



ENVIS NEWS LETTER

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TREND ANALYSIS OF AMBIENT AIR QUALITY OF PUDUCHERRY (2009-2014) & BHOGI FESTIVAL (2012-16)

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ENVIS CENTRE

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Introduction :

Being a developing country India faces great challenges in development and to maintain the serenity of the changing environment. Urbanization in India is more rapid in cities due to large infrastructure development and rapid Industrialization and over the years, these cities have become major centers for commerce, industry and education. Enormous increase in number of vehicles has resulted in increased emission of air pollutants and as a result, levels of air pollutants such as respirable suspended particulate matter showing different trends. There are study reports of pulmonary infection on rise due to air pollution in the resident communities near the traffic lane and in the cities.

The Trends of air pollutants are determined to find the effects of various actions taken so far to control air pollution and to make suitable policy decision to curtail pollution.

This changing environment and existing ambient air quality became a great threat to survival of life, properties, materials and ecosystem as a whole. In order to arrest the deterioration in air quality, Government of India has enacted Air (Prevention and Control of Pollution) Act in 1981. The responsibility has been further emphasized under Environment (Protection) Act, 1986. It is necessary to assess the present and anticipated air pollution through continuous air quality survey/monitoring programs. Therefore, Central Pollution Control Board (CPCB) had started National Ambient Air Quality Monitoring (NAAQM) Network during 1984 - 85 at national level. The programme was later renamed as National Air Monitoring Programme (NAMP). The air pollutants can be primary or secondary depending upon their formation mechanism. Primary pollutants are directly emitted from the source and secondary pollutants are formed in the atmosphere. Meteorological factors play a critical role in ambient concentrations of air pollutants due to chemical reaction.

National Ambient Air Quality Standards (NAAQS) :

The Central Pollution Control Board had adopted first Ambient Air Quality Standards on November 11, 1982 as per section 16 (2) (h) of the Air (Prevention and Control of Pollution) Act, 1981. The air quality standards have been revised by the Central Pollution Control Board on April 11, 1994. Which was later again revised by the Central Pollution Control Board and were notified in Nov 18, 2009. These standards are based on the land use and other factors of the area.

National Air Quality Monitoring Programme (NAMP):

CPCB implements the National Air Quality Monitoring Programme through a network comprising 544 operating ambient air quality stations covering 224 cities/towns in 26 States and 5 Union Territories of the country in compliance with the mandate under the Air (Prevention and Control of Pollution) Act, 1981 to collect compile and disseminate the information on ambient air quality.

Puducherry:

Puducherry, formerly known as Pondicherry is a Union Territory of India. It was formed out of four enclaves of former French India namely Puducherry, Karaikal, Yanam and Mahe. It is named after the largest district Puducherry. Puducherry lies in the southern part of the Indian Peninsula. The Union Territory of Puducherry consists of four small unconnected regions: Puducherry, Karaikal and Yanam on the Bay of Bengal and Mahe on the Arabian Sea. Puducherry and Karaikal have the largest areas and population, and are both enclaves of Tamil Nadu. Yanam and Mahé are enclaves of Andhra Pradesh and Kerala respectively. The territory has an area of 492 square kilometres: Puducherry 293 km², Karaikal 160 km², Mahé 9 km² and Yanam 30 km². Its population as per 2011 Census is 12,44,464.

Climate:

The climate of Pondicherry is classified as tropical wet and dry as similar to that of coastal Tamil Nadu. Summer lasts from April to early June, when maximum temperatures frequently hit the 41 °C (106 °F) mark. The average maximum temperature is 36 °C (97 °F). Minimum temperatures are in the order of 28–32 °C (82–90 °F). This is followed by a period of high humidity and occasional thunder showers from June till September. The northeast monsoon sets in during the middle of October, and Pondicherry gets the bulk of its annual rainfall during the period from October to December. The annual average rainfall is 1,240 mm (49 in). Winters are warm, with as high as 30 °C (86 °F) and low often dipping to around 18–20 °C (64–68 °F).

Objectives:

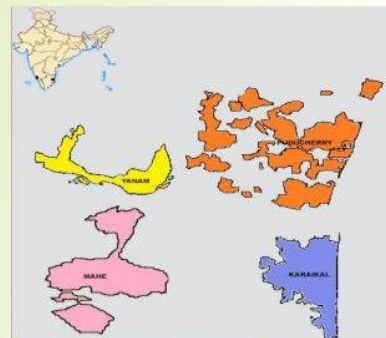
The objectives include;

- i. To determine status and trends of ambient air quality.
- ii. To ascertain whether the prescribed ambient air standards are violated.
- iii. To identify non-attainment cities.
- iv. To obtain the knowledge and understanding necessary for developing preventive and corrective measures.
- v. To understand the natural cleansing process undergoing in the environment through pollution dilution, dispersion, wind based movement, dry deposition, precipitation and chemical transformation of pollutants generated.

