CHAPTER-1
INTRODUCTION

1.1 GENERAL INTRODUCTION

Rajasthan is known as one of the most important mineral prospective states of India and from the last 34 years mining industries increased extremely. But mining can change most of the minor minerals tied with changing climate has posed serious problems to the environment fabric in the state.

Environment is called as a complex comprehensive of the external surroundings which can affect our life style, growth and survival rate of all the organisms. Environment is poised of the bio-physical, chemical and socio-economic elements. We can say that environment and people make a give and take relationship. Human beings have been detroit the natural resources for making the life more comfortable. Any misuse of the resources means change with the biosphere and which causes its influence to all organisms.

Even the environment acts as a natural globe for us and provides a safety to us from the natural disasters. But nowadays due to the rise in the rate of urbanization and gradually increasing the growth rate of the industries & development of mining etc sources to the various pollutions.

Now day’s pollution has developed into a major environmental concern as because of the increasing rates of various kinds of pollution lots of hazards created to the biodiversity. The problem is getting worse day by day because of the upbringing of innovative new technologies regarding the development. Pollution occurs when the pollutants detroit the natural environment; and which gets affects our normal life. Due to the environmental pollution it has harmfully affected the life of the human beings. Even our wildlife also found to be threatened with extinction to the increasing growth rate of industry and mines.
Environmental Pollution is getting enormous by increasing intensity of contamination by growth rate in the number of automobiles on the roads, mining at large level & increase in the number of factories causes water, air, noise and land pollution.

Air, Water & Soil Pollution is the most risky forms of pollution causing direct impacts to the human beings. Even we can say that we have no safe water to imbibe, pure air to breathe and pollution free cropland.

Mining Industry has rapidly deteriorated quality of the natural assets called as resources. These industries are getting centers of the pollution sources. We need timely actions and mitigative measures so that natural resources can be confined. Mining and related phenomenon has an insightful and ample persuade on the earth’s natural environment. On the one side mining industries increase the comfort of human life while on other hand; it pollutes the natural ecosystem.

However, efforts made by the all persons to exploit these natural resources and transformed into different forms of land degradation. It is crystal clear that due to untremendously growth rate in human population, the need for a better condition of living has ensured. One of major conflicts is from the land degradations. Basically, land degradation causes the degradation in the qualities and quantities of crops, productiveness of soil & the natural resources etc. Land degradation can be seen more concisely to signify a descending trend in the natural resource such that their vast level of use in the human society equally decreases at an increasing rate (FAO 1994).

Rajasthan is having a huge range of minerals in which construction stones is an important place. The most important building stone is marble which occupies a distinctive location among the other building stones due to the amusing look and easily carved. Variety of marble occurrence is widely spread in our Country.

Whereas due to the economic importance marble availability are found in India in number of states like, M.P, Gujarat, Haryana and Andhra Pradesh. As we very well known that Makrana marble is famous worldwide. Rajasthan is having the
biggest hub of superior quality of marble. Increasing popularity of the marbles in Rajasthan keeps on increasing for completed and fragmentary products invention of new marble deposits increasing the growing private and public supports have led to a significant growth in Marble Industry of this state. Due to this numbers of marble quarries even the marble processing units have extensively risen up mainly as per the last years. However, there is a significant rise in the production of completed and uncompleted products of marble. A wide spread knowledge is widen regarding to make the industries environmentally sustainable.

Marble positions the leading produced natural stone in the world and economically it accounts for 50% of the world’s natural stone production. Approx 92% production of marble are export from the India. However, more than 85% marble production in India is sent from Rajasthan and almost all mining and processing activities are concentrated around Udaipur, Rajsamand, Makrana etc. (Source: dmg-raj.org.)

Mining often generates land use conflicts in developed areas which cause negative impact on loss of vegetation, noise, dust, truck traffic, pollution and visually objectionable landscapes. Mining more ever represents a variance with rival land uses like agriculture, especially in areas where high-value farmland is limited and where post-mining restoration may be infeasible (Willis and Garrod, 1999). According to Ross, (2001) social and environmental activists have keen out that, there are potential connection between the mineral resources degradation and variance consequential underdevelopment. From the decades, marble has extensively been used the religious places, monuments, as well as in the enhancing stone. Marble is having the pleasing colors, eye-catching patterns and designs. Marble suitability for any purpose does not depend on the chemical constituents or genetic aspect, but it depends on its physical properties which are allure for its variation in color, shade, texture, luster and design preferred by the costumer. Usually, the Marble is oppressed in blocks after then it processed to make them suitable for the customers. Further than the quarrying waste, also there are processing wastes deriving from the various processes like sawing, with diamond wire, slabbing,
polishing etc. Generally, two types of natural stone processing waste are generated: solid and semi-liquid or slurry (Almeida et al., 2007).

