study is undertaken with the help of a sample survey conducted in the ecologically sensitive areas (ESA) of Western Ghats

**Key words** – economic effects, ESA, environmental issues, quarry

## 1.1 Introduction

Quarrying is the process of obtaining quarry resources, usually, rocks, found on or below the land surface. The difference between mining and quarrying is that quarrying extracts nonmetallic rocks and aggregates while mining excavates the site for mineral deposits. A variety of stones like sandstone, limestone, perlite, marble, ironstone, slate, granite, rock salt, and phosphate rocks are extracted by the industry through a series of processes. Among all the human activities that affect land, water, air, and biosphere, mining and quarrying are the most destructive that impose irreparable damages to the living environment. Mining and quarrying for minerals and other products to meet the demands of industries are inevitable for the sustenance of civilization. In Kerala, the activity is widespread throughout the hills of Western Ghats. The demand for natural resources like hard rock, laterite, sand, and soil in the past 4-5 decades for construction of buildings and other infrastructural facilities amplified many times the quarrying activities in the State. These activities are continuing without much interruption and due regard to the naturally evolved environmental settings. Often, the process leads to conflicts among various stakeholders and as a result, several cases are pending before the Courts and Government for clearance. Lack of adequate information on the gravity of the adverse effects of these activities is a major setback challenging the existing regulatory systems and also the implementation of necessary mitigation measures to reduce the ill effects of mining and quarrying to the barest minimum. Quarrying activities have various off-site and on-site impacts on environmental components.

Individuals and private companies are increasingly demanding lime stones for construction purposes and this has placed immense pressure on quarrying. Quarrying is a practice now becoming an environmental issue as the demand for limestone increases in the industry and construction. Quarrying includes the creation of a large amount of dust, noise, vibration and causes a decline in the groundwater levels. Thus polluting air, water, sound, soil, vegetation and also cause serious health impacts on the lives of local people. Although the process of quarrying is considered detrimental to the environment, a complete ban on the activity is not feasible. The government should take adequate measures to control and monitor the quarrying activities. Acceptable alternatives should be developed considering the socio-economic aspects involved in the issue.

## 1.2 Objectives

- i. To study the environmental and economic effects of quarrying.
- ii. To examine the health implications of quarrying activities.
- iii. To understand the economic implications of quarry industry

## 1.3 Statement of the Problem

The quarry industry is characterized by the direct exploitation of natural resources. It provides raw materials for the construction industry. The construction industry requires massive amounts of stone for its projects. The high demand for construction materials like sand, gravel, or rocks and paint production is triggering the demand for quarry products. It thus leads to the overexploitation of natural resources creating socio-economic and environmental issues. Dust pollution, cracks in the building, noise pollution, reduced photosynthesis by flora, nuisance dust, biodiversity loss, and others are usually associated with quarrying. Particulate matter, noise, vibrations, and run-offs are impacting negatively on the health and property of the people living around the industrial sites. These are most likely to generate environmental problems such as cracks in buildings, loss of biodiversity, alteration in the topography of the entire land area, land degradation, removal of vegetative cover, a decline in crop yield, and severely damages the road transport facilities of the area. The quarry industry is polluting because it leads to various kinds of pollution. The after-effects of pollution make the life of the people residing in the vicinity of quarries very miserable. People are vulnerable to health issues like skin diseases respiratory diseases. The quarry industry make short-term and long-term effects on the life of people and the environment. The area of study is a part of the ecologically sensitive area of the Western Ghats characterized by the rich biodiversity and forest cover. This factor aggravates the impacts of exploitation of natural resources. Although the industry poses serious implications for people and environment the industrial products are a basic requirement of the economy. It calls for sustainable practices and developments in the matter. Mitigative measures and alternative technologies to reduce the pressure on natural resources are relevant.

### 1.4 Methodology and Source of Data

The study is based on descriptive approach which relies entirely on primary data. The area of study is a part of the ecologically sensitive area of the Western Ghats characterized by the rich biodiversity and forest cover. Random sampling technique was used to select the quarry sites and households residing in the selected quarry sites formed the sample households. 3 quarry sites were selected for the study. The sample households was limited to a maximum of 200 households residing in the vicinity of the quarry who are directly and indirectly affected by the quarry process. A structured questionnaire was used to collect information from the households.