Operation of the Station: Each station is monitored 24 hours a day (4 Hourly sampling for gaseous pollutants and 8 Hourly sampling for Particulate Matter) with a frequency of twice a week in a cyclic manner.

Parameters Assessed:

Under NAMP four air pollutants viz., Respirable Suspended Particulate Matter (RSPM / PM₁₀ – Particulate Matter (less than or equal to 10 µm), Suspended Particulate Matter (SPM), Sulphur-di-Oxide (SO₂) and Nitrogen-di-Oxide (NO₂) are monitored at all the three locations in Puducherry and Karaikal Regions.



Ambient Air Quality Stations in U.T. of Puducherry:

At present, ambient air quality monitoring stations are being operated at the three locations as follows:

Sl. No.	Name of the Station with Location	Type of Station
I	Local Administration Department(LAD), Le' Suffren Street, Puducherry.	Residential Area
II	Department of Science, Technology and Environment (DSTE), Anna Nagar, Nellithope, Puducherry.	Residential-cum- Commercial Area
III	PIPDIC Industrial Area, Mettupalayam, Puducherry.	Industrial Area

Methods of Measurement :

Sl.No	Air Pollutant	Methods of measurement
1.	Particulate Matter -PM ₁₀ . (size less than 10 microns)	Gravimetric
2.	Oxides of Nitrogen	Improved West and Gaeke method
3.	Sulphur di Oxide	Modified Jacob and Hochheiser

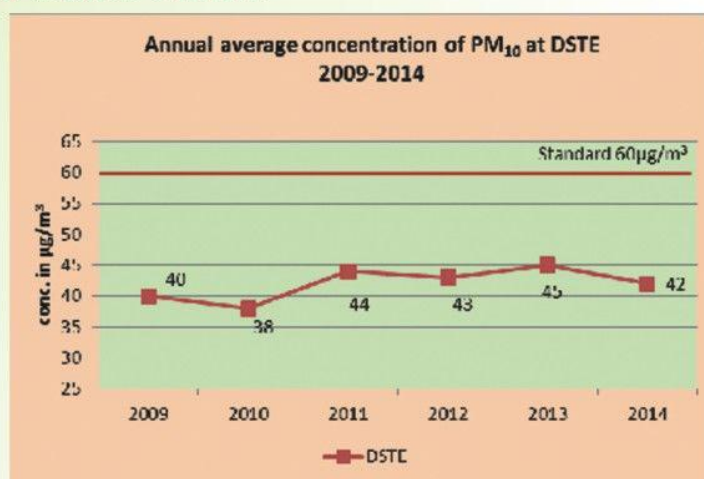
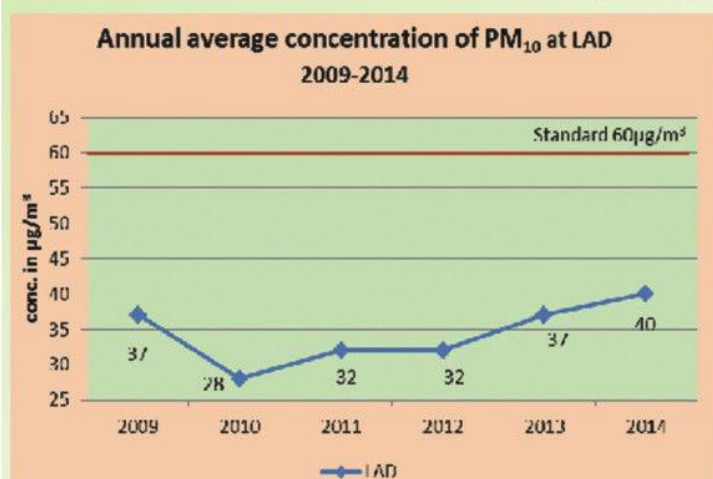
Ambient Air Quality Trend Analysis of Puducherry Region under National Ambient Air Quality Monitoring Programme (NAMP)from the year 2009 - 2014

The yearly annual average data generated at three air quality monitoring station in Puducherry Region under National Air Quality Monitoring Programme has been compiled and the values are tabulated for the year 2009 -2014 is as below:

