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Assessment of Noise Pollution in Balasore Area, INDIA

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ABSTRACT

Due to augment of urbanization, industrialization, transport network and motorization the noise level is exceeding the prescribed limits in many Indian cities day by day. The health implications of high noise levels are being identified as hypertension, sleeplessness, mental stress and so on. Due to this adverse effect of noise level, it is essential to assess the impact of noise pollution. An assessment of noise pollution and its effects was made by analyzing the noise pollution indices such as L_{eq}, L_{10}, L_{50}, L_{90}, N.C, L_{np}, and TNI. The findings conclude that the Noise Pollution and its effects are of serious concern to the general public in Balasore area. The Noise Pollution of the study area was greatly influenced by vehicular traffic and the industries around Balasore area.

Keywords: Noise, L_{eq}, N.C, L_{np} and TNI

INTRODUCTION

Due to augment of urbanization, industrialization, transport network and motorization the noise level is exceeding the prescribed limits in many Indian cities day by day [1, 2]. The health implications of high noise levels are being identified as hypertension, sleeplessness, mental stress and so on [2]. Noise pollution is recognized as a major problem for the quality of life in urban areas all over the world [3]. Noise can be referred to an unwanted sound or sound in the wrong place at the wrong time and Noise Pollution is a significant environmental problem in many urban centers and industrial activities in India but has not been properly identified in recent years. The noise originates from human activities, especially due to urbanization and the development of transport networks and industries. Noise affects human health unfavorably both physically and psychologically [4, 5]. Though the urban population is much more affected by such pollution, however small town or villages along side roads or industries

are also victim of this. According to Brigitta and Lindvall (1995) road, traffic, jet planes, garbage trucks, construction equipment, manufacturing processes and lawn mowers are some of the major sources of this unwanted sound that are routinely broadcasted into the air [6]. Traffic is the dominating source of noise [7] in urban areas with wide range effects to human beings. It produces disturbance and inversely impact more than other form of noise. This had led researchers in many countries to investigate and characterize traffic noise pollution [8, 9, 10, 11, 12, 13].

Balasore is one of the major industrial centers of Orissa. Three major industries such as Birla Tyres Ltd., Balasore Alloys Ltd. and Emami Paper Ltd are located in this area along with various ancillary industries. Balasore Township has grown into a major area of concern as regards to noise pollution. The present study on noise pollution is highly relevant. The present study aims at the assessment of noise pollution within 20 kms keeping Remuna Golei as the epicenter in Balasore area. This will provide a background level data of noise pollution before any other Industry establishes its new plant or the existing plants go for any further expansion in this area.

Study Area : Balasore is one of the coastal district of Orissa, lies on the northern most part of the state having 21 degree 03' to 21 degree 59' North Latitude & 86 degree 20' to 87 degree 29' East Longitude.

Balasore is an emerging industrial complex of diversities of industries. Birla Tyres Ltd., Balasore Alloys Ltd. and Emami Paper Ltd are the three major industries located in this area. There has been a rapid increase in industrialization due to better infrastructure, communication facilities and ground water. The exponential growth in industrial activities in this area affected the environment.