To avoid the increase quantity of the waste production we have to find alternative ways such as the Reuse, Rehabilitation, Reclamation and Recycling.

**MARBLE:** Marble availability is widely found in India. However, economically importance are restricted to few states only namely Rajasthan, Jammu & Kashmir, Gujarat, Chhattisgarh, Haryana and Uttarakhand (DMG, 1989; IBN; 2015). The total available types of all grades of marble in the country are placed at 1,931 million tones of these only about 276 million tons (14%) fall under reserve category and about 1556 million tones (86%) under remaining resources category.

From the grade wise section, about 28% resources falls under the provision of unclassified and unknown grades, 54% under comes in the section off color grade and 17% under white color grade. The available data on the various sources regarding the marble resources evaluate that about 64% resources are available in Rajasthan and 21% resources available in Jammu & Kashmir. The left over resources are widely spread mainly in Gujarat, Chhattisgarh, Maharashtra, Haryana, Uttarakhand and Sikkim in descending order (IBM, 2015).

The total available resources of all varieties or grades of marble in the Rajasthan are about 1,231 Million tones of good worth marble in India. The ample of varieties available for marble depends on the color, composition, texture, shades and structure. Marble of the one type or other found in almost all the geological horizons right from Precambrian to Tertiary rocks in Rajasthan. Out of the 32 districts, marble deposits are being oppressed in 20 districts. Rajasthan is the foremost important producer of marble and shares more than 90 % of the total country production. (Dwivedi 1991; DMG 1996; DMG 2001; Jha 2003; DMG 2014, IBM, 2015).
Table 1.1: Important Marble Deposits and Available Reserves in Rajasthan

<table>
<thead>
<tr>
<th>S.No</th>
<th>Deposit/ Belt</th>
<th>District</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Agaria, Amet, Kilwa, Morwad, Dharmita, Katre, Parvati, Koyal, Morchana, Arana</td>
<td>Rajsamand</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Makrana, Borawad (White), Chosira Dwagri (Pink, Kumari)</strong></td>
<td>Nagaur</td>
</tr>
<tr>
<td>3.</td>
<td>Kesariaji(Rikhabdeo), Odwas</td>
<td>Udaipur</td>
</tr>
<tr>
<td>4.</td>
<td>Babarmal (Devimata)</td>
<td>Udaipur</td>
</tr>
<tr>
<td>6.</td>
<td><strong>Andhi-Bhainslana</strong></td>
<td>Jaipur</td>
</tr>
<tr>
<td>7.</td>
<td>Jhiri-Sariska</td>
<td>Alwar</td>
</tr>
<tr>
<td>8.</td>
<td>Selwara-Dhanwan-Koteswar</td>
<td>Sirohi</td>
</tr>
<tr>
<td>9.</td>
<td>Jahajpur-Kekri</td>
<td>Bhilwara</td>
</tr>
<tr>
<td>10.</td>
<td>Kalyanpura-Narwar-Saradhana</td>
<td>Ajmer</td>
</tr>
<tr>
<td>11.</td>
<td>Patan-Rampura</td>
<td>Sikar</td>
</tr>
<tr>
<td>12.</td>
<td>Umar</td>
<td>Bundi</td>
</tr>
<tr>
<td>13.</td>
<td>Sabla, Nandli-dad, Peeth, Manpur, Dachki</td>
<td>Dungarpur</td>
</tr>
<tr>
<td>14.</td>
<td>Mandal, Deh</td>
<td>Chittorgarh</td>
</tr>
<tr>
<td>15.</td>
<td>Bar-Sendra, Sarangwa, Sevari, Kund</td>
<td>Pali</td>
</tr>
<tr>
<td>16.</td>
<td>Mooisagar, Amarsagar, Habur, Naripa</td>
<td>Jaisalmer</td>
</tr>
<tr>
<td>17.</td>
<td>Pachori Chadi, Moriya Munjasar</td>
<td>Jodhpur</td>
</tr>
</tbody>
</table>

Source- [http://www.dmg-raj.org/](http://www.dmg-raj.org/)