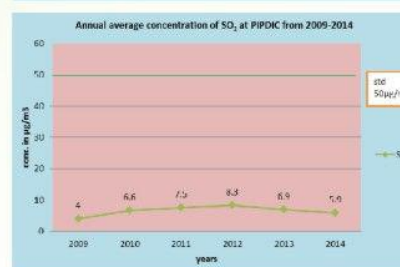
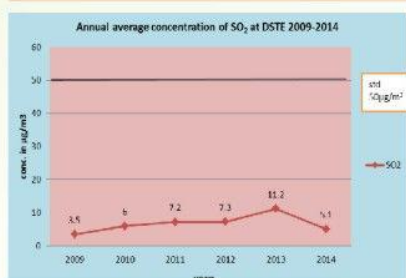
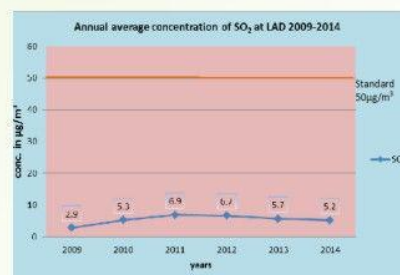
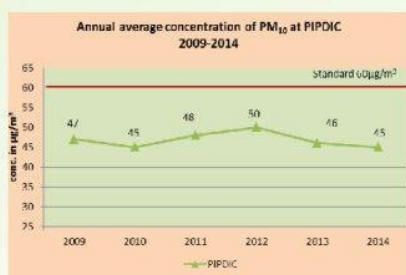
Year	LAD			DSTE			PIPDIC		
	PM10	SO2	NO2	PM10	SO2	NO2	PM10	SO2	NO2
2009	37	2.9	8.0	40	3.5	11.4	47	4.0	12.4
2010	28	5.3	10.6	38	6.0	14.5	45	6.6	15.0
2011	32	6.9	13.9	44	7.2	15.9	48	7.5	16.9
2012	32	6.7	12.4	43	7.6	14.3	50	8.3	14.9
2013	37	5.7	11.9	45	11.2	14	46	6.9	15.4
2014	40	5.2	12.1	42	5.1	12.2	45	5.9	13.7
Standard	60	50	40	60	50	40	60	50	40

Trend in Annual Average Concentration of air pollutants of Puducherry during the year 2009 – 2014

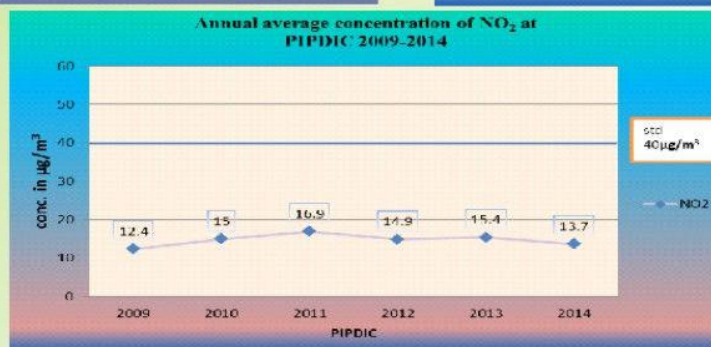
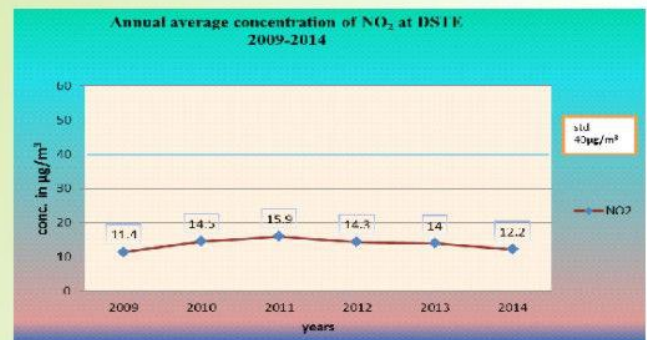
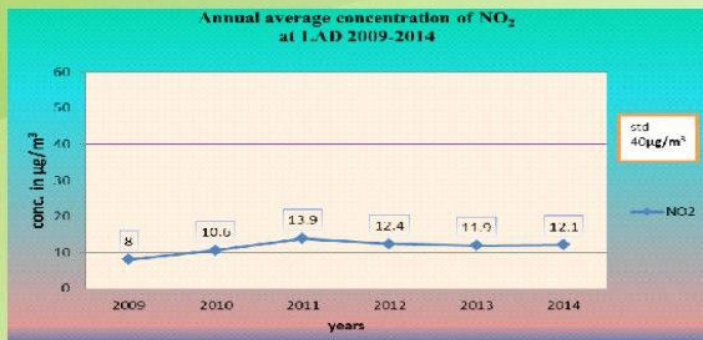
Annual average concentration of Particulate matter (size less than 10 μm) at three stations:



