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ANALYSIS OF POLLUTION IN MUMBAI CITY DISTRICT: CASE OF WARD 'A'

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Abstract

Human activity and natural processes causes air and noise pollution. The levels of air and noise pollution in Mumbai are high and rising. The objectives of this paper are to analyse the levels of air and noise pollution in Mumbai City District, to understand the causes of air and noise pollution in the area, and to suggest applicable measures to minimize the impact in the area. The area covered for the present study is Mumbai City District and the unit of analysis is wards. It consists of nine wards viz. A, B, C, D, E, F/N, F/S, G/N and G/S out of which Ward A has been selected for the study. The research methodology is divided into three phases- pre-field, on-field and post-field. The major findings shows that northern part of the study area is worst affected by air pollution. However, this is only when compared, the levels are independently high and cross the ideal levels for a healthy environment. To conclude it can be said that people should switch over to public transport instead of using private vehicles. People should wear mask while travelling as a precaution from pollutants and the Government must undertake road widening wherever possible.

Keywords: air pollution, noise pollution, impact, healthy environment, public transport, road widening.

INTRODUCTION

Any suspended air particle which is unfit for human consumption and causes harmful effects on the health of other fauna too, is termed as an air pollutant. The safe limit for air pollution by PM2.5 is 60μg/m3 (Central Pollution Control Board of India).There are many reasons for air pollution but vehicular pollution takes the first position in the process.

Noise pollution is defined as any disturbing sound which is an irritant and a source of stress.

A low sound is pleasant but a loud sound is unpleasant and is often referred to as noise. The effects of noise have a bearing on the receiver i.e., man. The sound reaches to a level which is unbearable, it then called noise. It is measured in decibels (dB). The slightest sound which can be heard by the human ear is 1 dB. Noise pollution is the most recent and increasingly important concern in the modern urban set ups. Major causes being transportation, industrialization, festivals etc. therefore the CPCB (Central Pollution Control Board of India) has strictly tried to regulate the levels of noise by setting a limit which is not followed in most of the cases. It has set the rules for following a particular decibel level area wise during daytime and night time. In the industrial areas, the permissible limit is 75 dB for daytime and 70 dB at night. In the commercial areas, it is 65 dB and 55 dB, while in the residential areas it is 55 dB and 45 dB during daytime and nighttime respectively. Additionally, state governments have declared 'silent zones' which includes areas that lie within 100 meters of the premises of schools, colleges, hospitals and courts. The permissible noise limit in this zone is 50 dB during the day and 40 dB during the night.

The paper tries to analyse the levels of air and noise pollution in the southern wards of Greater Mumbai which together are known as Mumbai

City District with the help of a case study of Ward A.

Review of Literature

(A. K. Chinnaswamy et.al, 1995) According to the study new buildings are provided with huge balconies which leads to insolation and heating in the house, thus, the houses are meant to have centralized air conditioning which harms the environment (Government of India, 2015) Report of the steering committee on air pollution and health related issues, the Global Burden of Disease 2010 (GBD) ranked air pollution as a leading cause of death and disability in India. Traditional stoves, biomass combustion produces a range of toxic products resulting from incomplete combustion, including PM2.5 that is roughly equal to burning about 400 cigarettes an hour during cooking. Given that this occurs at the times and places where people are breathing, a large percentage of the population (particularly women and children who tend to be in the kitchen most) are exposed to this source of pollution.