Table-1.2: Showing Geological Distribution of Marble Deposits in Rajasthan

<table>
<thead>
<tr>
<th>Age/Super-Group</th>
<th>Group</th>
<th>Deposits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesozoic(Jurassic)</td>
<td>Jaisalmer Group</td>
<td>Yellow Marble of Jaisalmer</td>
</tr>
<tr>
<td>Delhi Super Group</td>
<td>Ajabgarh Group</td>
<td>Sikar district, Bhainslana, Pali, Jaipur, Sirohi</td>
</tr>
<tr>
<td></td>
<td>Alwar Group</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Raialo Group</td>
<td>White Marble of Makrana (Nagaur), (Jamwa Ramgarh)Jaipur, Alwar</td>
</tr>
<tr>
<td>Aravalli Super Group</td>
<td>Udaipur Group</td>
<td>White marble and Green marble deposits of Rishabhdeo, Dungarpur, Rajsamand, Babarmal, Banswara, Selwara, Kherwa, Perwar (Sirohi)</td>
</tr>
<tr>
<td>Archaeans</td>
<td>Pre-Aravalli Group</td>
<td>White marble Bhilwara, Bundi, district (Umar area).</td>
</tr>
</tbody>
</table>
The definition of “Marble is a metamorphic rock which is created from the limestone called as the last result of heat and pressure in the earth crust and thereby causing a change in the texture and luster of the limestone.” Due to marble mining number of peoples get job in the marble mining industry.

Since a long Makrana a well known place in Tehsil Parabatsar of Nagaur district for the production of quality marble. The marble resources extend to a strike length of about 12 Kms having a width of 1.6 Km, situated in the west of Makrana town. It is trending NNE-SSW with steep dips from 50 to 70° towards ESE. In this belt there are six parallel to sub-parallel bands of marble having 2 to12 meters, found between Borawad and Makrana. In the main Makrana belt 50 M.T. reserves of marble is estimated.Due to the various physical properties or character of marble like the colour, pattern, grain size etc. Makrana marble belt has been divided into 14 blocks.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Block</th>
<th>Type of marble</th>
<th>Grain size</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bhermala</td>
<td>Pink, White, Adanga</td>
<td>Fine</td>
<td>I &amp; II</td>
</tr>
<tr>
<td>2</td>
<td>Rawat Dungri</td>
<td>Adanga</td>
<td>-</td>
<td>II</td>
</tr>
<tr>
<td>3</td>
<td>Kala-Nada Talab</td>
<td>Dark Pink</td>
<td>coarse</td>
<td>I of II</td>
</tr>
<tr>
<td>4</td>
<td>Dhobi Dungri</td>
<td>Adanga</td>
<td>coarse</td>
<td>III</td>
</tr>
<tr>
<td>5</td>
<td>Kurmari Nadi</td>
<td>Adanga</td>
<td>coarse</td>
<td>III</td>
</tr>
<tr>
<td>6</td>
<td>Ulodi</td>
<td>Adanga pink</td>
<td>coarse</td>
<td>III</td>
</tr>
<tr>
<td>7</td>
<td>Chaurasa</td>
<td>White</td>
<td>fine</td>
<td>I</td>
</tr>
<tr>
<td>8</td>
<td>Range Bhot</td>
<td>Adanga</td>
<td>-</td>
<td>II</td>
</tr>
<tr>
<td>9</td>
<td>Chak Dungri</td>
<td>Adanga</td>
<td>-</td>
<td>II</td>
</tr>
<tr>
<td>10</td>
<td>Pink Range</td>
<td>Light pink</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>Paharkuan Range</td>
<td>White adanga</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Modi Dungari Range</td>
<td>Adanga</td>
<td>-</td>
<td>II</td>
</tr>
<tr>
<td>13</td>
<td>Kala Dungri Range</td>
<td>Adanga</td>
<td>-</td>
<td>II</td>
</tr>
<tr>
<td>14</td>
<td>Boarwad Range</td>
<td>-</td>
<td>Coarse</td>
<td>II</td>
</tr>
</tbody>
</table>

Out of these 14 blocks, marble produced from Chausara block is white in colour and is of the superior quality. Basically, Makrana marble constitutes of coarse grained in texture but some fine grained varieties are also available in the varient
shades. The presence of some dark lines in the some white and pink marbles is because of the local bands of graphitic nature resultant from the original limestone. Eventually it gives a beautiful appearance (Adanga marble) to the finished product which is in vast demand especially for the exterior use.

Process Flow Diagram

Figure 1.0: Shows the District Wise Distribution of Mineral Deposits in Rajasthan
Figure 1.1: Shows the Marble Deposits in Rajasthan Specifically to the Study Area
Figure 1.2: Shows the Mineral Map of Nagaur District
1.2 PROBLEM STATEMENT

The environmental pollution has grown to be a worldwide calamity. The main cause of Environmental Pollution in the study area is Marble Mining. However the surface mining in severely disturbed the natural resources. Dust from the mining and the stone crusher dust is a hazardous pollutant and creates various pollutions problems causing major damage to the environment.