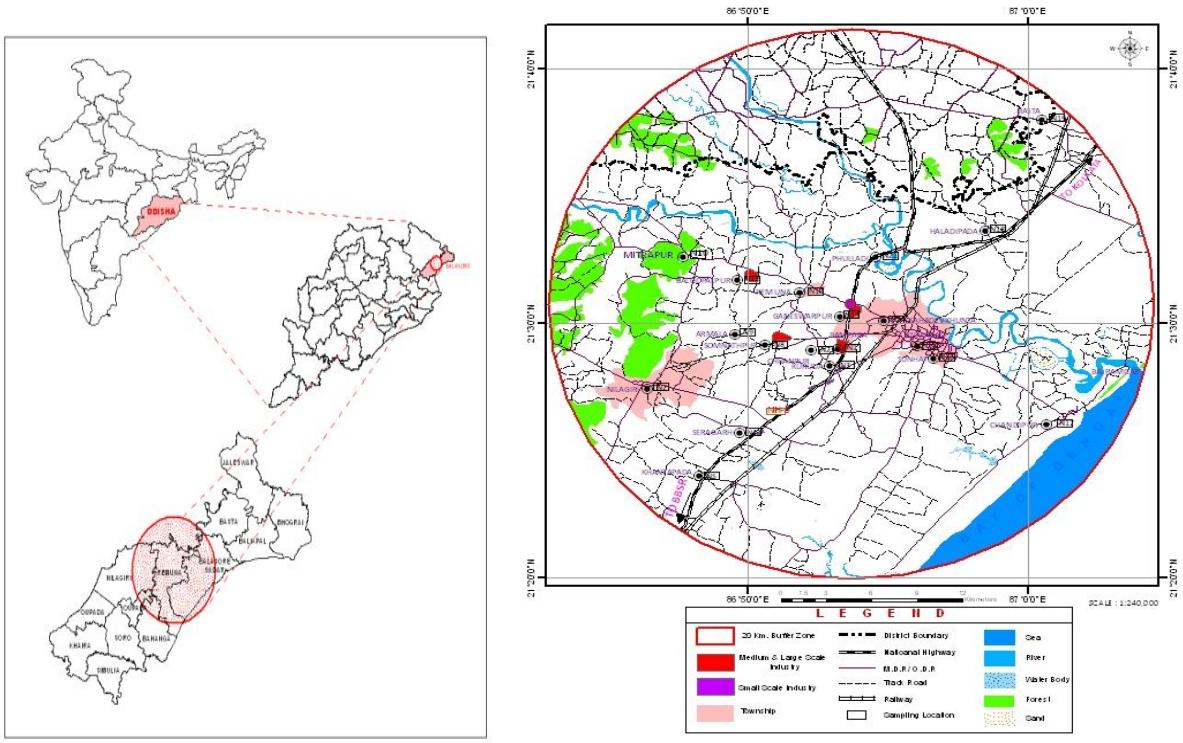

Figure 1: Location map of study area**.**

Besides the industries, recurrent experimental testing of missile and other related testing at Chandipur and huge increase in the number of vehicles for transportation and commercial activities due to hasty urbanisation has become an added problem for the area as regards to Noise Pollution.

MATERIALS AND METHODS

The sampling locations in and around Balasore area were chosen within a radius of 20 kms with Remuna Golei as the epicenter and are shown in Fig.l. The study area is classified into industrial zone, commercial zone, residential zone, residential cum commercial zone and silence zone. Places like hospitals, educational institutions, etc are commonly treated as silence zones. Noise levels were monitored by Cygnet Precision Sound Level Meter Type 2031

capable of measuring sound levels up to 0.1 dBA during day time on a weekly basis for a period of one year. Measurements have been made using appropriate weighing scale (A or C) and mode (Slow, Fast or Impulse) with time variation. The results are tabulated on an average basis for all the 21 locations of Balasore area. From these values after evaluating L_{10}, L_{50} and L_{90} the equivalent level of total energy continuously emitted during the period, L_{eq} has been computed using appropriate equation [14]. To have a substantial idea about noise, different noise indices like N.C and L_{np} and TNI are computed.

RESULTS AND DISCUSSION

The results of background noise level (L_{90}) the statistical noise level $L_{10,}$ L_{50} and L_{eq} are computed at 21 different locations in Balasore area are given in Table-1 and Fig.-2.It is noted that the background noise level corresponds to noise level in the absence of nearby noise sources, while the statistical noise level L_{10} corresponds to the upper end of the noise level range. The traffic noise index (TNI) is a method used to estimate annoyance responses due to traffic noise which is computed using the following equation [15, 16, 17]

$$\mathbf{TNI = 4\ (L_{10} - L_{90}) - 30 + (L_{90} - 30)\ \ldots\ldots\ldots\ldots\ldots} \quad (1)$$

The permissible limit for noise pollution is 75 dBA during day time and 70 dBA during night time in the industrial area. The noise limits exceeded occasionally when activities were taking place. The major contribution to noise was noticed at Bampada particularly may be due to release of the pressure valve of the boilers of Birla Tyres Ltd. and the corresponding L_{eq} was observed to be 66.8 dBA. Since noise is closely associated with activities and the various points were categorised under commercial zone, residential zone cum commercial zone and silence zone.