Research Objectives

1. To analyse levels of air and noise pollution in study area

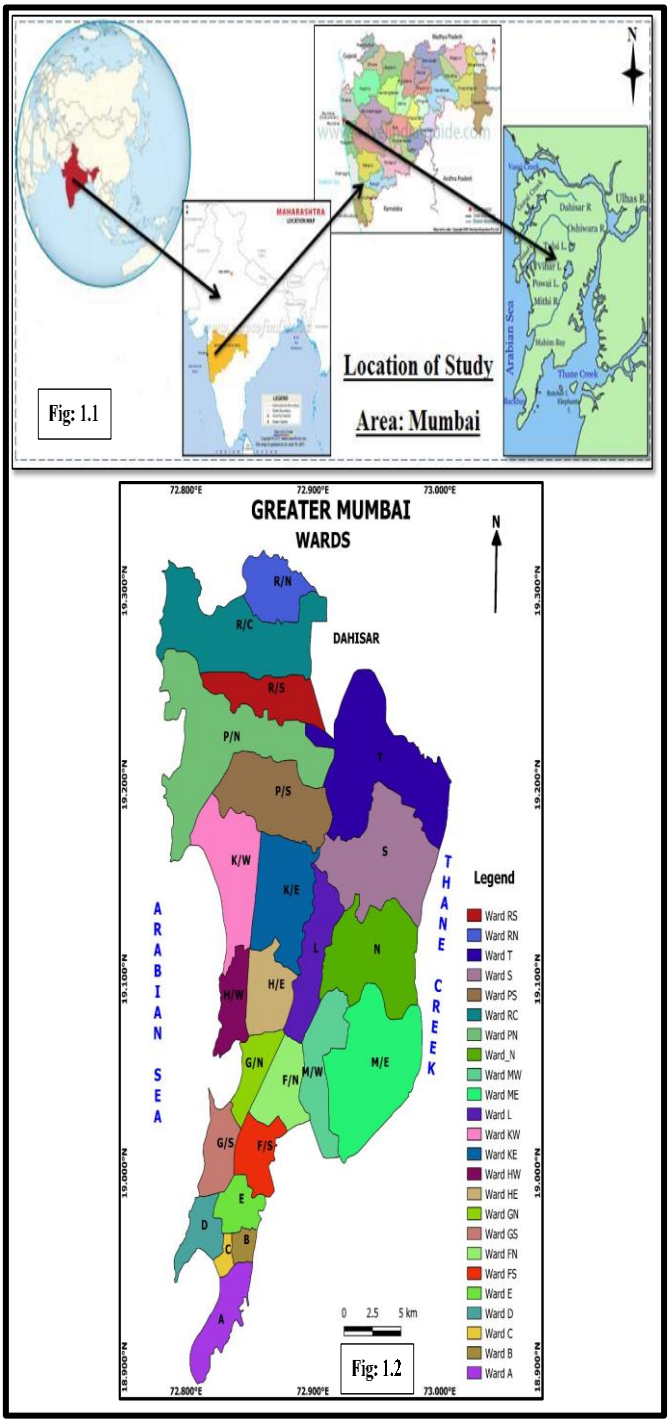
2. To understand the causes of air pollution in study area

3. To suggest applicable measures to minimize the impact in study area

Coverage

The area of study chosen is the city of Greater Mumbai and the unit of analysis is the Municipal Wards of the city. Its latitudinal extension is between 72.800N to 73.20N and longitudinal extension is between 18.90E to 19.300N. It is surrounded by Arabian Sea in the west, Thane district in the North and East and Raigad District in the South.

The area covered for the present study is Northern Mumbai and the unit of analysis is wards. Northern Mumbai consists of nine wards viz. A, B, C, D, E, F/N, F/S, G/N and G/S and the case study is presented for Ward A.



Research Methodology

The methodology is divided into three phases so that it can be followed and represented systematically. The three phases are as follows:

Pre-field: Selection of area for each ward has been carried out and 10 locations have been selected randomly from A ward. To gain knowledge about the study, secondary data has

been referred to undertake an extensive review of literature.

On field: The field work has been undertaken in the month of January 2020. The real time air pollution data has been collected with the help of air monitoring device which provides real time analysed air quality index of air. The device used here is the Airveda's Air Quality Monitor.

Post Field: The collected data has been stored, processed, analysed and represented using MS-Excel.

Results and Analysis

Air quality zones overlayed on the LULC map of each ward enrich the study of area wise pollution analysis in the particular ward. Bar diagrams showing the noise pollution also designate the pollution level of that particular area, the area under permissible noise limit or not. Ward wise road maps with car parking areas of 2000 and 2019, conclude the scenario of pollution status due to traffic movements on the road. Plates are also the evidence of that pollution scenario in the ward.