We can say that Marble Waste is an Environment Hazard. Due to the various activities of marble approx about the 1.5-2.0 million tons of marble waste is generated which is known as Marble Slurry. In spite of this the technical, operational and management practices in the mining process are not as much developed and they contributed extensively to the greater waste generation. There are two types of waste generated from the marble processing. At the time of marble processing 30% of the stone (in case of unprocessed stone) goes to scrap because minor or smaller size and/or irregular shape. Then the product sold to the chip manufacturers. However, in the case of semi-processed slab the scrap level reduces to 2-5% whereas the other waste material is called as marble slurry.

Slurry is known as the mixture in which water contains the marble powder. The water can be reused till it gets thick enough (70% water and 30% marble powder). We can estimated that approx 1 ton of marble stone processed in gang-saw or a vertical/horizontal cutter generates almost 1 ton of slurry (70% water). The suspension of marble fines in water generated during processing and polishing because water is used as a cooling agent to cool down the cutting blades. We can say that sludge is composed mainly of calcium carbonate or as a byproduct. The dimensional marble industry produces high percent of the waste generation. The main waste components are the marble waste & powder and slurry which are the most important sources in the environmental degradation in the area.

The Industry is having various severe problems in the area like:

I. Problems owing to slurry produced in different operations and left over the terrain.
II. Discarding of the small irregular boulders which are not so economical to cut into slabs.

III. When discarded near by the rain water pit it results in degraded the quality of ground water reservoirs and also causes drainage problems.

IV. Slurry has been leftover on the road side highways and it causes slippery when wet.

V. Marble is recrystallised limestone and its main component is Calcium Carbonate (CaCO$_3$), Magnesium Carbonate (MgCO$_3$), lime (CaO) and MgO. The main impurities in the form of Silica(SiO$_2$), as free quartz or silicates; iron oxides as hematite (Fe$2$O$_3$), Limonite; Manganese Oxide (MnO$_2$); Alumina (A1$_2$O$_3$) in the form of Aluminium Silicate; and Sulphur as FeS$_2$.

VI. Marble Slurry contaminates the underground resources.

VII. The waste cannot be destroyed.

VIII. The dumping sites are inadequate and distort the overall scenic beauty of the location.

IX. The marble dust particle reduces the fertility of the soil and increasing the alkalinity.

X. Serious health hazard to the labors in relation to dust, air and water pollution.

XI. The slurry generated all through processing can be probable about 10% of the total stone quarried (20% to 25% of the block as received from the quarries) and during polishing as 5% to 7%.

Now, the ultrafine particles considered as waste and treated as such by their producers consequently finer size fractions are still accumulated in the council waste site for inert materials. However, there is the essential of appreciate the potential value of marble and change it into marketable products, thus phenomenon with the costs necessarily incurred by the industry for its disposal.

Various process of taking out the material and quarrying effects the natural resources and our ecosystem which is a great threat for us. The health hazard of the mining workers has generated due to negligence of the air pollutants, contaminated water they are not getting appropriate and satisfactory attention even they are not using the proper guidelines and the personal protective equipments. Some impacts
are harmful and permanent on the health of the labours and on the vegetation. We can say that the marble mining industries, sister concern bodies and our governement are greatly aware to these issues.

The reclamation or rehabilitation of land degraded by marble slurry in Rajasthan is most overlooked areas of concern despite of its grave implications on the marble mining processing & quarrying. The Marble Mines situated in the districts of Nagaur forming a biggest marble clusters in India is a matter of serious concern due to the marble mining clusters it affects the environment of the mine and the surrounding area.

**Impact on the Air**

Air Pollution is the most direct and hazardous impact in the mining area. Dust Particles and other factors rise the pollution level of stone crusher dust, drilling blasting etc. The pollutants are like $SO_x$ & $NO_x$ are likely anticipated by machineries like excavator, air compressor, trucks and other transportation vehicles. From the various processes of mining air pollutants are generated which increase PM$_{10}$ & PM$_{2.5}$ level.

Marble Slurry is generated at every stage in operation phase & its dumping or throwing is a great matter of concern. The most severe concern that when its gets dried it blown with the air and causes air pollution and the related problems.

The particulate matter generated from the mining is a major health hazard. Air pollution also affects the health in particular for those who with respiratory problems but dust can also have physical effects on the surrounding vegetation such as blocking and damaging their internal structures and grazing of leaves and cuticles and make a white dust layer on the plants which cause necrosis. Even the chemical affects which may long term survival.

