

# A Review on Assessment of Environment Impact of Stone Crusher

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**Abstract** - The stone crushing industry is a crucial sector in India, producing crushed stones for construction purposes like roads, highways, bridges, buildings, and canals. This industry is growing rapidly due to infrastructure development plans. However, it also poses significant environmental issues, such as rapid pollution, which negatively impacts human health and the environment. The release of dust into the air and water is one of the many negative environmental and health effects of the mining and stone crushing industries.

This study highlights the urgent need for a more thorough evaluation of how stone crushing affects water quality. We suggest reorienting the analysis to focus on the presence of heavy metals and other contaminants that can leak from objects that are piled high or encounter water through unintentional spills. When water is contaminated, it can upset aquatic ecosystems and seriously jeopardize the health of neighbouring communities that depend on it for irrigation and drinking.

The material that has already been written about how stone crushing affects the environment is reviewed in this review, with an emphasis on how it degrades water quality. We draw attention to the shortcomings of the present research conducted in India, especially its lack of concentration on particular contaminants. We support a more thorough methodology to evaluate the whole range of possible pollutants discharged from stone-crushing processes.

The continued growth of the stone crushing industry necessitates the implementation of sustainable practices and stricter regulations. Responsible operations are crucial to safeguard vital water resources and ensure the health and well-being of surrounding communities. This review underscores the urgent need for a more comprehensive understanding of the water quality impacts of stone crushing in India, paving the way for sustainable development and environmental protection.

**Key Words:** Stone crushing, Pollution, Health effects, Environmental effects, Contamination, Heavy metals

## 1.INTRODUCTION

Mining is a significant economic endeavor in several developing nations, including our own. Operations, regardless of size, are naturally disruptive to the environment, generating significant quantities of dust debris that may be detrimental. The quarry and stone crushing

industry in India is expanding quickly because of the rising demands of construction and industry, as well as the current focus on developing the country's infrastructure. Nevertheless, reliable data for this industry is scarce. Numerous rural migrant and unskilled laborers in India receive direct employment from the country's numerous stone crushers. In India, most stone crushing is a small-scale, labor-intensive industry. [1]. The processes are performed manually. Currently, there is less information about dust emissions from these units, their connection to occupational exposure, and the respiratory health status of workers. Mining, particularly opencast mining, involves extracting rocks and minerals, and is often seen as a harmful activity with significant negative effects on the environment. Quarries produce significant amounts of stone via cutting processes, leading to adverse effects on nearby surface water. Regarding the influence of pollutants compared to pollution. Any chemical, radioactive nuclide, organ phosphorus compound, trace gas, geochemical material (such dust or silt), biological creature or product, or physical characteristic (such as heat) that is purposefully or inadvertently generated by humans. Potentially or currently discharged into the environment [2]. Mining affects many aspects of the ecosystem, including the enduring and significant effects of abandoned mining waste piles and extensive extraction locations. Drilling, blasting, and crushing minerals are crucial operations in the majority of big open-pit mines.

The operation of Heavy Earth Moving Machines (HEMM) in large open cast mines can significantly impact the environment, causing dust, noise, and ground vibration. Opencast mining, particularly in Jhansi district, is more damaging than underground mining, causing water, soil, noise, and land pollution. Mining activities not only affect the physical and biological structure of an area but also lead to socio-economic changes and eliminate traditional income sources. Supplied particulate matter (SPM) sulphur dioxide (SO<sub>x</sub>) are major sources of emissions from various open pit mining activities. Control methods include planning and implementing preventive and suppressive measures to maintain pollutant levels within certain standards. However, there is no well-defined method for predicting the impact of air pollution due to mining. Most dust found in industrial environments is mineral-based, and even after preliminary work has been done, it must be disturbed. Underground mines are the most abundant and ubiquitous contaminants in the atmosphere, with silica dust causing severe problems and widespread dust to which minerals come in contact due

to dust and gas pollutants in and around mining complexes from freshly cut open mines. This deterioration in air quality requires assessment of the impact on air quality due to mining and suggest appropriate abatement measures. Mining has a significant impact on the environment, especially on the quality of ground water and surface water. Mineral resources play a crucial role in a country's economic development and human civilization [3]. Mining, like any other industrial activity, leaves a strong negative impact on the environment unless executed carefully and in a planned manner. It is well established that mining is an environmentally destructive activity, with potential impacts on land zero or worse after mining ceases.

