Assessment of Air, Water and Noise Pollution along National Highway 32

Abithameenal Nagappan
Department of Civil Engineering
Panimalar Engineering College
Chennai, India.

Abstract—**In the name of urbanization, industrialization and modernization, man is causing damage to the elements of atmosphere and to the ecosystem itself. Of the 25 most polluted cities in the world, India occupies 9th position and this might increase in the near future. As a result of increasing pollution levels, the deaths due to environmental pollution are three times more than that of malaria, tuberculosis and AIDS combined. This has serious effect on all living creatures. This paper aims to assess the pollution levels especially, the concentration of Particulate Matter 2.5 and 10 in the air, water quality parameters from various natural sources and the noise levels along the National Highway 32.The primary areas of interest includes a stretch of 12.4 KMs in the National highway 32 from Guduvancherry to Tambaram concentrating on four major locations namely Guduvancherry, Urapakkam, Perungalathur and Tambaram which has seen a lot of development for the past two decades from infrastructure to transportation. Alongside, we have conducted surveys to understand the public knowledge on rising pollution levels and also suggesting the possible measures to reduce them.**

Keywords—Particulate Matter, Pollution, Physio-Chemical paramters, National Highway

I. INTRODUCTION

The pollution is an issue at every corner of the world killing millions of people every year. Some nations experience an accelerating pollution levels every year and India never fails to be away from the list. The air, water and noise pollutions are the most prevailing pollution in India. The use of private transportation has been increasing to make the lives easier and faster accounting to the increased air and noise pollutions. Burning of stubble and other wastes also contributes their part to the air pollution. People have exploited most of the forests and water bodies and converted them into private dwellings and continue to expand their foot prints on every part of the country [2] [3]. According to WHO, more than 80% of the diseases are water borne and they serve as crucial barriers to safe drinking water.. In India, air pollution accounts for more than 12.5 % of deaths and 86% of the Indian water bodies are critically polluted. Once crossed the safer levels, noise pollutions can become a killer too. The main motive of our study is to prepare a fundamental database for monitoring the ambient noise exposure levels, particulate matter levels, and the quality of drinking water in selected locations along the National Highway 32.

II. LOCATION

Due to rapid growth and crucial infrastructural development along the National Highway 32, there is an increased rate of pollution being observed every day. Thus, our area of study is focused upon a stretch of 12.4 KMs in NH32, which includes the hotspot locations such as Guduvancherry, Urapakkam, Perungalathur, and Tambaram. The traffic survey, noise levels, PM2.5, PM10, and water quality are assessed on these four specified locations given below.

TABLE I. LIST OF LOCATIONS AND ITS NAME

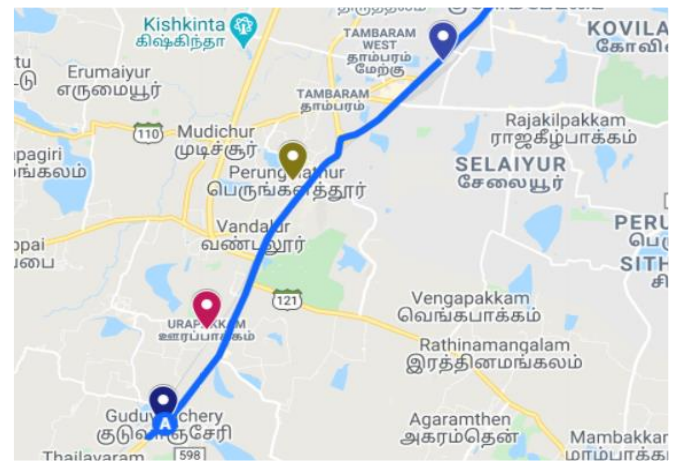| LOCATION	NAME
1	Guduvancherry
2	Urapakkam
3	Perungalathur
4	Tambaram

Fig. 1. Map showing the four locations where pollution were assessed.

