Scientific Journal of Impact Factor (SJIF): 5.71
E-ISSN (O): 2348-4470
P-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 9, Issue 2, February 2022

ASSESSMENT OF SUSPENEDED PARTICULATE MATTER IN THE AMBIENT ENVIRONMENT

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Abstract — Air pollution is both an ecological and a social problem, as it has a variety of negative consequences for human health, ecosystems, and climate change. The most important element that has a direct impact on the prevalence of diseases and reduces the quality of life in cities and metropolitan areas is air quality. The control of air pollution has become a matter of great importance in our society. Many of pollutants enter the atmosphere from sources currently beyond our control. The principle sources of these pollutants are human activities. Air quality in metropolitan areas has deteriorated due to rapid population growth, urbanization, and industrialization. Fine dust and gaseous aerosols are the most important air pollutants that affect air quality. Fine dust is naturally respirable and is considered a possible pollutant that can cause social economic losses and health consequences. To control air quality, constant monitoring of these polluting gases in the air is necessary. The air quality index was calculated based on pollutant concentrations. The aim of this study is to quantify PM2.5 and PM10 in Tirupati city, Chittoor (district), Andhra Pradesh, using an ambient fine dust sampler. Also discuss about causes of particulate formation and their consequential harmful effects. The ambient fine dust sampler is used to quantify PM2.5 and PM10 in Tirupati city at Balaji Colony, Bhavani Nagar, Leela Mahal Circle, Bliss Circle, and Regional Science Center. The exceedance factor values of PM 2.5 and PM 10 were also within limits, indicating that everything was fine. Otherwise we would have to take some precautions. G.I.S software is used to create various maps using this data.

Keywords- Ambient Fine Dust Sampler, Air Quality Index method, Geographical Information System, Particulate Matter 2.5, Particulate Matter 10 and G.I.S.

I. INTRODUCTION

Air pollutants are released into the atmosphere from a number of sources, altering its composition and impacting the biotic environment. The concentration of air pollutants is determined not only by the amount of pollutants produced by pollution sources, but also by the atmosphere's capacity to absorb or disperse these emissions. Because of variations in climatic and topographical conditions, air pollution concentrations vary geographically and temporally, leading the air pollution pattern to alter with various places and times. The nature of air pollution changed thousands of years ago. No longer is air pollution predominantly smoke-related and sulfur-related but now it is associated with nitrogen oxides, volatile organic compounds, and PM connected with the growing traffic and industrial emissions **[6].**

The quality of air that we breathe in is determined by the amount of gaseous pollutants and particulate matter present in the air **[22].** The composition of ambient air PM is complex and differs depending on source and location. The occurrence of toxic heavy metals in the respirable fraction of PM is assumed to contribute sustainable health [13]. Particulate matter found in industrial areas and near roadsides is particularly metal-rich **[15].** Air pollutants are released into the atmosphere from a number of sources, altering its composition and impacting the biotic environment. The concentration of air pollutants is determined not only by the amount of pollutants produced by pollution sources, but also by the atmosphere's capacity to absorb or disperse these emissions.

Particulate matter (PM) in the atmosphere as a result of chemical reactions between the different pollutants. Particulate matter (PM) includes particles with diameters of 10 micrometers (µm) or smaller, designated as PM10, and extremely fine particles with diameters 2.5 micrometers (µm) and smaller designated as PM2.5. Besides size, fine and coarse particles differ in sources, formation mechanisms, composition, atmospheric lifetimes, spatial distribution, temporal variability, and, probably, in biological effects. The penetration of particles closely depends on their size **[24].**

Particulate matter comprises a heterogeneous mixture of tiny particles, and liquid droplets suspended in air. The particles are variable in terms of their concentration, as well as their physicochemical and morphological properties. Particulates can be products of combustion, suspensions of soil materials, and spray suspensions, and can also be produced by chemical reactions in the atmosphere. It can be concluded that airborne particulate matter (PM) is a complex mixture of many different chemical species originating from a variety of sources **[21].** Fine particles, owing to their smaller size, penetrate deeply into the respiratory system and may affect the alveoli [3]. There is a strong correlation between particulate pollution and impaired lung function, growth deficits in lung function, worsening asthmatic symptoms, and increased emergency room visits for asthma and obstructive pulmonary disease **[23].**

