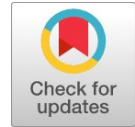


# A Learn on Air Quality Monitoring in Tirunelveli



S.Rajesh, S.Vanitha, R.Premkumar

**Abstract:** Progressing air quality observing study in the Tirunelveli has given almost persistent information to the centralizations of gas-stage Pollutants from its inception in June 2013 to September 2014. In addition to PM10 focuses, Concentrations of organic carbons and total suspended particulate were likewise estimated. The rate of emission and concentration of the ambient air is controlled by the accompanying techniques. Altered West & Gaeke's strategy for assurance of SO<sub>2</sub> at the surrounding atmosphere Adjusted Jacob & Hochheiser's strategy for assurance of NO<sub>x</sub> in encompassing atmosphere, and Gravimetric Method for the estimation of PM10. The surrounding checking and source portrayal information, results show that ATG tires and Cement plant outflows represented the majority of fine molecule mass focuses watched. At the Peak 24-h average concentrations of cement plant in (2013-14.83µg/m<sup>3</sup> of NO<sub>2</sub>, 10.33µg/m<sup>3</sup> of SO<sub>2</sub> and 60.17µg/m<sup>3</sup> of TSP, in 2014-14.17µg/m<sup>3</sup> of NO<sub>2</sub>, 12.67µg/m<sup>3</sup> of SO<sub>2</sub> and 58.33µg/m<sup>3</sup> of TSP), Paper Mills in (2013-10.5µg/m<sup>3</sup> of NO<sub>2</sub>, 8.67µg/m<sup>3</sup> of SO<sub>2</sub> and 56.5µg/m<sup>3</sup> of TSP, in 2014-9.97µg/m<sup>3</sup> of NO<sub>2</sub>, 9.27µg/m<sup>3</sup> of SO<sub>2</sub> and 33.83µg/m<sup>3</sup> of TSP), and ATG Tires in (2013-19.94µg/m<sup>3</sup> of NO<sub>2</sub>, 6.34µg/m<sup>3</sup> of SO<sub>2</sub> and 58µg/m<sup>3</sup> of TSP, in 2014-13µg/m<sup>3</sup> of NO<sub>2</sub>, 5.6µg/m<sup>3</sup> of SO<sub>2</sub> and 52.6µg/m<sup>3</sup> of TSP). The results of gaseous and suspended solid pollutants concentration compare with the permissible concentration of CPCB Standards. That contamination scene was thought to have added to a considerable increment in mortality.

**Keywords:** Oxides of nitrogen, PM<sub>10</sub>, Sulfur dioxide, TSP.

## I. INTRODUCTION

The air we breathe in is a mix of gases, minimal solid & liquid particle. A couple of substances start as of trademark sources whereas others be realized by man activities, for instance, our usage of motor vehicles, neighborhood activities, production, and commerce. Air pollution happens while the air contains substances in sums to could hurt the comfort or prosperity of individuals and animals or could mischief plants and materials. These mixes of atmosphere are called air toxins. Keeping the air quality adequate has turned into a significant assignment for chiefs just as for non-administrative associations. Particulate issue and vaporous outflows of contamination emanation from ventures and auto depletes are in charge of rising distress,

expanding aviation route sicknesses and decay of masterful and social patrimony. (Sundaram haridoss et al., 2017)

### A. Air Pollution in India

In India, contamination has turned into an incredible theme of discussion at all dimensions and particularly the air contamination in view of the upgraded anthropogenic exercises, for example, copying petroleum products, gaseous petrol, coal & oil toward control modern procedures and engine vehicles. From the hurtful synthetic intensifies, this consuming keen on the air, are CO<sub>2</sub>, CO, NO<sub>x</sub>, & SO<sub>2</sub>.

**i.Sulfur oxides:** Eminent groupings of SO<sub>2</sub> be shown with a smell of 'consuming matches' they related to men wellbeing impacts, particularly wising. Ecological impacts incorporate corrosive testimony and the arrangement of PM<sub>2.5</sub>. Plants, particularly lichens, are able to touchy near SO<sub>2</sub> on moderately short focuses. The gas bothers aviation routes and eyes are famous to cause longer-term feeling ailments, additional cardiovascular infirmities, & bronchitis. It likewise promptly causes smallness of inhalation and hacking among asthma sufferers. SO<sub>2</sub> is likewise noteworthy supporter of the corrosive downpour, which harms the earth and annoys environments.

