



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 11, November 2021

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

**Impact Factor: 7.569**

9940 572 462

6381 907 438

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# Impact of Marble Industry of Makrana on Human Health And Environment

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**ABSTRACT:** Conventional and unscientific mining poses severe threat to life, public property and continuation of mining in the area. Incompatible land uses, huge waste dumps and large scale land transformation have resulted in land degradation, ponding, flooding, water contamination and health hazards in Makrana mining area. Segregation of dumps, compatible land use and research and development activity for use of marble slurry are suggested measures for reclamation and restoration of the degraded land. However, though the marble industry provides employment to thousands of people, and contributes substantially to the economy of the state, no attempts have been made to evaluate and table the social and environmental costs of marble mining. The death of the Gomati is just one example of how mammoth the ecological cost can be. It has come about through careless and unplanned marble mining in the river's catchment and the blocking of rivulets through the dumping of marble overburden and slurry. The river has been reduced to a narrow, seasonal stream that comes alive only during the monsoon. Taking note of the situation, and prompted by a PIL by a local NGO and other environmental organizations, the Supreme Court ordered a complete ban on marble mining in 2002, over the whole of Rajasthan. The ban did not last long; lobbying and affidavits by the state government, lobbying by the media for development activity, fear of unemployment, and changes in policy and permission regimes all ensured that it was lifted a mere two months later.

**KEYWORDS:** marble, Makrana, health, environment, hazards, degradation, contamination

## I. INTRODUCTION

Though the marble industry provides employment to thousands of people, and contributes substantially to the economy of the state, no attempts have been made to evaluate and table the social and environmental costs of marble mining. The death of the Gomati is just one example of how mammoth the ecological cost can be. It has come about through careless and unplanned marble mining in the river's catchment and the blocking of rivulets through the dumping of marble overburden and slurry. The river has been reduced to a narrow, seasonal stream that comes alive only during the monsoon.<sup>1</sup>

Taking note of the situation, and prompted by a PIL by a local NGO and other environmental organizations, the Supreme Court ordered a complete ban on marble mining in 2002, over the whole of Rajasthan. The ban did not last long; lobbying and affidavits by the state government, lobbying by the media for development activity, fear of unemployment, and changes in policy and permission regimes all ensured that it was lifted a mere two months later.

Last year, the Rajasthan High Court ordered the closure of 474 marble mines in Makrana that were found to be flouting the rules with impunity. No action has been taken on mines in the southern part of Rajasthan whose owners are in a hurry to extract as much as they can before the court wakes up or the department realizes that the time to take appropriate action has come. Bhomik Shah who worked with WWF-India as senior programme coordinator and Aakash Mehrotra, a researcher in a paper titled "Mountains of Marble Waste" observed that there increasing threat of desertification. The situation is so bad that in many parts there is no pastureland for cattle to graze and no productive farmland to plough. The tribals of Obri village in Udaipur district, for example, now have no common pastures left for their cattle or farmland to grow food. The entire area is an intense marble mining zone. Fifty-five-year-old Hukma Bhai from Obri says:<sup>2</sup> "Tees saal pahle hamne mines ka swagat kiya lekin ab hum apne jungle or zamin sab kho chuke he. Jo kuchh bacha he wo kisi kam ka nahi he." ("Thirty years ago we welcomed the mines but now we have lost our forests and our land. Whatever is left is useless." The limestone mines of Chittor have breached the region's water table. The mines have been operational since 1987, and the unit has excavated pits as much as 40 metres deep. In New Surjana village, located near the mines, there is acute water scarcity and recession in the groundwater table. Residents claim that water could earlier be found at 25 feet, but now the water table has fallen to as low as 400-500 feet.<sup>3</sup>

Unregulated legal mining and rampant illegal mining in Rajasthan has systematically destroyed forests, devastated the Aravallis, and played havoc with the water resources of the state, says Centre for Science and Environment's Sixth State of India's Environment report, "Rich Lands, Poor People" — Is sustainable mining possible? With the industry pouncing on mining leases