Annual average concentration of Sulphur Dioxide (SO₂) at three stations:



Annual average concentration of Nitrogen Dioxide (NO₂) at three stations:



Observation and Result:

- The monitoring result reveals that the annual average concentrations of all assessed the pollutants in all the three National Air Quality Monitoring locations are within the prescribed standard limits.
- Annual average concentration for the period from 2009-2014 for the parameter PM₁₀ in LAD is in the range of 28 - 40µg/m³, DSTE is in the range of 38 - 45µg/m³ and PIPDIC is in the range of 45 - 50µg/m³.and for SO₂ in LAD is in the range of 2.9 - 6.9µg/m³, and DSTE is in the range of 3.5 – 11.2µg/m³and PIPDIC is in the range of 4 - 8.3µg/m³ and for NO₂ in LAD is in the range of 8 – 13.9µg/m³ and DSTE is in the range of 11.4 – 15.9µg/m³ and PIPDIC is in the range of 12.4 – 16.9µg/m³.
- One of the reasons for low levels of pollution in coastal cities like Puducherry is that it has excellent dilution effects due to sea and land breezes which reduces pollution levels.
- The PPCC is not favouring in establishing highly polluting industry in Puducherry, there by taking precautionary steps for reducing the pollution potential from these industries.
- The existing industries are advised to provide suitable air pollution control devises in the unit to contain the emission from the process and also been advocated to install online emission monitoring systems.
- Promotion of use of LPG as domestic fuel instead of burning coal, wood & cow dung etc.
- PPCC has been insisting the industries to switch over to other less pollution potential fuel usage i.e agro based briquette and also directing the industries to opt for non-conventional energy by tapping solar power. The trend in slight increasing of PM₁₀ is due to road dust from the vehicular movement due to increase in the usage of the vehicles both by the residential community as well as mobile community as Puducherry is being a tourist destination.

Table : Revised National Ambient Air Quality Standards (NAAQS)
[NAAQS Notification dated 18th November, 2009]

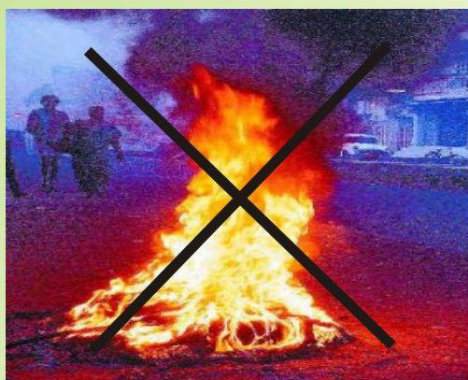
Sl. No.	Pollutants	Time Weighted Average	Concentration in Ambient Air		Methods of Measurement
			Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (notified by Central Government)	
1	Sulphur Dioxide (SO ₂), µg/m ³	Annual* 24 Hours**	50 80	50 80	1. Improved West and Gaeke 2. Ultraviolet Fluorescence
2	Nitrogen Dioxide (NO ₂), µg/m ³	Annual* 24 Hours**	40 80	40 80	1. Modified Jacob & Hochheiser 2. Chemiluminescence
3	Particulate Matter (Size <10µm) or PM ₁₀ µg/m ³	Annual* 24 Hours**	60 100	60 100	1. Gravimetric 2. TEOM / 3. Beta attenuation
4	Particulate Matter (Size <2.5 µm) or PM _{2.5} µg/m ³	Annual* 24 Hours**	40 60	40 60	1. Gravimetric 2. TEOM 3. Beta attenuation
5	Ozone (O ₃), µg/m ³	8 hours** 1 hours**	100 180	100 180	1. UV photometric 2. Chemiluminescence / 3. Chemical Method
6	Lead (Pb), µg/m ³	Annual* 24 Hour**	0.50 1.0	0.50 1.0	1. AAS/ICP Method after sampling using EPM 2000 or equivalent filter paper
7	Carbon Monoxide (CO), mg/m ³	8 Hours** 1 Hour**	02 04	02 04	2. ED-XRF using Teflon filter Non dispersive Infra Red (NDIR) Spectroscopy
8	Ammonia (NH ₃), µg/m ³	Annual* 24 Hour**	100 400	100 400	1. Chemiluminescence 2. Indophenol blue method
9	Benzene (C ₆ H ₆), µg/m ³	Annual*	05	05	1. Gas chromatography based continuous analyzer 2. Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene (BaP)-particulate phase only, ng/m ³	Annual*	01	01	Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m ³	Annual*	06	06	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m ³	Annual*	20	20	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform interval.** 24 hourly 08 hourly or 01 hourly monitored values, as applicable shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

NOTE : Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

Ambient Air Quality Status on the day of Bhogi (2012 – 2016)

Celebrate smokeless Bhogi.