That the Heavy Vehicular Traffic movement caused by the transportation of raw materials and products from this mining industries is as such very much irksome for the entire villagers as these trucks and tipper leaf dust and dirt on the roads which is the major cause of pollution in the villages and adjoining area.
Impact on the Water

Mining can degrade the quality of surface and the ground water, hydrological phenomenon is concerned by the mining quarrying and processing activities which eventually reduce the quality of water bodies and disturbed the life in the mining areas. The effluents caused by the mining and other related phenomenon are discharged into nearby areas which eventually pollute the water resources. Marble Slurry also works as a major pollutant of ground water. Marble Industry also requires water in its various processes for cooling etc and in this process water gets contaminated. This Contamination is known to be water pollution of the area caused by discharging slurry. Marble slurry flows with rain and contaminated the waterbodies. Polluted water affects the irrigation and drinking water resources. Ground Water is also gets polluted due to the mining which contains toxic substances and gets leached and make the water highly toxic. Water is highly contaminated which is not reuse for any purpose not for domestic and industrial purpose.

Impact on the Land & Soil

Both the agricultural and forest land has faced harmful impacts due to the mining. In the surface mining land surface is completely gets disturbed whereas underground mining has limited losses. Open cast mining causes disruption of existing drainage patterns. Mining of the mineral resources results in soil damage, micro organisms and affects the agriculture leads to the destruction of land. Soil is a combination of constituents of nutrients that is competent of supporting plant life. Similarly fertility of the soil is degraded in two ways. Firstly, fertile topsoil is removed during excavation and secondly overburdens along with boulders and waste are dumped on the fertile soil cover of land mass around the quarries. Also excavated material from the quarries mixed with the soil of the land area and damages fertility of the soil and becomes unfertile which does not support to any vegetation. We can say that land use pattern is also getting disturbed due to deforestation and shifting of agricultural activities in mine area.
Introduction

Increase in the activities of the mining detorite the quality of the soil. The two most important cations are Calcium and Magnesium which is found in the soil. Because of the mining soil gets polluted. (Pandey and Kumar, 1996) stated that mining affects the quality of texture of the soil degrades the procity of the soil. More amount of Calcium found in the soil shows the low content of Phosphorus, Iron, Manganese, and Zinc (Pandey et al. 2005). Plenty quantity of calcium mineral present in the marble make the less composition of other important minerals. (Demooy and Pesek, 1996). Ca$^{2+}$ & Mg$^{2+}$ has been found same in nature. (Pandey et al., 2005).

The researcher’s experimented out the N is the best mineral for the plant growth. But mining degrades the soil quality makes the agricultural land less productive soil is having lack of the entire nutrient which does not support the growth of the plants. Marble waste collected on the land for years and years which are not properly disposed or dumped.

Impact from Noise & Vibration

The language “sound” and “noise” are used interchangeably since the allocation between them is biased. Noise is called as un-wanted or UN desirable sound, which is characterized by intensity, frequency, periodicity and duration. All emitted sound is not audible. Noise is renowned as a severe health hazard, which on excessive contact has lead to noise induced hearing loss to many workers, interfered with speech communication and also caused industrial accidents when workers could not pay attention to warning signals or display boards etc.

Noise has affected blood pressure, heart beat rate, caused stress related disease, sleep disruptions adversely interfering with rest and relaxation function of sleep. Likewise vibration may cause damage to buildings and continuous apprehensions of damage and consequent stress. Noise could be due to ancillary activities and movements of vehicles on roads, highways etc. At mines it could be on account of drill operation, compressors, blasting noise, movement of dumpers excavation equipments, blowing of horns etc contribute even more noise to the environment.
Ground Vibration, fly rock, air blast, noise, dust and fumes are the effects of the blasting of environments. The blasting or explosive energy sets up a seismic wave in the mine area, which can cause considerable damage to structure and trouble to human habitation.

**Impact on Biodiversity**

One of the major negative impacts of mining on the environment is the harm to the biodiversity. Biodiversity essential refers to the varied range of living species including insects, reptiles, birds, mammals, plants, fungi and micro-organism.

Mining activities carry the latent of destroying habitats and the species. Even if the habitats are not directly removed by excavation they can be indirectly affected and damaged by the other environmental impacts—such as contamination of water resources that cause some habitats to dry out to others become inundated even noise pollution is also having a significant impact on the some genus and affects their successful reproduction rate.

The mining and quarrying activities drastically affect the biodiversity of the mining area and also affect the vegetation through the changes. Because of this the original vegetation is completely striped off. The dust or smog particulates widen over the surrounding areas and affects the agriculture, vegetation, soil and nearby resources. Fauna also suffer for green fodder and shelter which is contaminated by the fine particles of marble slurry.

That quarrying and mining of the area for supplying raw materials have already affected the demography of the area. Blasting in these mines and quarries on daily basis has reduced the conceiving rate among the native animals in the surrounding area thereby drastically reducing the population of animals.

