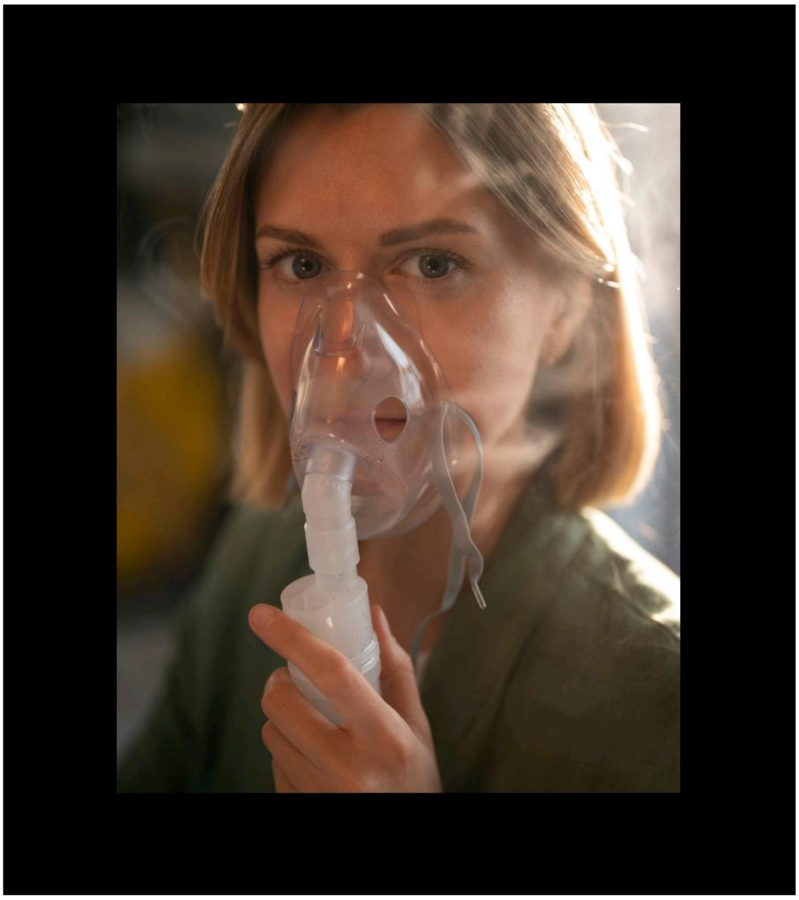
Breathing Easy: A Comprehensive Analysis of Air Quality in Tamil Nadu

Breathing Easy

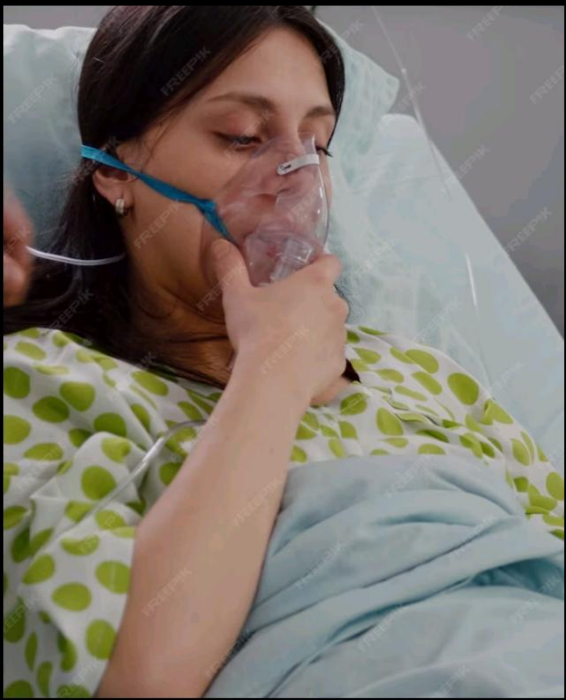
A comprehensive analysis of air quality in Tamil Nadu. This presentation aims to provide a professional overview of the current state of air quality in the region. It will cover the main sources of air pollution and the impact on human health.