The permissible limits in the commercial area for day and night are 65 dBA and 55 dBA respectively. Noise levels were high in the Bampada, Chhanpur, Balgopalpur and Sahadevkhunta. The factor that contribute to noise levels in the market place are bustling capacity of people, public address system, music system, loud speakers etc. At Sahadevkhunta the factor responsible is heavy vehicular traffic. The level of traffic noise depends on traffic flow rate, speed of vehicles, change in engine speed and power and the proportion of heavy vehicles plying on the road. Table: 1 indicates that the statistical noise level throughout Balasore area varied between 52.1 dBA, lowest at Bahanaga and the highest 73.5 dBA at Bampada. The statistical noise levels appear to be high at all the 21 locations except a few. The result of the background noise level in Balasore area varied between 47.3 dBA to 62.9 dBA which are usually considered moderate. The lowest is observed at Khantapada (47.3 dBA) and the highest at Sahadevkhunta, Ganeswarpur and Somanathpur (62.9 dBA). The noise level L_{np} is an indicator of noise pollution which incorporates both quality and quantity and is computed by the following equation.

$$\mathbf{L_{np} = L_{50} + (L_{10} - L_{90})\ 2/60 + (L_{10} - L_{90})} \ldots\ldots\ldots\ldots (2)$$

L_{np} varies in all the locations between 54.98 dBA at Bahanaga and 82 dBA at Bampada and is obviously seems high for all the locations. Noise Climate (NC) is the range over which the sound levels are fluctuating in an interval of time and is given by the relation.

$$\mathbf{NC = L_{10} - L_{90}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

NC values varied between 2.9 dBA at Azimabad which is the lowest and 15.1 dBA at Bampada which is the highest. The Traffic Index Level (TNI) in Table 1 is the lowest at Bahanaga (4.4 dB A) and the highest at Bampada (58.8 dB A) due to the presence of heavy vehicular traffic. It is observed that the traffic noise level is quite high because of the large transport network in Balasore area. Traffic Noise Index (TNI) is a parameter which describes annoyance response to people living around locations due to the sound of traffic. High TNI values obtained were in Balgopalpur, Chhanpur and Bampada. It is suggested that traffic control measures at least in peak hours should be implemented. In Balasore, the increased urbanization and increased vehicular traffic all contributes to noise pollution. The L_{10}, L_{50} and L_{90} values at all the 21 locations are depicted in Fig.2 and show their effect on different locations and they show a definite pattern. Similarly the Noise Climate (NC) values are depicted at all the locations in Fig. 3 and their fluctuation can be ascribed due to industrial activities. The L_{np} and TNI are depicted in Fig. 4 and 5 for all the 21 locations. The higher peaks in the two figures are ascribed to industrial and vehicular noise pollution at the concerned locations. SPL_{max} and SPL_{min} are depicted in Fig. 6 and show a definite pattern for all the locations and are consistent with the results.

Table 1: Average noise levels recorded around Balasore area**.**

SL. NO	LOCATION	L_{10}	L_{50}	L_{90}	L_{eq}	SPL max	SPL min
1	Armala	54.3	51.7	49.2	52.1	63	40.9
2	Azimabad	64.8	62.7	61.9	64.9	69.6	62.7
3	Bahanaga	52.1	50.6	48	50.9	61	39.6
4	Balgopalpur	72.2	64.7	61.8	66.5	74.7	59.8
5	Bampada	73.5	63.1	58.4	66.8	74.9	55.3
6	Basta	52.1	50.6	48	50.9	61	39.6
7	Chandipur	65.3	62.5	57.8	63.4	76.5	76.4
8	Chhanpur	72.2	64.7	61.8	66.5	74.7	59.8
9	Ganeshswarpur	66.8	64.7	62.9	64.9	68.5	61.8
10	Haldipada	54.7	51.9	48.7	52.5	64	39.8
11	Khantapada	52.2	49.7	47.3	50.1	61.1	38.6
12	Kuruda	54.2	50.3	47.6	51	63.7	38.8
13	Mitrapur	62.1	51.9	48.7	54.9	71.9	39.9
14	Nilagiri	63.3	61.2	60.3	61.4	65.9	58.2
15	Phuladi	57.4	53.6	49.3	54.7	66.5	40.2
16	Remuna	66.1	64.5	62.3	64.1	68.2	61.8
17	Rupsa	54	50.2	48.6	50.7	62.8	40.3
18	Sahadevkhunta	65.8	63.7	62.9	61.9	68.7	59.9
19	Seragarh	52.9	50.2	48.2	50.6	62.4	39.4
20	Somanathpur	66.8	64.7	62.9	64.9	68.5	61.8
21	Sunahat	66.2	64.3	62.6	64.8	68.5	61.8