in schedule V areas – banned for the last nine years and opened by the previous Vasundhara Raje Scindia government in 2008 — it could be only a matter of time before the damage to ecology and environment becomes irreparable. Rajasthan has the highest number of mine leases in the country — 1,324 leases for major minerals, 10,851 for minor minerals and 19,251 quarry licenses for mining stones. The state earned about 590 crore royalty from major minerals like lead, zinc and limestone in 2004-2005. But the sector contributes only three per cent to the state's revenue. Rajasthan holds reserves for 44 major and 22 minor minerals and is the only producer of garnet, jasper, selenite, wollastonite and zinc concentrates. It is also the leading producer of calcite, lead concentrate, ball clay, fireclay, ochre, phosphorite, silver and steatite. But it is best known for its production of marble, sandstone, marble and other stones. It produces 10 per cent of the world's and 70 per cent of India's output of sandstone. Ajmer, Bhilwara, Bikaner, Dungarpur, Jaipur, Pali, Rajsamand, and Udaipur are its main mining districts. Rajasthan has thousands of unorganized mines, which can be as small as one-twentieth of a hectare. They fall out of the purview of government control and there are no accounts of these mines. Illegal mines have no mechanism in place to implement environmental protection measures. For instance, sandstone quarries may be as small as 200 x 100 feet and because these mines operate beyond the law, workers' rights are not recognized. Basic facilities such as toilets and water do not exist, nor do safety procedures or compensation for accidents. In Makrana mines, there is an average of one death a day from work-related illnesses like silicosis and tuberculosis.<sup>4</sup>

It is the large variety of marbles that make it attractive for some unscrupulous segments to exploit. Rajnagar, is considered to be the largest marble-producing region in the world. Located near Udaipur, Rajnagar is home to over 2,000 marble units. Although the original colour of marble is white, but to make these commercially viable, a chemical process is adopted. Marble rocks in this region are passed through a technical process of color change. Indo-Italian is a unique variety prepared by a similar process. Its color is pistil. It is here the problem arises. This process pollutes the environment. Therefore, by the order of the Supreme Court, many units adjacent to the Sariska Tiger Sanctuary have been closed. In Makrana mines, there is an average of one death a day from work-related illnesses like silicosis and tuberculosis.<sup>5</sup>

## II.DISCUSSION

A distinct marble is prepared by giving it a slightly darker and pinker color. It is known as Onyx marble, which is a different and exotic stone, which gives a beautiful and breathtaking impression. It gives royal and stunning appearance when it is used in flooring and other interior designing projects. There are so many excellent uses of onyx marble. Onyx is available in beautiful different color. Onyx marble is known for its rich palette of beautiful colors and appearance. It became a popular choice due to its beauty and elegance. It is easy to use also it is a versatile material that is used to make wall claddings, tabletops, wainscot, and vanity tops. It is similar to Pakistan Onyx marble gemstone.<sup>6</sup>

Makrana is the source of the marble used in the Taj Mahal. It is situated at a distance of 60 km from Kishangarh and falls in the Nagaur district of Rajasthan. The region has various mining ranges, mainly Doongri, Devi, Ulodi, Saabwali, Gulabi, Kumari, Neharkhan, Matabhar, Matabhar kumari, Chuck doongri, Chosira and Pahar Kua amongst others. World's largest marble-producing area, with over 2,000 gang saw units located in the nearby town of Udaipur to process the material produced. Agaria is the best variety of this area, with numerous other varieties and patterns, primarily in white base. The marble is dolomite and often has quartz intrusions. Located near the capital city of the state of Jaipur (also known as the 'Pink City'), it is dolomite marble with intrusions of tremolite, and is commonly known by the name of pista (pistachio) marble, because of the green colored tremolite against an off-white background. One of the famous varieties of this area was known as Indo-Italian, owing to its resemblance with Satvario Marble. The Supreme Court of India because of the vicinity of the area to the Sariska Tiger Reserve now bans most of the mining of this famous field. Also known as Onyx Marble, it has thick bands of green and pink hint. A resemblance to Onyx Marble from Pakistan gives it this name. This is also highly dolomite. It is considered to be a thick layer stone with a green and pink aura. Though it has not been metamorphosed and hence is still a limestone, it is known as Yellow Marble in trade circles.<sup>7</sup> It is mined in the Jaisalmer District. The yellow marble is called Jaisalmeri marble in commercial areas. Marble found in Abu is basically used in decoration. This stone is mostly used in sculpting temples and sculpture. The stone, known as Green Marble, is found in the mines of Kesariyaji region near Udaipur. However, Kishangarh in Marwar is famous as Marble Mandi. There is yellow marble. These are ultra basic rocks in shades of brown and green color. The crisscross linear pattern given it a remarkable resemblance to a photograph of dense forest. These are also known as forest green/brown or fancy green/brown. There is Kishangarh Marble. Sand stone marble is equally indispensable in the marble industry. Sand stones available in different sizes and types are mostly transparent. In addition to a mixture of metal particles, it also occurs in the form of fractures or fragments. Sand stone is also available in brown, green, pink, white and black and white colors. Sand stones of certain colors are available only in certain areas. However, they are also made from a mixture of water or other chemicals. They have immense ability to absorb water. They are most commonly used for filling or bridging cracks. Sand stones are basically deep shining. They also have the form of chalk and coal. Its maximum use is in framework during construction. Sand stone is the backbone for the handicrafts industry.<sup>8</sup>