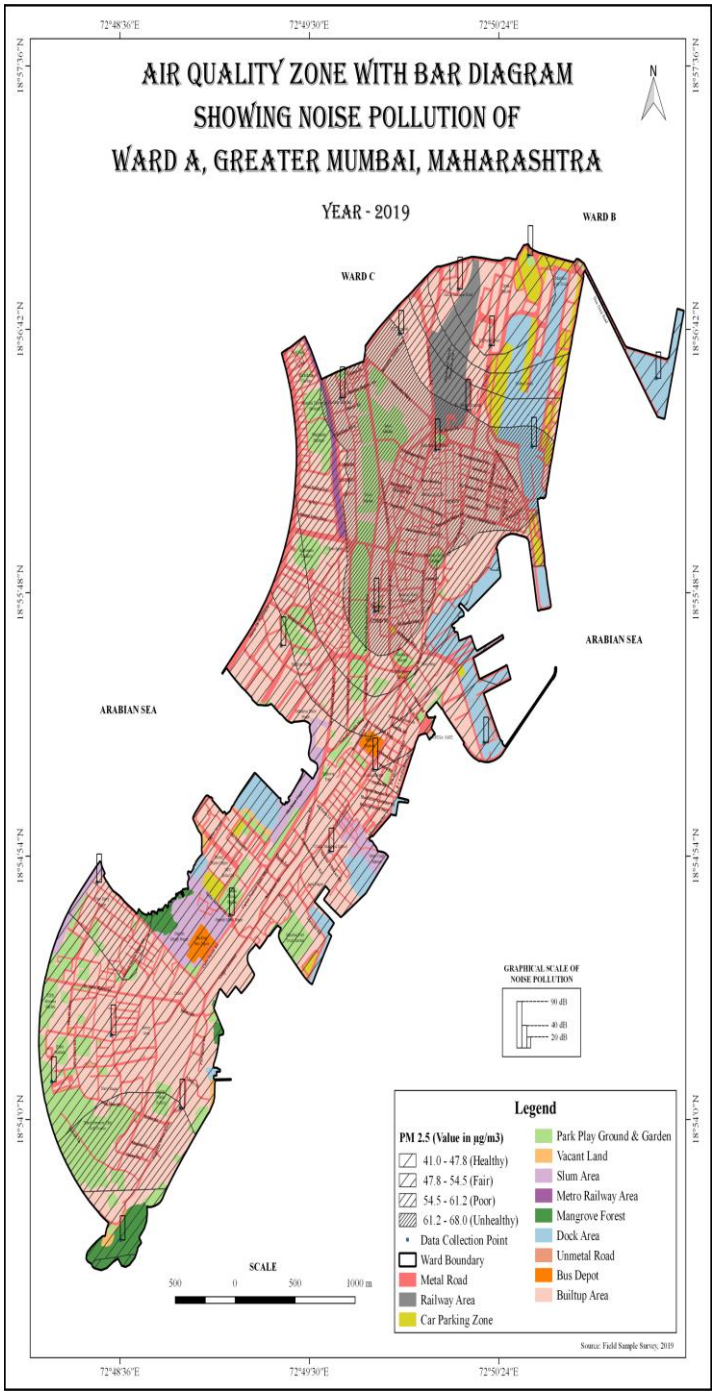


Fig. 1.2 – *Air quality zone map with bar diagram showing noise pollution of Ward A, Greater Mumbai, 2019*

Fig.1.2 demonstrates the air quality zone map with bar diagram showing noise pollution of Ward A, Greater Mumbai for the year 2019, which is an output of GIS application. Based on the different LULC types, 20 field survey locations have been opted to collect the air quality and noise pollution data throughout the ward using Global Positioning System (GPS). The GPS waypoints have been incorporated into

the land use and land cover map of Ward A and then PM2.5 values of different locations have been used to generate the spatial distribution of air quality into four zones like 'Healthy', 'Fair', 'Poor' and 'Unhealthy' within the ward by the kriging algorithm of interpolation method. Bar diagrams are depicted on those surveyed locations in different scales to show the noise pollution based on surveyed data.

Table 1.1 – *Surveyed data of air quality and noise pollution of Ward A, Greater Mumbai,2019*

Sl. No.	Location	LULC Type	PM $_{2.5}$ ($\mu g/m^3$)	Noise Pollution (dB)
1	St. George Hospital, P D Mello Road	Builtup	68.5	75
2	P D'mello Road	Road Junction	39.5	73.6
3	G T Hospital	Builtup	69	57.35
4	Bombay Hospital	Builtup	71	76
5	Manohardas BMC School	Builtup	74	76
6	Colaba Municipal School	Builtup	41.5	58.5
7	Saboo Siddique Road	Road Junction	47	79
8	Ganesh Murti Nagar	Road Junction	52	67.5
9	Colaba Market	Commercial	46	78.5
10	Near Kendriya Vidyalaya No. 3	Mangrove Forest	52	60
11	Near Mulla Auditorium	Builtup	53	75
12	New Dock Road	Dock	42	65
13	Mansion Road	Car Parking	45	74
14	Indira Docks	Dock	72	72
15	INHS Ashwini Hospital	Builtup	55	72
16	Geeta Nagar	Builtup	57	70
17	WNC Mess	Builtup	50	62
18	Maharshi Karve Road	Builtup	75	82
19	Bandar Road	Dock	43	63
20	INOX, Nariman Point	Commercial	52	71