Table 2: Noise levels recorded around Balasore area**.**

SL.NO.	LOCATION	N.C	L_{np}	TNI
1	Armala	5.1	57.234	9.6
2	Azimabad	2.9	65.74	13.5
3	Bahanaga	4.1	54.98	4.4
4	Balgopalpur	10.4	76.903	43.4
5	Bampada	15.1	82	58.8
6	Basta	4.1	54.98	4.4
7	Chandipur	7.5	70.938	27.8
8	Chhanpur	10.4	76.903	43.4
9	Ganeshswarpur	3.9	68.854	18.5
10	Haldipada	6	58.5	12.7
11	Khantapada	4.9	55	6.9
12	Kuruda	6.6	57.626	14
13	Mitrapur	13.4	68.293	42.3
14	Nilagiri	3	64.35	12.3
15	Phuladi	8.1	62.794	21.7
16	Remuna	3.8	68.541	17.5
17	Rupsa	5.4	56.086	10.2
18	Sahadevkhunta	2.9	66.74	14.5
19	Seragarh	4.7	55.268	7
20	Somanathpur	3.9	68.854	18.5
21	Sunahat	3.6	68.116	17

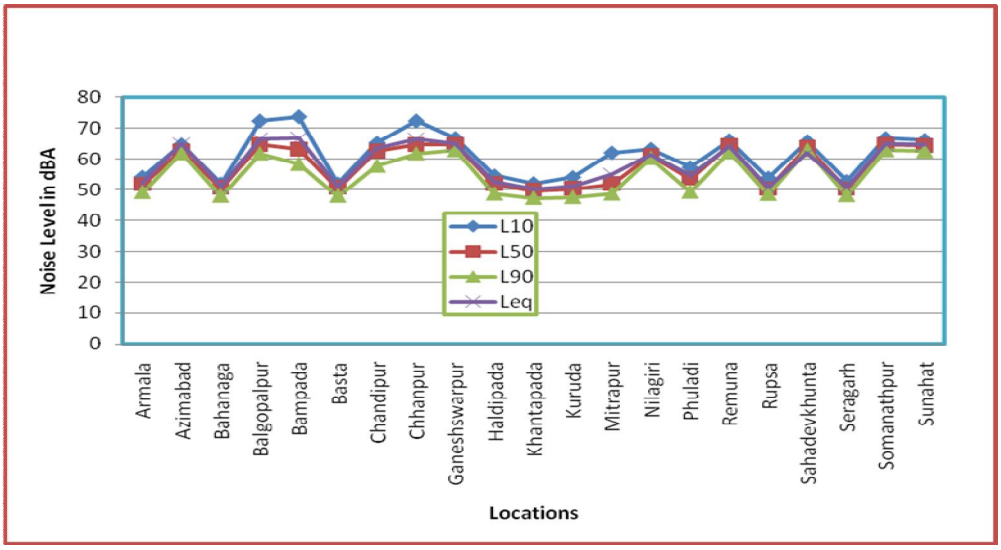

Figure 2: Plot of L_{10}, L_{50}, L_{90} and L_{eq} in various locations in Balasore area.