Although there are sand stone mines in Bihar, Gujarat and Assam and Andhra Pradesh, 90 percent of sand stone is extracted from the mines of Bundi, Chittor, Kota, Dholpur, Jodhpur and Sawai Madhopur in Rajasthan. Sand stones also exported. Architects say that sand stone of various colours found in these areas are considered superior in terms of interiors and exteriors. Talking about its selection of attractive colors, Agra Red, Jodhpur Red, Lalitpur Pink, Rainbow Sandstone and Raj Green are considered more favorites. Architects say that Jodhpur Pink is considered to be the best in terms of exterior decoration. Sand is also found in Rajasthan with about 200 attractive colored hues. Granite is at number five among the products exported from India to overseas. In Makrana, mining affects environment adversely. The study reveals that in Summer Season the dust emission occurs from many operations in the stone quarrying and processing viz, drilling or blasting from deposit beds, loading and transportation of rocks at crushers, open conveyors, primary, secondary and tertiary crushing of stones, screening transporting rock by belt conveyors, storage and loading of the crushed materials etc. So, the air pollutants were found at the high side. But as we observed that in Summer Season results are reduced with the comparison to the Summer Season previous year because when the mine digs deeper the most of the air pollutant concentration were encircled in the mine. From the study we have conclude that it's really important to take a various mitigative measures to protect the environment or the surrounding area. Marble production in the state has a great contribution in the market due to the different activities and these mines create a lot of jobs or employment in local area. There will be further improvement in infrastructure like education, roads, availability of drinking water, medical facilities in adjacent villages.<sup>9</sup>

Makrana, a small town in Rajasthan, is best known for the pristine white marble that went into the construction of that great monument of love, the Taj Mahal. However, it now attracts attention more for the deaths in the marble quarries. On an average, five to seven people die, or are seriously injured, every month in the quarries. But few are compensated. While there is no comprehensive data available for all the mines, the Mine Labour Protection Campaign (MLPC), a network that has been organising mineworkers across Rajasthan, has registered 368 complaints of death and injury due to work-related accidents over the past two years. Of these, 87 relate to deaths. At least 52 mines collapsed last year. The main reason is that marble is mined along an incline that becomes wider towards the bottom. The lease-holders of the mines are required to keep 'safety pillars' between the various pits so that the top does not collapse. Unfortunately, they don't comply. "What makes matters worse is that none of the workers wears a helmet, even though dynamite is used to blast through the rocks. They do not want to wear helmets because of the heat; but it is the responsibility of the employers to ensure that the workers take precautions, whether they wish to or not. Also, no warnings are issued at the time of blasting so that workers can be moved away from the site of the explosion."<sup>10</sup>

### III. RESULTS

Due to ill equipped mining with respect to mechanization as estimated 60% of marble block comes under mine waste that includes odd blocks of various sizes & shapes, unwanted blocks or rock fragments produced during trimming and shaping of mined out blocks before dispatch to processing units. During processing of marble block on gang saw, 10% of the mined marble comes under processing waste comprising of small fragment & powder mixed with water. On grinding & polishing 5-7% waste generated comprising fines of marble mixed with grinding & polishing material in water. From un-mechanized mining to processing and processing to polishing in total 70% of the mined marble is waste. Nearly 20% of the total weights of the marble processed results into marble slurry that contents 35- 45% water. Every year nearly 5-6 million metric tons marble slurry waste generated through established processing units. The mine & processing waste are dumped on forestland, roadsides, riverbeds, Pasture lands & agricultural fields. However, Rajasthan State Industries & Investment Corporation (State Industrial Infrastructure Development Agency i.e. RIICO for Rajasthan) and marble associations including Makrana has identified & demarcated the dumping sites than also the unscientific & improper dumping of slurry is in practice. This unscientific & improper dumping of slurry is deteriorating environmental quality by reducing water permeability, soil fertility & increasing the Suspended Particulate Matters (SPM). This guideline deals with scientific collection & disposal of marble waste along with the gainful utilization of the slurry waste. Marble slurry samples of Makrana are studied for physical and chemical characteristics states that in large, the marble slurry on dry is fine powder of mostly Off white color. The dried marble slurry has about 40% particles below 75µm diameter of which about 30% has size less than 25µm size. The particle size distribution ranges from 5 to 20%. Makrana marble slurry has calcite as major mineral. The Makrana marble slurry has 39.4-47.4% and 4-8% of CaO & MgO respectively.<sup>11</sup>

