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STUDY OF NOISE QUALITY IN AND AROUND THE COAL MINING AREA TAMNAR, DISTRICT-RAIGARH,CHHATTISGARH.

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ABSTRACT: Noise pollution or noise disturbance is the disturbing or excessive noise that may harm the activity or balance of human or animal life. The source of most outdoor noise worldwide is mainly caused by machines and transportation systems, motor vehicles, aircraft, and trains. Outdoor noise is summarized by the word environmental noise. Poor urban planning may give rise to noise pollution, since side-by-side industrial and residential buildings can result in noise pollution in the residential areas.

Indoor noise can be caused by machines, building activities, and music performances, especially in some workplaces. Noise-induced hearing loss can be caused by outside (e.g. trains) or inside (e.g. music) noise.

High noise levels can contribute to cardiovascular effects in humans, a rise in blood pressure, and an increase in stress and vasoconstriction, and an increased incidence of coronary artery disease. In animals, noise can increase the risk of death by altering predator or prey detection and avoidance, interfere with reproduction and navigation, and contribute to permanent hearing loss

Noise pollution effects both health and behavior. Unwanted sound (noise) can damage psychological health. Noise pollution can cause hypertension, high stress levels, tinnitus, hearing loss, sleep disturbances, and other harmful effects.

Noise can have a detrimental effect on wild animals, increasing the risk of death by changing the delicate balance in predator or prey detection and avoidance, and interfering the use of the sounds in communication, especially in relation to reproduction and in navigation. Noise pollution is a major problem in India. The government of India has regulations against firecrackers and loudspeakers, but enforcement is extremely lax

Study area is coalmining area Tamnar, district-Raigarh located on toposheet 64 N /8 & 64 N /12. A noise rating developed by E P A for specification of community noise from all the sources is the Day-Night Sound Level (Ldn). It is similar to a 24 hr equivalent sound level except that during the night time period, which extends from 9 p.m. to 6 a.m., a 10 dB (A) weighing penalty is added to the instantaneous sound level before computing 24 hr average.

KEYWORDS: Noise pollution, Sound level meter, Coalmining area Tamnar, Raigarh.

1. INTRODUCTION

Noise can be described as sound without agreeable musical quality or as an unwanted or undesired sound. Thus noise can be taken as a group of loud, non harmonious sound or vibration that is unpleasant and irritating to the ears. "Noise Pollution" is a form of pollution, which does not give any residue. The noise pollution is due to the contribution of modern civilization, the main causes of which are Urbanization, Mechanized means of transport & new devices of Recreation & Entertainment. The modern civilization creates more noise, because of the development of Industry, Machinery & Technology. It has increased in factories, in hospitals, in colleges, theatres, at building sites & in the countryside. The Noise, unwanted sound has penetrated almost every aspect of modern life. It is potentially a serious signal & grave threat to the environment & health. The increased level of noise pollution affects the welfare of Human life, Animals, Plants & Structures & finally affects their existence. The noise pollution is highly complex & different from other forms of pollution.

Sound becomes unwanted when it either interferes with normal activities such as sleeping, conversation, or disrupts or diminishes one's quality of life.

Chronic exposure to noise may cause noise-induced hearing loss. Older males exposed to significant occupational noise demonstrate more significantly reduced hearing sensitivity than their non-exposed peers, though differences in hearing sensitivity decrease with time and the two groups are indistinguishable by age 79. A comparison of Maaban tribesmen, who were

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insignificantly exposed to transportation or industrial noise, to a typical U.S. population showed that chronic exposure to moderately high levels of environmental noise contributes to hearing loss.

Nandanwar et al. studied the effect of traffic noise on the quality of life among residents around the major road intersections in Nagpur city (2009). Majority of the subjects expressed annoyance due to traffic noise during daily activities, and of these 29% were extremely, 24% very much, 22% to some extent, and 19% little annoyed. 33% of subjects reported more annoyance during evening than daytime. No exposure-effect curve was reported for this study. Most identified causes due to traffic noise were headache, nervousness, and hearing problems. The authors concluded that both income and education positively affected the perceived impact of traffic noised on health-related variables.