Keep the Environment Clean.

Bhogi is the first day of the four day Pongal festival. It is a festival celebrated widely in Puducherry, Tamil Nadu, Andhra Pradesh and Telangana. On Bhogi, people discard old and derelict things and concentrate on new things causing change or transformation. At dawn, people light a bonfire with logs of wood, other solid-fuels and wooden furniture at home that are no longer useful. The significance of the bonfire, in which is burnt the agricultural wastes and firewood is to keep warm during the last lap of winter. Earlier the event was limited to farm waste but nowadays people burn plastic, rubber, tyres and non-degradable material causing environmental pollution. In spite of the awareness programmes conducted, this practice still doesn't cease to exist. There are also court orders against burning of plastics and tyres and the Environment Protection Act, 1986, Section 15, specifies penal action for persons who cause air pollution. In spite of all these efforts, there are people who still burn plastic and tyres. The Bhogi bonfires increase particulate matter in air and cause several diseases. There is also a low visibility level on Bhogi day due to the smog. Burning tyres emit dangerous gases like oxides of nitrogen and sulphur dioxide. Hydrogen cyanide gas and vinyl chloride are emitted due to the burning of plastic and PVC. Inhaling of these gases can cause cancer, respiratory problems, asthma, water eyes, itching and trigger other diseases.

Puducherry Pollution Control Committee has been conducting awareness activity through media and requesting the public to celebrate Bhogi in a smokeless and eco-friendly way. Awareness materials has also been distributed to the students through the Education Department and to the public about the ill effects of burning wastes, plastic and tyres and also about the impact it has on the environment.

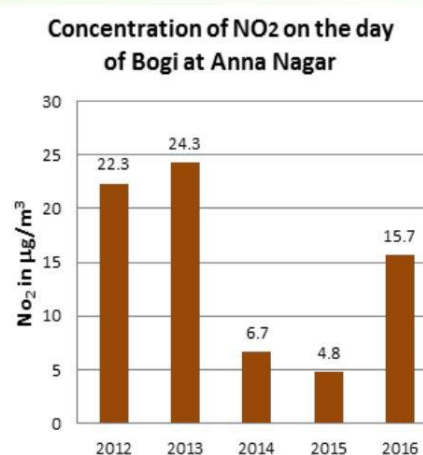
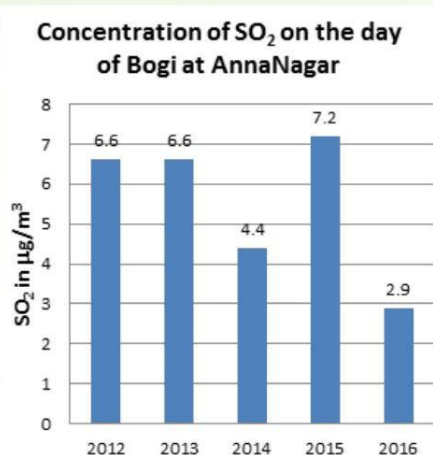
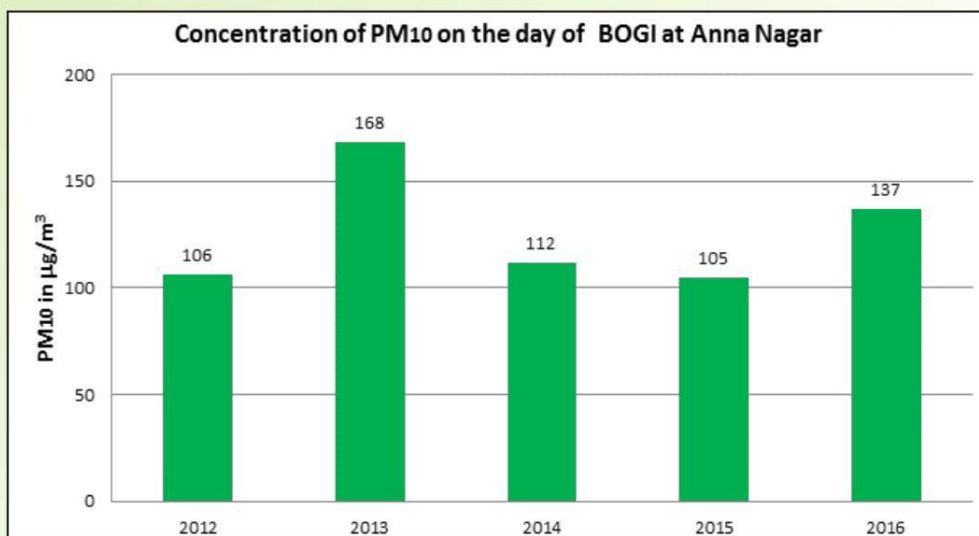
Besides this, PPCC has monitored the ambient air quality at Puducherry and Karaikal on the day of Bhogi. During monitoring, sporadic activity of burning of unwanted old article was noticed at some locations and the concerned people were advised not to carry out such activities and they responded affirmatively and put off the flame/smoke with water.

