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ASSESSMENT AND MODELLING OF NOISE DUE TO RAILWAY ASSETS FOR LUCKNOW CITY

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ABSTRACT

Railways are the second largest source of noise pollution after road traffic noise pollution and it effects the humans and the workers who travel and live in localities along the railway tracks. The various sources of railway noise which causes annoyance are horns, wheel-track interference noise, brake squeals, loudspeakers, trolleys on platforms etc. The present study was done for Lucknow railway station which is situated in the heart of Uttar Pradesh. Lucknow railway station consists of two sub railway stations i.e. Lucknow NR railway Station and Lucknow NE railway station which is also known as Lucknow Junction .The monitoring of noise level in Lucknow railway stations was done only for outer platforms where a large number of facilities are provided for the passengers and moreover a lot of crowd gathers only in outer platforms of the railway stations.The results showed that the L_{eq} *and* L_{avg} *valued reached at a maximum of 120.694 and 78.373 respectively during the day time period of 10:30 am -12:30 pm. It was found that the main source of noise in platforms was due to warning horns and loudspeakers used for announcement. Sound level modelling was done using MAS environmental consultancy tool which validates ISO 9613-2. The noise contours were plotted at every 5 m interval and mapping was done for every 2 hours. The modelling results also satisfies the on site measurements and the peak sound level was during the day time period of 10:30 am -12:30 pm*

Keywords- contours, peak sound level, sound pressure level (SPL), sound level modelling, noise indices, L_{eq} **,** L_{avg}

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INTRODUCTION

Noise pollution is known for among the major causes to impact the people living in urban areas across the world.Due to rapid urbanization, industrialization and development in communication and transportation the noise levels have reached to an extreme level (Rajesh B.Hunashal, 2012).The word 'noise' has been derived from the latin word "Nausea" which means "unwanted sound" or the sound that is unpleasant or unexpected (Pawar et al.2010).The phenomenon of noise is associated with rapid industrialization, urbanization and population growth (Alam, 2011).The general public prefers to live in places that are away from the noisy sources (Yilmaz and Ozer ,1998) .

The major steps involved in the assessment of noise are – noise monitoring;spatial analysis of noise distribution;emission – or receptor based noise modelling and health risk assessment for general public(Tor H.Oiamo, 2018) and for this purpose the noise monitoring is done for a sufficient duration for the interested areas is recommended (ISO, 2017). We have introduced here a sound propagation model that is fully complaint to ISO 9613-2 which is internationally accepted for the purpose of prediction of noise levels in the outdoor environment and it is considered as one of the most accurate and recent authentic prediction model for sound propagation. The validity of this model will be checked by comparing it with the on site measurements taken at the outer platforms in Lucknow.

STUDY AREA

Lucknow, which is the capital city of Uttar Pradesh, situated in northern India is chosen for study. Lucknow has two main railway stations which connect to various parts of India. The Lucknow NR railway station has 9 platforms while the Lucknow NE or Lucknow Junction has 6 platforms. The noise monitoring was done on the outer platforms i.e. platform no.1 for both the railway stations. The Coordinates of Lucknow railway station are**26°49′55″N 80°55′08″E**having an elevation of 123.500 metres (405.18 ft).The charbagh railway station was a part of east India railway till 1952 and presently it serves 13 districts of Uttar Pradesh

with a total route length of 1458.94 km through 194 stations. The Lucknow railway station comes under the Northern Zone of Indian Railways.

Fig-1 : Site Map of Study Area including Lucknow Junction and Lucknow NR railway station

MATERIALS AND METHODS:

1. **Noise Level Monitoring**

The monitoring of noise level in Lucknow railway stations was done only for outer platforms where a large number of facilities are provided for the passengers and moreover a lot of crowd gathers only in outer platforms of the railway stations. The noise level monitoring was done for platform number 1 of Lucknow NR railway station and Lucknow Junction railway station. A total of 8 hours sampling was done for each platform. The noise level meter was placed at the centre of the platform and normal to the tracks. The noise reading in dB(A) was recorded for every 15 second interval and a total of 1920 readings were taken for each platform.

Fig -2 : Class 1 Sound Pressure Level Meter

The sound pressure level meter was placed at a height of 1.5 metre above the platform level. The readings were taken by installing the sound pressure level meter at angle of 90 degrees with respect to the tracks.