Studies have revealed that improper dumping of marble slurry causes adverse impact on ecology, health and quality of water & air. Reduced porosity & permeability of the topsoil affects the soil fertility and reduces the percolation rate of rain water results in reduced rate of ground water recharging. Fine particles of slurry on drying blew with wind & settle over epidermal layer of crops & plants results in stomata (responsible for plant respiration) blocking. Continuous exposure of marble dust can cause severe respiratory disorders like bronchitis, asthma along with dermal & eye irritation in labors and local population. Deposition of particulate/fugitive dust on roads upto 2-5cm causes emission of particulate matter due to vehicular activities and strong wind currents. Disposing the slurry waste near to water bodies, road side areas can deteriorate the surface & ground water quality by increasing turbidity, suspended solids, calcium and magnesium hardness. The workers working near/on the processing gang saw

machine are getting exposed to continuous noise level of 90- 120 dB(A), this high decibel sound exposure can cause annoyance & aggression, hypertension, high stress levels, hearing loss, sleep disturbances. Major disasters are waiting to happen. Thankfully, most of the collapses so far occurred at night or in early mornings, before people came to work. One entire stretch of railway track was destroyed when a mine close to the railway line collapsed," he said.<sup>12</sup>

Bansi Lal himself had worked in a few of the 795 or so mines in Makrana before he formed the union, which, along with the MLPC, filed a public interest petition about the violation of norms in the quarries. As a result of the intervention, 35 mining licences were cancelled. "Each maalik (mine owner) now has to put up a notice board detailing the name of the lease-holder, and the exact size and location of the mine. At least, workers now know who they work for. Safety-kits are also provided to workers. We also insisted on metal ladders, in place of ropes, to descend into the pits," Bansi Lal said.<sup>13</sup>

#### IV. CONCLUSIONS

According to the Mines Act of 1952, workers are entitled to the provision of drinking water and first aid at the site, free health check-ups, registers of employment, resting sheds, a weekly holiday and so on. But none of these norms is followed. Unfortunately, most workers are illiterate, debt-ridden and hard to mobilise. The union has only a little more than 2,000 members though there are at least 30,000 workers. In Makrana, the Marble Mazdoor Union was formed only recently. In contrast, the lease-holders are well-organised; the Makrana Marble Mines Society has 500-odd members. Its chairman, Deepak Bansal, said that there was no question of providing Provident Fund and maternity benefits because the laws did not apply to all workers. "Each mine does not have more than seven workers on an average. The others are employed to drill, dress, transport the product and so on. We do not count them as labourers. There is no exploitation. They are paid Rs.2,500-3,500 a month." On the issue of worker safety, he is defensive. "We conduct health camps. We've also started mining training camps along with the State government's Department of Mines," he said.<sup>14</sup>

Bansal believes that the concept of 'safety pillars' is outdated and unfeasible. "The rules require 15-metre gaps between mines. The maximum area allowed per person is 200 square feet (18 sq metres). The rules also say that mines should be like an inverted bench, at 90(+0) angles. It isn't feasible. In fact, rock mechanics say that safety pillars are unsafe. Now, we're planning to construct concrete 'hanging walls' down the sides of the mines. The Department of Mines has agreed." Bansal warns against any attempt to close down the mines. Since mining is the second-largest employment generator in the State, this seems next to impossible. But the government needs to rethink its policies. There is the question of environmental impact, for one. Sengupta says, "Earlier, we were talking about environmental damage and the impact on agricultural land. But now we focus on labour issues because we realise how many livelihoods are dependent on mining. However, we are also lobbying to get the village panchayats involved. In Jaisalmer and Barmer districts, there is already an order making it compulsory to get no-objection certificates from panchayats before leasing mines." One alternative is the amalgamation of smaller mines; this would mean a single large pit, thus minimising the need for safety pillars, and accidents. The MLPC has already helped form 14 cooperatives, which have led to higher incomes for workers and better control over their working conditions. At any rate, Makrana's workers are better off than their brethren in other districts of Rajasthan and neighbouring Gujarat. According to Deepak Malik, Director of Health, Environment and Development Consortium, the plight of sandstone workers is the worst as most of them are affected by silicosis and tuberculosis. Silicosis is a lung disease caused by silica dust; it is incurable and has been certified as an occupational hazard through the Rajasthan Silicosis Rules, 1955. Says Malik: "Rule 9 of the Silicosis Rules (1955) requires employers to get workers medically examined before hiring them, followed by a check-up every five years, to check for the onset of silicosis. Rule 10 requires that a post-mortem be performed on a worker who dies of silicosis, so that the family of the deceased can claim compensation."<sup>15</sup>