Agarwal and Swami studied the correlation between annoyance level and different noise indices along selected roadways in Jaipur city (2009). In this study, to define the noise annoyance quantitatively, a new point scale of MDS was used. A set of regression equations were developed between mean noise index (L eq , L 10 , L max L dn , and TNI) and percentage of the person highly annoyed and MDS. It was observed that among the subjects, the reported percent HA ranged between 17.07% and 39.69%. It was concluded that a strong correlation existed between percentage highly annoyed and various noise indices.

Goswami studied traffic noise in terms of standard noise indices, community response, and community health effects in Balasore city (2009). It was reported that 63% respondents were not satisfied with the noise level in their dwellings. Of the different sources of environmental noise, the most significant was identified as road traffic, with 49% of respondents reported being highly annoyed by the road traffic stream. 28% of subjects reported sleep disruption due to nighttime movement of vehicles.

Mishra et al. reported traffic noise along a rapid bus transit corridor in Delhi city (2010). On the basis of the study, relationship between different noise parameters and annoyance level was quantified using linear and multiple regressions. It was observed that 68% of the subjects reported the problem of stress due to traffic noise exposure. No exposure-annoyance curves were reported. The subjects identified hearing loss (64%), blood pressure (56%), depression (48%), agitation (36%), and fatigue (12%).

Wani and Jaiswal studied traffic noise and subjective community response in the Gwalior city (2010). Based on a questionnaire survey, it was reported that 50% of the subjects were always annoyed and 33% had a constant headache For speech interference, 43% subjects reported highly affected, 21% moderately affected, 32% low, and 4% least affected.

Agarwal and Swami studied the impact of noise pollution on residents dwelling near roadside in Jaipur city (2011). The degree of annoyance was assessed by means of a questionnaire and it was reported that road traffic was the major source of noise in the area. Results of a health survey reported about 52% of subjects were suffering from frequent irritation, 46% had hypertension, and 48.6% reported difficulties in sleep due to traffic noise and that female subjects were more sensitive toward noise-related health problems. It was explained that in India the numbers of housewives are higher than the working-class females and due to continuous living in a particular surrounding they have to face noise-related problems daily.

Goswami et al. studied traffic noise levels along a road connecting two university campuses in Balasore city (2011). It was reported that the source of noise along the study area was predominantly due to vehicular traffic with heavy vehicles being the major emitters. The survey identified that the majority of the subjects, including drivers, expressed their dissatisfaction over the increasing intensity of noise in the area. The study reports that headache, bad temper, hearing problem, and loss of concentration were some of the significant effects due to high noise levels. About 86% of students reported that their study was disturbed by frequent air horns and 21% had sleep disruption nighttime traffic noise.

Patil et al. reported subjective analysis on traffic noise and the quality of life among residents around the major arterials roads in Amravati city (2011). It was reported that majority of the subjects were aware of the interference of traffic noise with daily activities and impact on health. It was observed that 16.8% were extremely and 21.1% were very much annoyed due to vehicle noise. Reported maximum annoyance (47%) was highest during the midday and afternoon, while 50% of subjects reported headache, nervousness, and hearing difficulties due from exposure to noise.

High noise levels can contribute to cardiovascular effects and exposure to moderately high levels during a single eight-hour period causes a statistical rise in blood pressure of five to ten points and an increase in stress

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and vasoconstriction leading to the increased blood pressure noted above, as well as to increased incidence of coronary artery disease.

Noise pollution also is a cause of annoyance. A 2005 study by Spanish researchers found that in urban areas households are willing to pay approximately four Euros per decibel per year for noise reduction.

A decibel is a standard for the measurement of noise. The zero on a decibel scale is at the threshold of hearing, the lowest sound pressure that can be heard, on the scale. 20 dB is whisper, 40 dB the noise in a quiet office. 60 dB is normal conversation, 80 dB is the level at which sound becomes physically painful.