2. Parameters Measured

After each 2 hours sampling the L_{eq} and L_{avg} values were calculated by using excel sheets because it was very difficult to analyse such a huge data set by manual calculations. The L_{eq} and L_{avg} values were obtained by general formulas-

$$L_{eq} = 10.\log_{10}\sum_{i=1}^{i=n} \left[10^{(Li/10)} \text{ x } \frac{ti}{tt}\right]$$

$$L_{avg} = 20.\log_{10} x(1/N) \sum_{i=1}^{i=n} \left[10^{(Ln/20)}\right]$$

3. Noise Modelling and Mapping

The modelling of the noise level was done under the stipulations of ISO–9613 part 2 which includes the general method for calculation of noise.The freely available online tool of MAS

Environmental consultancy was used in the modelling and mapping of noise near the railway station zone. This modelling and mapping tool was used to create grids.

RESULTS AND DISCUSSIONS

Noise Level Monitoring was done for a total of 8 hours for each outer platform. The monitoring results are presented for every 2 hours according to the peak hours selected. The Noise Reading was taken for every 15 seconds interval on platform no. 1 of Lucknow Junction Railway station and Lucknow NR railway station.

Table – 1: Noise Level Monitoring Results for Lucknow Railway Station

LOCATION	Parameter Measured	PEAK HOURS DURATION (8hrs)			
		10:30 AM-12:30 PM	1:00 PM - 3:00PM	5:00PM-7:00 PM	9:00PM-11:00 PM
Lucknow NR Railway station (Platform No.1)	Leq (dBA)	99.129	97.770	116.032	124.123
	Lavg	23.492	23.396	23.746	24.191
Lucknow Junction (NE) Railway station (Platform No.1)	Leq (dBA)	120.694	90.318	94.005	91.521
	Lavg	78.373	60.607	64.846	62.631

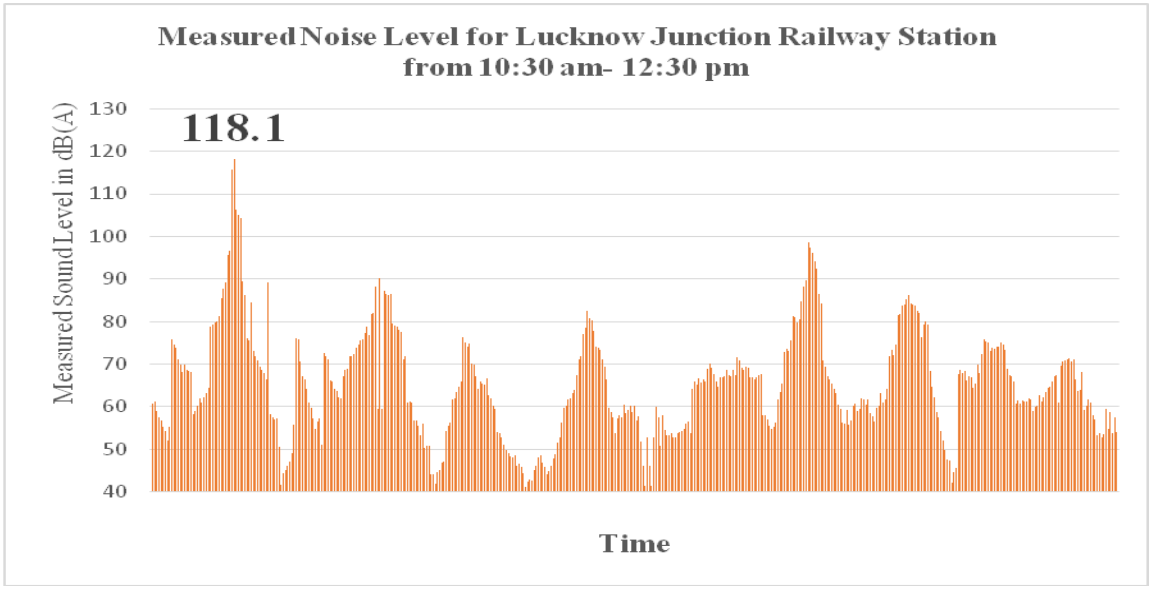

Fig- 3 : Measured Sound Pressure Level for Lucknow Junction Railway station during 10:30 AM – 12:30 PM