Fine particulates deposit over the leaves of vegetation, plants and trees create aesthetic troubles. Due to deposition of marble dust particulates over leaf the vegetation, plants as well as trees die which causes loss of flora and fauna.
Figure 1.3: Dust Deposition over Plants

Impact on the Human Health

Due to the occupational accidents and health hazards affect public health and safety and the environment. The impact on the health and safety of workers, expenditure to the economy and it gets impacts the environment. Too much dust, noise and vibration are the major health hazards for the workers and the local villagers.

A. Exposure to Dust

Exposure to the fine particulates is linked with work in most of the dust-generating activities from drilling and blasting, mineral handling and transportation. Workers which are having a long term exposure to fine particulates dust are at hazard of pneumoconiosis, emphysema, chest pain, lung cancer, silicosis, scleroderma bronchitis and fibrosis. Amount of the lethal gases and particulate
matter together has adverse effects on the human health. General symptoms are of eye irritation, cough, asthma, inflammation and lung infections. The occurrence of particulate matters can also be viewed by the white dust deposition on the face and hairs of person working in the area or lives in the area. Fine particulates of marble slurry blown with air and create serious health problem by inhaling.

B. **Noise and Vibration Exposure**

HEMM Operation, drilling, blasting and transportation is the main source of noise and vibrations.

C. **Physical Hazards**

Injuries during the operation are typically related to slips and fall; contact with falling/moving objects and lifting/over exertion. Other injuries may occur due to contact with or capture in moving machinery.

That these industries have not only laid negative impact on the overall health of the people have drastically increased illiteracy rate in these villagers. The male folk mostly teenagers being the major victims of illiteracy have indulged in other unavoidable circumstances. Thus putting their lives at risk as well and have become menace to the society.
Figure 1.4: Shows the Marble Slurry Waste on the Road Side
1.3 RATIONALE FOR THE STUDY

Despite these worries, a variety of proper management or reclamation have been implemented or suggested in the Rajasthan. Reclamation is known as the process to restore the environmental reliability of these degraded mine land or the slurry areas. In which the management of all factors of physical, chemical and biological disturbances of the land such as pH, fertility, microbial community and various soil nutrients in soil that makes the degraded land productive. We can say that reclamation of degraded mine land is not a very simple process.

Reclamation is the process by which abandoned or highly degraded lands is back to the productivity and by some actions biotic function and productivity can restored. According to (Singh et al.2002) long term mine spoil reclamation needs the establishment of constant nutrient cycles from the plant growth and microbial processes. Soil provides the base for this process and its constituents and concentration directly affect the future stability of the restored plant community.

Restoration of flora cover on overload dumps can fulfill the objectives of stabilization, pollution control, visual illustration and removal of threats to human beings (Wong, 2003). Reclamation activities must emphasized on structure of soil, soil fertility, population of the microbe, management of top soil and the stability of nutrient cycling in order to reclaim the land as closely as significantly to its like new condition and prolong as a sustainable ecosystem.

One of the best methods of reclamation is to form a permanently green area or landscape that is aesthetically and ecologically compatible with local environment. Reclamation should concentrate on topographic restoration, topsoil replacement or substitution and re-vegetation. Efficient care is also in use to minimize erosion and run off and the ground cover is temporally unconcerned. Another method is the Re-vegetation for the reclaimed area through the proper growth culture. In the re-vegetation we can save the top soil before drilling and blasting. Top soil should be stored at an appropriate place along with suitable preventive measures so that it can be reuse during reclamation process. Stacked topsoil should be bounded by proper embankments to prevent erosion. Re vegetation are from simple erosion to the full
restoration of intricate inhabitant communities. At the beginning time of re
vegetation quick growing grasses with short life cycle, legumes also planted. Plants
of fast growing with thick vegetation foliage should be planted. Indigenous/Exotic
plant species with easy adaptable to the locality should be adapted. Selection of
careful trees and shrub species that tolerate alkaline soil is important in the
rehabilitation of alkaline in the area. One of the useful purpose of reclamation that
we can convert the mining area into water reservoir as the rain water is collected into
the water reservoir and the water reservoir can be use for the irrigation purpose etc.

Jaipur and Nagaur area are known on the mineral map of the state for its
important occurrence. Makrana region has a variety of mines in the aravallis range.
The white to greyish-white marbles of Jaipur area are being sold under the varience
name Andhi Pista, a white marble having green laths of twisting; onyx; Indo-Italian
and Black Marble. The Bhainslana marble is dark-black. From the above observation
it is clear that the Makrana is the center of marble mines where as the Jaipur is
limited mines as per the Nagaur. The study area has chosen that the districts Jaipur
with Nagaur area are polluted by the vast number of mines. So, this natural problem
of the area needs serious attention by scientific community. Though, a good number
of attempts have been made by different researchers for the various reclamation
methods of land which is degraded by marble mining.