III. NOISE POLLUTION

Noise is defined as an unpleasing sound to the ears. The various sources of noise pollution include noise from traffic, industries, construction sites, animals, and people. World Health Organization lists noise pollution as one of the most dangerous threat to human health. Its negative effects include annoyance, sleep disturbance, hearing impairment, and interference with spoken communication, premature deaths and hospitalizations.

A. Noise Measurements

In order to study the traffic noise data effectively, the vehicular survey was first taken. The traffic volume was studied by grouping the vehicles in five categories namely two wheelers, cars, auto rickshaws, buses and heavy vehicles [4]. The hourly flow of the traffic was noted for about a week [3] .The data consolidated in given in the table below.

Special Issue - 2021

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NCIIE - 2021 Conference Proceedings

TABLE II.   LOCATIONS AND ITS TRAFFIC SURVEY
FOR A WEEK

LOCATION	AVERAGE VEHICLES PER HOUR				
	Two Wheeler	*Cars*	*Bus*	*Auto*	*Heavy Vehicles*
1	600	298	53	43	72
2	549	321	50	41	67
3	1132	411	54	119	67
4	957	334	47	86	48

Fig. 2. Image showing the traffic at Urapakkam location

The noise was measured using a calibrated digital sound level meter as shown in Fig 3.

Fig. 3. Noise Meter showing the max reading value at Urapakkam location

The device was kept undisturbed in the fore mentioned locations for about an hour in a day [4].

Fig 4. Image showing noise reading being monitored at Guduvancherry

The readings were taken similarly, for about a week and the consolidated data is given in the table below.

TABLE III.   LOCATIONS AND ITS NOISE VALUES
FOR A WEEK

LOCATION	NOISE VALUES		
	MIN VALUE OF THE WEEK(DB)	*MAX VALUE OF THE WEEK(DB)*	*AVERAGE VALUE OF THE WEEK(DB)*
1	61	93.4	80.74
2	60.5	94	77.87
3	67.9	98.3	78.04
4	65.3	92.1	79.20

IV.   AIR POLLUTION

Air is vital for any living thing in the world. The contaminated air is a mixture of solid particles and unfriendly gases. The solid particles called as particulate matter comes under 2 types namely PM 2.5 and PM 10 classified based upon their size in micrometer levels. The particulate matter 2.5 and 10 not only vary in their size, but also from the source form which is comes from. The sources of PM 2.5 are automobiles, burning, smelting, and material processing, whereas for PM10 the sources are road, factories and farming. According to WHO, eleven out of twelve cities with highest particulate pollutions are in India.   The effects of prolonged exposure to Particulate Matters are coughing, wheezing, decreased visibility, lung damage and pre mature deaths.

A.   Particulate Matter Monitoring:

The Particulate Matter was monitored using calibrated high quality laser sensor, AIRVEDA PM2.5, PM10 Air Quality Monitor which works under the light scattering principle. The values were monitored for an hour per day for about a week and the consolidated data is given in the table 2 below

Special Issue - 2021

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NCIIE - 2021 Conference Proceedings

Fig. 5. Particulate Matter monitoring sensor showing the readings at Guduvancherry location

TABLE IV.   LOCATIONS AND ITS PARTICULATE MATTER READINGS

LOCATION	PM2.5			PM10		
	min value	max value	avg value	min value	max value	avg value
1	32	94	63	57	287	172
2	49	88	68.5	73	180	126
3	34	97	65.5	60	230	145
4	22	171	96.5	40	352	196

V.   WATER POLLUTION

A.   Water Sampling

The main sources of drinking water in the selected four locations are bore wells, open wells, village panchayat water, lakes and packaged drinking water. The natural sources of drinking water were sampled for testing. The water samples were collected in 1 liter polyethylene water bottles. The bottles were first cleaned with 1% of nitric acid [1]. They are rinsed with distilled water and then with the sample. The samples were tested in an ISO 17025:2005 Certified laboratory (GESRA Labs India Pvt Ltd, Chennai).The total number of samples collected were nine and the samples were named as following.

Fig 6: Image showing the collected water samples from the four locations.

