NOISE POLLUTION ATTENUATION BY ROADSIDE TREEBELTS IN AND AROUND COIMBATORE

Abstract

Noise is the excessive and unwarranted sound that creates discomposure to human beings and abruptly disrupts the quality of the environment. The noise is magnified by the intensity of the sound produced at a particular place and is measured in decibels (dB). The noise pollution is mainly caused by the transportation of road, rail and airways and also the industrial activities. Increased growth and development of the cities marks the predominant source for the road travel of the people. The road traffic in main cities becomes the part and parcel of life because everyone contributes to the self and development of society as a growing concern for the community. The green energy usually absorbs and disintegrates the excess noise and air pollutants which divine has given to us through the green belts. So the green belts helps in natural source of noise and air pollutant reduction. The potentialities of the greenbelts are laid along the road sides have been assessed in Coimbatore, Tamil Nadu at various selected places. Reduction of noise level was achieved up to 14 dB under the green belt area while compared to the open area. Area having higher crown density demonstrated lower level of noise compared to the area having lower crown density.

Key words: Noise meter, Greenbelts, Decibel

Introduction

The anthropogenic activities intrude the mother earth due to the evolution of industrial revolution and drastically modified the nature and the environment. Due to this, the need for the environmental protection and sustainable growth is growing faster. The pollutants that affect our environment are mostly chemicals. Noise is a physical pollutant. It is not recognized easily. This is because the sensitivity of human ear gets automatically adjusted to ambient level of sound and so slow increases in the ambient level go unnoticed. Subsequently continuous damage is agreed to remain. The noise level at a high decibel poses serious problems and major menace to the human health and safety but the scenario is neglected often. The impact of the negative effects of noise urges to have a wide range of interest for research and settlement of dispute to control the noise and its effects.

The welfare of the human beings is contracted by the noise pollution. The high decibels of sound pose severe in physical and mental illness to human and animals and, hence forth it is obvious that the noise affect the humans.

Coimbatore is the second largest city in Tamilnadu with a metropolitan population of two million. It is a major commercial center and often been referred to as the 'Manchester of south India'. Coimbatore has been ranked fourth among climate by a survey done by the confederation of Indian Industry (CII). Seven major roads are there in the Coimbatore city. They are Avinashi road, Mettupalayam road, Trichy road, Sathyamanglam road, Palakad road, Pollachi road, and Marudhamalai road. There are three National Highways passing the city. They are NH-47, NH-67, NH-209.

Greenbelts provide the green energy all around the environment which disintegrates the sound and noise pollution. Implementation of greenbelts on road sides is most effective in reduction of air and noise pollution which is induced by the anthropogenic causes. The greenbelts almost near the stream of traffic pathways and streets not only transform to a smart city but also it absorbs the excess air and noise pollutant factors by balancing the temperature and moisture level and enhance the green energy into the city which thereby brings mental peace and harmony rich place to well-beings. (Yang *et al.,* 2008). In urban areas the trees acts as a buffer in order to reduce the noise pollution (Huddart, 1990). The energy is absorbed by the plants through the transfer of kinetic energy. This energy has a vibrating molecule of air particulate matter and transfer to the leaves vibration pattern thereby the vibration is absorbed by the plants (Pathak *et al.*, 2008). Therefore through greenbelts, the pollution level could be effectively minimised without causing damage to the mother nature and environment. In recent years this method has been widely adopted (Nowak *et al.,* 2006)

Materials and methods

i) **Assessment of noise level at different locations in Coimbatore city**

The various locations along the highways in Coimbatore were assessed for noise levels. All sorts of transportations such as bicycle, two wheelers, four wheelers of all types etc., are the common transportation observed on these roads. So the noise meter (Larson Davis) was used for analysing and observing the noise at these five different selected locations. Initial and final observations were observed. The initial observations were recorded for 15 minutes and noted down and the mean average of all the initial observations was recorded. After that the noise observations were recorded behind the rows of the trees at a distance of 20 meters. The name, species and numbering of those trees were identified. Then the reduction in noise levels by tree belts was calculated by subtracting the noise level recorded from the two locations. A control was also taken i.e. in an open area at a distance of 20 m noise level was

recorded for 15 minutes and the mean value was taken. Reduction in noise level by vegetation/tree belts was observed or calculated by subtracting the difference between the noise recorded at 20 m away in open area and in vegetation area/area behind the tree belts. The observation was recorded during the traffic peak hours.

Noise observations were recorded in an area where vegetation was higher and for example *Prosophis* and *Leuceana* sp was predominant the observations were recorded. In the given table, the distance from the noise source and the width of the vegetation or plant width and approximate height of the trees and canopy diameter were given. In some locations, even spacing is observed and in some areas the trees have been grown in uneven spacing and the age of the trees also varies. Tree species and each type of tree species are described in the Table 2. Some unidentifiable herbs and shrubs were also present in the observed plots.

ii.) Noise reduction by tree belts created by Bluetooth speaker

A small Bluetooth speaker was used in this study. Music was played in the Bluetooth speaker for 15 minutes. Noise meter (Larson Davis) was used to measure the noise level at nearby the source (i.e.at 1 m) at a distance of 15/20 meter away from the source in an open area. Then again the Bluetooth speaker was played and the noise level recorded by different tree belts was observed at a distance of 20 meter behind the tree belts. The noise level reduction was observed by subtracting the two different values calculated at two different times one at open space (control) and another behind the tree belts.