**ii.Nitrogen Oxides:** It causes extreme respiratory issues, particularly kids. At the point when joined to water, it frames nitric corrosive and further lethal nitrates. Nitrogen dioxide is likewise a primary part during the arrangement of O<sub>3</sub> on the outside dimension. The gases disturb the lungs and have been identified to bring down the resistant framework. It might source fermentation and eutrophication unsafe to wellbeing, resources, social antiques, flora, and yields. Raised groupings of NO<sub>2</sub> can likewise influence permeability through the making of a ruddy dark colored cloudiness. Notwithstanding, the impacts of NO taking place plant life is going underneath expanding examination in Europe, as NO<sub>2</sub> is likewise a worry because of the job it acting like a forerunner toxin on behalf of PM<sub>2.5</sub> arrangement and its relationship with the corrosive affidavit.

**iii.Total suspended particulate:** TSP is related to tasteful and natural effects, for example, the dirtying of resources or covering of plants. It can represent the best risk headed for human wellbeing in light of the fact that, for a similar mass, they assimilate more poisonous and cancer-causing mixes than bigger particles and enter all the more effectively profound into the lungs.

**iv.PM<sub>10</sub>:** The increments during the particulate issue have been appeared near origin little, asymptomatic youngsters, in the two grown-ups and kids, especially wising. The progressions are regularly going with, particularly in grown-ups, by increments in manifestations, for example, incessant bronchitis or hack.

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## A Learn on Air Quality Monitoring in Tirunelveli

(Anil Kumar Singhdeo and Nilamadhab Suna Gupta et al., 2010)

In South India, air contamination is far reaching inside town zones somewhere vehicles are significant donors and here a couple of different zones among a elevated convergence of ventures & warm control plants. Vehicular outflows are specific worry because the ground-level sources and in this way cover the most extreme effect overall public.(Anon et al.,2005)

### B. Air Pollution Control in India

The Act of pollution control in 1981 when corrected during 1987 expects to anticipate manage air contamination and safeguard quality of air. According to the TNPCB screens modern discharges during standard reviews of contamination air manage actions given through the enterprises. An AAQ review/heap discharge study is directed to survey the nature of the emanations let out.

### C. Air Quality Monitoring

Quality air is observed through survey the convergence of atmospheric toxins emerging absent of discharges as of businesses just expanding vehicular inhabitants.

The current study has to assess the Air quality in Thamirabarani river basin around Tirunelveli, by using (i) Modified Gaeke & West technique for sulphur dioxide (ii) Modified Hochheiser and Jacob technique for nitrogen oxides (iii) Cyclonic flow technique for the measurement PM<sub>10</sub>.

## II. STUDY AREA

### A. Air quality monitoring sites

The Study researches the convergence of the contaminations sulfur, nitro oxides, settle particle issue, and complete suspended settle particle produced as of different resources similar to autos, enterprises encompassing air nature of Tirunelveli. All things considered, Tirunelveli is a major city and it is beyond the area of imagination to expect to quantify the convergence of these real contaminations in all regions, so we have confined our investigation to three industries. There is India Cements (P) Ltd, Sun Paper mill, and ATG Tires. From these industries, every industry fixed six examining stations. The six stations were chosen considering the outflows contaminations from ground level and temperature. The examining station areas have appeared here table 1, 2&3. The samples were gathered consistently for a long time. (2013&2014).

**Table-1: Air quality Sampling Station-1: India Cements Ltd**

Sampling Locations	Latitude	Longitude
A- Top of scaffolding near workshop	8 <sup>0</sup> 47'20.69"N	77 <sup>0</sup> 43'47.25"E
B-On top of recreation club	8 <sup>0</sup> 47'15.43"N	77 <sup>0</sup> 43'24.67"E
C- Top of Sankar Hr sec school	8 <sup>0</sup> 47'38.97"N	77 <sup>0</sup> 43'22.19"E
D-Top of scaffolding of north security quarters	8 <sup>0</sup> 47'28.93"N	77 <sup>0</sup> 44'01.26"E

E- Boundary gate	8 <sup>0</sup> 47'09.13"N	77 <sup>0</sup> 43'45.51"E
F-Top of near east boundary	8 <sup>0</sup> 47'11.96"N	77 <sup>0</sup> 43'56.44"E