Stone crushers are beneficial for the building sector, although they contribute to issues including increased expenses and different environmental and health concerns. We will study stone crusher functioning, identify problems, and provide industry-economic remedies. Our cost analysis will assess the additional costs of adopting stone crusher control devices to reduce their effect. We will compare Indian stone crushing facilities to those in wealthy countries to find implementation concerns.

The nation depends on the stone crushing industry to provide crushed stone in different sizes for use in building, bridge, road, highway, and canal construction. In India, there are more than 12,000 stone crushers. There will likely be more due to plans for the highways, canals, and other infrastructure required for the nation's expansion. The Indian stone crushing industry is an important economic sector, with an estimated yearly turnover of Rs. 5000 crore, or roughly US\$ 1 billion. Over 500,000 people are thought to be employed directly by the business, doing tasks including transporting crushed and mined goods and running crushing plants. Since most of these people are from rural, economically deprived areas with limited employment opportunities, they play a vital social role in rural communities. It gives poor, uneducated, illiterate rural populations a means of subsistence, and unskilled individuals living in rural areas.

The stone crusher sector is present near most major cities and villages throughout the country due to ongoing building activity nationwide. Crushed stone items become more expensive when transported over long distances; for this reason, crushers should be located closer to demand centers, such as cities, bridges, and canals. In order to run, stone crushers require a large quantity of labor and electricity. Transporting crushed stone products as well as mined stone requires access roads [4]. For these reasons, the majority of stone crushers are located outside of major cities or close to important construction sites. Stone Crushers often form clusters consisting of five to fifty machines. The crushers are situated closer to the raw material source, including stone mines and river beds.

Mining is a significant economic endeavor in several developing nations. Operations, regardless of size, impact the environment by releasing vast amounts of dust and pollutants. The mining and stone crushing sector in India is expanding quickly in response to rising demand from the building industry. Although exact statistics for this sector are not easily accessible, it is believed that 12,000 stone crushers in India directly employ around 500,000 rural migrant and unskilled laborers. Stone crushing is a small-scale industry in India that relies heavily on physical labor.

## 2. REVIEW OF LITERATURE

Stone crushing and screening procedures are dusty. The dust generated has a tendency to remain suspended in the air and disperse across the area around the stone crusher. The dispersion of dust is influenced by the wind's direction and velocity. Air humidity significantly influences the dispersion of dust particles. Inhaling fine particles in the stone crusher business might pose health risks to workers. The word 'occupational hazard' denotes the risky characteristics. Individuals who transport rocks and stones, live near stone crusher industries, and those who trespass in the area will all be impacted by this issue of dust pollution. Both animals and plants will also be impacted.

**Krishnendu Mukhopadhyaya, et al. (2011)** reviewed that workers in stone crushing units are exposed to asbestos, particle pollution, and repairable silica at the workplace and nearby homes. In both the workplace and adjacent communities, the levels of repairable particulate matters and silica exposure were planned to be evaluated in the research. To reduce the unit's dust emissions, researchers tested a novel dust abatement dry engineering control system, and the findings were encouraging [5].

**Dulal Chandra Saha and Pratap Kumar Padhy (2011)** reviewed that Trees should be strategically planted near factories and roadsides to absorb air pollutants, such as particulate matter, in order to mitigate pollution. Trees experience substantial harm from dust accumulation, which hinders photosynthesis and protein synthesis, making them vulnerable to damage from bacteria and insects despite having stress-tolerant systems. Some species thrive in polluted environments, and the effects of pollutants are spatially influenced. Regulations like dust containment and suppression measures are needed to mitigate these effects [6].

**Ravindran (2013)** reviewed emphasized the need of maintaining a clean atmosphere inside the sector. Rocks are crushed into little fragments in a stone crusher. When boulders are crushed, a significant amount of dust is produced, which then disperses in the air around the stone crusher. He determined that breathing in fine dust poses a health risk [7].