## II ENVIRONMENTAL AND ECONOMIC IMPACTS OF QUARRYING

### 2.1 Exploiting Western Ghats

The mountain range of Western Ghats has been identified as one of the world's eight richest biodiversity hot spots and received the UNESCO World Heritage Site tag. The Western Ghats extend from Gujarat to Tamil Nadu, covering an area of over 164,000 sq. km. It is a region of great environmental importance characterized by rich biodiversity. The hilly tracts of Western Ghats have abundant sources of limestone and granite rocks. Mining and quarrying is a widespread economic activity in this region. Quarry mafias are appropriating large hectares of land to extract limestones. Reckless exploitation of the quarrying industry has led to the disappearance of many huge rocks as a whole. A report submitted by the Western Ghats Ecology Expert Panel, headed by ecologist Kasturirangan had recommended that almost the entire Western Ghats should be declared as an ecologically sensitive area (ESA). A ban on all polluting industries (including mining) categorized as most hazardous in the Water (Prevention and Control of Pollution) Act, 1974, and Air (Prevention and Control of Pollution) Act, 1981 is one of the important recommendations of the report. A recent report submitted by a committee headed by Madhav Gadgil also submitted a report namely Gadgil report. The committee warned the government that Kerala will face serious catastrophic impacts in the recent future if the reckless exploitation of natural resources going on in the Western Ghats continued. Report gave a direct blow to the operation of quarries in the Western Ghats.

### 2.2 Quarrying and Environmental Pollution

The nature of mining processes creates a potential negative impact on the environment both during the mining operations and for years after the mine is closed. This impact has led to most of the world's nations adopting regulations to moderate the negative effects of mining operations. Some of the environmental disturbances created by quarrying are caused directly by engineering activities during aggregate extraction and processing. The most obvious engineering impact of quarrying is a change in topography and conversion of land use, with the associated change in the visual scene. This major impact may be accompanied by loss of habitat, noise, dust, vibrations, chemical spills, erosion, sedimentation, and dereliction of the mined site. Some of the impacts are short-lived and most are easy to predict and easy to observe. Most engineering impacts can be controlled, mitigated, kept at tolerable levels, and restricted to the immediate vicinity of the aggregate operation by employing responsible operational practices that use available engineering techniques and technology

#### 2.2.1 Air Pollution

Dust from quarry sites is a major source of air pollution, although the severity will depend on factors like the local microclimate conditions, the concentration of dust particles in the ambient air, the size of the dust particles, and their chemistry, for example, limestone quarries produce highly alkaline (and reactive) dust, whereas coal mines produce acidic dust.

Air pollution is not only a nuisance (in terms of deposition on surfaces) and possible effects on health, in particular for those with respiratory problems but dust can also have physical effects on the surrounding plants, such as blocking and damaging their internal structures and abrasion of leaves and cuticles, as well as chemical effects which may affect long-term survival.

#### 2.2.2 Noise Pollution

Unfortunately, quarrying involves several activities that generate significant amounts of noise. It starts with the preparatory activities, such as establishing road or rail access, compound, and even mineral processing facilities. Next is the process of exposing the mineral to be extracted and this is usually done by removing the topsoil and other soft layers using a scraper, or hydraulic excavators and dump trucks. The excavation of the mineral itself will involve considerable noise, particularly is blasting methods are used. Following this, the use of powered machinery to transport the materials as well as possibly processing plants to crush and grade the minerals, all contribute even more noise to the environment.

#### 2.2.3 Quarry Waste

Again, like many other man-made activities, quarrying involves the production of significant amounts of waste. Quarry wastes are a largely unavoidable by-product of the extraction and processing of rock aggregates. They are defined as wastes because no market currently exists for them; the good news is that they are generally inert and non-hazardous, unlike the waste from many other processes. However, there is still potential for damage to the environment, particularly with water contamination and also soil pollution.

For example, suspended particles – even though they are chemically inert – may imbalance freshwater ecosystems. Large amounts of solids can also exacerbate flooding if it is dumped on the flood plains. Lastly, the accumulation of waste by-products will still need to be stored and managed somewhere that will not adversely affect the environment. Furthermore, the treatment and disposal of waste may produce more negative impacts on the environment.

### 2.3 Effect on Land, Water, and Vegetation.

Temporary or permanent land sterilization may result in the original landform permanently altered and the original vegetation cover destroyed. The visual impact of the quarries extends over larger areas as noticeable scars of high color contrast, reducing the aesthetic appeal of the landscape and deteriorating the scenic quality of areas where tourism may be a major constituent of income. In other areas, arable lands are destroyed. Temporary or permanent loss of the associated fauna and flora are also likely, although this can be mitigated.