Table-2: Air quality Sampling Station-2: Sun Paper Mills Ltd

Sampling Locations	Latitude	Longitude
A-Top of scaffolding near rice mill	8 <sup>0</sup> 42'36.65"N	77 <sup>0</sup> 33'51.15"E
B-On top of co-gen plant security	8 <sup>0</sup> 42'25.03"N	77 <sup>0</sup> 33'21.53"E
C-Top of scaffolding near hollow block	8 <sup>0</sup> 42'27.25"N	77 <sup>0</sup> 33'17.94"E
D-Top of scaffolding south side of co gen plant,	8 <sup>0</sup> 42'18.24"N	77 <sup>0</sup> 33'15.85"E
E-On building top of super market	8 <sup>0</sup> 42'24.70"N	77 <sup>0</sup> 34'03.48"E
F-Top of scaffolding near temple	8 <sup>0</sup> 41'53.57"N	77 <sup>0</sup> 33'51.64"E

Table-3: Air quality Sampling Station-3: ATG Tyres Ltd

Sampling Locations	Latitude	Longitude
A-Top of scaffolding near RO Plant	8 <sup>0</sup> 50'37.69"N	77 <sup>0</sup> 44'21.76"E
B-On top of scaffolding near SE corner of boundary	8 <sup>0</sup> 50'32.56"N	77 <sup>0</sup> 44'20.99"E
C-Top of Scaffolding of EB sub station	8 <sup>0</sup> 50'29.39"N	77 <sup>0</sup> 44'16.34"E
D-Top of scaffolding SW corner of boundary,	8 <sup>0</sup> 50'15.78"N	77 <sup>0</sup> 44'01.26"E
E-On top of scaffolding near rubber yard	8 <sup>0</sup> 50'18.43"N	77 <sup>0</sup> 44'19.42"E

- Station I, the India cements (P) Ltd., everything appeared to be fine about the setting up of the gadget and association for power aside from we must know about the specialists who thought that it was interested enough to contact and deal with it.
- Station II: In a local location, for example, the dispensary we found indistinguishable troubles from. Alongside that, there was likewise another issue that should have been dealt with. The secondary school that is before the plant was of a noteworthy concern while setting the gadget.
- Station III: In this majority packed measurement of the three points (picked) through the working day. Along these lines, now genuine safeguards were liked.

## III. EXPERIMENTAL ANALYSIS

The techniques agreed intended for the gases Sulfur, Nitro oxidizes and PM<sub>10</sub> are correspondingly.(i).Modified Geake-West Technique, (ii).Modified Jacob Hochheiser Technique, (iii).Gravimetric Technique

### A. Modified Geake-West Technique

The intention of this method is monitoring and examination of sulfur-dioxide in ambient air. The NAAQ standards on behalf of sulfur-dioxide, nitrogen-dioxide and PM<sub>10</sub> are accessible in the chart table 4.

**Table- 4:NAAQ standards**

Contaminant	Time biased average	Business, Suburban, Rustic and other Areas	Economically Sensitive Area (CPCB)
Sulfur Dioxide (SO <sub>2</sub> ), µg/m <sup>3</sup>	Annual *	50	20
	24 Hrs **	80	80
Nitrogen Dioxide (NO <sub>2</sub> ), µg/m <sup>3</sup>	Annual *	40	30
	24 Hrs **	80	80
Particulate Matter, PM <sub>10</sub> , µg/m <sup>3</sup>	Annual *	60	60
	24 Hrs **	100	100

\*Annual Arithmetic methods for least 104 estimations in a year at a specific site taken two times every week 24 hourly at uniform interims.

\*\*24 hourly or 8 hourly or 1 hourly checked qualities, as appropriate, will be conformed to 98% of the time in a year. 2% of the time, they may surpass the points of confinement yet not on two sequential long stretches of observing.

#### i. Working procedure

##### • Modified West-Gaeke technique

Sulfur-dioxide from air is caught up in an answer of potassium tetrachloro-mercurate. A dichlorosulphitomercurate complex, which opposes oxidation by the oxygen noticeable all around, is framed. When framed, this complex is steady to solid oxidants, for example, ozone and oxides of nitrogen and subsequently, the safeguard arrangement might be put away for quite a while proceeding examination. The complex is made to respond with para-rosaniline and formaldehyde to frame the strongly hued pararosaniline methyl sulphonic corrosive. The absorbance of the arrangement is estimated by methods for a reasonable spectrophotometer.