Air Quality Standards

This slide will cover the different air quality standards used in Tamil Nadu and how they compare to international standards. It will also highlight the health risks associated with exposure to poor air quality.



This slide will cover the main sources of air pollution in Tamil Nadu, including industrial emissions, transportation, and agricultural practices. It will also discuss the impact of natural factors such as dust storms and wildfires.



This slide will discuss the health impacts of exposure to poor air quality, including respiratory diseases, cardiovascular diseases, and cancer. It will also highlight the vulnerable populations who are most at risk.

Government Initiatives

This slide will cover the government initiatives aimed at improving air quality in Tamil Nadu, including policies and regulations, as well as public awareness campaigns. It will also discuss the challenges faced in implementing these initiatives.

Conclusion

This presentation has provided a professional overview of the current state of air quality in Tamil Nadu. It has highlighted the main sources of air pollution, the health impacts, and the government initiatives aimed at improving air quality. It is clear that more needs to be done to address this important issue.

AIR QUALITY ASSESSMENT OF NEYVELI IN CUDDALORE DISTRICT, TAMILNADU, INDIA

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ABSTRACT

Particulate matter which includes PM_{10} (Particulate Matter) and TSPM (Total Suspended Matter) serves as an important tool to determine the ambient air quality. This study reveals the concentration of PM_{10}, TSPM, NOx, SO_2 and CO at all the sampling stations to be dangerous to plants, animals and human beings. The sampling stations fall under the category of industrial, residential and sensitive zones. As the industries happen to be the main establishment of this area it is highly important to understand about the ambient air quality. The statistical analysis reveals a positive correlation for Neyveli Township between the Pre and Post monsoon of TSPM and the correlation was found to be a bit lesser between PM_{10}, TSPM, NOx, SO_2 and CO during both period of all the areas, but still there is no negative correlation noticed between the data.

Key words: Air quality, PM_{10}, TSPM, NOx, SO_2, CO, Neyveli in Cuddalore District.

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1. INTRODUCTION

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or cause damage to the natural environment or built environment, into the atmosphere.

The atmosphere is a complex dynamic natural gaseous system that is essential to support life on planet Earth. Stratospheric ozone depletion due to air pollution has long been recognized as a threat to human health as well as to the Earth's ecosystems. Indoor air pollution and urban air quality are listed as two of the world's worst pollution problems in the 2008 Blacksmith Institute World's Worst Polluted Places report.

Environmental Quality (EQ) by definition has two major meanings, the first deals with the physical environment, while the second deal with the perceived environment. The immediate meaning of environmental quality is the material aspects of the physical environment like air, water pollution, depletion of resources, domestic and industrial pollution, and consequence of over population and noise, etc (Abbassi, 1998).

It is mainly in the twentieth century that the impact of human activities on the environment increased, in association with population increase and the major technological upheavals of the industrial revaluation.

The release of contaminants in to an environment causes instability, disorder, harm or discomfort to the ecosystem (physical system or living organisms). That is why the major problem at the end of the twenty first century is the preservation of environmental health since it has become clear that the health of human populations depends to a large extent on the quality of their environment.

2. MATERIALS AND METHODS

2.1. Ambient Air quality

To assess the ambient air quality, station were identified in the population density areas. Calibrated Respirable Dust Samplers (Enviro tech APM 460) with flow rate ranging between 1.2-1.45 m^3/min) were used for monitoring of SPM and RPM. Gaseous samples were collected by integrated gas sampling assembly (Envirotech APM 411). A tapping provided in the hopper of the sampler was utilized for sampling of SO_2, NO_X and CO, with proper flow controller and a flow 1.0 l/min. Envirotech Organic Vapour Sampler (APM 850)and a digital imported personnel sampler Drager Multiwarm II BD were used for monitoring CO. The pollutants were monitored on 24 hourly basis in twice in month or season wise.