We can predict that the outcome of the study will therefore provide useful
and sustainable ways of conducting marble mining or the land degraded by marble
slurry such that the impact on the environment will be reduce. This is to provide a
source of data on social, economic and ecological impact of marble mining in Jaipur
& Nagaur district.

1.4 OBJECTIVES OF THE STUDY

General objective of research is to “Reclamation of Land Degraded by
Marble Slurry in Rajasthan with Special Reference to Jaipur & Nagaur District” has
been specifically dealt with by the researcher while keeping following objectives in
consideration.
• To conduct a detailed study of the marble Industry in Jaipur & Nagaur with an aim to highlight environmental problems concerns associated with it.
• To thoroughly assess the major effective impacts of waste-water and solid waste disposal strategies adopted in marble manufactures along other environmental norms through simple preliminary EIA.
• To assess and analyze the possible impacts caused by mining on Air, Water, Soil and Vegetation in the research area.
• To study and analyze the noise pollution & loss of bio diversity due the marble industry in the study area.
• Identification and fetching out the major causes of Land degradation caused by marble slurry in the research specified areas.
• To critically analyze the existing socio-economical legal framework with respect to the key areas so identified and fetched out.
• To suggest the modifications and amendments in the regulatory framework with respect to the identified key areas.
• To analyze the available methods and technologies for the purpose of reclamation of degraded land such as cultivation of medicinal plants, watershed development and revegetation etc. and identify the existing and possible flaws.
• To suggest and provide for the best suitable technology or mode of reclamation of the degraded land in the research area keeping in mind the geographical situation, socio-economical and legal framework and other related factors.

1.5 METHODOLOGY

In order to accomplish the objectives and for the progress in concepts which are basic for the completion of the whole research work a detailed literature review is gone through to understand the previous work which include the study of text books, periodicals and journals, national & international seminars and various research papers.
The technique attain to achieve this objectives of the research is basically on type and method of data collection and their analyses, evaluation. Various alternative data different collection methods such as experiments, observations and research papers are examined.

Both the collection of primary data from the source and secondary data from various sources is collected and used for the analysis.

The results were presented in tabular & graphical forms and the analysis and discussions were also made on the research findings both qualitatively and quantitatively. Finally based on the findings, conclusions and recommendations were forwarded.

1.6 STUDY AREA

The study was made on one of the states of India viz Rajasthan. Rajasthan is situated on the north-western part of India. It covers 3, 42,239 square kilometers (132,139 square miles). Rajasthan lies between latitude 23°3’ and 30°12’ north and longitudes 69°30’ and 78°17’ east. Compared to many countries that is located in a similar latitudinal belt, such as in northern Arabia, Rajasthan has a less harsh climate. The State’s scorching and dry summers and its parched landscape in the western part of Rajasthan is undergoing major changes because of the progress effort that have led to the spread of the Indira Gandhi Nahar.

Rajasthan is surrounded by Pakistan in the west and north-west; by the state of Punjab in the north; by Haryana in the north-east; by Uttar Pradesh in the east, by Madhya Pradesh in the south-east and Gujarat in the South-West.

The Aravalli mountain ranges that run from Delhi to Gujarat cut through the State almost vertically. The Aravalli ranges divide the state through south-east and North West. The north-west region covering two thirds of the state consist mostly of a series of sand dunes. Bikaner, Jaisalmer, Jodhpur and part of the Jhunjhunu districts are part of this region. The eastern region has large fertile tracts.

Slurry problems of marble are encountered in the marble producing state and the problem is localized. However the two study areas were selected the Jaipur district and Nagaur District, where slurry problems have been identified.
1.6.1 Area-I-Jaipur Region

Jaipur Probably known as the pink city even Jaipur is a district in the central part of Rajasthan, bordering to Haryana in the Northeast (Figure 1.6). Jaipur district has an area of 36,46,590 Square Kilometers and a population of 30,73,350 people as per Census 2011.

Figure No. 1.6: Map Showing the Study Area of Jaipur District of Rajasthan
The study was concentrated to the one of the marble mine in Kotputli tehsil of Jaipur District.

1.6.1.1 Location

The Geographical Location of the mining area is Latitude- 27°39’23.97”N and Longitude- 76°06’0.60”E. The study area is located about 10.5 km in NE direction is Kotputli town and is accessible from National Highway-8 which is approx 3.0 km in the SE direction of mine site. State Highway 37-B is at a distance of 6.0 Km in NNE direction from mine site. The lease area is about 88 km away from Jaipur (i.e District Headquarter).