#### ii. Sampling & Analysis:

Spot 30 ml of retaining arrangement in an impinge and test for four hours at the stream rate of 1 L/min. In the wake of inspecting measure the volume of the test and move to an example stockpiling container Replace any water lost by dissipation during examining by adding refined water up to the alignment mark on the safeguard. Blend all together, pipette out 10 ml of the gathered example into a 25 ml volumetric flagon. Include 1 ml 0.6% sulfamic corrosive and permit responding for 10 minutes to wreck the nitrite coming about because of oxides of nitrogen. Include 2 ml of 0.2% formaldehyde arrangement and 2 ml pararosaniline arrangement and makeup to 25 ml with refined water. Set up a clear in a similar way utilizing 10 ml of unexposed retaining reagent. After a 30 min shading improvement interim and before an hour, measure and record the absorbance of tests and reagent clear at 560 nm. Use refined water; not the reagent clear, as the optical reference.

The real centralization of the sulfite arrangement is controlled by including abundance iodine and back titrating with standard sodium thiosulfate arrangement. To back-titrate, measure, by pipette, 50 ml of the 0.01 N iodine arrangement into everyone of two 500 ml iodine jars An and B. To flagon A (clear) include 25 ml refined water and into carafe B (test) measure 25 ml sulfite arrangement by pipette. Plug the flagons and permit to respond for 5 minutes. Set up the working sulfite-TCM arrangement in the meantime iodine arrangement is added to the carafes. By methods for a burette containing institutionalized 0.01 N thiosulfate, titrate every flagon thusly to a light yellow. At that point include a 5 ml starch arrangement and proceed with the titration until the blue shading disappears..

Plot a bend absorbance (Y pivot) versus focus (X hub). Draw a line of best fit and decide the slant. The corresponding of incline gives the adjustment factor (CF).

Concentration of sulfite arrangement:

$$C = ((V_1 - V_2) \times N \times K) / V$$

Where, C = SO<sub>2</sub> concentration in mg/ml

V<sub>1</sub> = Capacity of thiosulfate for blank, ml

V<sub>2</sub> = Capacity of thiosulfate for sample, ml

N = Normality of thiosulfate

K = 32000 (Milliequivalent wt of SO<sub>2</sub>/µg)

V = Capacity of standard sulphite solution, ml

$$C (\text{SO}_2 \mu\text{g}/\text{m}^3) = (A_s - A_b) \times CF \times V_s / V_a \times V_t$$

Where, C = Concentration of SO<sub>2</sub>, µg/m<sup>3</sup>

A<sub>s</sub> = Absorbance of sample

A<sub>b</sub> = Absorbance of reagent blank

CF = Alignment factor

V<sub>a</sub> = Capacity of air sampled, m<sup>3</sup>

V<sub>s</sub> = Capacity of sample, ml

V<sub>t</sub> = Capacity of aliquot taken for analysis, ml

### B. Modified Jacob Hochheiser technique

The intention of this method is monitoring and examination of nitrogen-dioxide in ambient air.

#### i. Working Procedure

Modified Jacob-Hochheiser technique Surrounding nitrogen-dioxide (NO<sub>2</sub>) is gathered by percolating air through an answer of sodium hydroxide and sodium arsenite. The centralization of nitrite particle (NO<sub>2</sub>) delivered during examining is resolved calorimetrically by responding the nitrite particle with phosphoric corrosive, sulfanilamide, and N-(1-naphthyl)- ethylenediamine di-hydrochloride (NEDA) and estimating the absorbance of the profoundly hued azo-color at 540 nm.

#### ii. Sampling & Analysis:

Spot 30 ml of engrossing arrangement in an impinger and test for four hours at the stream rate of 0.2 to 1 L/min. In the wake of examining measure the volume of the test and move to an example stockpiling bottle. Supplant any water lost by dissipation during inspecting by adding refined water up to the alignment mark on the safeguard, blend completely. Pipette out 10 ml of the gathered example into a 50 ml volumetric jar. Pipette in 1 ml of hydrogen peroxide arrangement, 10 ml of sulphanilamide arrangement, and 1.4 ml of NEDA arrangement, with careful blending after the expansion of every reagent and makeup to 50 ml with refined water.

Set up a clear in a similar way utilizing 10 ml of unexposed retaining reagent. After a 10 min shading advancement interim, measure and record the absorbance of tests and reagent clear at 540 nm.

Use refined water; not the reagent clear, as the optical reference Samples with an absorbance more prominent than 1.0 must be re-dissected in the wake of weakening an aliquot of the gathered examples with an equivalent amount of unexposed retaining reagent. An arbitrarily chosen 5-10% of the examples ought to be re-broke down as separated from an inward quality affirmation program.