2.2. PM_{10} & TSPM

Calibrated Respirable Dust Sampler is used with Whatman GF/A microfibre filter paper for the determination of PM_{10}. PM_{10} is a measure of particulate matter having size <10 microns. Respirable Dust Sampler (RDS) is attached with a cyclone. Air enters a vertical cylinder with swirling (Vortex) motion and particle larger than design cut-off are deposited on the on the inner surface of the cylinder, whereas particles below 10 microns are deposited on the whatman GF/A microfibre filter paper. PM_{10} was calculated by taking the difference between final and initial weight of the filter paper and dividing volume of the air sampled. TSPM was calculated taking the difference between final and initial weights of dust collection bottle plus filter paper dividing of volume of air sampled.

2.3. SO_2 (Modified West-Gaeke Spectrophotometric Method)

Sulphur dioxide is collected in a scrubbing solution of sodium tetrachloro-mercurate and is allowed to react with HCHO and then with Para-rosaniline hydrochloride. The absorbance of the product red-violet dye is measured using digital spectrophotometer at a wavelength of 560nm. SO_2 Modified West & Gaeke method (spectrophotometric) was adopted. SO_2 was collecting in a scrubbing solution of sodium tetrachloro mercurate (TCM) and was allowed to react with sulphuric acid, formoldihyde and then with pararosaniline hydrochloride. The absorbance of the product red-violet dye was measured using UV Visible Spectrophotometer at a wavelength.

2.4. NO_X (Jacob and Hocheiser Modified Method)

Nitrogen oxides as nitrogen dioxide are collected by bubbling air through sodium hydroxide solution to form a stable solution of sodium nitrite. The nitrite ion produced during sampling is determined using digital spectrophotometer at a wavelength of 540 nm by reacting the exposed absorbing reagent with phosphoric acid, sulfanilamide and N (1-naphthyl) ethylamine di-hydrochloride.

2.5. Carbon monoxide (CO)

An imported digital CO detector (Drager' s Mini Warn) is used for monitoring of CO. The dust particles having size >10 microns are being collected in the cyclone and measured. This along with RPM value gives TSPM (RPM & SPM).

3. RESULTS AND DISCUSSION

The environmental quality in terms of air quality parameters were assessed at different sampling stations of the four selected stations namely Neyveli township, Mantharakuppam, Puthu kudieruppu and Mines-I of Neyveli and were tabulated in table.1 to 4. The level of PM_{10}, TSPM, SO_2 and NOx recorded at various sampling stations was tabulated in the following tables and figuratively represented too. During 2014, the highest PM_{10} level [46.55μg/m^3) has been recorded at Neyveli township (Pre monsoon). Similarly the highest TSPM level has been recorded at Neyveli town (Pre monsoon) (128.2μg/m^3) respectively. The values of SO_2 and NOx 8.9μg/m^3 & 12.8μg/m^3 respectively in Neyveli township (Pre monsoon).

During 2015, the highest PM_{10} level [35.45μg/m^3) has been recorded at Neyveli township (Pre monsoon). Similarly the highest TSPM level has been recorded at Neyveli township (Pre monsoon) (114.48μg/m^3) respectively. The values of SO_2 and NOx 8.52 μg/m^3 & 13.13μg/m^3 respectively in Neyveli township (Pre monsoon).During post monsoon the highest value of PM_{10} is seen in Neyveli township and it is 32.19 μg/m^3.

During 2016, the highest PM_{10} level [63.98μg/m^3) has been recorded at Neyveli township (Pre monsoon). Similarly the highest TSPM level has been recorded at Neyveli township (Pre monsoon) (137.26μg/m^3) respectively. The values of SO_2 and NOx 8.69μg/m^3 & 12.15μg/m^3 respectively in Neyveli Township (Pre monsoon) .In the post monsoon period the highest PM_{10} & TSPM was at Neyveli Township and the values were 43.45μg/m^3 & 109.05μg/m^3.