**Anjani Gupta (2019)**, reviewed that dust from stone crushing activities contains excessive amounts of particulate matter, exceeding permissible limits in winter and summer. The concentration of SO<sub>2</sub> and NO<sub>2</sub> is within the National Ambient Air Quality Standard (NAAQS) limits. The higher particulate matter value is found at BKC due to increased vehicle movement and handling of stone boulders and gravels. The dust also contains a high percentage of respirable particulate matter, including silica, which can cause serious health problems. The human nose filters out 99% of inhaled particles, while the rest enter the wind pipe and lungs. Respirable particulates may deposit in alveoli, slowing oxygen exchange and causing shortness of breath [8].

**Dr. H. Thavamalar (2019)**, reviewed that Stone crushing business in India's small scale sector significantly contributes to meeting the housing needs of people by supplying crushed stones for constructing roofs. This business is valuable for supplying essential raw materials for infrastructure projects such as road paving, bridge construction, and canal development. The research reveals that there are existing social and economic issues in the stone crushing facilities. Implementing ideas effectively should eliminate the difficulties. The proprietors of the crusher plants should provide suitable amenities to create a pleasant environment and ensure the workers' health and safety [9].

**Javed Manzoor and Mahroof Khan (2020)**, reviewed that Stone crushing and quarrying operations significantly impact environmental quality and human health. This study set out to compare and contrast the environmental policies of several quarrying and stone crushing operations in the Poonch region of Jammu and Kashmir, India. Methods such as questionnaires, laboratory experiments, general observations, and fieldwork were used to carry out the study. Numerous significant negative effects have been reported, such as increased noise, dust, and water pollution; decreased agricultural output; loss of biodiversity; deterioration of the land; formation of unproductive areas; reduction in water quality; accidents; socioeconomic disputes; and serious health risks to the local population. There is no attempt made by the local administration of these units in the region to lessen negative impacts on human health and the environment. According to the most recent studies, regulations must be put in place to protect the environment and public health from the several types of pollutants that these facilities produce. [10].

### 3. ENVIRONMENT PRESPECTIVE OF STONE CRUSHER

In response to rising population demands, there has been extensive exploitation of natural resources recently, which continues daily. The environmental threats resulting from the gradual decline of the biosphere have become a significant concern in recent times. Human activities impact the environment via both direct and indirect means. Stone

crushing and quarrying are illustrative of such operations. Stone crushing and quarrying are important industrial sectors that produce crushed stones for construction purposes. However, they have caused global concerns due to their socioeconomic impacts. Human activity can produce a variety of pollutants, including dust, water, noise, and air pollution, which can have a significant negative impact on the environment. The native plant life, soil, forests, and the habitats of various animals are all impacted by these activities. One significant form of pollution that significantly affects people is the noise produced by stone crushing and quarrying operations. After air and water pollution, the WHO ranks it as the third most dangerous type of pollution. Because of the immediate and cumulative harm that noise from the stone crushing and quarrying industries causes to health, including heart problems, depression, stress, sleep disruptions, and hearing loss, it is regarded as a major annoyance. [11]. Stone dust is a primary aerosol that plays a key role in air pollution. The influence fluctuates depending on several factors associated with the particular geographical location and microclimatic conditions. It harms plant and animal life, changes soil pH, and creates haze that reduces vision. Stone crushing releases many dust particles of various sizes into the air, dispersing suspended particulate matter and gaseous contaminants. Dust may clog and harm plants' internal systems, wear down leaves and cuticles, and reduce agricultural productivity. Dust may cause silicosis and other illnesses. Dust is not only a nuisance but may also have adverse impacts on the health of adjacent populations and the surrounding ecosystem, including biodiversity, plants, and water bodies. Exposure to dust may lead to respiratory disorders and illnesses such as silicosis, as well as skin infections. Stone crushing and quarrying operations alter ecosystems, disrupting local hydrological and geological processes, in addition to generating dust and noise. These actions alter the substratum, landscape patterns, damage natural habitat, disturb natural succession, and impact genetic resources. Disposing of waste rocks near crushing and quarrying facilities may impair natural drainage, leading to rivers and streams being diverted into farmland regions and causing floods. Furthermore, the rise in stone crushing and quarrying operations has led to social challenges and conflicts worldwide. These issues encompass land use disputes, threats to socio-cultural heritage, displacement of communities, destruction of cultural landmarks, struggles for self-governance, control over resources, and the emergence of abandoned towns.