Plot a bend absorbance (Y pivot) versus focus (X hub). Draw a line of best fit and decide the incline. The proportional of incline gives the alignment factor (CF).

$$C(\text{NO}_2 \mu\text{g}/\text{m}^3) = (A_s - A_b) \times CF \times (V_s / V_a) \times V_t \times 0.83$$

Where, C= Concentration of NO<sub>2</sub>, μg/m<sup>3</sup>

A<sub>s</sub> = Absorbance of sample

A<sub>b</sub> = Absorbance of reagent blank

CF = Alignment factor

V<sub>a</sub> = Capacity of air sample, m<sup>3</sup>

V<sub>s</sub> = Capacity of sample, ml                      V<sub>t</sub> = Capacity of aliquot taken for analysis, ml 0.83 = Sampling effectiveness.

### C. Gravimetric technique

The intention of this method is monitoring and examination of Particulate Matter PM<sub>10</sub> in ambient air.

#### i. Working Procedure

Air is drawn through a size-specific gulf and through a 20.3 X 25.4 cm (8 X 10 in) channel at a stream rate, which is normally 1132 L/min. Particles with streamlined width not exactly the cut-purpose of the bay are gathered, by the channel. The mass of these particles is controlled by the distinction in channel loads preceding and in the wake of inspecting. The convergence of PM<sub>10</sub> in the assigned size range is determined by partitioning the weight addition of the channel by the volume of air inspected.

#### ii. Sampling & Analysis:

Field Sampling - Tilt back the gulf and secure it as indicated by the maker's guidelines. Release the faceplate wing nuts and expel the faceplate. Expel the channel from its coat and focus it on the help screen with the unpleasant side of the channel confronting upwards. Supplant the faceplate and fix the wing nuts to verify the elastic gasket against the channel edge. Tenderly lower the gulf. For consequently stream controlled units, record the assigned stream rate on the information sheet. Record the perusing of the passed time meter. The predetermined length of inspecting is normally 8 hours or 24 hours. During this period, a few perusing (hourly) of stream rate ought to be taken. After the required time of inspecting, record the stream meter perusing, take out the channel media from the sampler, and put in a holder or envelope.

Channel examination: Inspect the channel for stick openings utilizing a light table. Free particles ought to be evacuated with a delicate brush. Apply the channel recognizable proof number or a code to the channel on the off chance that it's anything but a numbered. Condition the channel in molding room kept up inside 20-30°C and 40-half relative moistness or in a water/air proof desiccators for 24 hours. Take the beginning load of the channel paper (Wi) before testing. Condition the channel in the wake of inspecting in molding room kept up inside 20-30 °C and 40 °C half relative

moistness or in a water/air proof desiccator for 24 hours. Take last weight of the channel paper (Wf)

Periodical adjustment of the sampler is being finished by Orifice Transfer Standard - The PM<sub>10</sub> sampler alignment opening comprises a 3.175 cm (1.25 in) distance across the gap at last top of 7.62 cm (3 in) breadth by 20.3 cm (8 in) long-empty metal chamber. This opening is mounted firmly to the channel support instead of the bay during alignment. A little tap in favor of the chamber is given to gauge the weight drop over the opening. A stream rate of 1132 L/min through the hole regularly brings about a weight contrast of a few creeps of water. The connection between weight distinction and stream rate is built up by means of an adjustment bend got from estimations against an essential standard, for example, a Roots meter at standard temperature and weight. Stream protections that reproduce channel protections are presented toward the finish of the calibrator inverse the hole by a lot of punctured round plates.

$$\text{PM}_{10} \mu\text{g}/\text{m}^3 = (W_f - W_i) \times 106 / V$$

Where, PM<sub>10</sub> = Concentration of Particulate matter size below 10nm, μg/m<sup>3</sup>

W<sub>f</sub> = Initial weight of filter in g

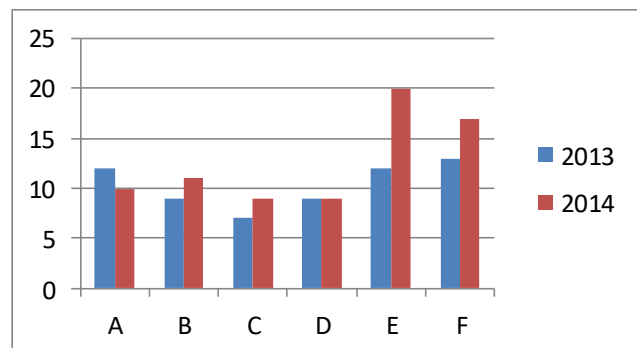
W<sub>i</sub> = Initial weight of filter in g