Fine particles can travel large distances (more than 100 km), with the potential for high background concentrations over a wide area. As a consequence, their composition may be extremely heterogeneous, depending on the meteorological conditions and human activities in a particular geographical area. Ultrafine particulates are fresh emissions from combustion-related sources, such as vehicle exhaust and atmospheric photochemical reactions, and are considered important markers of exposure to traffic fumes along major roads, as they can reach the deepest parts of the airways or even the bloodstream [19]. Fine and ultrafine particles are the ones that have been linked to the worst health effects, as they can reach the deepest areas of the airways or even directly into the bloodstream directly [20]. Exposure to particulate matter (PM) has been linked to increases in not only respiratory health effects but cardiovascular morbidity and mortality as well [9-10]. There are several different hypotheses about the mechanism of this linkage, one of which is that soluble components associated with PM, including metals, after inhalation, migrate directly through the pulmonary vasculature and enter the systemic circulation and, therefore, they have a direct impact on the extra pulmonary pathway, organs, including the heart[12].

Particulate matter (PM) that can be inhaled into the human respiratory tract is associated with the most serious health effects, including pulmonary and cardiovascular diseases [13-14]. Besides its effects on health, PM also impairs visibility, plays an important role in the formation of acid rain, affects the amount of sunlight reaching the ground and in turn interferes with a variety of environmental processes. The main sources of air borne particulates include natural and anthropogenic processes. The most noteworthy anthropogenic sources with regard to quantity stem from incomplete combustion processes, such as fossil fuel and biomass burning [17]. Particles deposited in the trachea and bronchioles ascend the mucosal ladder and are excreted or ingested by coughing. Particles that deposit beyond the terminal bronchioles are largely eliminated by pulmonary macrophages, which transport the ingested particles to mucosal conductors or the lymphatic system. A small part of these distally deposited particles migrates through the alveolar tissue directly to the lymphatic system [18].

The Air (Prevention and Control of Pollution) Act was enacted by the Indian government in 1981 to stop the worsening of air quality. Under the Environment (Protection) Act of 1986, the duty has been stressed even more. Through ongoing air quality survey/monitoring programmes, it is important to analyse current and expected air pollution. As a result, the National Ambient Air Quality Monitoring (NAAQM) Network was established at the national level by the Central Pollution Control Board in 1984-85. National Air Quest was the new name for the programme. The paper includes instructions for conducting ambient air quality monitoring as part of the NAMP programme. Monitoring of ambient air quality is done in order to provide data that fulfils the monitoring goals. Ambient air quality monitoring programmes are required to identify the current state of the air and to provide possible solutions. The report's goal was to measure PM2.5 and PM10 in Tirupati, Chittoor (District), Andhra Pradesh, using an ambient fine dust sampler. The paper talks about which pollutants should be monitored and where they should be monitored. These standards serve as the foundation for determining the monitoring objectives for ambient air quality **[25].**

II. LITERATURE REVIEW

Various air quality indicators are used to analyse the Air Quality Indices (AQIs) at two distinct locations in Delhi City for the year (2016-2018). The concentrations of five criterion pollutants, namely respirable suspended particulate matter (RSPM/PM2.5), suspended particulate matter (SPM/PM10), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), and ozone (O_3), were calculated during a 24-hour period. The AQIs were computed, and it was discovered that in the winter, the AQIs at both sites were in severe condition, but in the summer and monsoon seasons, they were in moderate to bad condition. AQIs were higher above the standard levels for the whole year. It was also discovered that NO_2 levels in the industrial area were higher than those in the residential area, but SO_2 levels in the industrial area were lower. The levels of SO_2 and NO_2 at both sites were below acceptable limits. Due to PM10 and PM2.5, the AQIs were determined to be in the category of ‘severe' and ‘very bad,' respectively **[1].**