During 2017 pre monsoon period the highest PM_{10}, TSPM, SO_2 & NO_X has been reported at Neyveli township and the values were 54.92μg/m^3,118.16μg/m^3,8.21μg/m^3 & 11.58μg/m^3 respectively. In the post monsoon also the higher values were recorded in the Neyveli Township itself.

TABLE:1 Summary of Ambient air quality data in pre and post monsoons monsoon during 2014-2017 (mean values) Neyveli township

Pre monsoon(January-April)					Post monsoon (Sept.-December)			
Year	TSPM ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	TSPM ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)
2014	128.2	46.55	8.9	12.8	94.81	34.49	7.85	11.19
2015	114.48	35.45	8.52	13.13	99.55	32.19	7.64	10.85
2016	137.26	63.98	8.69	12.15	109.05	43.45	7.25	10.46
2017	118.16	54.92	8.21	11.58	113.4	47.65	7.31	10.6

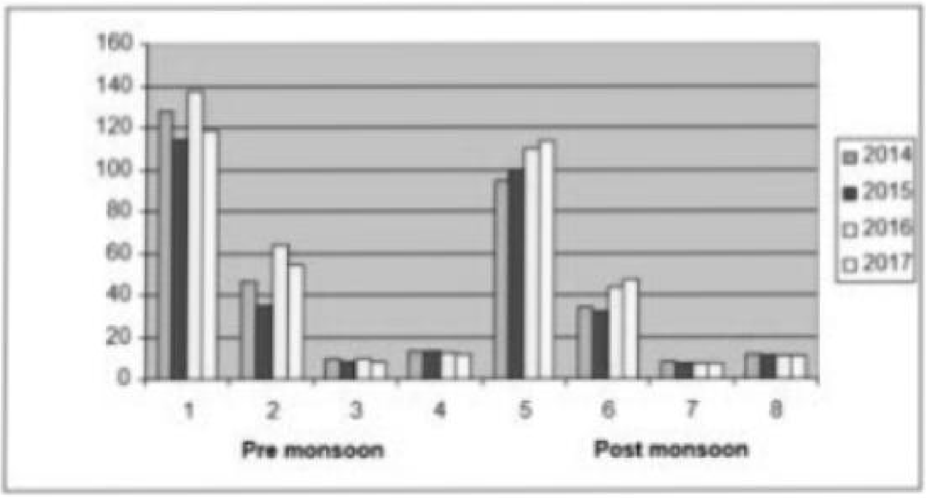

Figure.1. Diagrammatic representation of TSPM, PM_{10}, SO_2 and NO_X of Neyveli township sampling station during 2014-2017

TABLE 2 Summary of Ambient air quality data in pre and post monsoons during 2014-2017 (mean values) Mantharakuppam

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Pre monsoon(January-April)					Post monsoon (Sept.-December)			
Year	TSPM ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	TSPM ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)
2014	90.15	29.21	7.78	10.54	70.75	29.28	6.38	8.69
2015	77.34	30.96	7.45	11.4	64.14	28.29	6.29	8.2
2016	92.08	37.93	7.81	12.41	83.69	35.09	6.88	11.94
2017	102.29	47.9	7.48	11.35	90.24	41.43	7.16	10.63