106 = Aadaptation of g to μg

V = Capacity of air sample, m<sup>3</sup>

## IV. RESULTS AND DISCUSSIONS

### A. Comparison of Air quality monitoring @ Station-1- from 2013&2014.



**Fig.4.1.1. SO<sub>2</sub> Emission variations**

In X- Observation stations

Y- axis concentration in μg/m<sup>3</sup>

**B. Comparison of Air quality monitoring @ Station-2- from 2013&2014.**

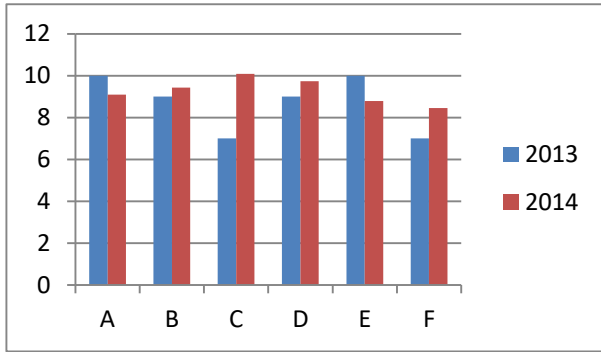


Fig.4.2.1. SO<sub>2</sub> Emission variations

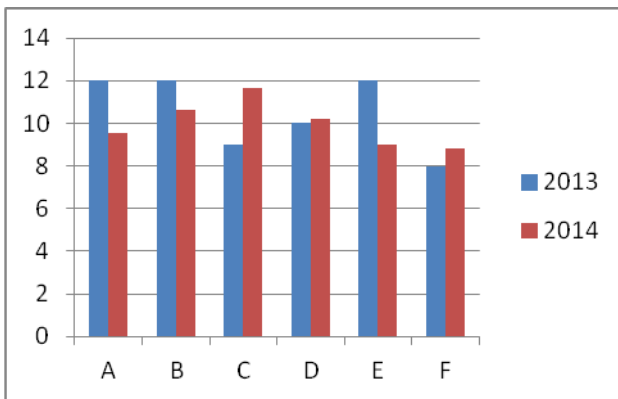


Fig.4.2.2. NO<sub>2</sub> Emission variations

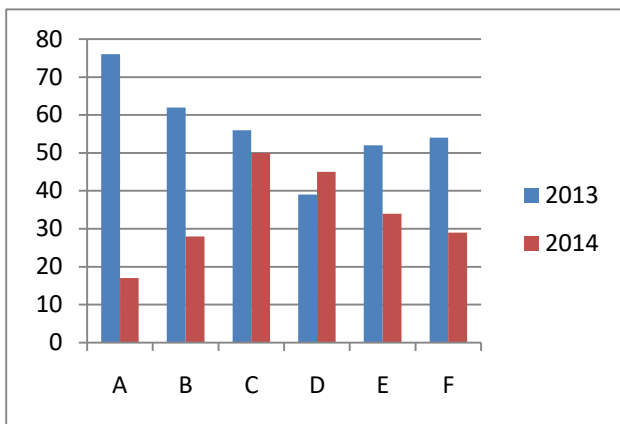


Fig.4.2.3. PM<sub>10</sub> Emission variations

In X-axis station points  
Y- axis concentration in  $\mu\text{g}/\text{m}^3$

**C. Comparison of Air quality monitoring @ Station-3- from 2013&2014.**

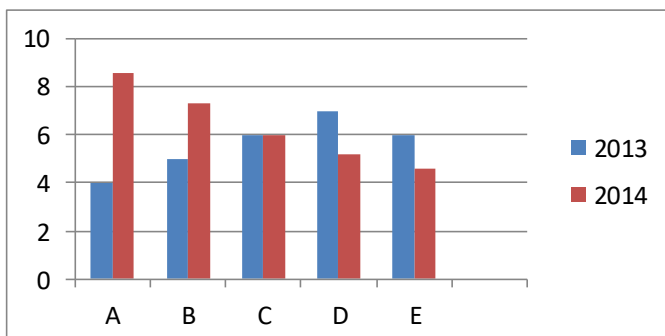


Fig.4.3.1. SO<sub>2</sub> Emission variations

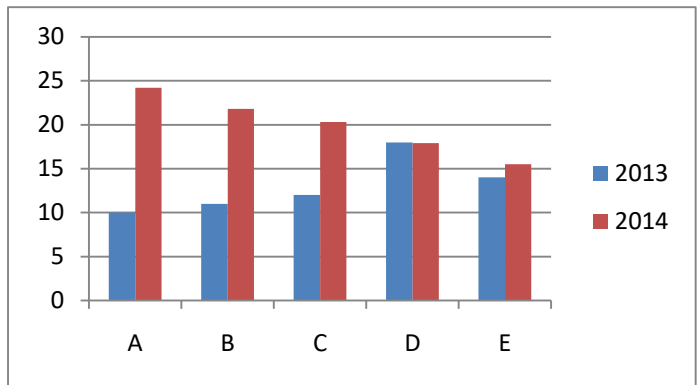


Fig.4.3.2. NO<sub>2</sub> Emissions variations

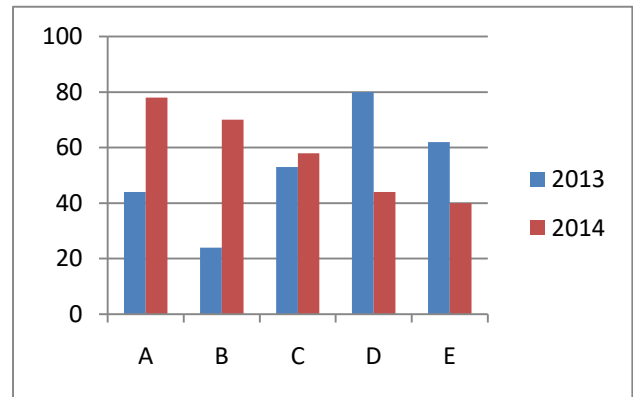


Fig.4.3.3. PM<sub>10</sub> Emissions variations

In X-axis station points  
Y- axis concentration in  $\mu\text{g}/\text{m}^3$

Progressing air quality observing study in the Tirunelveli has given almost persistent information to the centralizations of gas-stage In the study of air quality monitoring, it was observed that the Tirunelveli city and around area pollutants concentration level variation is there. The monitoring station pollutant concentration level is measured using the following methods

1. Altered West & Gaeke strategy for SO<sub>2</sub>
2. Adjusted Jacob & Hochheiser for NO<sub>x</sub>
3. Gravimetric Method for the estimation of PM<sub>10</sub>

From the Concentration of pollutants in the above three stations monitor from January 2013 to December 2014. The mean value of each pollutant (SO<sub>2</sub>, NO<sub>2</sub> & PM<sub>10</sub>) concentration level was calculated in table 5, 6 &7. Table 4 is the allowable concentration level. To compare the allowable limit, the concentration level of pollutants is limited. In Station 1, the cement plant