Table 1.1 describes those 20 locations of sample survey, their LULC types, values of PM2.5 and noise pollution. The PM2.5 data have been catagorised into Healthy (41 – 47.8), Fair (47.8 – 54.5), Poor (54.5 – 61.2) and Unhealthy (61.2 – 68) zones with the different hatch fill pattern. Though at Maharshi Karve Road sample collection point, the PM2.5 value is the maximum of 75µg/m3 and at Colaba Municipal School, the minimum value was 39.5µg/m3 but for purpose of interpolation in equal interval by kriging algorithm of GIS analysis, the maximum and minimum value have been considered as 68 and 41µg/m3respectively. From the map it has been observed that Bandar Road, New Dock Road (land use - Dock), part of P D'mello Rd, Saboo Siddique Road (land use - road junction), Colaba Municipal School, Colaba Market (land use - builtup), Mansion Road (land use - car parking) are in the minimum PM2.5 effected zone ('Healthy') and St. George Hospital, G T Hospital, Bombay Hospital, Manohardas BMC School, Maharshi Karve Road (land use - builtup), Indira Docks (land use - dock) were the maximum PM2.5 effected area ('Unhealthy'). It should be a great matter of concern that the St. George Hospital, G T Hospital, Bombay Hospital, Manohardas BMC School are in the highly polluted zone. Ganesh Murti Nagar (land use - road junction), Near Kendriya Vidyalaya No. 3 (land cover – mangrove forest), Near Mulla Auditorium, WNC Mess (land use - builtup), and INOX, Nariman Point (land use – commercial) area were in the second category zone ('Fair'). INHS Ashwini Hospital and Geeta Nagar (land use type builtup) are in the third category i.e. Poor.According to table 4.1, Colaba Market area (land use – commercial) was in the highest (78.5 dB) noise pollution area. It also observed that sample surveyed area are in high

noise pollution zone except G T Hospital, Colaba Municipal School, WNC Mess (land use - builtup), Near Kendriya Vidyalaya No. 3 (land cover – mangrove forest) and Bandar Road (land use - dock) which are slightly less noise polluted area.

The outcome of the analysis - Colaba Municipal School area is the lowest polluted area with respect to PM2.5 and noise pollution within the Ward A, Greater Mumbai for the year 2019.Mansion Road (land use - car parking) is the one of the highly noise polluted though it is under minimum PM2.5 polluted area. The land use type car parking is also a colossal cause of pollution.

The degree of association is measured by a correlation coefficient, denoted by R. The correlation coefficient is measured on a scale that varies from + 1 through 0 to – 1. Complete correlation between two variables is expressed by either + 1 or -1. When one variable increases as the other increases the correlation is positive; when one decreases as the other increases it is negative. Complete absence of correlation is represented by 0.