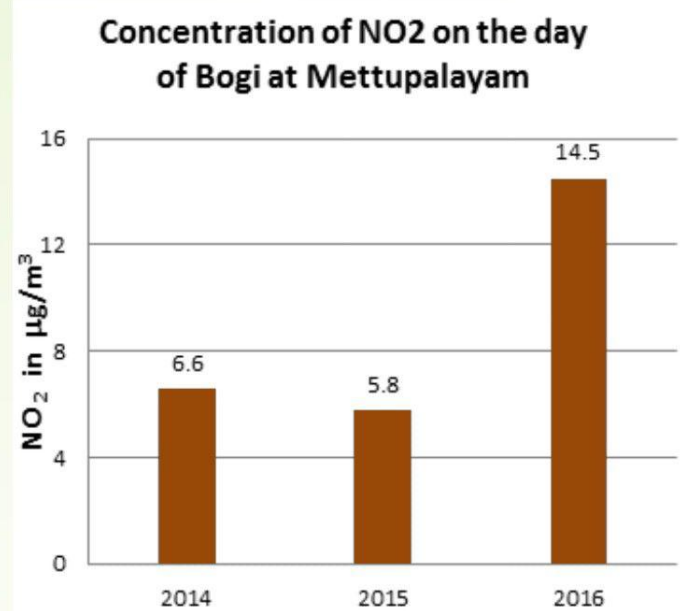
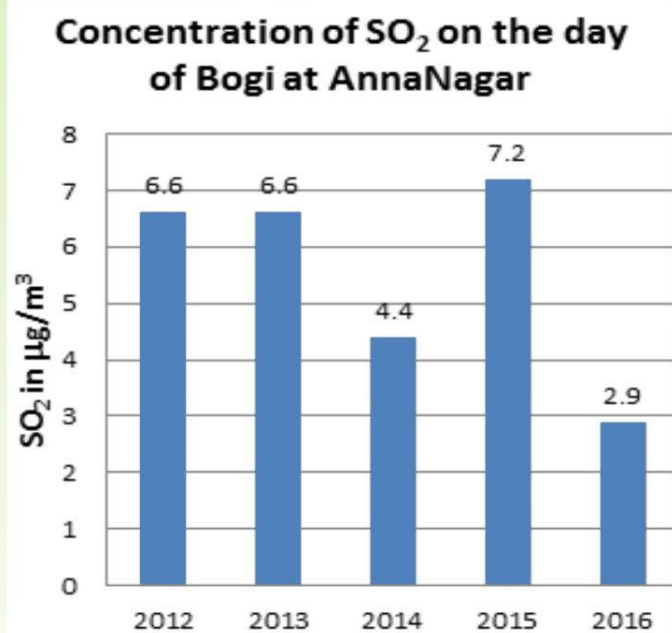
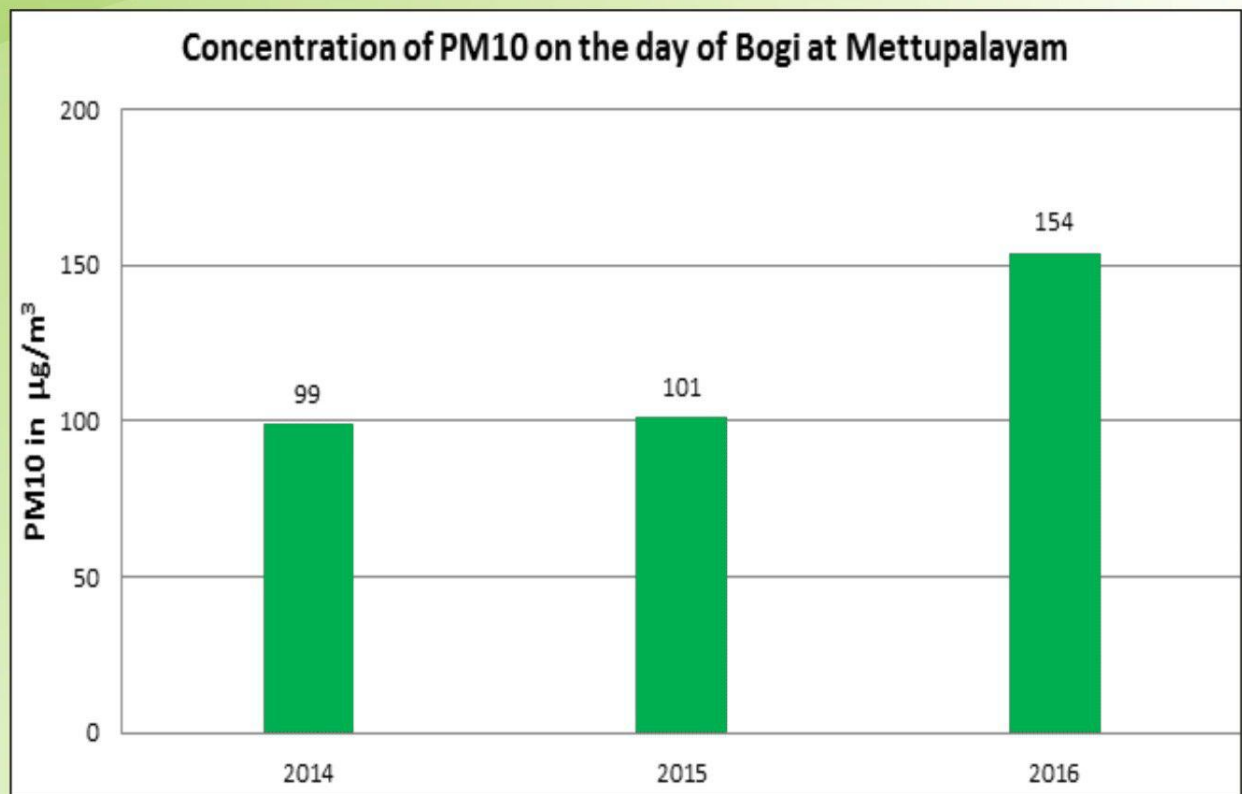
The monitoring report also revealed that there was an increase in concentration of PM₁₀ on the day of bhogi and this might have been due to the high humidity and low wind speed which does not favour easy diffusion of pollutants. However, the gaseous pollutants like sulphur di oxide and Nitrogen di oxide are well within the prescribed standard limit.