In this research, an attempt was made to determine ambient air quality on main arterial routes in Jaipur using the Air Quality Index (AQI). After learning about the traffic characteristics of the study area's arterial roads, monitoring stations were set up at 35 strategic locations on all arterial roads, and air samples from various monitoring locations were analyzed. The results were compared to permissible standards as specified in Gazette of India Notification Extraordinary Part III, Section-4, and Year 2009. The findings show that gaseous pollutants like SO_2 and NO_x are below acceptable levels, and that particulate matter is the main source of air pollution in the study region. More than half of all sites have severe air pollution, while the remaining one-third has high air pollution **[16].**

Air pollution has been highlighted as a major issue across the world, causing significant damage to human health and food yields by influencing plant development and production. Previously, air pollution was just a problem in urban and industrial areas. However, it has become clear that pollutants may travel great distances and hence have an influence that can be felt across rural and woodland regions. Comparative basis mean concentrations of SO_2, NO_2, SPM, and RSPM were determined in sampling areas, namely urban, industrial, and forest areas of Udaipur, which is an atypical tropical city with varied lakes around its periphery and good forest cover, making it a unique site for studying ambient air pollution **[4].**

All atmospheric substance that is not gases but may be suspended droplets, solid particle or mixture of the two is generally referred to as particulates. Particulate matter causes respiratory problems like asthma, reduction in visibility and cancer. It also affects lungs and tissues **[8].**

Air pollution is a serious problem all over the world which causes terrific loss to human health and other living being. Sulphur Dioxide(SO_2),Nitrogen Dioxide(NO_2),Particulate Matter (PM2.5, PM10), Ozone(O_3), Lead (Pb),Carbon Monoxide(CO), Benzene(C_6H_6) and Nickel(Ni) are some of the parameters which have significant impaction environmental pollution. Purpose of this paper is to review the literature relating to the monitoring of ambient air pollution in India and compare the same with Indian National Ambient Air Quality Standards-2009 **[7].**

Development in industrialization, urbanization and expansion of the Haridwar city has resulted in increase of air pollution like SO_2, NO_x, SPM and RSPM in urban and industrial areas of Haridwar (Uttarakhand), India. This investigation represented the assessment of ambient air quality with respect to PM 10 (RSPM), SPM, oxides of nitrogen (NO_x) and sulphur dioxide (SO_2) at four sites namely Shivalik nagar, SIDCUL, Clock Tower, and Bhadrabad. Meteorological parameters like temperature, relative humidity, wind speed and rainfall were also recorded simultaneously during the sampling period. Monthly and seasonal variation of these pollutants have been observed and recorded. The annual average and range values have also been calculated. It has been observed that the 13 concentrations of the pollutants are high in winter in comparison to the summer or the monsoon seasons. Investigation results elucidates that industrial activities, indiscriminate open air burning of coal by the local inhabitants for cooking as well as cooking purpose, vehicular traffic etc. are responsible for the high concentration of pollutants in this area. In the present study, it was noticed that the SPM and PM 10 levels at residential and industrial areas exceeds the prescribed limits as stipulated by Central Pollution Control Board (CPCB) New Delhi, India. Apart from this the SO_2 and NOx levels in residential, industrial and commercial areas remain under prescribed limits of CPCB **[2].**

Vehicular traffic has become a major source of air pollution in urban areas. Ambient air quality study was undertaken at Mysore City, India. The main parameters considered include: suspended particulate matter, NOx, and SO2. Mysore city being one of the major tourist centres shows alarming increase in vehicular pollution from the past few decades mainly due to increased vehicular traffic, adulterated petrol, traffic disorder, and allied drawbacks **[11].**

III. STUDY AREA

The study area is Tirupati Region, Chittoor district of Andhra Pradesh state. As of 2011 census, it had a population of 287,588, making it the ninth most populous city in Andhra Pradesh. It is the seventh most urban agglomerated city in the state, with a population of 459,985.The area of the Tirupati city is *27.44* square kilometres (10.59 square mile).Tirupati has been selected as one of the hundred Indian cities to be developed as a smart city under Smart Cities Mission by Government of India. Tirupati is located at 13.65°N 79.42°E in the Chittoor District of South Indian State of Andhra Pradesh. It lies at the foot of Seshachalam Hills of Eastern Ghats which were formed during Precambrian era.