None of these rules is followed, and as a result, the incidence of silicosis is found to be as high as 40-50 per cent among sandstone workers. Paipa Ram, who has been afflicted by the disease for 15 years now, believed he had tuberculosis. He says, "I've been in hospital 10 times. My medical file is thicker than my legs. Now I am told it is silicosis. But there is no help. The maalik will suck the best years out of us, and then discard us." As in other cases, he has no proof of employment. Nor does he know his maalik. Along with three of his colleagues, Bhaira, Malla and Shivalal - all of whom are dead now - he filed a case for compensation in 2002, through the Pathhar Khan Mazdoor Union, Jodhpur. Paipa Ram does not expect anything to come of it. When this correspondent asked him what he was going to do next, he broke into a rasping cough, "I'm going to die, what else?"<sup>16</sup> Hedcon had even managed to get silico-tuberculosis certifications for the four sandstone workers. Malik recalls, "We were threatened by mine-owners. They said they would close down the organisation. Workers were also threatened and paid a few thousand rupees to withdraw the case. One worker was made to sign a statement saying he had never been sick. In two cases, it turned out that the lease was benami. Those responsible denied having any leases. That is the other problem - we can fight, but whom do you fight against?" He adds that the authorities' unwillingness to acknowledge the problem is the worst hurdle. Although a State-level Pneumoconiosis Board was constituted in 1976 to check the incidence and severity of silicosis cases, and to facilitate

compensation claims of victims, the three-member board never functioned. No medical examinations were conducted and the issue of compensation was conveniently forgotten. In 2002, the board was reconstituted after HEDCON filed a public interest petition in the High Court. According to Malik, the board in Jaipur refused to come to the workers' aid.<sup>22</sup> "It sent a letter to the Health Secretary, saying that its duties were not clear and so it could not do anything." One thing that everyone is agreed on is that the State's mining policy needs to be revised, ensuring safety and justice for the mineworkers. The first step would be to insist on employment records. Most workers spend their lives working as casual labourers. According to Bansilal, employment registers are mostly incomplete, if maintained at all. "Some workers get wage-cards for attendance, but are not allowed to keep copies of it since this would be against the employers' interests; if the number of workers officially crosses 25, the employer would have to provide for gratuity, maternity leave, provident fund and so on."<sup>17</sup>

Living conditions of the workers are also sub-standard. Since most of them are immigrant workers, they live in tiny shacks, without their families; 15-20 men share a single room. Women rarely have the shelter of a roof. Bhurla Devi, who migrated from Jodhpur, where she was a landless peasant, says:<sup>21</sup> "I have been working here for the past 25 years but don't even have a dera (home). Our children sleep in the dust." Lease-holders like Bansilal blame the government for this, saying that they need land allotments if they are to build houses for the workers. Women also fare worse in the matter of wages; they are paid only Rs.50 a day, which is below the minimum wages in the State. They are told that they do not work 'as hard as the men'. Women form 37 per cent of the mineworkers and children 15 per cent. The State Labour Department has to be made more responsible if the workers are to receive justice. As of now, it does not resolve disputes involving amounts greater than Rs.1,800. For claims above Rs.1,800, the labourer has to go to court.<sup>18</sup>

The State's apathy to the health and safety of workers in a sector that brings crores of rupees as revenue is worrying.<sup>20</sup> All attention is directed towards raising production, while the welfare of workers is ignored. In fact, a telling statement of the State government's lack of concern in this matter is its Mineral Policy 2005, where the welfare of workers is mentioned in one short paragraph at the end. The document mentions health camps for workers, but serious issues such as accident compensation and occupational disease are not mentioned even in passing.<sup>19</sup>

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**Impact Factor:  
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