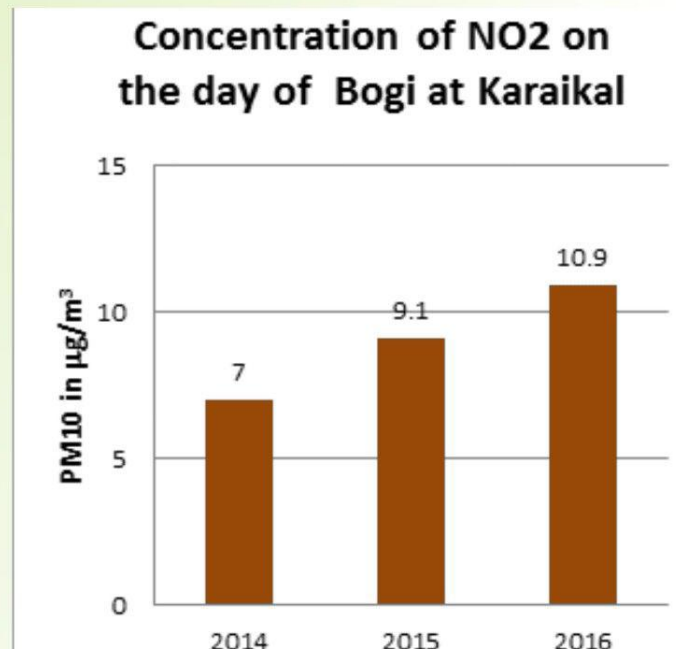
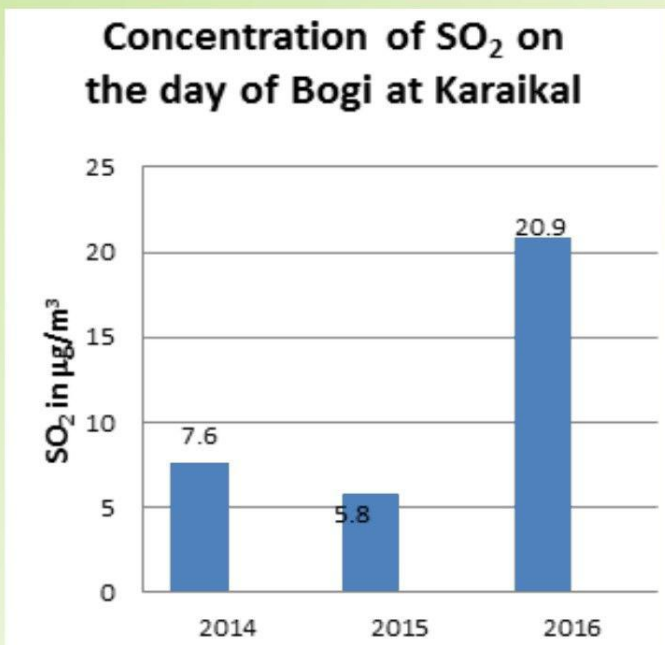
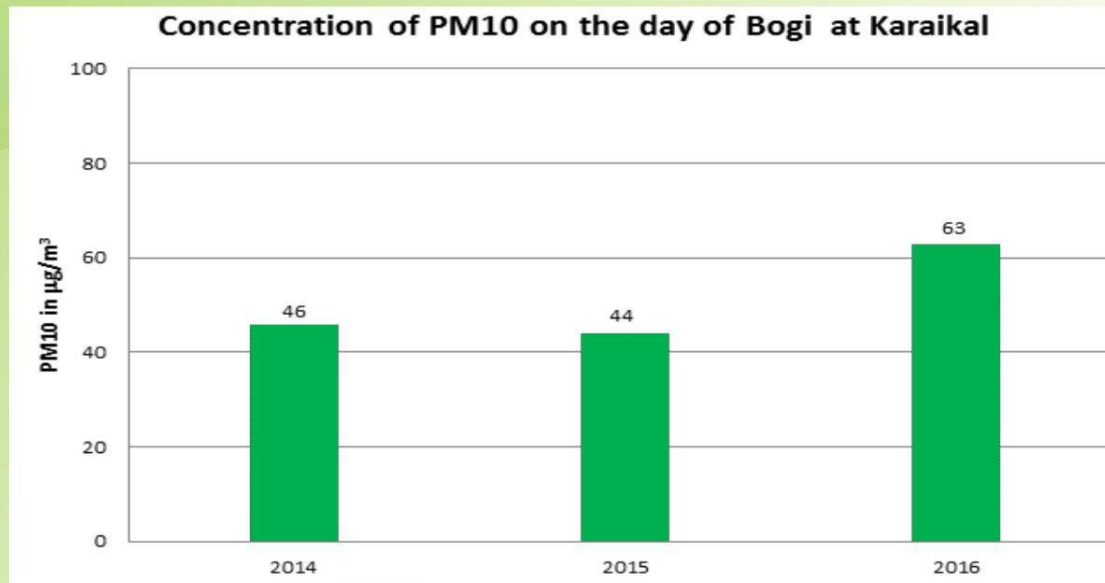
The ambient air quality status on the day of Bhogi in Puducherry has been compiled and the values are tabulated for the year 2012 -2016 is as below:

Year	Location	Boghi		
		Pollutants Concentration in ($\mu\text{g}/\text{m}^3$)		
		PM10	SO2	NO2
2012	Anna Nagar	106	6.6	22.3
2013	Anna Nagar	168	6.6	24.3
2014	Anna Nagar	112	4.4	6.7
	Mettupalayam	99	5.9	6.6
	karaikal	46	7.6	7
2015	Anna Nagar	105	7.2	4.8
	Mettupalayam	101	24.2	5.8
	karaikal	44	15.1	9.1
2016	Anna Nagar	137	2.9	15.7
	Mettupalayam	154	63.3	14.5
	karaikal	63	20.9	10.9

Graphical representation showing the trends of pollutant on the day of Boghi (2012 – 2016) at the three monitored location.







Action taken:

- ❖ Puducherry Pollution Control Committee had issued a circular requesting the Director, Directorate of School Education to instruct to all Heads of the educational institutions to conduct awareness programmes for the students about the ill-effects of burning wastes on boghi.
- ❖ The Director, Information and Publicity Department had been requested to make necessary arrangements to publish the press note and awareness material about the ill effects of burning wastes on boghi.
- ❖ The ill effect of burning wastes on the day of boghi was also explained to the public through AIR and FM's.

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