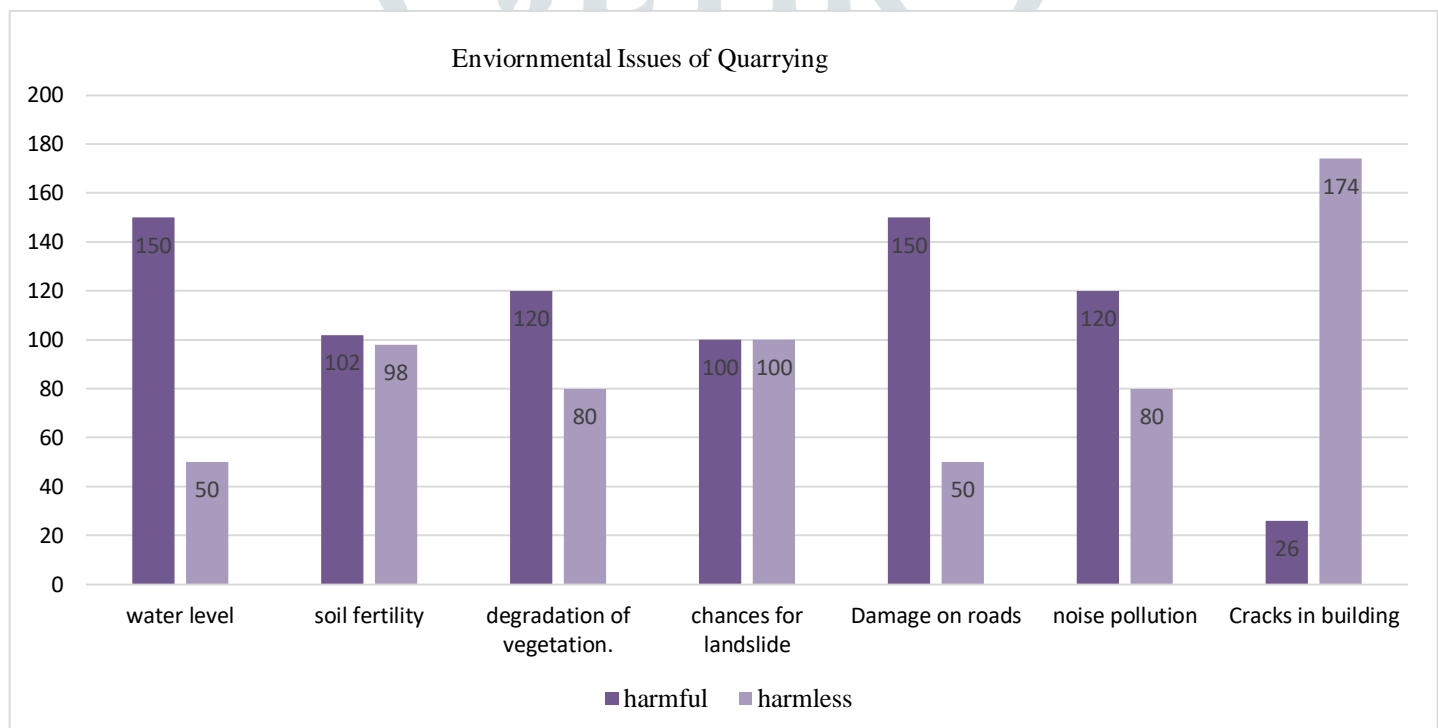
Dust deposition, or dust fall, is dust that settles out of the air and is monitored by determining the amount of dust collected over an exposed surface in a fixed period. Wind suspends large amounts of dust in the atmosphere. Dust in the atmosphere settles back to the earth's surface and is deposited on plant leaves when wind velocities decrease. Suspended dust blocks light in the atmosphere from reaching plants through the air and also settles on plants and blocks sunlight by covering the stomata of plant leaves that need to perform photosynthesis (Vardaka et al, 1995). Dust may have physical effects on plants such as blockage and

damage to stomata, shading, abrasion of leaf surface or cuticle, and cumulative effects like drought stress on already stressed species (Banez et al, 2010). The chemical effects of dust, either directly on the plant surface or on the soil, are likely to be more important than any physical effects. Dust deposited on the ground may produce changes in soil chemistry which may in the long-term result in changes in plant chemistry, species competition, and community structure. Since the stomata have been blocked Carbon dioxide cannot enter plants to serve as a raw material for photosynthesis. Plants in this environment may undergo stunted growth. It is likely dust deposition on vegetation is increasing due to the increase in quarrying; open- cast mining and road traffic (Farmer, 1993). Dust may have physical or chemical effects on plant surface or dust effects on plants may occur through changes in the soil chemistry. Dust may affect photosynthesis, respiration, transpiration and allow the penetration of phytotoxic gaseous pollutants. Visible injury symptoms may occur and generally, there is decreased productivity. Most of the plant communities are affected by dust deposition so that community structure is altered.