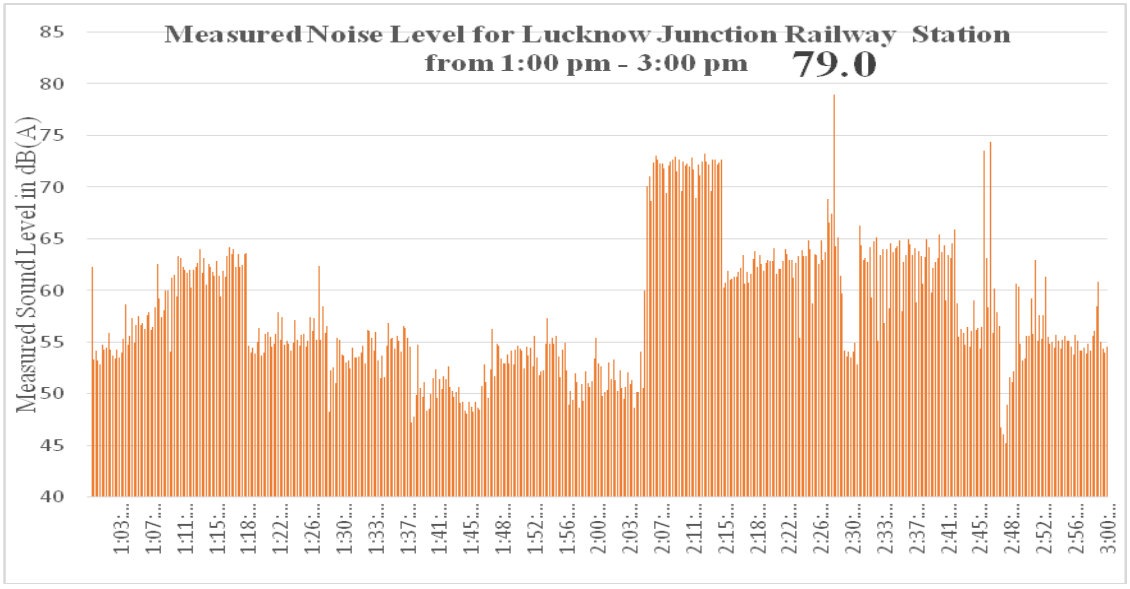

Fig- 4 : Measured Sound Pressure Level for Lucknow Junction Railway station during 01:00 PM – 03:00 PM

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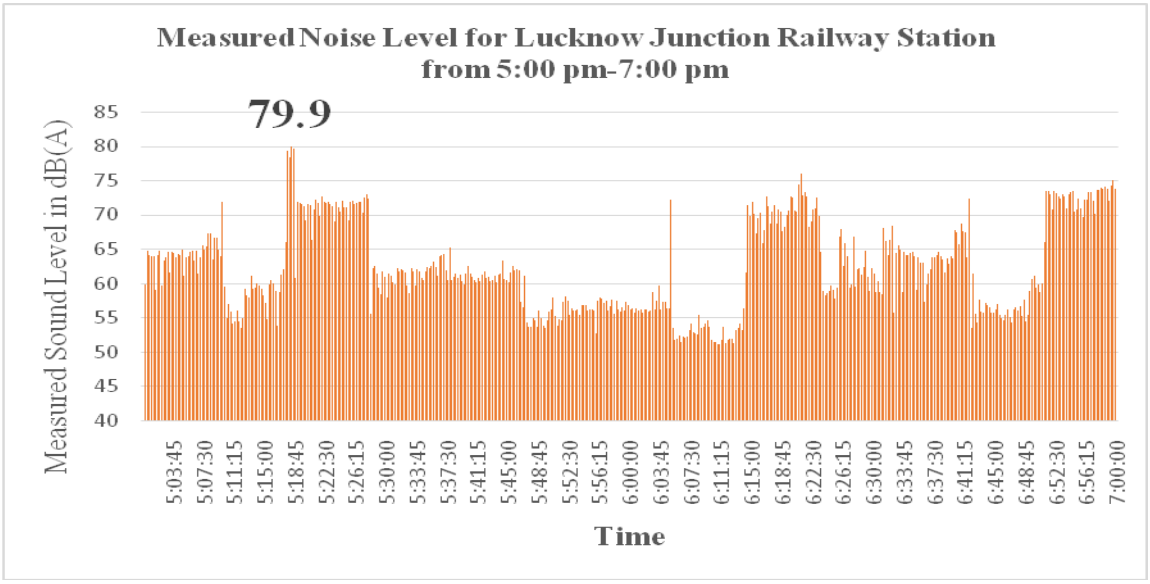