**Fig -1:** Environmental impact of a stone crusher unit

#### 4. ENVIRONMENT IMPACT OF STONE CRUSHER

The environmental impact of a stone crusher can be considered in terms of several aspects, such as air quality, water quality, noise pollution, soil erosion, and habitat destruction. Here's a brief assessment of each aspect:

##### **Air Quality:**

**Dust Emissions:** Stone crushers produce a considerable amount of dust during the crushing process. This dust can lead to respiratory problems for nearby residents and workers. Additionally, it can settle on vegetation and contribute to air pollution.

**Particulate Matter (PM) Emissions:** Crushing activities can release particulate matter into the air, including fine particles (PM<sub>2.5</sub>) and coarse particles (PM<sub>10</sub>), which can have adverse health effects.

##### **Water Quality:**

**Runoff Contamination:** The operation of stone crushers can generate runoff containing sediments, minerals, and other pollutants. This runoff can enter nearby water bodies, leading to water pollution.

**Groundwater Contamination:** The use of chemicals in the crushing process or improper disposal of waste materials can lead to groundwater contamination, affecting local water quality.

##### **Noise Pollution:**

**Operational Noise:** Stone crushers produce noise during their operation, which can be a source of disturbance for nearby residents and wildlife. Ecosystems can be disrupted and human health negatively impacted by prolonged exposure to loud noise.

##### **Soil Erosion:**

**Disturbance to Landscape:** The process of stone crushing may involve extensive excavation, leading to soil erosion and

disruption of natural landscapes. This can result in the loss of fertile soil and alteration of local ecosystems.

##### **Habitat Destruction:**

**Impact on Flora and Fauna:** Destroying natural habitats for a variety of plant and animal species is a potential outcome of establishing and operating stone crushers. This has the potential to upset ecological harmony and lead to a decline in biodiversity.

##### **Waste Generation:**

**Waste Disposal:** The handling and disposal of waste generated during the crushing process, such as unused materials and by-products, need to be managed properly to prevent environmental harm.

To mitigate these environmental impacts, stone crusher operators can implement various measures, including:

**Dust Suppression Systems:** Installing dust control systems to minimize airborne dust emissions.

**Water Management:** Implementing proper drainage systems and sedimentation ponds to control water runoff and prevent water pollution.

**Noise Barriers:** Erecting barriers or soundproof enclosures to reduce noise emissions.

**Reclamation and Rehabilitation:** Implementing reclamation and rehabilitation plans to restore disturbed land and habitats.

**Compliance with Regulations:** Adhering to environmental regulations and obtaining necessary permits before initiating operations.

It's important for stone crusher operators to conduct comprehensive environmental impact assessments and adopt sustainable practices to minimize their ecological footprint. Additionally, community engagement and consultation with relevant stakeholders can help address concerns and find abbreviations in the title or heads unless they are unavoidable.

#### 5. CONCLUSIONS

The dust produced during stone crushing processes comprises a substantial quantity of fine inhalable particles. Although fine particle matter makes only a tiny percentage of total suspended particulate matter, its impact may be far greater. The high silica content in the dust, together with the particle size distribution, may create a dangerous environment for workers and nearby regions, posing risks to human health. Based on the results of the site's air quality and health evaluation, the dust that was found there may be very harmful to respiratory health. The study entails

conducting an exhaustive assessment of air quality and formulating a detailed strategy for the management of occupational and environmental health in these vital small-scale industries. Dust is mostly produced by aggregate production activities including mining, blasting, cutting, hauling, processing, and transportation. As has been the case in previous years, dust accumulates due to the dry climate, lack of vegetation, and strong winds. The high aggregate production rate contributes significantly to the accumulation of dust particles in the surrounding open area. Water hardness indirectly impacts human health by contributing to air pollution. Local challenges in implementing control measures include high investment costs, large water use, insufficient expertise among stone crusher operators, and financial limitations.

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