TABLE V.   WATER SAMPLES AND THEIR SOURCE

LOCATION NO	SAMPLE NO	SOURCE
1	S1	Bore well 1
	S2	Bore well 2
	S3	Lake water
2	S4	Bore well 1
	S5	Bore well 2
	S6	Panchayat water
3	S7	Bore well 1
	S8	Lake water
	S9	Panchayat water

B.   Water Testing

Each of the sample were tested for the parameters namely Appearance, pH @25°C, Color, Odor, Turbidity, Electrical Conductivity, Total Suspended Solids, Total Dissolved Solids, Total Hardness as CaCO3, Calcium Hardness as CaCO3, Magnesium Hardness as CaCO3, Phenolphthalein Alkalinity as CaCO3, Total Alkalinity as CaCO3, Chloride as Cl⁻, Sulphate as SO4, Total Iron as Fe, Silica as SiO2, Residual Free Chlorine, Carbonate Hardness as CaCO3 and Non- Carbonate Hardness as CaCO3.The results are discussed in brief as follows.

- Appearance
  Ideal water should be transparent in its appearance. Turbidity indicates the contamination of water. It was tested through visual examination [1]. All the samples except S5 were found to be transparent.

- pH
  pH known as power of Hydrogen is a measure that indicates how acidic or basic the water is. The Ideal water for drinking purpose should have a pH range of 6.5 to 8.5. It was tested as per IS 3025 Part 11 1983 RA 2017[1]. All the samples were found to be in the limit.

- **Colour**
  The water should be colourless in nature and it is measured in a unit called Hazen. It was tested as per IS 3025 Part 4 1983 RA 2017. The maximum permissible limit is 15 Hazen and all the samples were within permissible limits.

- **Odour**
  Water must be free of any kind of odour. It was tested as per IS 3025 Part 5 1983 RA 2017. The odour of all samples except S5 was found to be agreeable.

- **Turbidity**
  Turbidity is the measure of transparency of water. Its unit is NTU (Nephelometric Turbidity Unit). It was tested as per IS 3025 Part 10 1984 RA 2017. The maximum permissible limit is 15 NTU. The results of the samples are shown in the graph below.
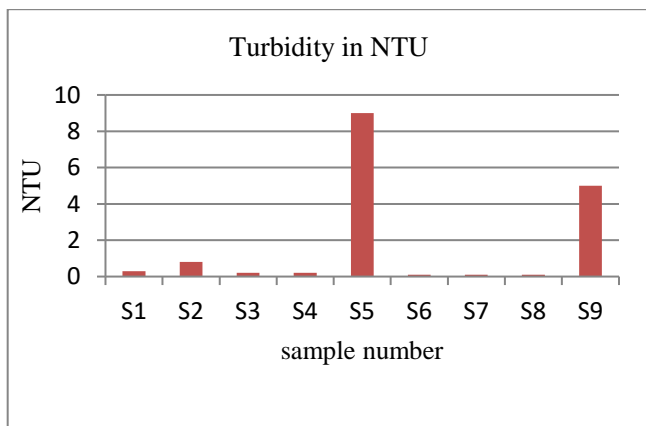
Fig 7. Graph showing the Turbidity values for the collected water samples

- **Electrical Conductivity**
  Electrical Conductivity (EC) is the measure of the ability of water to pass the electric current. Its unit is $\mu s/cm$ [1]. It was tested as per IS 3025 Part 14 1984 RA 2013. The results of the samples are shown in the graph below.
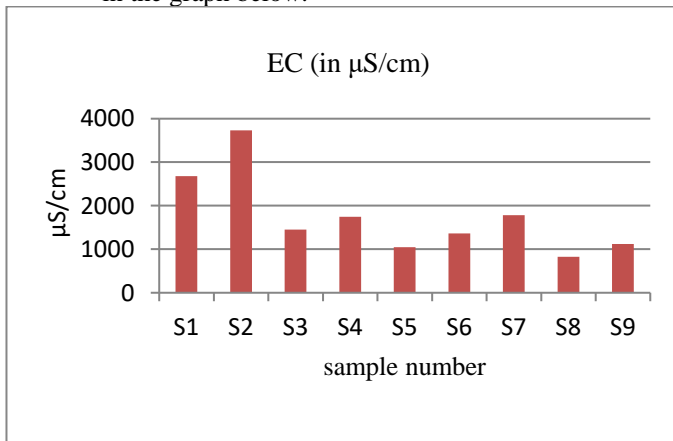