Fig- 5 : Measured Sound Pressure Level for Lucknow Junction Railway station during 05:00 PM – 07:00 PM

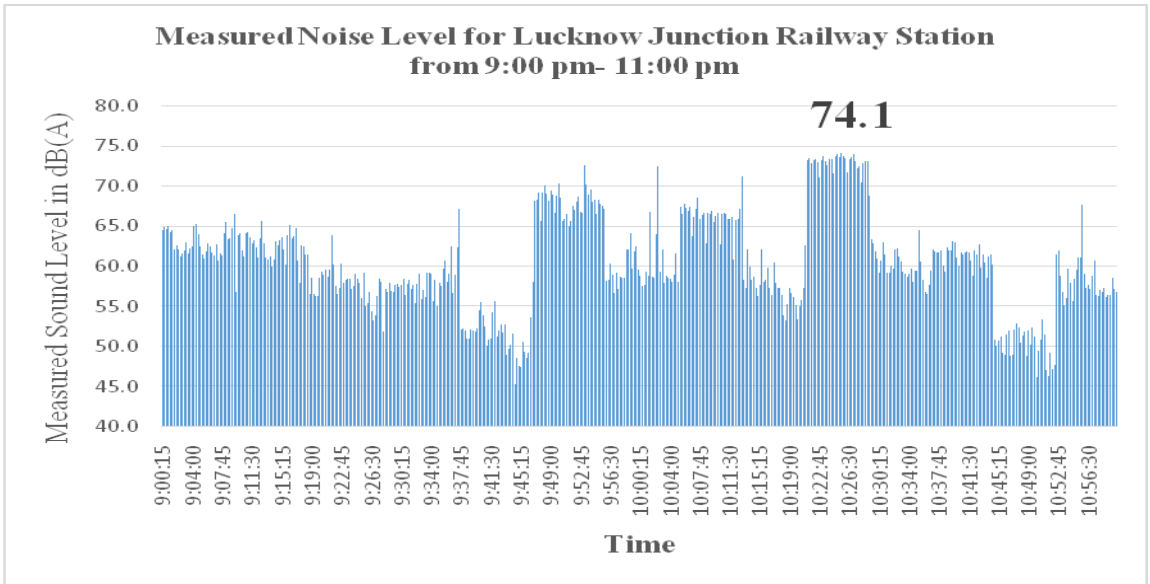

Fig- 6 : Measured Sound Pressure Level for Lucknow Junction Railway station during 09:00 PM – 11:00 PM