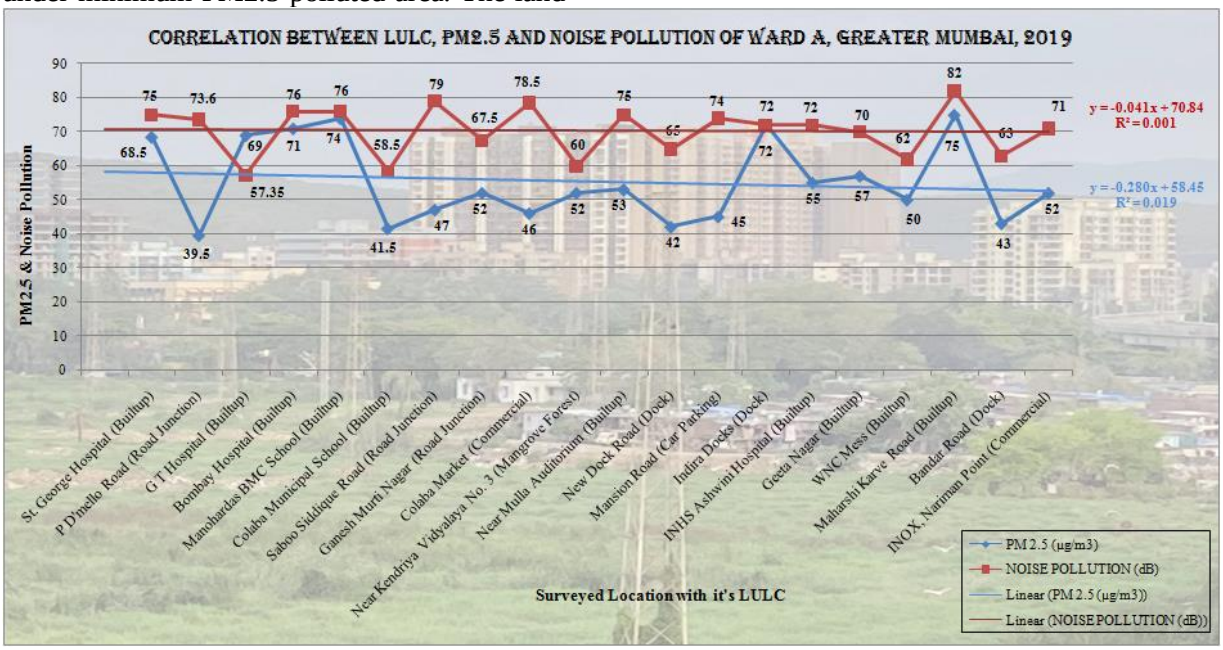


Fig. 1.2 - *Correlation between LULC, PM2.5 and Noise Pollution of surveyed location for Ward A, Greater Mumbai, 2019*

Correlation of the land use land cover, air quality (PM2.5) and noise pollution of 20 surveyed locations with the linear regression analysis for the Ward A, Greater Mumbai, 2019 is shown by Fig. 4.2. The Fig. shows that the relation between air quality of PM2.5 and noise pollution on the different type of land use land cover of the ward are fully correlated. It seems that at all the surveyed location, both are either increased or decreased and that is why the correlation between PM2.5 and noise pollution is positive. The difference between the correlation coefficient of air quality (PM2.5) and noise pollution is +0.018, meaning that the correlation coefficient of PM2.5 is much less than the noise pollution. The 'y' shows the linear regression analysis values for both the PM2.5 and noise pollution with conical lines.

Table 1.2 – *Metal Road and Car Parking area of Ward A, Greater Mumbai, 2000 and 2019*

Area (Sq. Km.) of Ward A, Greater Mumbai			
Sl. No.	**Type**	**2000**	**2019**
1	Metal Road	2.2783	2.4375
2	Car Parking	0.1766	0.2675

Table 1.2 shows that the changes of areas for the land use features Metal Road and Car Parking of Ward A, Greater Mumbai for the year 2000 and 2019.

Fig.1.3 is the pictorial representation of metal road with overlaid car parking area of Ward A, Greater Mumbai for the year 2000 and 2019. Car parking area (yellow colour) of 2000 is 0.1766 sq. km and in the year 2019, car parking became 0.2675 sq. km. It has been observed that by the

year 2019, the car parking area has been increased 0.0909 sq. km. compare to the year of 2000, which is an enormous issue of concern for the local authority with respect to traffic congestion and pollution. Mainly Indira Dock and around World Trade Centre areas have been crowded by the parked cars.