Results and discussion

Noise levels were observed in thirteen different locations in Coimbatore city during September, 2020 using Larson-Davis 824 sound level meter. The locations are Thudiyalur , K.Vadamadurai, Gounder mills stop, 100 feet road, Gandhipuram, VOC Park, Peelamedu, Coimbatore airport, Brookfield's road, North Coimbatore, Lawley road, Madukkarai and Kuniyamuthur (Table 1). The observations were recorded by keeping the noise meter at 1.5 m above ground level facing the noise source and the readings were continuously taken for 15 minutes. Noise levels in all the locations exceeds the prescribed limits (i.e 65 dB during day). The maximum noise level was observed in Gandhipuram followed by K.Vadamadurai, Thudiyalur and Madukkarai. Similar results were obtained as the noise level exceeds above 65 dB during daytime in many areas in Coimbatore (Anitha SelvaSofia *et al.*, 2019).

Noise reduction

In urban areas, the traffic noise imposes human health issues. Noise pollution is expected to be a problem in most of the roads of Coimbatore city. This can be reduced by

appropriate plantations of trees species which reduces the noise to a maximum level. While comparing the sound levels, the green belt areas along the highway roads reduced the noise level by 14 dB when compared to areas without trees. In another study, tree belts of 20 m width reduced 13 dB noise when simulated noise was created by playing a Bluetooth speaker (Table 2 and Fig.1). Greenbelts comprising tree species like *Acacia nilotica, Bombax ceiba, Acacia auriculiformis, Albizzia lebbeck, Melia azedarach, Moringa oleifera, Eucalyptus camaldulensis* and *Coccus nucifera* in Khulna-batiaghata road in Bangladesh reduced noise by 17 (dB) more while in Khulna city street this reduction value was seen 13 dB (Nazrul Islam *et al*., 2012). In another similar study, Pathak et al. (2008) recorded the atmost reduction of 17 (dB) for *Putranjiva roxburgi* and 14 dB for *Cestrum nocturnum* at greater frequency. The characteristics of trees species viz., height, branches numbers, leaf dimension beside the path of noise, and crown density marks the decrease in pollution level of noise (Bernatzky,1978; Finke,1980). This was may be due to the presence of denser vegetation with mixed species along underground shrubs in some areas where observations were taken. Greenbelts reduce noise through various means viz. absorption by leaves, dispersion, reflection and diffraction by stems and spherical divergence by canopy (Cook and Haverbeke, 1974; Martens and Micheisen, 1981). Greenbelt provides larger surface area and therefore more prospects for diffusion and absorption of noise (Cook and Haverbeke, 1974)

Table 1. Noise level (dB) observations in different locations in Coimbatore city during September, 2020

S.No.	Location	Time	Noise level (dB)
1	Thudiyalur (Near SBI ATM)	Day	72.85

2	K.Vadamadurai (Near HDFC bank)	time	74.44
3	GV Mills (Gounder mills)		72.19
4	100 feet road (Near Vasanth & Co)		68.19
5	Gandhipuram		75.37
6	VOC Park (Stadium)		69.05
7	Peelamedu (Near Pricol)		70.55
8	Coimbatore Airport(Near Central bank of India)		72.25
9	Brookfield's road		71.00
10	North Coimbatore (Near Central theatre)		71.65
11	Lawley road (Near Vuzhavar sandhai)		69.46
12	Madukkarai (Near ACC Cements)		72.55
13	Kuniyamuthur		71.20

Fig. 1. Studies on noise level reduction by different types of vegetation when bluetooth speaker was played