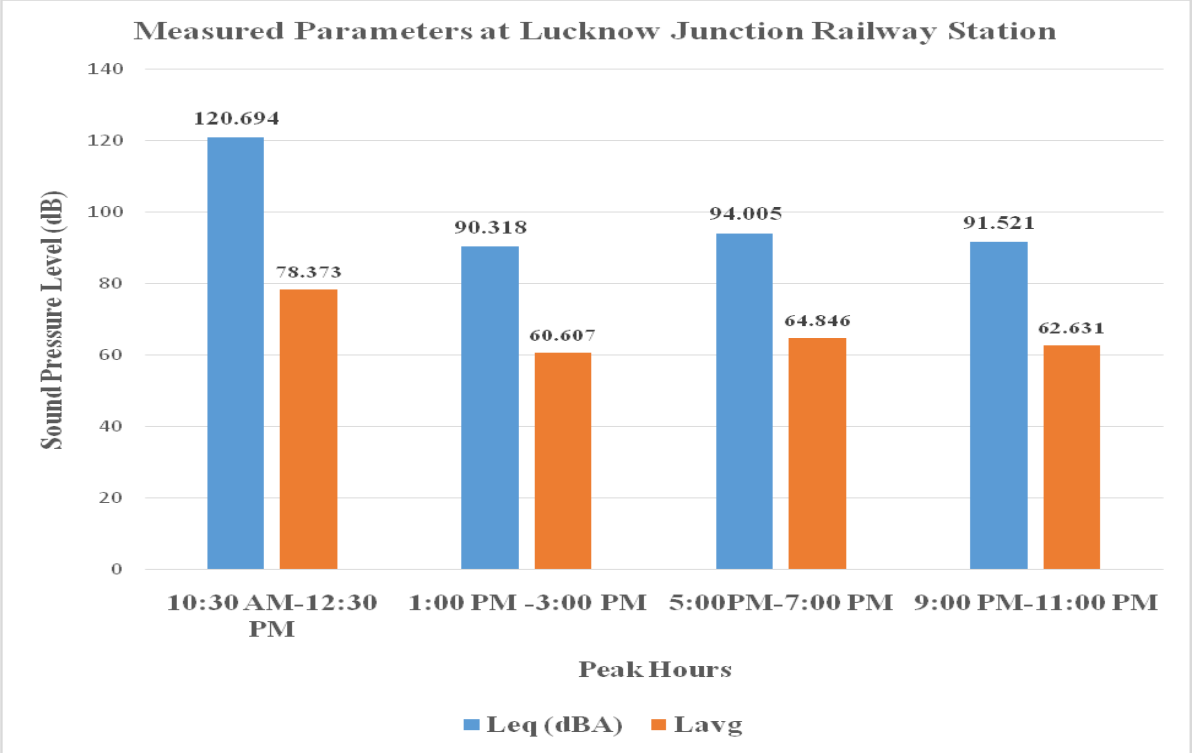

Fig- 7 : Measured Parameters for Lucknow Junction railway station during peak hours

Mapping of Noise levels

The Mapping of noise level was done using ISO 9613 certified tool of MAS environmental Consultancy. This tool was freely available for use on www.noisetools.net and it was used to create noise contours for every 2 hours. The grid height was taken as 1 meter and noise contours were drawn for 5dB.

The mapping of noise level was done for platform No.1 and the receiver was placed at a height of 1.5 meter above the floor level. The L_{eq}value which was measured was used as reference in ISO 9613 model and mapping of noise levels was done.

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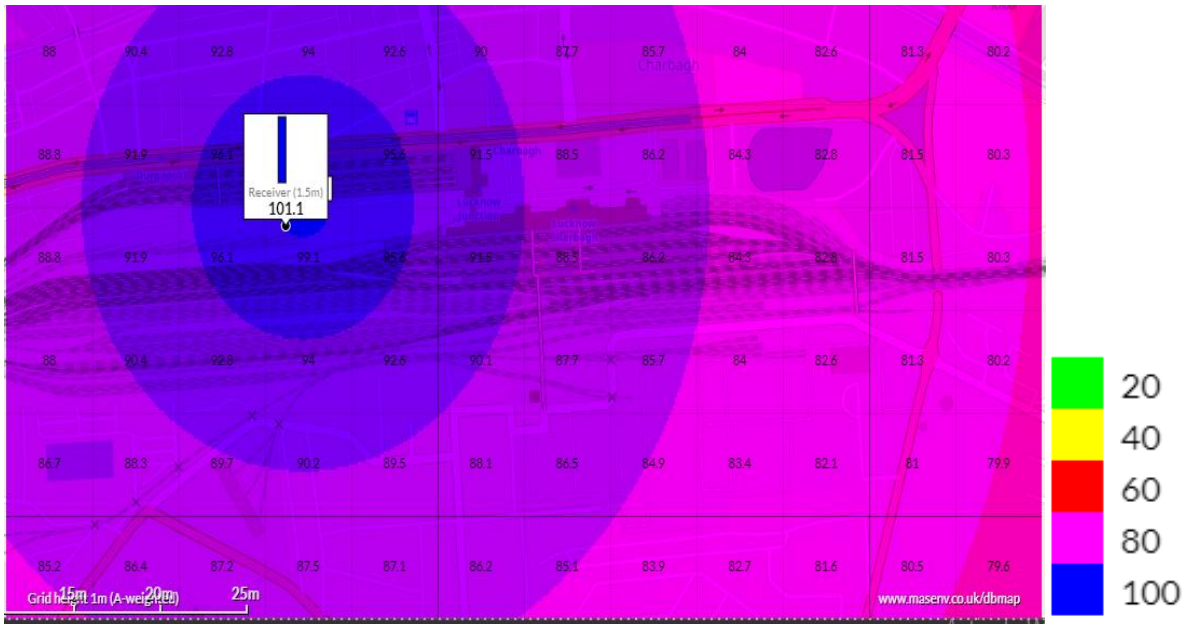