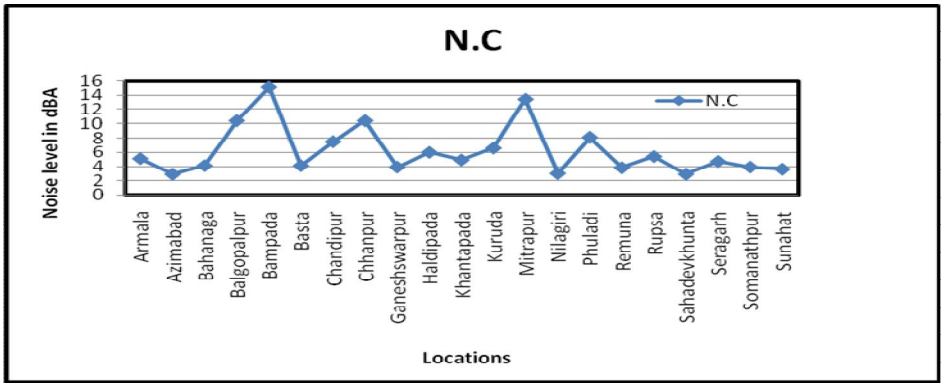

Figure 3: Plot of N.C in various locations in Balasore area**.**

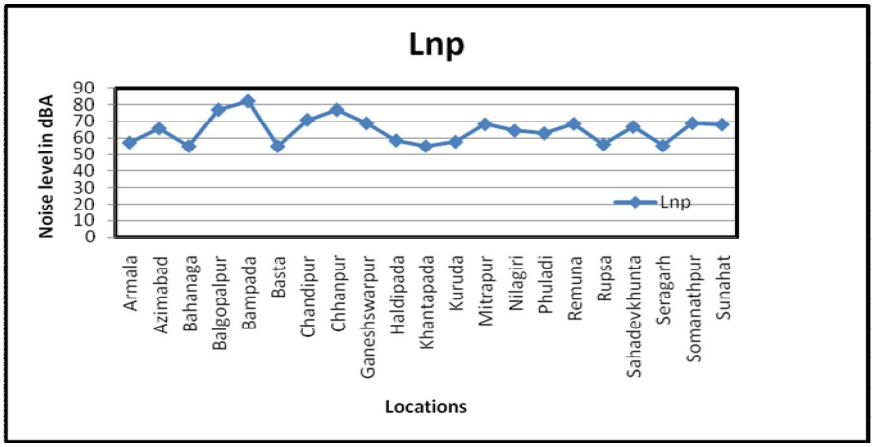

Figure 4: Plot of L_{np} in various locations in Balasore area**.**

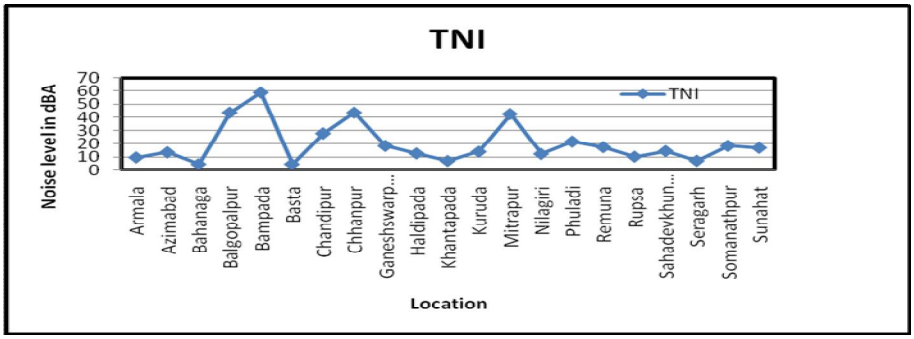

Figure 5: Plot of TNI in various locations in Balasore area**.**

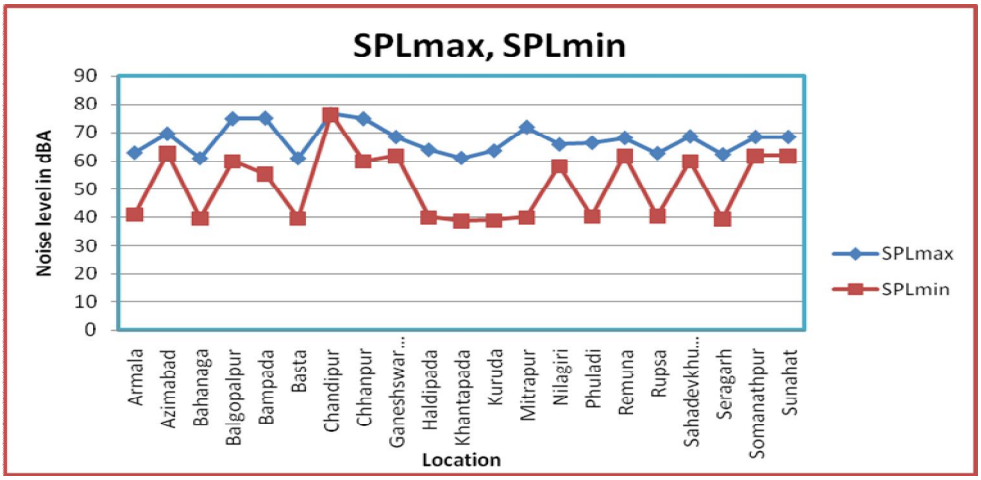

Figure 6: Plot of SPLmax and SPLmin in various locations in Balasore area**.**

APPLICATIONS

This study is applicable to suggest the Noise Pollution nature in more populated cities. Also it is useful to fetch awareness in the public about the Environment where they are living.

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CONCLUSIONS

Noise level monitoring in and around Balasore area in 21 locations revealed that industrial and commercial activities along with heavy vehicular traffic are the main sources of noise pollution. The noise levels are higher at all sampling stations in Balasore Township and in all industrial areas around Balasore for obvious reasons. The authors suggest that construction of noise barriers, vegetation belt with appropriate width and height and traffic mitigatory measures can be adopted to reduce the noise pollution in urban and industrial areas.

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