Fig 8. Graph showing the Electrical Conductivity values for the collected water samples

- **Total Suspended Solids**
  Total Suspended Solids (TSS) is defined as the solids present in the water that can be segregated by a filter. Its unit is mg/l [1]. It was tested as per IS 3025 Part 17 1984 RA 2017. Except for sample S5 having TSS of 6 mg/l, no other samples were found to have TSS in it.

- **Total Dissolved Solids**
  Total Dissolved Solids refers to any kind of dissolved salts, metal and ions present in water. Its unit is mg/l [1]. It was tested as per IS 3025 Part 16 1984 RA 2017. The maximum permissible limit is 2000 mg/l. The results of the samples are shown in the graph below.
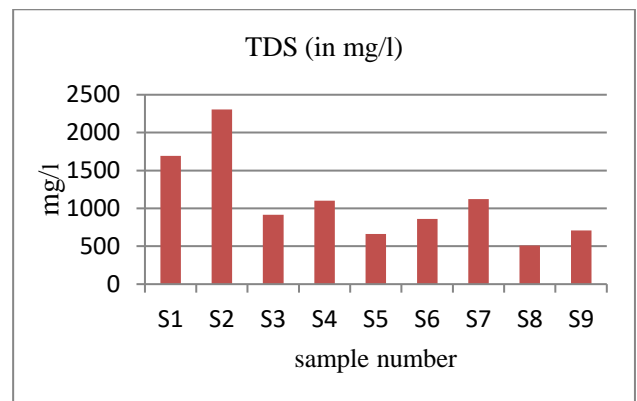

Fig 9. Graph showing the Total Dissolved Solids values for the collected water samples

- **Total Hardness As $CaCO_3$**
  The amount of dissolved calcium ions expressed as an equivalent of Calcium Carbonate. Its unit is mg/l. It was tested as per IS 3025 Part 21 2009 RA 2014. The maximum permissible limit is 600 mg/l [1]. The results of the samples are shown in the graph below.
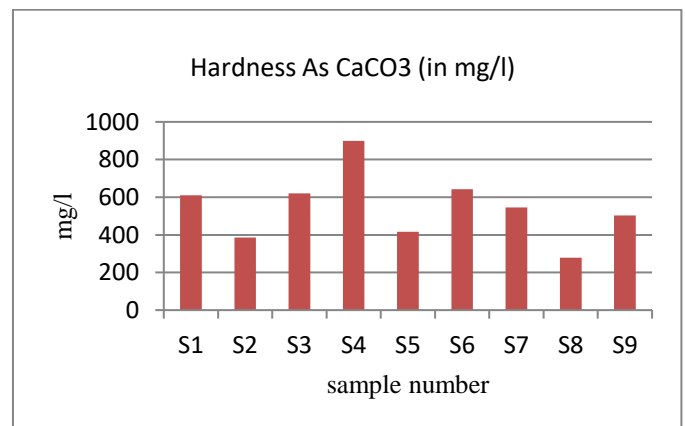

Fig 10. Graph showing the hardness as CaCO3 values for the collected water samples

Special Issue - 2021

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NCIIE - 2021 Conference Proceedings

- **Calcium**
  It refers to the amount of dissolved Calcium ions in water. Its unit is mg/l. It was tested as per IS 3025 Part 40 1991 RA 2014.The maximum permissible limit is 200 mg/l [1]. The results of the samples are shown in the graph below.