Tirupati has a tropical wet and dry climate, designated under the Koppen climate classification. In winter the minimum temperatures are between 18 and 20 degrees Celsius. Usually summer lasts from March to June, with the advent of rainy season in July, followed by winter which lasts until the end of February. The city experiences heavy rainfall in November during the northeast monsoon season. The highest rainfall in 24 hours was on 16 November 2015 with 219 mm. Cyclones commonly hit the Coast of Nellore, which brings heavy showers to the city. The study area is classified according to the type of high traffic areas and type of Zone. So, considering places like Balaji colony, Bhavani Nagar, Leela Mahal circle, Bliss circle as highly traffic areas, considered as commercial zone and Regional Science Centre consider as sensitive zone.

Table1: Location Details of Study Area

S. No	Location	Type of zone	Latitude	Longitude
1.	Balaji colony	Commercial	$79^0$24’31’’	$13^0$37’51’’
2.	Bhavani Nagar Circle	Commercial	$79^0$24’58’’	$13^0$38’21’’
3.	Leela Mahal Circle	Commercial	$79^0$25’49’’	$13^0$38’35’’
4.	Bliss Circle	Commercial	$79^0$25’51’’	$13^0$37’34’’
5.	Regional Science Center	Sensitive	$79^0$23’53’’	$13^0$38’35’’

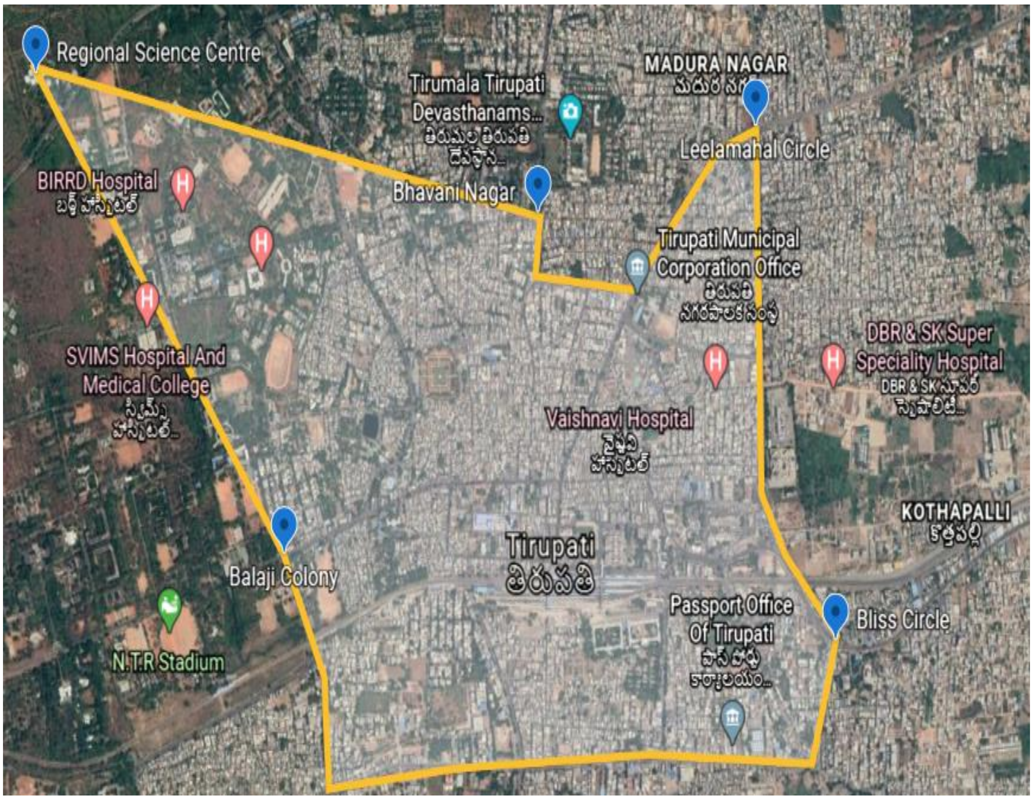

Figure 1 Location of sampling points

IV. METHODOLOGY

4.1 Criteria for site selection

A site is representative if the data generated from the site reflects the concentrations of various pollutants and their variations in the area. It is not easy to specify whether the location of the station is satisfactory or not, however it may be checked by making simultaneous measurements at some locations in the area concerned. The station should be located at a place where interferences are not present or anticipated.