Table 2.1: Response of the households regarding environmental issues

Environmental Impacts	Harmful	Harmless
Water level	150	50
Soil fertility	102	98
Degradation of vegetation.	120	80
Chances for landslide	100	100
Damage on roads	150	50
Noise pollution	120	80
Cracks in building	26	174

Figure 2.1: Response of the households regarding environmental issues



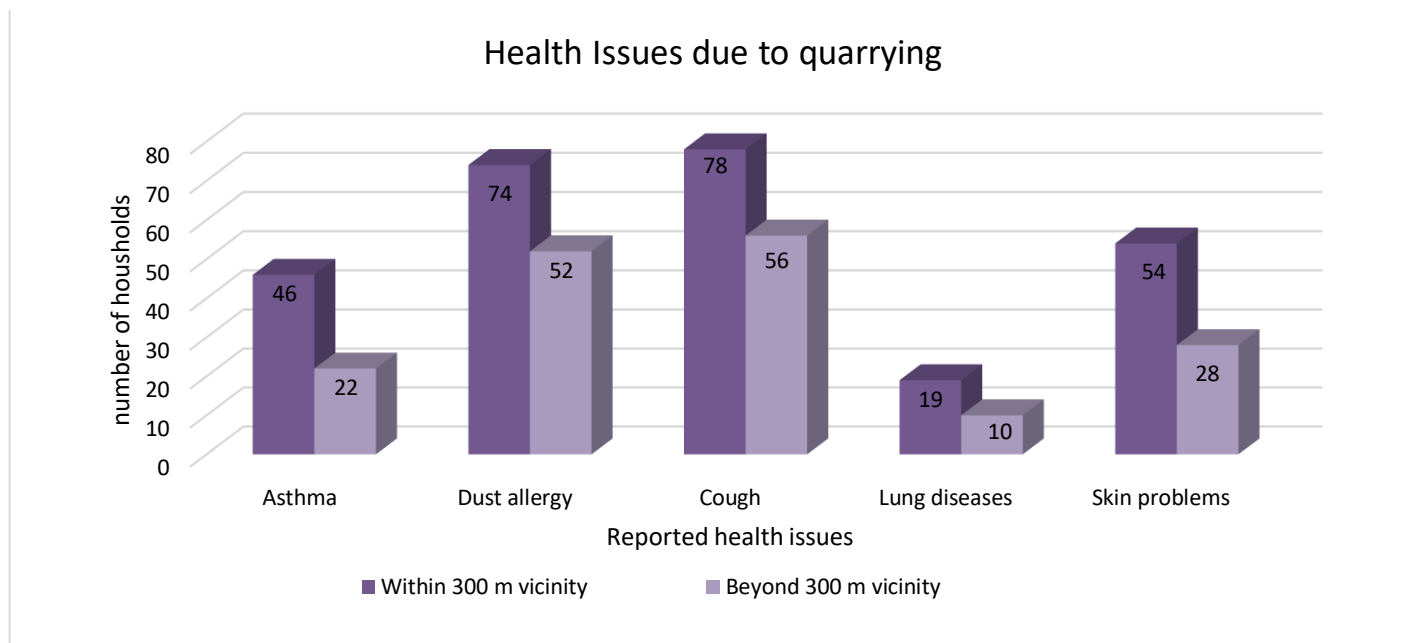
Environmental issues of quarrying are of several types which affect water, soil, vegetation, nearby housing structures, etc... Depletion in groundwater levels and damage to the road transport system are the issues that affected households the most. 75% of households suffer from declining water levels and damaged roads. Noise pollution and degradation of vegetation affected 60% of the households. Loss of soil fertility, the occurrence of landslides, cracks in buildings are the other environmental issues faces by the households due to quarry. Cracks in buildings of 26 households were identified which is detrimental to the lifespan of the property. The heavy explosive used in the process also causes the scattering of stones to distant places from quarry sites.