Fig- 8: Noise Modelling for Lucknow Junction Railway Station during 10:30 AM – 12:30 PM

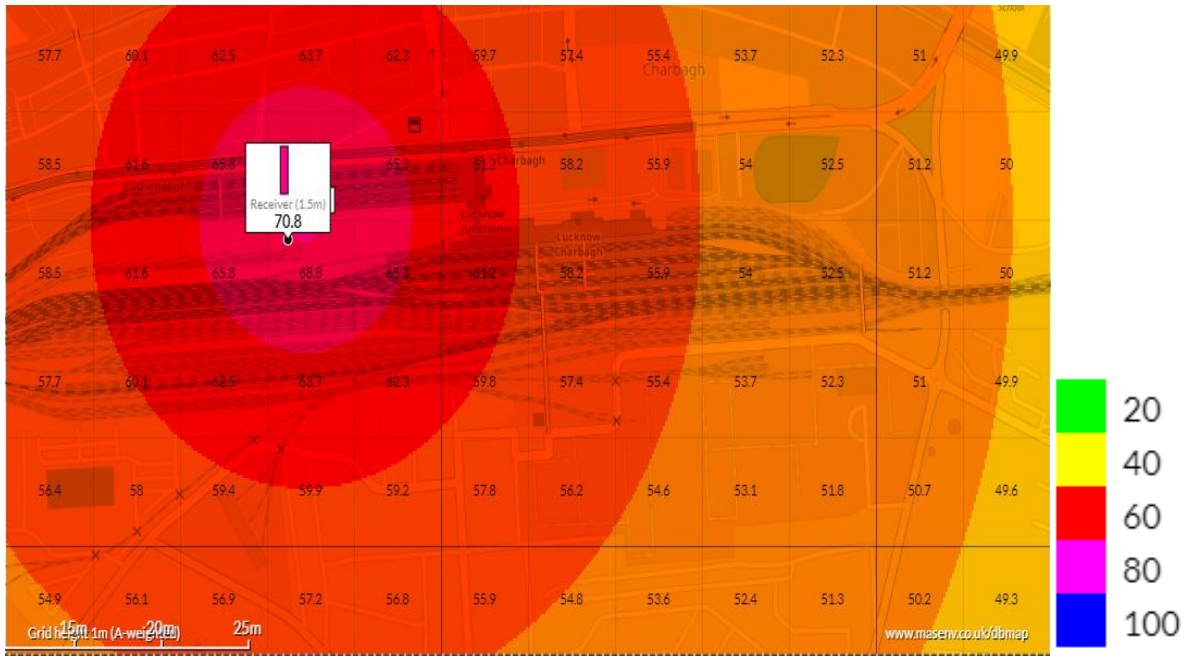

Fig-9: Noise Modelling for Lucknow Junction Railway Station during 1:00 PM – 03:00 PM