In general, the following conditions should be met:

- The site should be away from major pollution sources. The distance depends upon the source, its height and its emissions. The station should be at least 25 m away from domestic chimneys, especially if the chimneys are lower than the sampling point; with larger sources the distance should be greater (WHO, 1977).
- The site should be away from absorbing surfaces such as absorbing building material. The clearance to be allowed will depend on the absorbing properties of the material for the pollutant in question, but it will normally be at least 1 m. (WHO, 1977).
- The objective of monitoring is often to measure trends in air quality and measurements are to be conducted over a long time; thus the site should be selected such that it is expected to remain a representative site over a long time and no land use changes, rebuilding's etc. are foreseen in near future.
- The instrument must be located in such a place where free flow of air is available. The instrument should not be located in a confined place, corner or a balcony.
- On all the sides it should be open, which is the intake should not be within a confined space, in a corner, under or above a balcony.
- For traffic pollution monitoring the sampling intake should be 3 m above the street level. The height of 3m is recommended to prevent re-entrainment of particulates from the street, to prevent free passage of pedestrians and to protect the sampling intake from vandalism.
- Sampling in the vicinity of unpaved roads and streets results in entrainment of dust into the samplers from the movement of vehicles. Samplers are therefore to be kept at a distance of 200 m from unpaved roads and streets.

4.2 Based on traffic volume study

Traffic volume study is the procedure to determine mainly the volume of traffic moving on the roads at a particular section during a particular time.
Traffic volume count can be obtained by the following methods**:**

1) Manual method
2) Automatic devices
3) Photographic method
4) Combination of manual and mechanical methods
5) Moving observer method

We adopt,
Manual Counting Method**:**

- The most common method of collecting traffic volume data is the manual method of traffic volume count, which involves a group of people recording number of vehicles passing, on a pre-determined location.
- Still this is the most reliable and best method to obtain classified volume and directional volume for short counts

Steps to a manual traffic volume count**:**

- Determine the type of equipment to use, the field procedure to follow, and the number of observers required.
- Label and organize tally sheets

Select observer locations**:**

- Observers (data collectors) should be positioned where they have a clear view of traffic and are safely away from the edge of the road way.
- Also, Observer needs to check every type of vehicle, if any special vehicle like means we need to record it.
- Record observations on sheet.

A. PCU (Passenger Car Unit):

In view of variety of vehicles, a number is assigned to a vehicle based on its speed, space and characteristics in comparison to the 'car termed as equivalent passenger car unit (PCU)'. Passenger Car Unit or Passenger Car Equivalent is first introduced by Highway Capacity Manual In 1965. PCU defined as in Highway Capacity Manual is "The number of passenger cars displaced in the traffic flow by a truck or a bus, under the prevailing roadway and traffic conditions".
India is a developing country and its cities are undergoing rapid urbanization and modernization as a result there is rapid growth in the road traffic. Traffic movement in India is very complex due to the heterogeneous traffic stream sharing the same carriageway. Also, despite having lane markings, most of the times lane discipline is not followed particularly at intersections. The total traffic volume at different locations Balaji colony, Bhavani nagar, Leela Mahal circle, Bliss circle are listed in Table 2, By Observing the Figure:1 and Figure: 2 we can know the Places where traffic volume study done.

Table 2: Traffic volume study

Traffic volume study (Tirupati city)				
Time	Balaji colony	Leela Mahal circle	Bhavani Nagar	Bliss circle
8-9	3191	3900	3466	5380
9-10	3306	4034	4647	5904
10-11	3951.5	3735	3495	6712
11-12	3370	3265.5	3476	7262
12-1	4420	4149.5	3474	6472
1-2	2744	3812	2934	6296
2-3	2514	3586	3217	6290
3-4	2646	2748	3076	5730
4-5	3145.5	4082	3294	5996
5-6	3876	5200	3065	6361

6-7	4208	5472	2881	6482
7-8	3200	4486	3404	3958
8-9	1838	3722	2199	3026
Total(PCU)	**42410**	**52192**	**42628**	**75869**

Figure 2: Traffic volume study at different locations (Field work)

4.3 Selection of sampling procedure

Two type of sampling procedures were used. First one is the continuous sampling, which is carried out by automatic sensors, optical or electrochemical and spectroscopic methods that produce continuous records of concentration values. In the second method, specified time-averaged concentration data can be obtained from continuous records. Time-averaged data can also be obtained by sampling for a short time.