1.6.1.2 Climate

The study area experiences two monsoon periods annually. The first of them is the southwest monsoon period (during July to September) with heavy rains; as much as 65-85% average rainfall recorded during this period. After southwest season comes northeast monsoon period (during October to December) with lighter rains as only some 20% of the average rainfall recorded. The remaining season is a dry period (January to May). During the dry period, some rain is still received during April & May, but in general the soil is very dry during this period. Also, the study has a very high coefficient of runoff 45 percent of the total rain was lost as run off. This is due to the high elevation difference in the area and high concentrations of rain. The large run of coefficient suggests shallow ground water conditions in the plains and also a higher base flow contribution from the groundwater body to the streams and lakes in the area. The humid temperature of the areas differs from 92 percent to 69 percent. During June to November the humidity is almost constant around 80 percent.

1.7. AREA-II-NAGAUR REGION

Nagaur is positioned almost in the middle of the Rajasthan state. (Figure 1.7). Total geological area of the nagaur is 17178 square kilometers is surrounded by various districts. Nagaur district has a population is 2773894 and total urban area is 269.28 square kilometer area i.e 1.52 % of the total geological area. Total urban population 477159 and urban population is density 1272 per square kilometers.
Slurry dumping which is the major concern point in the Makrana region or in the surrounding area. Disposal of marble slurry anywhere by the marble cutting, environmental degradation, it has already happened is being in place or is likely to occur in near or far future-measures to ensure such things are investigated properly and suitable measures are efficiently taken.

Figure No 1.7: Map Showing the Study Area of Nagaur District of Rajasthan
1.7.1 Location

Nagaur is situated almost in center of Rajasthan the Geographical Location of the mining is Latitude-26°58’13.2’’ N and Longitude-74°39’20.2’’ E. Mining area is of 2 hectare whereas Nagaur covers a region of 17178 sq.km and surrounded by various districts.

1.7.2 Climate

The climate of Nagaur district is generally is very scorching in the May, June. Soil erosion is highly common in this area. In March, summer commences and extends till middle of June. A metrological observatory was established and according to the observation, the maximum temperature of 22°C and minimum temperature of 8°C remains in winter, where as in summer the maximum and minimum temperature 45°C and 24°C respectively. After monsoon the temperature falls but the relief heat is not marked because of the discomfort from the increase in humidity. In summer months humidity remains relatively very low as compared to average humidity of 51.5%.

The average annual rainfall in the whole of the district 36.16 cm but is generally decrease from the south-east to north-west. About 93% of annual is during June to September of which July & August are the rainiest months.

1.8 GENERAL GEOLOGY

1.8.1 Regional Geology in Nagaur

Sabalpur marble deposit belongs to the Ajmer formation of Kumbhalgarh Group of Delhi Super Group. Delhi Super group comprises the Railaso, Alwar & Ajabgarh group; Raialo Group is mainly represented by conglomerate Quartzite, Dolomitic & Calcilicate marble & Garnetiferous schist. These are mainly exposed near Ras & Makrana. Now a day’s Raialo Group has been designated as Ras formation, which has been given separate entity and stratigraphically placed as Post Arawali & Delhi. The Alwar Group comprises mainly quartzite and arkose. The overlying Ajabgarh Group is consist of crystalline limestone & Marble, Silicious Limestone, ferruginous quartzite, slate & schist.
Local Geology

On the basis of the physical characteristics like colour, grain size, texture, pattern and quality. This marble is deposit has been divided in four blocks having grade I to grade IV in quality. This marble is usually having some shades in white colour. The streaks are mainly due to the presence of graphite derived from original limestone, this provide beautiful look to the rock. The quarries are quite old and deep hence day-by-day operations are becoming increasingly difficult.

1.8.2 Regional Geology in Jaipur

The stratigraphic succession of rocks is as follows:

<table>
<thead>
<tr>
<th>Recent</th>
<th>Soil, Sand dunes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Delhi</td>
<td>➢ Pegmatite, Granite, Amphibolite,</td>
</tr>
<tr>
<td>Delhi Super Group</td>
<td>➢ Ferruginous quartzite, Ortho Quartzite, phyllite, Carbonaceous phyllite, Impure marble</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Ajabgarh Group</td>
<td>➢ Gritty Quartzite with basic flow, conglomerate, quartzite</td>
</tr>
<tr>
<td>Alwar Group</td>
<td></td>
</tr>
</tbody>
</table>

Local Geology

The area represents the rock of formation belonging to Alwar group of Delhi Super Group.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marble</td>
<td>The grayish colour marble is observed in the lease area in pit and at surface .Except marble and intrusions of low grade bands of dolomitic lime stone the rest area is covered with soil.</td>
</tr>
</tbody>
</table>
Source: Geological Survey of India

Figure 1.8: Shows the Geological and Mineral Map of Rajasthan
Figure 1.9: Shows the Geological Map of Nagaur District