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Impacts of Stone Quarrying on Ambient Noise Level

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Abstract

Mining and quarrying are an ancient tradition occupation, long recognized since the beginning of human life. The lifecycle of mining consists of exploration, mine development, mine operation, decommissioning and land rehabilitation. Mining and quarrying activities have ecological impact, which ultimately result in ecological imbalance. Hence mining and quarrying operations necessarily involves deforestation, habitat destruction, bio-diversity erosion and destruction of ores and minerals also lead to widespread environment pollution.

A large number of activities in operation of stone quarrying cause environmental degradation including noise pollution. These quarries are usually located in clusters in remote locations of mineral rich areas where living standards is lower and understanding of people towards environmental impact is also poor. These quarrying activities results in disturbance of land surface, altering drainage pattern and land use, besides the pollution problems, which may lead to the environmental problem of water, air, noise, solid waste pollution and dust pollution. Consequently want of suitable solutions to the problem were very much high on demand for eco-friendly quarrying.

Keywords: Impact of Stone Quarrying, Noise Pollution, Eco-Degradation.

Introduction

Mining and quarrying activities have adverse effect on the environment and it is the main cause of environmental degradation (Dutta and Sharma, 2000). Urban station and rapid industrialization most of the Indian cities are suffering environmental degradation due to heavy air pollution. The environmental degradation due to marble mining and land degradation, deforestation, air, water, noise pollution, occupational health hazards and socio-cultural pollution has investigated by Gadhvi (1998).

Review of Literature

Noise is almost ubiquitous in mining and quarrying. It is generated by drilling, blasting, cutting, materials handling, ventilation, crushing, conveying and ore processing. Controlling noise has proven difficult in mining and quarrying and noise-induced hearing loss remains common (Frank et al., 2003).

Mishra and Bhubaneswar (2008) reported that phenomenal growth of construction activity in the country to meet the modern day requirements of civilization has tremendously boosted the demand for building materials. Meeting the domestic commitments as well as fulfilling the export demands has forced the stone quarrying industry to quickly readjust for proven quality, maximum production and profitability. However, along with the accrued benefits, the industry is facing severe crisis due to constraints such as quarrying in proximity of habitation, critical structures etc. there by endangering them through various quarry activities. Main issues are dust pollution, water pollution, air pollutionand noisepollution.

Material and Methods

Monitoring of noise level of the study was carried out with the help of Sound Level Meter, which can measure in the range of 35 – 130 dB with a resolution of 0.1 dB and frequency measurement in the range of 30.5 Hz to 8,000 Hz.The SLM 100 is a “Type 2” Integrating Sound Level Meter designed to meet the requirements of IS 15575 (Part 1) 2005. The instrument has a frequency weighting of “A” type and allows the user to select slow or fast mode of measurement. A built-in Data Logger can record all the important sound level parameters in Non-Volatile Flash memory for 24 hours making detailed field data collection very simple. Each record consists of the LEQ, MIN and MAX sound pressure level and

sound exposure level observed during the recording interval. A built-in Real Time Clock maintains a date and time stamp in the recorded data. Noise level of insides the study site was measured and the noise level outside the quarrying site was also studied.

0bservation

The study was conducted at four study sites in central Aravali region. These quarrying sites are Parbatser in Nagaur district, Rajnagar in Rajsamand district, Sedariya in Beawar of Ajmer district and Shrinagar in Ajmer district. The main focus of the study was to assess occupation related health risks in quarrying activities.

The processing of stone quarrying involves operation of different equipments like hammer, drilling machines, edge cutter, sabble and chenies etc. The main sources of producing more noise in the quarrying sites are operation of drilling, blasting, underground mining equipments, ventilation fans and crushing machines. Heavy earth moving machinery, dumpers and material handling, crushing and cleaning equipments are prominent sources above ground. It was therefore decided to study noise level in quarrying sites during drilling, blasting and crushing time.

In order to assess the noise levels, a study has been carried out on ambient noise level in the study sites. The result of noise levels of quarrying sites (Parbatser -S1, Rajnagar - S2, Sedariya - S3 and Shrinagar - S4) are represented in the table.

Ambient noise level showed significant seasonal variation. Noise level in the study sites was varied from 76 dB – 100 dB. Maximum noise level (100dB) was observed during the month of May in S3 and minimum noise level (76dB) was observed during the month of July in S4. Maximum (Average) value of ambient noise level 97.00 ± 1.00 dB was observed in the month of May in summer season and minimum (Average) value of ambient noise level 77.50 ± 1.00dB in the month of July in rainy season during study period 2011 to 2013.

Result and Discussion

Though several factors contribute towards environmental degradation each has its own degree of impact. Considering the popular use of explosives & blasting as a major technique of extracting building materials, the problems associated with it has taken a major dimension. Truck transport, tractor-trolly transport and heavy machinery like shovels and compressors also generate noise levels beyond tolerable limits.