Sampling time

A period of sampling should be suitable to measure the actual existing ambient air quality. It is preferable to observe the sampling period reliable with the averaging time for which air quality standards of the given pollutants are specified in Table3.

Table 3: Sampling Time

Pollutant	PM10	PM2.5	CO	SO_2	NO_2	O_3
Average Sampling Time	24-hrs	24-hrs	8-hrs (max)	24-hrs	24-hrs	8-hrs (max)

4.4 High volume air sampler

To measure the ambient concentrations of particulate matter by using **'High Volume Sampler'** shown in figure sampling of respirable particulate matter in the ambient outdoor environment air and the demonstration of its concentration in various sizes. Instruments used:

1. High volume air sampler
2. filter paper
3. Desiccators
4. Weighing Balance.

4.5 Conditioning the membrane filter prior to use

As the total mass of fine particles likely to be deposited s very small, while handling the Membrane filters for use in PM2.5 particulate sampling, care should be taken to avoid contaminating the filter in any manner. In fact, even electrostatic charge on the filter can affect the weighment. To minimize errors, follow the precautions mentioned below:

1) Minimize exposure of the filters to open air. Keep them covered inside the filter carriers provided with the instrument.
2) The membrane is a fine and fragile material; take care to handle the filter only by the support ring on its edge using non-separated forceps.
3) Inspect the filters against a light source for pinholes and loose contamination.
4) To equilibrate the filters keep them in a controlled environment such as desiccators at 25 degrees C and RH less than 35% for at least 16 hours..
5) Weigh the filters on a micro-balance with a resolution of at least 0.01 milligram shown in the below figure. For best results it is advisable to re-weigh the filters a few times and confirm repeatability of the weight. Reject the weighment if the weight varies by more than 0.1 mg.
6) Number and record the weight of the filters. As identification numbers cannot be marked on the filter a suitable identification code should be written on the filter carrier.

Caution: Weighment errors can significantly affect your results as the mass of Fine Particles deposited on the membrane filter can often be less than a milligram. Use a reliable balance and process a blank filter along with the exposed one to keep a check on drifts in the readings of the balance.

V. RESULTS

5.1 Calculation for pm 2.5 & pm10

Calculating Average Flow rate: =

Where, F_a =Average Flow in LPM

F_1 =Initial Flow ate on the Rotameter (LPM)
F_2 =Final Flow rate on the Rotameter (LPM)
Calculating Total Volume; $V_a = (F_a \times T \times 0.06)$
V_a = Total Volume in m^3
F_a = Average Flow in LPM
T = Time in Hours
0.06 = Conversion factor for LPM into m^3/h

The PM2.5 and PM 10 concentration is calculated as: $PM2.5 = ((W_f - W_i) X\ 10^3)/V_a$

$PM10 = ((W_f - W_i) X\ 10^3)/V_a$

PM 2.5 = Total Mass concentration of PM2.5 collected during the sampling period, µg/m³
W_f, W_i = Final and Initial mass of equilibrated filter used to collect PM2.5 particle sample, mg
10^3= Units Conversion (µg/mg)
V_a = Total Air Volume Sampled

- **Sample – 1 calculation For PM2.5 (Bhavani Nagar):**

Average Flow rate
F_1= 16.76, F_2 =16.79
F_a= (16.76 + 16.79)/2
= 16.775 LPM
Calculating Total Volume:
F_a =16.775, T=24
V_a = (16.775 x 24 x 0.06)
=24.15 m^3
PM2.5 Concentration:

W_f= 0.1519 gm, W_i = 0.1514 gm, V_a = 24.15m^3
$PM_{2.5}$ = (0.1519 – 0.1514) x 10^6/ (24.15)
= 20.7039 μg/m^3
Concentration of PM2.5 for different locations calculated, as shown in Table 5