Ca (in mg/l)
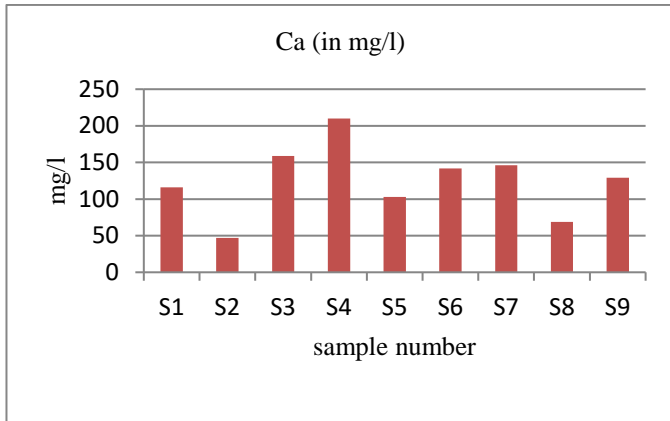
Fig 11. Graph showing the calcium values for the collected water samples

- **Magnesium**
  It refers to the amount of dissolved Magnesium ions in water. Its unit is mg/l. It was tested as per IS 3025 Part 46 1994 RA 2014. The maximum permissible limit is 100 mg/l [1]. The results of the samples are shown in the graph below.
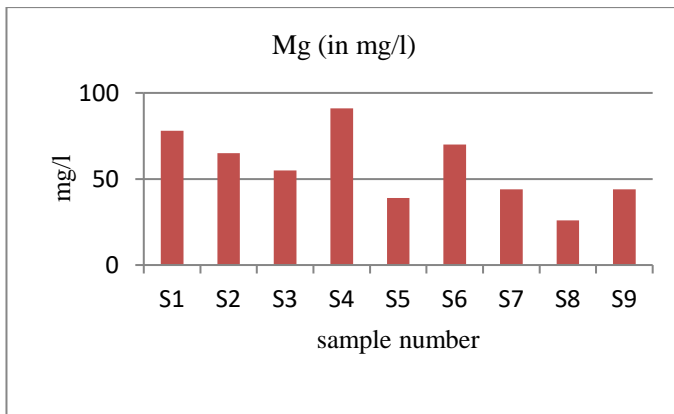
Mg (in mg/l)

Fig 12. Graph showing the magnesium values for the collected water samples

- **Cl⁻**
  It refers to the amount of dissolved Chlorine ions in water. Its unit is mg/l. It was tested as per IS 3025 Part 32 1988 RA 2014. The maximum permissible limit is 1000 mg/l [1]. The results of the samples are shown in the graph below.
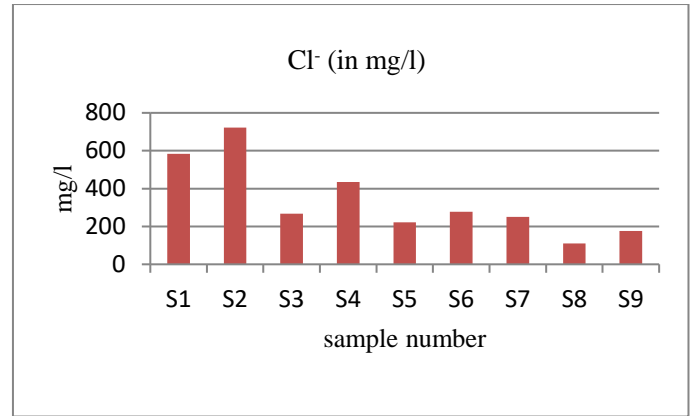
Cl⁻ (in mg/l)