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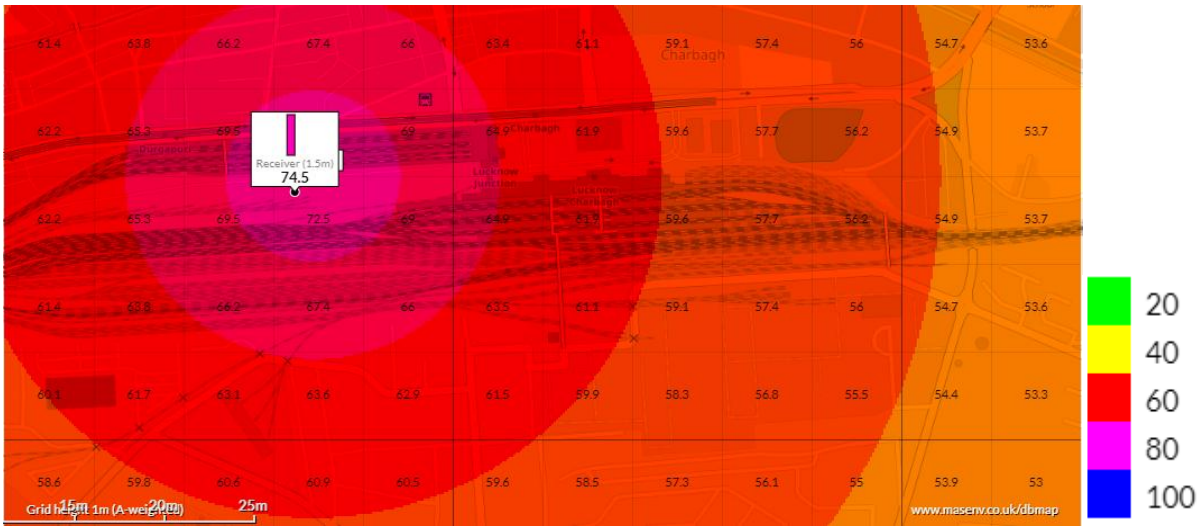

Fig-10: Noise Modelling for Lucknow Junction Railway Station during 5:00 PM– 07:00 PM

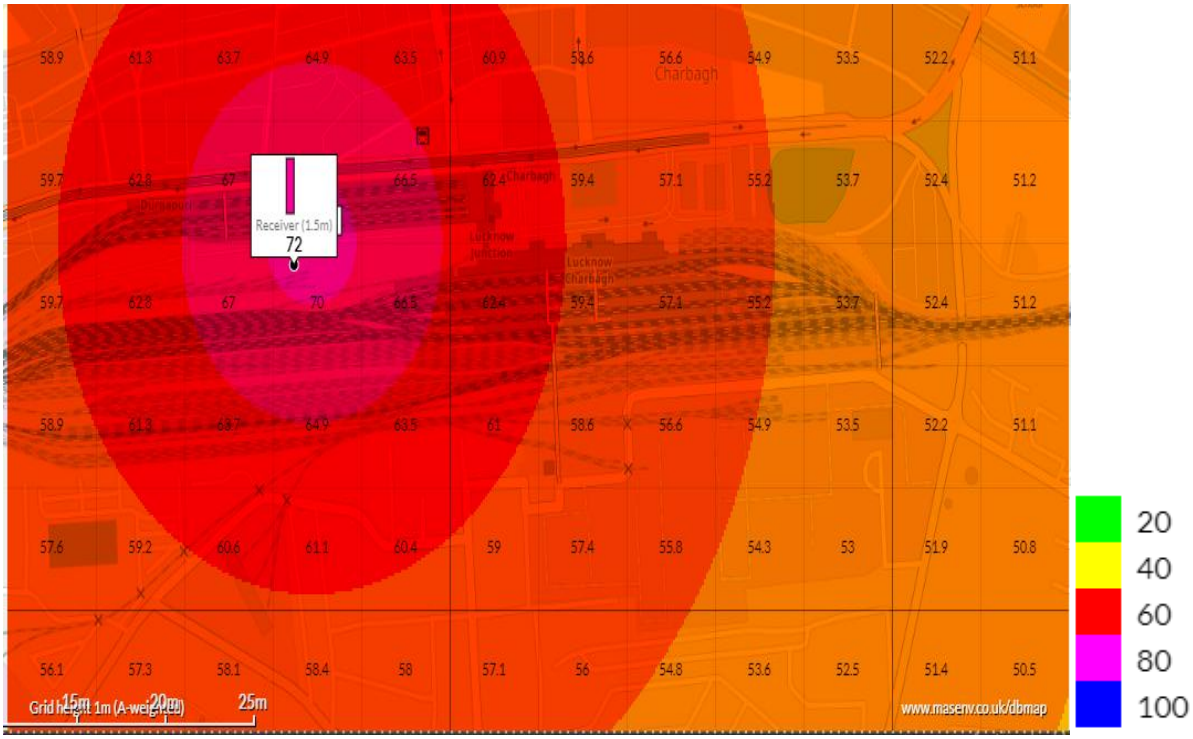

Fig-11: Noise Modelling for Lucknow Junction Railway Station during 9:00 PM – 11:00 PM

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