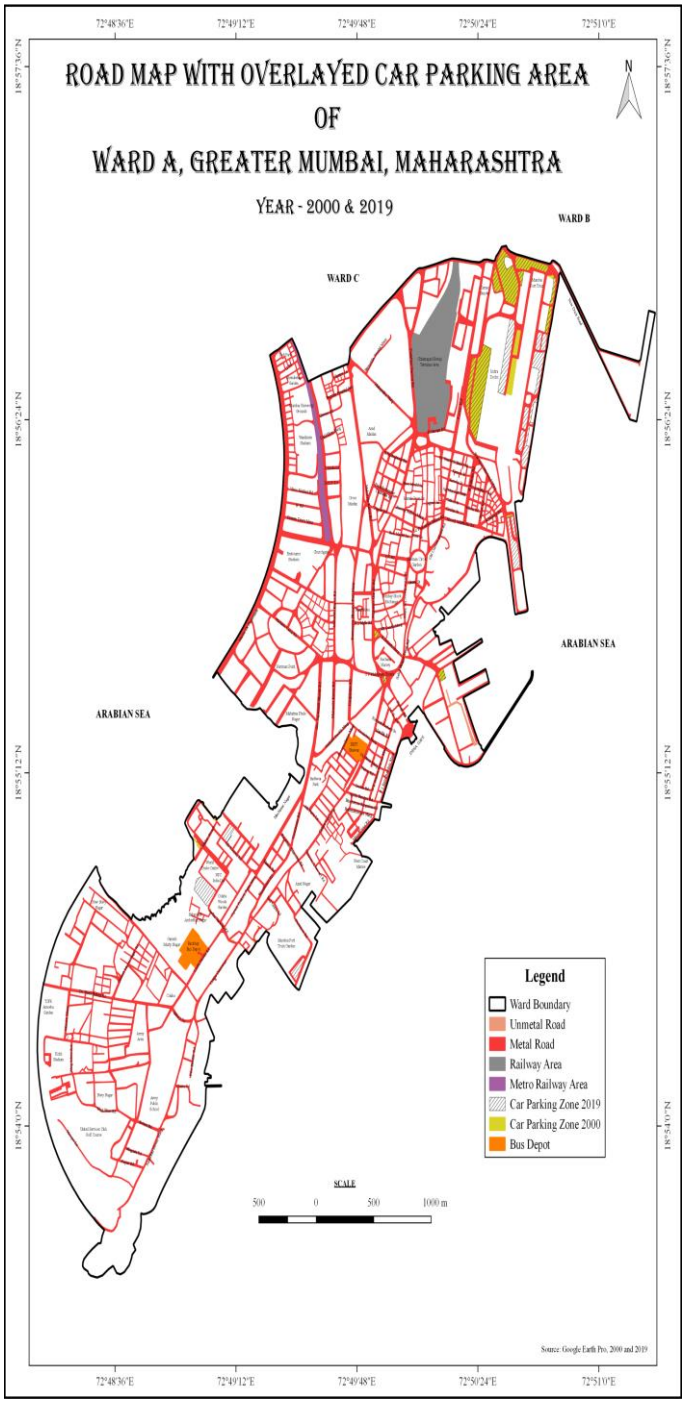


Fig. 1.3 – *Road map with overlayed car parking zone of 2000 & 2019, Ward A, Greater Mumbai*

Rigal Park

Road parking (illegal) at 2nd Pasta Lane

Road parking (illegal) at 2nd Pasta Lane

Navy Nagar Cooperative Society

Plate 1.1 – *Pictures of car parking areas of Ward A, Greater Mumbai, 2019*

Car emissions can be divided in to three categories: exhaust emissions, abrasion emissions and evaporative emissions. Exhaust emissions are created by the combustion of fuels when the vehicle engine is running or idling. Causes of abrasion and evaporative emissions relate to general aging or overall car use. Abrasion emission is corrosion of car parts and mechanical abrasion of tires. Abrasion causes particulate matter (PM) emissions also.

Plate 1.1 exhibits the pictures of legal and illegal car parking of Ward A, Greater Mumbai. The illegal parking is one of the causes of traffic congestion. Systematic way of parking leads to less traffic congestion as well as noise and air pollution. Local authority can impose various rules but the awareness of noise and air pollution due to illegal parking, should be formed. Not only that, anyone can become injure due to the inappropriate car parking.

Conclusion

Air and noise pollution is increasing day by day and leading to various problems which has made it important to study the levels of pollution in the area. Air and noise pollution leads to environmental issues and causes harm to the health of human beings, livestock and vegetation. Transportation is also affected due to pollution in air and higher levels of noise in the surroundings. There are many diseases which are caused by air pollution which can be fatal. Noise pollution causes irritability and may also lead to heart attack. The study reveals that the levels of air pollution and noise pollution are high in ward A. The most noteworthy cause of the increased or high levels of pollution is the increasing number of vehicular traffic and resultant congestion. However the congestion is more due to illegal and unorganised parking on the streets which make them narrower and cause disruption.

Recommendations

- People should be advised to switch over to public transport instead of using private vehicles. Carpooling could also be an apt measure.
- Instead of using petrol or diesel vehicles, people should use CNG gas run vehicles. Futuristic electric cars could be a good option.
- Vehicle should be serviced regularly so that there is less release of smoke emission
- Afforestation must be encouraged.
- People should wear mask while travelling as a precaution from pollutants.
- Government must undertake road widening wherever possible.

Acknowledgement

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Reference

[1] Chinnaswamy, (1995): "Strategies for Prevention and Control of Air Pollution in India",ResearchGate.https://www.researchgate.net/publication/236179607_Strategies_for_Prevention_and_Control_of_Air_Pollution_in_India

[2] Government of India, (2015) " Burden of Diseases Attributable to measure Air Pollution source", Health Effect Organization. https://mohfw.gov.in/sites/default/files/541202366145043272 4_0.pdf