Table 4: Measurement of Concentration for PM2.5 (24 hrs)

Location	Zone	Total volume (m^3)	Filter weight for PM2.5		Concentration for PM2.5 (μg/m^3)
			W_f	W_i	
Balaji colony	Commercial	24.15	0.1542	0.1535	28.9855
Bhavani nagar circle	Commercial	24.15	0.1519	0.1514	20.7039
Leela Mahal circle	Commercial	24.15	0.1560	0.1551	37.2670
Bliss circle	Commercial	24.15	0.1520	0.1514	24.8448
Regional science centre	Sensitive	24.15	0.1505	0.1504	4.1407

- **Sample – 2 calculation For PM10 (Bhavani Nagar):**

F_1 =16.75, F_2 =16.81
F_a = (16.75 + 16.81)/2
=16.78 LPM
Calculating Total Volume:
F_a =16.78, T=24
V_a =(16.68x 24 x 0.06)
=24.16 m3
PM10 Concentration:
W_f = 0.1241 gm, W_i = 0.1226 gm, V_a = 24.16m^3
PM2.5 = (0.1241 – 0.1226) x 10^6/ (24.16)
= 62.086 μg/m^3
Concentration of PM10 for different locations calculated, as shown in Table

Table 5: Measurement of Concentration for PM10 (24 hrs)

Location	Zone	Total volume	Filter weight for PM10		Concentration for PM10 (μg/m^3)
			W_f	W_i	
Balaji colony	Commercial	24.15	0.1230	0.1218	48.6894
Bhavani nagar circle	Commercial	24.16	0.1241	0.1226	62.0860
Leela Mahal circle	Commercial	24.15	0.1283	0.1267	66.2525
Bliss circle	Commercial	24.15	0.1256	0.1238	74.5341
Regional science center.	Sensitive	24.15	0.1223	0.1229	24.1447

5.2 Results

The concentration of PM2.5 and PM10 recorded in table 6

Table6: Concentration of PM2.5 & PM10

S. No	Location	Concentration of PM2.5 (µg/m^3)	Concentration of PM10 (µg/m^3)
1.	Balaji colony	28.9855	48.6894
2.	Bhavani nagar circle	20.7039	62.0860
3.	Leela Mahal circle	37.2670	66.2525
4.	Bliss circle	24.8448	74.5341
5.	Regional science centre	4.1407	24.1447

Correlation with AQI

S. No	Location	Monitored values for PM 2.5 (µg/m^3)	AQI Range for PM 2.5 (µg/m^3)	AQI Category	Monitored values for PM 10 (µg/m^3)	AQI Range for PM 10 (µg/m^3)	AQI Category
1	Balaji colony	28.9855	0-30	Good	48.6894	0-50	Good
2	Bhavani Nagar	20.7039	0-30	Good	62.0860	51-100	Satisfactory
3	Leela Mahal circle	37.2670	31-60	Good	66.2525	51-100	Satisfactory
4	Bliss circle	24.8448	0-30	Good	74.5341	51-100	Satisfactory
5	Regional science center	4.1407	0-30	Good	24.1447	0-50	Good

VI. CONCLUSION

In the present study, concentrations of suspended PM in two particle sizes, PM2.5 to PM10 have been measured. Tirupati is exposed with lot of vehicular traffic due great pilgrimages which lead lots of air pollution especially particulate matter pollution. Entire Tirupati city divided into 5 zones as per traffic point of view and traffic data has been collected manually at these places. Air quality data of PM2.5 and PM 10 has been collected at these zones and correlated with air quality index (AQI) value. At locations of Balaji colony, Bliss circle, Bhavani nagar circle, Regional science center the AQI categorized as good for PM 2.5. Balaji colony and Regional science center the AQI index are categorized as good for PM 2.5 and also at Bhavani Nagar, Leela Mahal circle and Bliss circle the AQI categorized as satisfactory. Terminalia Arjuna, Cassia fistula Linn, Polyalthialongifolia and Bougainvillea (Mahara Magic) are very good to absorb particulate emission from vehicles. So these plants suggested plant along road side and open areas of busy center.

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