Broadly speaking, the noise pollution has two sources, i.e. industrial and non- industrial. The industrial source includes the noise from various industries and big machines working at a very high speed and high noise intensity. Non- industrial source of noise includes the noise created by transport/vehicular traffic and the neighbourhood noise generated by various noise pollution can also be divided in the categories, namely, natural and manmade.

Most leading noise sources will fall into the following categories: roads traffic, aircraft, railroads, construction, industry, noise in buildings, and consumer products

1. Road Traffic Noise.
2. Air Craft Noise.
3. Noise from railroads.
4. Construction Noise.
5. Noise in Industry.
6. Noise in building.
7. Noise from Consumer product

2. STUDY AREA METHDOLOGY-

The present study is going to centralize in and around coalmining area Tamnar district Raigarh in Chhattishgarh. The study area (coalmining field) is a part of Mand Raigarh Coalfields. The area is located in Survey of India, Toposheet No. 64 N/8 & 64 N/12 on 1:50000 scale. Mand-Raigarh coalfield is well connected by National/ State Highways from Bilaspur, and Raigarh with trijunction at Dharamjaygarh, located in the northern part of the coalfield. Bilaspur and Raigarh towns are connected by National Highway No. 200. Dharamjaygarh-Raigarh (State Highway No. 1) and Dharamjaygarh-Kharsia (State Highway No. 23) roads pass through the coalfield. These roads are also connected with each other by Chhal-Ghargoda road. Besides, there are several fair weather roads criss-crossing the coalfield. The nearest town Gharghoda and Tamnar has Telephone Exchange (STD code 07767) connected to National Network. Post Office and Telegraph Office are functioning at town. Gharghoda town is about 15 km and Tamnar town is about 8 km from this coalmining area.

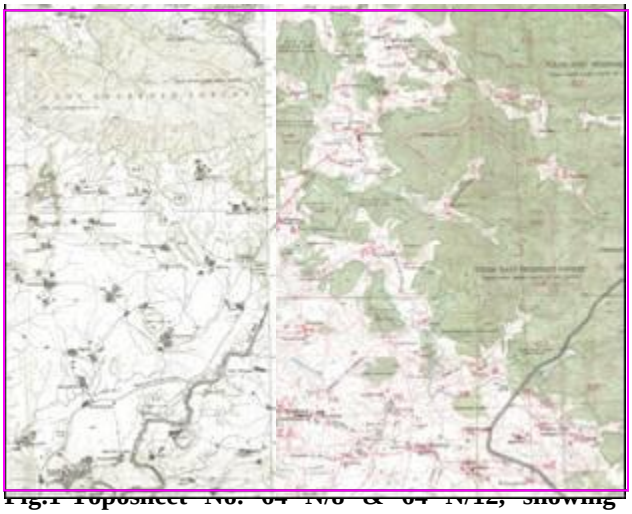

Fig.1 Toposheet No. 64 N/8 & 64 N/12, showing coalmining area, Tamnar district Raigarh Chhattisgarh.

Considerable noise gets generated in any industrial situation due to operation of equipment. In the present case, the area is virgin village / revenue area and surface operations are limited, although in the surrounding area of buffer zone commercial / industrial activities are going on. At present, noise at site is produced due to multiple sources of noise in the neighbouring state highway due to movement of trucks and other vehicles on the road.

Parameters Measured During Monitoring: A noise rating developed by E P A for specification of community noise from all the sources is the Day-Night Sound Level (Ldn). It is similar to a 24 hr equivalent sound level except that during the night time period , which extends from 9 p.m. to 6 a.m., a 10 dB(A) weighing penalty is added to the instantaneous sound level before computing 24 hr average. This night time penalty is added to account for the fact that noise during night when people usually sleep is judged more annoying than the same noise during the day time. For Noise levels measured over a given period of time interval, it is possible to describe important features of noise using statistical quantities. This is calculated using

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the percent of the time certain noise levels exceeding during the time interval. The notation for the statistical quantities of noise levels are described below:

- L10 is the noise level exceeded 10 percent of other time.
- L50 is the noise level exceeded 50 percent of the time and
- L90 is the noise level exceeded 90 percent of the time and
- Lday is defined as the equivalent noise level measured over a period of time during day (6 am to 9 pm)
- Lnight is defined as the equivalent noise level measured over a period of time during night (9 pm to 6 am).