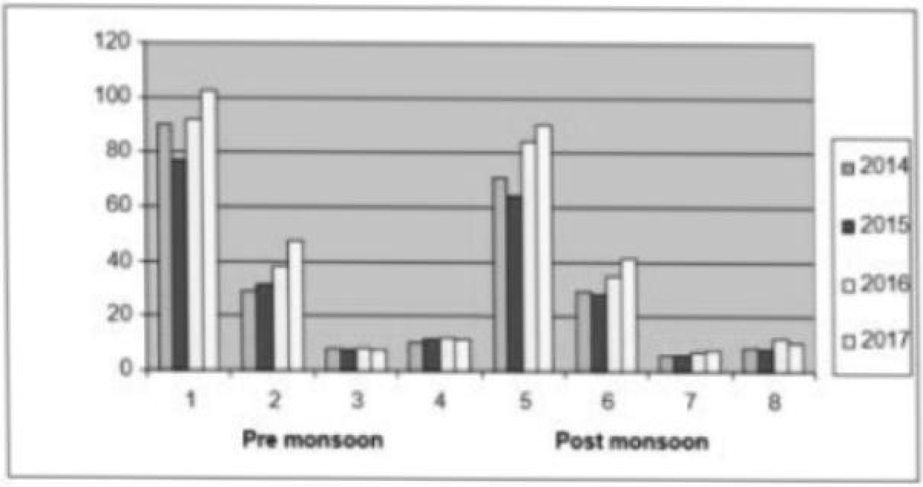

Figure.2. Diagrammatic representation of TSPM, PM_{10}, SO_2 and NO_X levels of Mantharakippam sampling station during 2014-2017

TABLE 3 Summary of Ambient air quality data in pre and post monsoons during 2014-2017 (mean values) Pudhu kudieruppu

Pre monsoon(January-April)					Post monsoon (Sept.-December)			
Year	TSPM ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	TSPM ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)
2014	91.71	35.03	5.85	8.26	66.29	28.18	5.64	7.36
2015	85.81	32.71	6.88	8.35	68.18	29.56	5.42	8.0
2016	103.84	38.22	6.76	9.21	73.98	34.48	6.4	9.05
2017	92.63	39.99	6.49	9.31	81.96	39.2	6.39	8.8

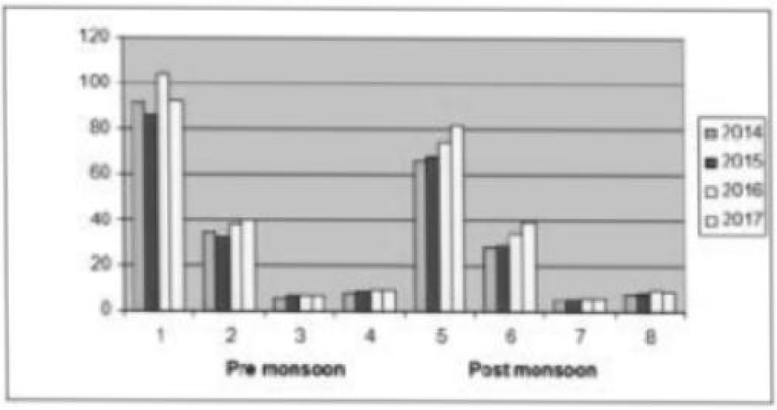

Figure.3. Diagrammatic representation of TSPM, PM_{10}, SO_2 and NO_X levels of Pudhu kudieruppu sampling station during 2014-2017

TABLE 4 Summary of Ambient air quality data in pre and post monsoons monsoon during 2014-2017 (mean values) Mines-I

	Pre monsoon(January-April)				Post monsoon(Sept.-December)			
Year	TSPM (µg/m³)	PM_{10} (µg/m³)	SO_2 (µg/m³)	NOx (µg/m³)	TSPM (µg/m³)	PM_{10} (µg/m³)	SO_2 (µg/m³)	NOx (µg/m³)
2014	66.14	35.39	5.24	6.48	66.84	27.94	5.05	6.23
2015	59.66	28.8	4.76	6.76	60.69	24.98	5.24	6.86
2016	72.19	34.53	5.58	7.45	67.59	31.96	5.24	7.69
2017	87.56	40.76	6.1	8.08	69.99	33.7	5.5	7.39