The result of noise levels of quarrying sites (Parbatser -S1, Rajnagar - S2, Sedariya - S3 and Shrinagar - S4) are represented in the table. It was found that noise level was higher in quarrying sites. Ambient noise level showed significant seasonal variation. Noise level in the study sites was varied from 76 dB – 100 dB. Maximum noise level (100dB) was observed during the month of May in S3 and minimum noise level (76dB) was observed during the month of July in S4. Maximum (Average) value of ambient noise level 97.00 ± 1.00 dB was observed in the month of May in summer season and minimum (Average) value of ambient noise level 77.50 ± 1.00dB in the month of July in rainy season during study period 2011 to 2013. These are much above than the permissible limits of 75 dB for mining and quarrying area prescribed by WHO.

It was found that noise levels were comparatively higher in the active zones like drilling, blasting and mine service stations. The noise level value 115.3 dB -124.60 dB was found at blasting operation and 105.5dB -110.4 dB at drilling operation. Noise level exposure of workers during quarrying activities was observed vary from 87.2 dB to 110.4 dB. Maximum noise level exposure 102.3dB per hour per day was showing by blaster and minimum noise level exposure 87.2dB per hour per day was showing by contractor. These are much above than the permissible limits of 70 dB - 75 dB for mining and quarrying area prescribed by CPCB.

Conclusion

Another aspect of quarrying activities is noise pollution due to operation of various machines like drilling, blasting, gangsaw, compressor, showel, loading and tractor-trolly transportation. It was found that in quarrying sites high noise level 76 dB – 100 dB which comes in the range of noise pollution. Data revealed that noise levels were comparatively higher in the active zones like drilling, blasting and mine service stations. The present study in stone quarries indicates that the noise level during blasting hours was high within quarry sites. Though the duration of high intensity noise during blasting might be a few seconds, the noise levels would be well above the permissible limits that would cause adverse effects on health. The workers involved in quarrying units are constantly affected by noise pollution. The noisy environment may lead to hypertension, auditory fatigue, deficiency in hearing capacity and permanent deafness. Noise induced hearing loss % observed much above in workers involved in quarrying activities.

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Table: Average Ambient noise level (dB) at the study sites (Parbatser -S1, Rajnagar - S2, Sedariya - S3 and Shrinagar - S4) during study period:-2011 to 2013

Month	Average of 2011	Average of 2012	Average of 2013	Average + S.D. of 2011 to 2013
January	89.25	87.25	86.25	87.58±1.53
February	90.25	89.25	87.25	88.92±1.53
March	94	92	93	93.0±1.00
April	96	94	95	95.00±1.00
May	98	96	97	97.00±1.00
June	91.25	93.25	92.25	92.25±1.00
July	78.5	77.5	76.5	77.50±1.00
August	80.75	78.75	79.75	79.75±1.00
September	81.5	80.5	81.75	81.25±0.66
October	84.25	82.25	83	83.17±1.01
November	85.75	83.75	84.25	84.58±1.04
December	87.25	85.25	85.25	85.92±1.15

Table: Average Ambient noise level (dB) at study sites (Parbatser -S1, Rajnagar - S2, Sedariya - S3 and Shrinagar - S4) during study period: – 2011 to 2013

Month	Average of S1	Average of S2	Average of S3	Average of S4	Average + S.D. of S1 to S4
January	87.33	86.33	91.33	85.33	87.58±2.63
February	88.67	87.67	92.67	86.67	88.92±2.63
March	94.00	92.00	96.00	90.00	93.00±2.58
April	96.00	94.00	98.00	92.00	95.00±2.58
May	98.00	96.00	100.00	94.00	97.00±2.58
June	93.00	91.00	94.00	91.00	92.25±1.50
July	77.00	78.00	79.00	76.00	77.50±1.29
August	79.00	80.00	82.00	78.00	79.75±1.71
September	80.67	81.33	84.00	79.00	81.25±2.08
October	83.00	82.67	86.00	81.00	83.17±2.08
November	84.67	83.67	88.00	82.00	84.58±2.53
December	85.67	84.67	89.67	83.67	85.92±2.63

Table: Noise levels at different location in stone quarry at study sites (Parbatser -S1, Rajnagar - S2, Sedariya - S3 and Shrinagar - S4).

Location in stone quarry	Range of noise level (dB)			Limits as per CPCB	
	Minimum	Maximum	Average	Day	Night
Within the quarry (during transport)	87.2	91.2	89.7	75	70
Within the quarry (during loading)	91.3	95.3	93.3	75	70
Quarry sites (during shovel, compressor operation)	95.4	105.4	100.4	75	70
Within the quarry(during drilling)	105.5	115.2	110.4	75	70
Within the quarry (during blasting)	102.3	112.60	107.5	75	70
Within the quarry (during breaking of stones)	89.7	93.3	91.5	75	70