## 2.4 Health Effects of Quarrying

Table.2.2: Response of the households regarding health issues

Diseases	Within 300 m vicinity	Beyond 300 m vicinity
Asthma	46	22
Dust allergy	74	52
Cough	78	56
Lung diseases	19	10
Skin problems	54	28

Figure 2.2: Response of the households regarding health problems



Quarry pollutes the surroundings in various ways. Air pollution is the major pollution created in the process of quarrying. It leads to severe and minor health impacts on people residing in the vicinity of quarries. Households residing in the close surroundings of quarries suffer from pollution and health issues the most. The proximity of residence to quarry and health issues are having a positive relation. Households which are not having proximity to quarries are suffering from health issues not as much as the latter. Respiratory disease is the main disease that has affected households.

**2.5 Economic Effects of Quarrying.**

One of the most visible economic impacts of mining/quarrying operations on a community is the employment that it generates. Employment is generated through the creation of jobs at different phases of mining/quarrying operations. These jobs are directly related to the mining/quarrying operation. However, there are jobs created outside of the compound of a mining/quarrying operation. These are a result of the building of roadways to reach the mine/quarry, the construction of new homes for mines/quarries and their families, and the businesses required to service the families for instance. Apart from creating direct and indirect employment opportunities quarrying benefits local business activities directly and indirectly. Employment generated in the region by social investment and provision activities, including local business development; and induced employment in local communities generated by the spending of direct and indirect employees, such as those in local services (for example shops, transport and public services) contribute to enhancement of local business.

Table 2.3: Response of the households regarding economic benefits

Economic Effect	Direct Benefit	Indirect Benefit
Employment	42	44
Business	12	38
Aid	74	0

Quarry industry creates direct and indirect employment opportunity in the region. 21% of the households benefits from direct employment opportunities and 22% of them benefit from indirect employment opportunities due to operation of quarry industry. Employees of quarries mostly consists of people from places other than the locality. There are a number of migrant workers employed in the quarries. Quarry also helps to increase business activities of the locality. 25% of the households enjoy direct and indirect benefits in their business activities due to quarry. 37% of the households has benefitted from direct aid from quarry industry. Financial needs at emergency situations, financial needs incurred for personal matters, expenses related to marriage functions etc... were aided by the quarry industry to households situated in the vicinity of quarries.

**III. SUMMARY AND FINDINGS**

**3.1 Conclusion**

Quarrying is one of the biggest economic activities taking place in Western Ghats. There has been a significant increase in quarrying since the beginning of the 1990s. Quarrying is very much part of the local heritage but most people in the area are only a little bothered by the potentially negative impact of quarrying on the environment. However, the industry has undergone tremendous changes, especially over the last two decades, fulfilling the demand for stone products for construction activities in the urban and rural areas. Studies and reports empathetically prove that quarrying will negatively affect the environment and human livelihood around the quarry.

The Indian constitution is one of the first in the world to recognize the importance of environmental conservation. The constitution directs the state to take measures to protect and improve the environment and to safeguard the environmental quality. It also makes it a fundamental duty of every citizen to protect and improve the natural environment including forests, lakes, rivers, and wildlife. As the constitution provides the framework for creating a welfare state the finite natural recourses of the state must be optimally utilized

without adversely affecting either the health of the people or the environment. This is the essence of sustainable development. We must make conservation-oriented development choices to avert pressure on natural resources and life support systems.

Quarrying negatively affects environment. It also threatens the health of the local households. Large-scale quarrying in a reckless manner is open exploitation of natural resources. The development going on through overexploitation of resources is unsustainable. The beauty and greenery of the forest cover are wiped out and the land is turned into a bare and barren site. So, quarrying activities should be restricted and the negative impacts should be minimized. The tiny relief factor is the positive effect of quarrying on creating employment and enhancing local business activities.

### 3.2 Suggestions

- Grievances of the local community regarding harmful effects of the industry should be addressed properly; local bodies should be more responsible and active in such grievance redressal.
- Large-scale mining, quarrying, and reclamation activities may be allowed only based on the recommendations of scientific studies.
- Small-scale mining and quarrying activities that are permitted in various local bodies should be planned and executed as a part of a regional development plan.
- Avoid mining in ecologically sensitive areas. Mining should be allowed at a safe distance (buffer areas) away from the road/ rail/ building/ river etc.
- Fencing should be made around the waterlogged quarries/ mines and signboards should be kept warning.
- The arrangement should be done to promote manual mining in all possible phases of mining/ quarrying. Mechanical mining should be allowed only in areas where manual mining is not possible.
- Research and developmental activities should be strengthened for updating resource databases, technologies, and management.
- Estimate the resource availability in the local body/region wise and its extraction to be considered in a sustainable and eco-friendly manner.

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