Fig 13. Graph showing the chlorine values for the collected water samples

- **SO₄**
  It refers to the amount of dissolved sulphur ions in water. Its unit is mg/l. It was tested as per IS 3025 Part 24 1986 RA 2014. The maximum permissible limit is 400 mg/l [1]. The results of the samples are shown in the graph below.
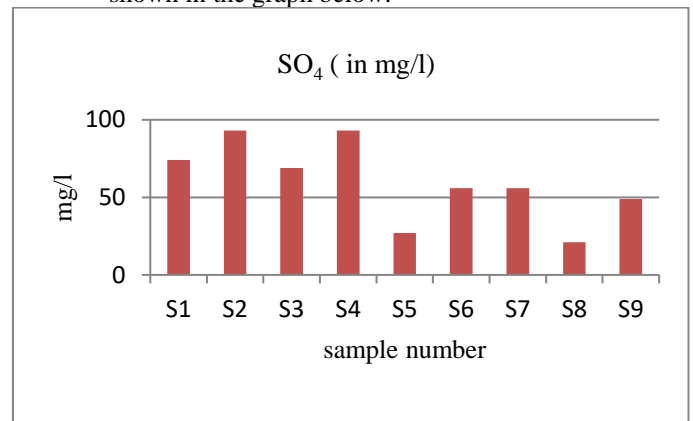
SO₄ (in mg/l)

Fig 14. Graph showing the sulphur values for the collected water samples

- **Iron**
  It refers to the amount of dissolved ferrous ions in water. Its unit is mg/l [1]. There is no such maximum permissible limit for iron. It was tested as per IS 3025 Part 53 2003 RA 2014. The results of the samples are shown in the graph below.
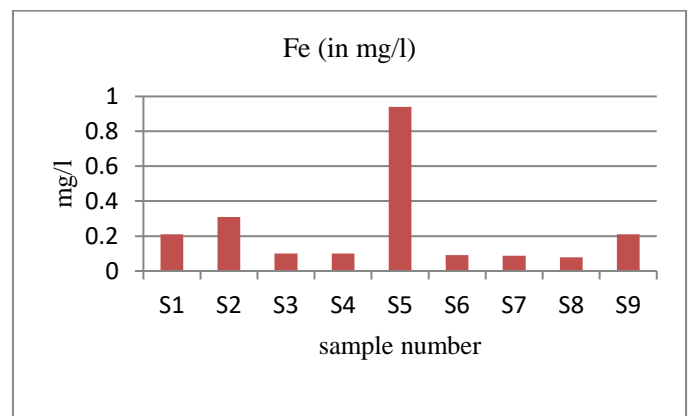
Fe (in mg/l)

Fig 15. Graph showing the iron values for the collected water samples

Special Issue - 2021

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NCIIE - 2021 Conference Proceedings

VI. CONCLUSION

Lack of knowledge about the environmental factors is the major reason for the rising pollution levels in India [5]. As a responsible citizen of the country, this paper aims to acquire the sound knowledge about the environment in and around our dwellings. Thus, from the data collected, we could conclude that people are more vulnerable to the effects pollution levels in terms of Particulate Matter and noise levels. In case of water, most of the samples were chemically unfit for drinking as per BIS standards. The people living in and around will be vulnerable to various effects of the appalling pollution levels. Lack of care and knowledge about the environment will be more dreadful in the future [5]. According to a source, majority of the media coverage on pollution is in English instead of the regional language. When every citizen becomes aware of his environmental condition that he is surviving, everyone can automatically bring the change that we are expecting from others. Thus, we understood the pollution levels in our locality and we will act for eradicating it in future.

REFERENCES

[1] Indian Standard DRINKING WATER — SPECIFICATION (Second Revision) © BIS 2012 Bureau of Indian Standards, MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG NEW DELHI 110002

[2] Environmental impact assessment of proposed NH-6 of Chhattisgarh, Vikram Singh Rajput, Santosh Kumar Sar*, Shweta Singh, Vijita Diwan – journal of applied and advanced Research

[3] Impact of Vehicular Emissions on Environmental in and around Chennai City- Assessment and control Measures – International Journal of Innovative Technology and Exploring Engineering (IJITEE)

[4] Dr.Latha.A, Princy.F, Hannah Jerline.S, Nivashini.M, " Study of Traffic noise levels at Chennai city and its impact"- JASC: Journal of Applied Science and ComputationsVolume VI, Issue IV, April/2019ISSN NO: 1076-5131

[5] G.Anbalagan , K.Shanthi, "A Study On Environmental Awareness and Related Practices Among The High School Students at Madurai District, Tamil Nadu".