Equivalent Sound Pressure Level (Leq) : This Leq is the equivalent continuous sound level which is equivalent to other same sound energy as the actual fluctuating sound measured in the same period. This is necessary because sound from noise source often fluctuates widely during a given period of time.

This is calculated from the following equation:

$$Leq = L50 + \frac{(L10 - L90)2}{60}$$

Ldn : The noise rating developed for community noise from all sources is the Day-Night Sound Level (Ldn). It is similar to a 24 hr equivalent sound level except that during night time period (9 pm to 6 am) a 10 dB(A) weighing penalty is added to the instantaneous sound level before computing the 24 hr average. The Ldn for a given location in a community may be calculated from the hourly Leq's, by the following equation.

$$Ldn = 10 \log (1/24 [15(10\ Ld/10) + 9 (10 (Ln + 10)]\}$$

Where Ld is the equivalent sound level during the day time (6 am to 9 pm) and Ln is the equivalent sound level during the night time (9 pm to 6 am).

Method of Monitoring: A detailed noise survey was undertaken to study the levels of noise as the high noise levels may cause adverse effect on human beings and the associated environment. Noise level was recorded at 6:00, 10:00, 14:00, 18:00, 22:00, hours with setting at 'A' response - slow mode.

Ambient Noise Level Standards: Ambient Air quality standards in respect of noise have been notified by the Ministry of Environment & Forests vide Gazette Notification Dated 26th December 1989. It is based on the A weighted equivalent noise level (Leq). The standards are given in Table-1.1

Table1.1 -Ambient Noise Level Standards

Area Code	Category of Area	Limits in dB(A) Leq	
		Day time	Night time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone**	50	40

** Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.

Standards for Occupational Noise: Industrialized countries have specified limits for occupational noise exposure. The permissible noise exposure limit for industrial workers is primarily concerned with the harmful aspect of noise and its objective is to protect the hearing of majority of working people. The American Conference Government of Industrial Hygienists (ACGIH), USA has prescribed the following permissible noise exposure limits for industrial workers. These limits are given in Table-1.2

Table-1.2 Standards for Occupational Exposure

Exposure time in hour/day	Limit in dB(A)
8	90
4	93
2	96
1	99
1/2	102
1/4	105
1/8	108
1/16	111
1/32	114

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Exposure to continuous or intermittent noise louder than 115dB (A) should not be permitted. Exposure to pulse or impact noise should not exceed 140 dB(A)

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OSHA STANDARDS: The Occupational Safety and Health Administration (OSHA) have also prescribed the following allowable limits to noise exposure for industrial workers. These are given in the following Table-1.3

TABLE-1.3 OSHA Standards for Occupational Exposure

Duration per day (in hours)	Sound level in dB(A)
8	85
6	87
4	90
3	92
2	95
1.5	97
1	100
0.5	105
0.25	110

3. RESULT AND DISCUSSION

Noise levels were measured at hourly intervals at ten stations N1,…. N7 as described at Table 1.4 and readings recorded are detailed in Table 1.5..1.12.