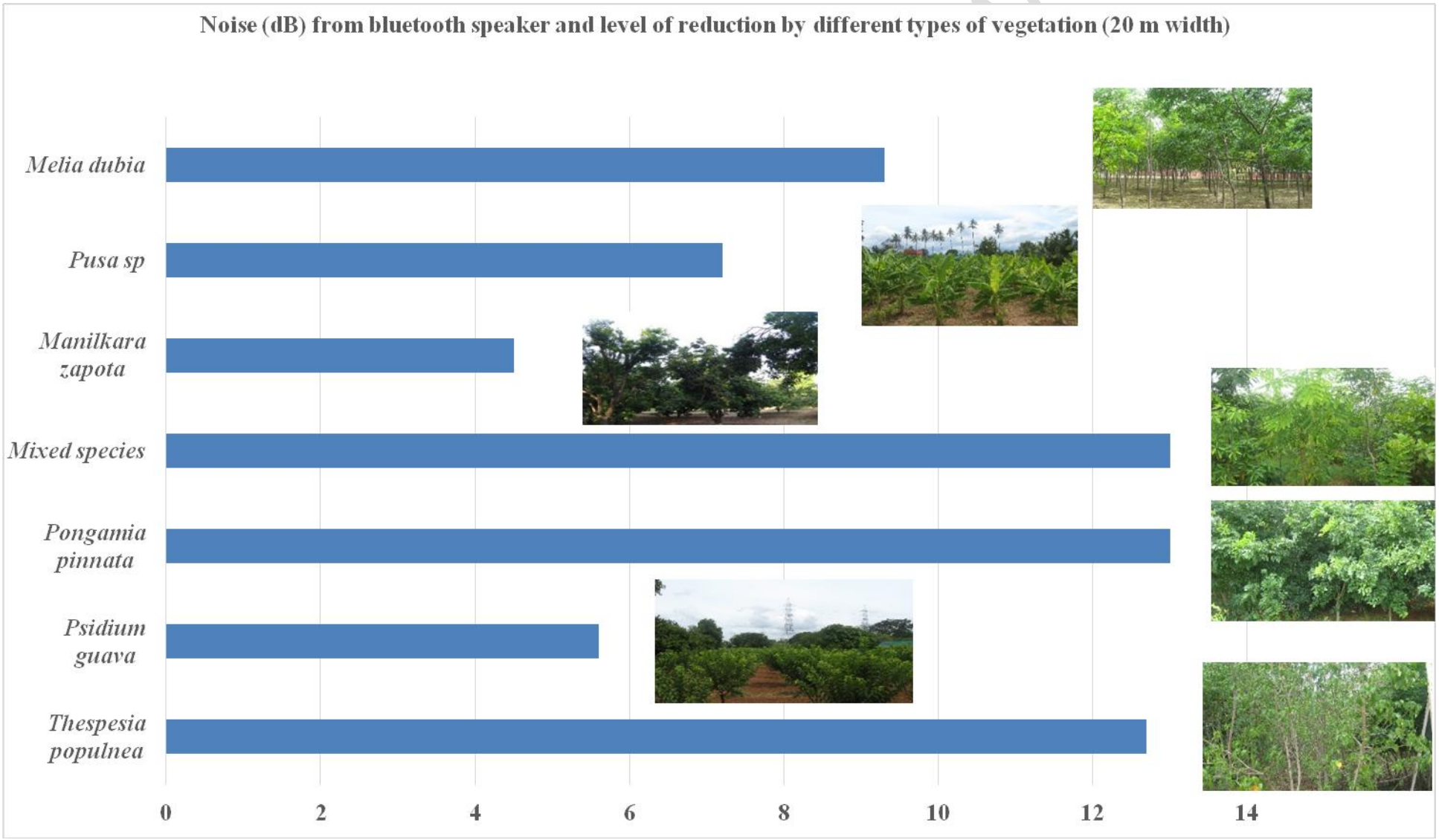

Table 2. Traffic noise level reduction by different green belts in Coimbatore

Tree belts	Characteristics of Tree belt					Control	Noise level (dB)	
	Width (m)	Woody plant width (m)	Appx. Height (m)	Appx. Canopy Diameter (m)	Spacing		Observed noise	Reduction in noise
Prosophis juliflora, Leucaena leucocephala and *Lantana camera*	25.0	20.0	15.0	8.0	Uneven	73.3	54.0	11.0
Nerium oleander, Bambusa bambus and *Leucaena leucocephala*	25.0	20.0	25.0	12.0	Uneven	72.8	58.6	7.6
Prosophis juliflora and *Opuntia* sp	25.0	20.0	15.0	6.0		72.8	65.8	4.5
Alstonia scholaris	60.0	50.0	8.0	5.0	10 x 10	76.9	60.9	9.1
Syzigium cumini, Bamboo vulgaris, Manilkara zapota, Prosophis juliflora, and *Nerium oleander*	40.0	30.0	7.0	4.0	3 x 3	76.9	55.2	13.9
Pongamia pinnata, Azadirachta indica Delonix regia and *Peltophorum ferrugianum*	20.0	10.0	10.0	8.0	5 x 5	69.9	54.7	7.0
Ficus sp, *Polyalthia longifolia,* and *Albizzia .saman*	15.0	7.0	15.0	8.0	8 x 3	69.9	60.1	3.6
Tamarindus indica	50.0	30.0	9.0	7.0	10 x 10	69.9	53.7	7.0

Tamarindus indica and *Tectona grandis*	20.0	15.0	15.0	10.0	7 x 10	69.9	61.2	
Tamarindus indica, Polyalthia longifolia and *Peltophorum ferrugianum*	40.0	30.0	25.0	15.0	Uneven	70.9	56.5	8.3

Conclusion:

Urban tree belts can help to improve the environmental quality and can play an important role in the reduction of traffic induced air pollution and noise levels in and around urban area. This study evaluated that the road-side vegetation stands play an important role in the reduction of traffic induced noise levels in and around urban area. So, development of suitable green belts in areas vacant in urban areas or along highways helps to reduce noise pollution.

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