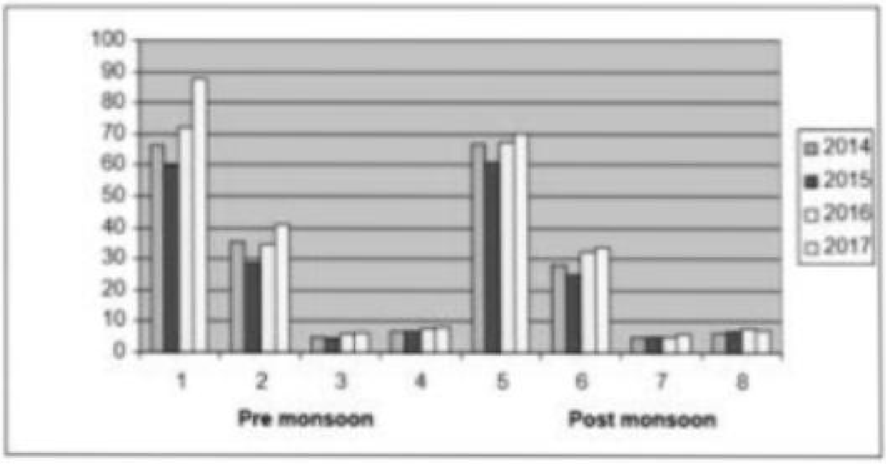

Figure.4. Diagrammatic representation of TSPM, PM_{10}, SO_2 and NO_X levels of Mines-I sampling station during 2014-2017

With the overall observation, it is clear that a different place of Neyveli describes the probability of increase of the TSPM concentration. Normally the TSPM are directly emitted into atmosphere through natural & anthropogenic activities (Adachi &Tainosha, 2004), Viana *et al.*, 2006) The increased SPM concentration in these places can be contributed to the increased vehicular pollution due to the increased population and also may be due to the increased industrial activities along with sand quarrying. (Dilipkumar Jha *et al.*, 2011).

Jayasree, (2000) in her study stated the air pollution is a major environmental problem faced by many Indian cities. One important factor that brings air pollution is automotive emissions. Attempts to identify the various types of pollutants emitted by automobiles in Thiruvananthapuram city area have disclosed that speed limit in the city and various operating modes of vehicles determine the amount of pollutants released by them.

Sarin *et al.*, (1999) studied that Delhi, one of the twenty mega cities of the world, is facing serious air pollution problems mainly from vehicular sources, which contribute 64% of the total emissions.

Gutpa *et al.*,(1997) made a study on the suspended particulars matter and oxides of nitrogen in residential and industrial areas of Paonta Sahibe during 1994 – 1996. In the residential area maximum SPM were recorded as 722.0 µg/m³ in 1996. Corresponding values in the industrial area were 928.27 µg/m³ of SPM and 19.30 µg/m³ of NO_x. Monthly average values of SPM and NO_x were well below the prescribed standards in Industrial areas of Paonta Sahib.

4. CONCLUSION

With the overall observation, it is clear that the particulate matter concentration and the gaseous pollutant concentration clearly shows that most of the study areas does not have higher levels of pollutants but comparatively Neyveli township region has shown higher concentration of pollutants. This can be attributed to the population density of this area along with the vehicular movement in this region and also the main market activities in Neyveli. The level of PM_{10}, TSPM, SO_2, NOx is well within the limits in all the other sampling stations located in Mantharakuppam, Puthu kudieruppu and Mines-I. The area of needs thorough eco-friendly measures to protect the environment.

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Python3

```
# importing pandas module for d
import pandas as pd
# loading dataset and storing i
train=pd.read_csv('AQI.csv')
# display top 5 data
train.head()
```

Output:

	PM2.5-AVG	PM10-AVG	NO2-AVG	NH3-AVG	SO2-AG	CO	OZONE-AVG	air_quality_index
0	190	131	107	4	42	0	63	190
1	188	131	110	4	40	0	62	188
2	280	174	155	2	37	0	52	280
3	302	181	144	2	39	0	78	302
4	285	160	121	3	19	0	71	285

1- WAP AREA OF RECTANGLE

CODE

```
# wap area of rectangle
l=int(input("length in cm"))
b=int(input("breadth in cm"))
a=l*b
print("your area rectangle is:",a,"cm^2")
```

OUTPUT

```
length in cm 50
breadth in cm 20
your area rectangle is: 1000 cm^2
>>>
```

Thanks!

Do you have any questions? addyouremail@freepik.com
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