Table 1.4 Details of Sampling Stations of Noise Level Measurement

Sr. No.	Description of the sampling station	Zone /area
N-1	Milupara	Mining area
N-2	Bankheta	Mining area
N-3	Beljor	Mining area
N-4	Hukaradipa	Mining area
N-5	Khamria	Mining area
N-7	Gare	Mining area
N-8	Libra	Mining area

TABLE 1.5:NOISE MONITORING RESULTS AT MILUPARA CHOWK (N1)

Time	Noise Level in dB(A)					
	L_{eq}	L_{90}	L_{50}	L_{10}	L_{max}	L_{min}
05:45-6:00	42.27	39.80	42.50	43.76	43.80	39.80
10:00-10:15	52.46	48.96	51.20	54.72	55.00	48.40
14:00-14:15	54.09	47.64	52.70	56.66	58.70	46.80
18:00-18:15	54.17	53.54	54.10	54.76	54.80	53.50
22:00-22:15	49.90	49.10	49.50	50.80	51.20	49.10
AVERAGE	**50.58**	**51.32**	**51.80**	**52.78**	**53.00**	**51.30**
Ldn	**50.58**					
Lday	**53.58**					
Lnight	**46.08**					

TABLE 1.6:NOISE MONITORING RESULTS AT VILLAGE BANKHETA (N2)

Time	Noise Level in dB(A)					
	L_{eq}	L_{90}	L_{50}	L_{10}	L_{max}	L_{min}
05:45-6:00	40.37	39.00	40.30	41.30	41.50	38.20
10:00-10:15	56.18	51.56	55.20	58.68	59.60	51.20
14:00-14:15	55.47	46.24	54.30	58.50	59.70	45.20
18:00-18:15	52.91	50.68	52.10	54.66	55.30	50.20
22:00-22:15	51.31	49.04	50.20	53.12	53.40	48.60
AVERAGE	**51.25**	**49.86**	**51.15**	**53.89**	**54.35**	**49.40**
Ldn	**51.25**					
Lday	**54.86**					
Lnight	**45.84**					

TABLE 1.7:NOISE MONITORING RESULTS AT VILLAGE BELJOR (N3)

Time	Noise Level in dB(A)					
	L_{eq}	L_{90}	L_{50}	L_{10}	L_{max}	L_{min}
05:45-6:00	39.59	38.34	39.00	40.80	41.20	38.10
10:00-10:15	45.49	40.78	42.10	48.18	50.10	40.50
14:00-14:15	50.39	44.82	49.80	52.94	54.10	44.30
18:00-18:15	49.93	48.60	50.20	50.92	51.40	48.60
22:00-22:15	48.71	46.88	48.60	50.00	50.20	46.40
AVERAGE	**46.82**	**47.74**	**49.40**	**50.46**	**50.80**	**47.50**

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Ldn	**46.82**
Lday	**48.60**
Lnight	**44.15**

TABLE 1.8:NOISE MONITORING RESULTS AT VILLAGE HUKARADIPA CHOWK (N4)

Time	Noise Level in dB(A)					
	L_{eq}	L_{90}	L_{50}	L_{10}	L_{max}	L_{min}
05:45-6:00	43.92	41.70	43.50	45.36	46.20	40.50
10:00-10:15	63.12	55.92	58.70	66.48	67.20	55.60
14:00-14:15	61.53	58.00	60.20	63.84	64.80	57.60
18:00-18:15	60.92	55.88	58.90	63.32	65.40	54.60
22:00-22:15	61.28	51.56	60.70	64.20	65.40	50.20
AVERAGE	**58.15**	**53.72**	**59.80**	**63.76**	**65.40**	**52.40**

Ldn	**58.15**
Lday	**61.86**
Lnight	**52.60**

TABLE 1.9:NOISE MONITORING RESULTS AT VILLAGE KHAMHARIA (N5)

Time	Noise Level in dB(A)					
	L_{eq}	L_{90}	L_{50}	L_{10}	L_{max}	L_{min}
05:45-6:00	41.23	39.72	41.20	42.34	42.50	39.40
10:00-10:15	58.10	53.26	55.20	60.80	62.40	52.30
14:00-14:15	57.79	53.58	56.40	60.28	61.20	53.10
18:00-18:15	59.27	54.16	58.70	61.72	62.40	53.20
22:00-22:15	51.70	49.14	50.20	53.74	54.10	48.70
AVERAGE	**53.62**	**51.65**	**54.45**	**57.73**	**58.25**	**50.95**