surrounded area, PM<sub>10</sub> pollutant concentration level is increasing. In Station 2, Sun paper mill surrounded area compare to PM<sub>10</sub>, sulfur oxide, and nitrogen oxides concentration level allowable limit due to diluted in air. In Station 3, ATG Tyres (inside the city), pollutant level of nitrogen concentration is continuously increasing, and also SO<sub>2</sub> and PM<sub>10</sub> concentration increase within limit. Because the station 3, has more no vehicular emissions is there.

From the result and discussions section 4.1, 4.2 & 4.3 are representing the pollutants (SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>10</sub>) level comparison.

## IV.CONCLUSION

In the study of air quality was evaluated utilizing three observing stations in Tirunelveli city along the Thamirabarani river, the investigations have uncovered the degrees of air toxins for SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>10</sub>. The estimations of every one of these contaminations are seen to live especially underneath NAAQMS. These experimental studies in the air quality at these locals are likely due to the expanded urbanization (industry and increasing population) of Tirunelveli. As it should be obvious every one of the readings has been expanded at a reliable level, we should have some control strategies to stop air contamination. So we should have more consideration regarding limiting air contamination. The air quality is giving the all-encompassing perspective on air contamination levels. So from the outcome, it is clear that for now, the encompassing air along Thamirabarani waterway and Tirunelveli, does not require any consideration from the policymakers with the exception of the neighborhood, however perhaps later on we have to define a few different behaviour to neutralize that expansion during air contamination by explicit locals, because we cannot identify when the developing urbanization & the passage will expand the atmosphere contamination point in Tirunelveli city considerably other than the large amount extreme passable breaking points.