Ldn	**53.62**
Lday	**58.38**
Lnight	**46.47**

TABLE 1.10:NOISE MONITORING RESULTS AT VILLAGE GARE (N6)

Time	Noise Level in dB(A)					
	L_{eq}	L_{90}	L_{50}	L_{10}	L_{max}	L_{min}
05:45-6:00	41.08	39.78	40.30	42.40	43.20	39.50
10:00-10:15	56.50	51.48	56.10	58.84	59.80	50.20
14:00-14:15	63.13	57.34	62.00	65.82	66.70	56.30
18:00-18:15	59.62	53.76	57.60	62.52	63.40	53.20
22:00-22:15	53.36	49.36	50.20	56.00	57.60	49.20
AVERAGE	**54.74**	**51.56**	**53.90**	**59.26**	**60.50**	**51.20**

Ldn	**54.74**
Lday	**59.75**
Lnight	**47.22**

TABLE 1.11:NOISE MONITORING RESULTS AT VILLAGE LIBRA (N7)

Time	Noise Level in dB(A)					
	L_{eq}	L_{90}	L_{50}	L_{10}	L_{max}	L_{min}
05:45-6:00	41.32	39.70	41.50	42.34	42.50	39.10
10:00-10:15	63.50	51.84	54.60	67.22	68.70	51.20
14:00-14:15	63.14	53.94	56.80	66.76	67.20	53.70
18:00-18:15	58.73	54.00	56.70	61.36	62.40	52.80
22:00-22:15	53.67	50.62	52.30	55.76	57.20	50.10
AVERAGE	**56.07**	**52.31**	**54.50**	**58.56**	**59.80**	**51.45**

Ldn	**56.07**
Lday	**61.79**
Lnight	**47.49**

TABLE 1.12:COMPARATIVE NOISE LEVEL MONITORING IN COALMINING AREA

Location	L_{eq}	L_{90}	L_{50}	L_{10}	L_{max}	L_{min}
N1	50.58	51.32	51.80	52.78	53.00	51.30
N2	51.25	49.86	51.15	53.89	54.35	49.40
N3	46.82	47.74	49.40	50.46	50.80	47.50
N4	58.15	53.72	59.80	63.76	65.40	52.40
N5	53.62	51.65	54.45	57.73	58.25	50.95
N6	54.74	51.56	53.90	59.26	60.50	51.20
N7	56.07	52.31	54.50	58.56	59.80	51.45
Average	**53.03**	**51.17**	**53.57**	**56.63**	**57.44**	**50.60**
Std*.	**55.00**					

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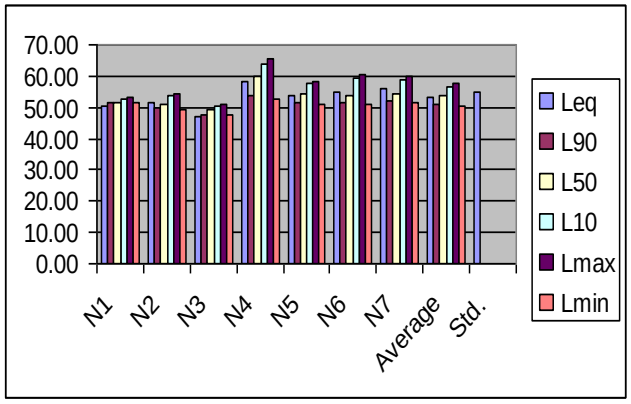
*Residential Area Only.

Diagram 1.1 Showing the Comparative noise level in the study area.



It has been clearly observed in tables and graph that noise levels are in the range of 38.10 to-67.20 dB(A) at all seven stations. Noise levels at stations N4 N6 and N7 are comparatively higher than these other stations. There is lot of movement of vehicles like dumper, truck, and trailer during the transportation of coal and other related activities, perhaps, is reason for these high noise levels. Thus noise pollution can be mitigated by the shifting of roads those are passing through the village to outer side of village area and three tier plantations all along the road side.

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