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**STATION 1: INDIA CEMENTS Ltd., ( 8°47'17.67"N,77°43'37.35"E)**

**Observation year :2013**

Temperature : 25 to 34 degree celsius  
Weather : Clear Sky  
Humidity : 56 to 76 %  
Wind Speed : 6.2 km/hr  
Direction : NW-SE  
Category : Red Large

**Observation year :2014**

Temperature : 27 to 36 degree Celsius  
Weather : Clear Sky  
Humidity : 56 to 72 %  
Wind Speed : 6.4 km/hr  
Direction : NW-SE  
Category : Red Large

**Table 5.Ambient Air Quality (2013&2014)**

S.No	Location	Direction	Distance	Ht GL	PM <sub>10</sub> µg/m <sup>3</sup>		SO <sub>2</sub> µg/m <sup>3</sup>		NO <sub>2</sub> µg/m <sup>3</sup>	
					2013	2014	2013	2014	2013	2014
1	A(8°47'20.69"N,77°43'47.25"E)	NNE	360	2	68.0	78.0	12.0	10.0	16.0	15.0
2	B(8°47'15.43"N,77°43'24.67"E)	SW	500	3	44.0	39.0	9.0	11.0	16.0	14.0
3	C(8°47'38.97"N,77°43'22.19"E)	NW	650	5	34.0	33.0	7.0	9.0	10.0	10.0
4	D(8°47'28.93"N,77°44'01.26"E)	N	800	3	47.0	50.0	9.0	9.0	12.0	9.0
5	E(8°47'09.13"N,77°43'45.51"E)	S	350	2	82.0	68.0	12.0	20.0	17.0	16.0
6	F(8°47'11.96"N,77°43'56.44"E)	E	600	3	86.0	82.0	13.0	17.0	18.0	21.0

**STATION 2: SUN PAPER MILL Ltd.,( 8°42'21.68"N,77°33'21.37"E)**

**Observation year :2013**

Temperature : 28 to 34 degree Celsius  
Weather : Clear Sky  
Humidity : 47 to 78 %  
Wind Speed : 3.2 km/hr  
Direction : NE-SW  
Category : Red Large

**Observation year :2014**

Temperature : 29 to 34 degree Celsius  
Weather : Clear Sky  
Humidity : 467 to 78 %  
Wind Speed : 3.5 km/hr  
Direction : NE-SW  
Category : Red Large

**Table 6.Ambient Air Quality (2013&2014)**

S.No	Location	Direction	Distance	Ht GL	PM <sub>10</sub> µg/m <sup>3</sup>		SO <sub>2</sub> µg/m <sup>3</sup>		NO <sub>2</sub> µg/m <sup>3</sup>	
					2013	2014	2013	2014	2013	2014
1	A(8°42'36.65"N,77°33'51.15"E)	NNE	1000	3	76	17	10	9.10	12	9.55
2	B(8°42'25.03"N,77°33'21.53"E)	N	100	3	62	28	9	9.43	12	10.60
3	C(8°42'27.25"N,77°33'17.94"E)	NW	200	3	56	50	7	10.08	9	11.66
4	D(8°42'18.24"N,77°33'15.85"E)	S	200	3	39	45	9	9.74	10	10.20
5	E(8°42'24.70"N,77°34'03.48"E)	E	1200	4	52	34	10	8.79	12	8.99
6	F(8°41'53.57"N,77°33'51.64"E)	SSE	800	3	54	29	7	8.45	8	8.83

**STATION 3: ATG Tyres,( 8°50'35.26"N,77°44'14.82"E)**

**Observation year :2013**

Temperature : 28 to 35degree Celsius  
Weather : Clear Sky  
Humidity : 52 to 84 %  
Wind Speed : 3.3 km/hr  
Direction : NW-SE  
Category : Red Large,Rubber

**Observation year :2014**

Temperature : 28 to 37degree Celsius  
Weather : Clear Sky  
Humidity : 48 to 80 %  
Wind Speed : 3.0 km/hr  
Direction : NW-SE  
Category : Red Large,Rubber

**Table 7.Ambient Air Quality (2013&2014)**

S.No	Location	Direction	Distance	Ht GL	PM <sub>10</sub> µg/m <sup>3</sup>		SO <sub>2</sub> µg/m <sup>3</sup>		NO <sub>2</sub> µg/m <sup>3</sup>	
					2013	2014	2013	2014	2013	2014
1	A(8°50'37.69"N,77°44'21.76"E)	NE	250	2.0	78	44	8.6	4.0	24.2	10
2	B(8°50'32.56"N,77°44'20.99"E)	SE	200	2.0	70	24	7.3	5	21.8	11
3	C(8°50'29.39"N,77°44'16.34"E)	S	175	2.0	58	53	6.0	6	20.3	12
4	D(8°50'15.78"N,77°44'01.26"E)	SW	700	2.0	44	80	5.2	7	17.9	18
5	E(8°50'18.43"N,77°44'19.42"E)	SE	500	2.0	40	62	4.6	6	15.5	14