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Assessment of Total Vehicular Pollution Load & PM_{10} on Manglia Corridor at Asian Highway 47 Indore Region

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Abstract: ***RSPM (PM $_{10}$) ,Total Vehicular Pollution load has been simultaneously measured during the winter months of November & December 2022 at on Asian Highway 47 at Indore city which are Manglia Corridor . Sampling was conducted with the help of respirable dust sampler & followed by CPCB norms. The comparisons between lowest and highest PM10 concentrations has been conducted on the basis of peak hours and none peak hours . The lowest RSPM has been observed in morning time at IDTL Toll Manglia that is 103.17µg/m^3 and highest in morning that is 156.06 µg/m^3. On the other end the RSPM concentration at IDTL Toll Manglia have been observed 190.82 µg/m^3 as lowest and 168.58 µg/m^3 as highest concentration in evening and on the basis of number of vehicles ply the total vehicular pollution load has been calculated.***
Keywords: RSPM, PM 10, AQI, TVPL, RDS, CPCB, Gaseous Pollutant

I. INTRODUCTION

Transportation is a major Source of air pollution in many countries including India due to the high number of vehicles that are available on the roads today. [1] The increase in population resulted in increase in no. of vehicles which is contributing high level of vehicular pollution. The Asian Highway Network (AH) is a cooperative project among countries in Asia ,Asian Highway 47 start from Gwalior
M.P. and reaches to Matara Sri lanka via Banglore.[2], Asian Highway 47 passes through Indore which is a highly traffic loaded highway that starts from IDTL toll tax at Manglia and ends at Rau square with the length of 34.5 km in Indore region ,Along with this highway many of residential townships , commercial complexes and Institutional Buildings are available. Traffic divergence point IDTL Toll Manglia on Asian Highway 47 Indore region consist of heavy traffic load resulted in higher air pollution that is responsible for human health hazard.

Causes of vehicular pollution

1) High population in the urban areas has also resulted in increase in the number of vehicles, risingof vehicular air pollution.
2) Older vehicles (2-stroke 2/3-wheelers) are a significant contributor of air pollution.
3) Inadequate inspection and maintenance facilities of vehicles.
4) Adulteration of fuel and fuel products
5) Improper traffic management system and road conditions

II. OBJECTIVE OF THE STUDY

1) To identify the sources causing vehicular pollution
2) To Analyse the changes in vehicular pollution due to variations in traffic load on IDTL TollManglia on Asian Highway 47 corridor at Indore region
3) To calculate the concentration of RSPM & Gaseous Pollutant at monitoring site.

III. MATERIALS & METHODS

1) The samples have collected continuously two times in a week for a single station up to one month according to CPCB sampling guidelines.
2) Sampling on each station has conducted for four hours in morning and on same day four hours in evening according to CPCB guidelines for assessment of vehicular pollution.

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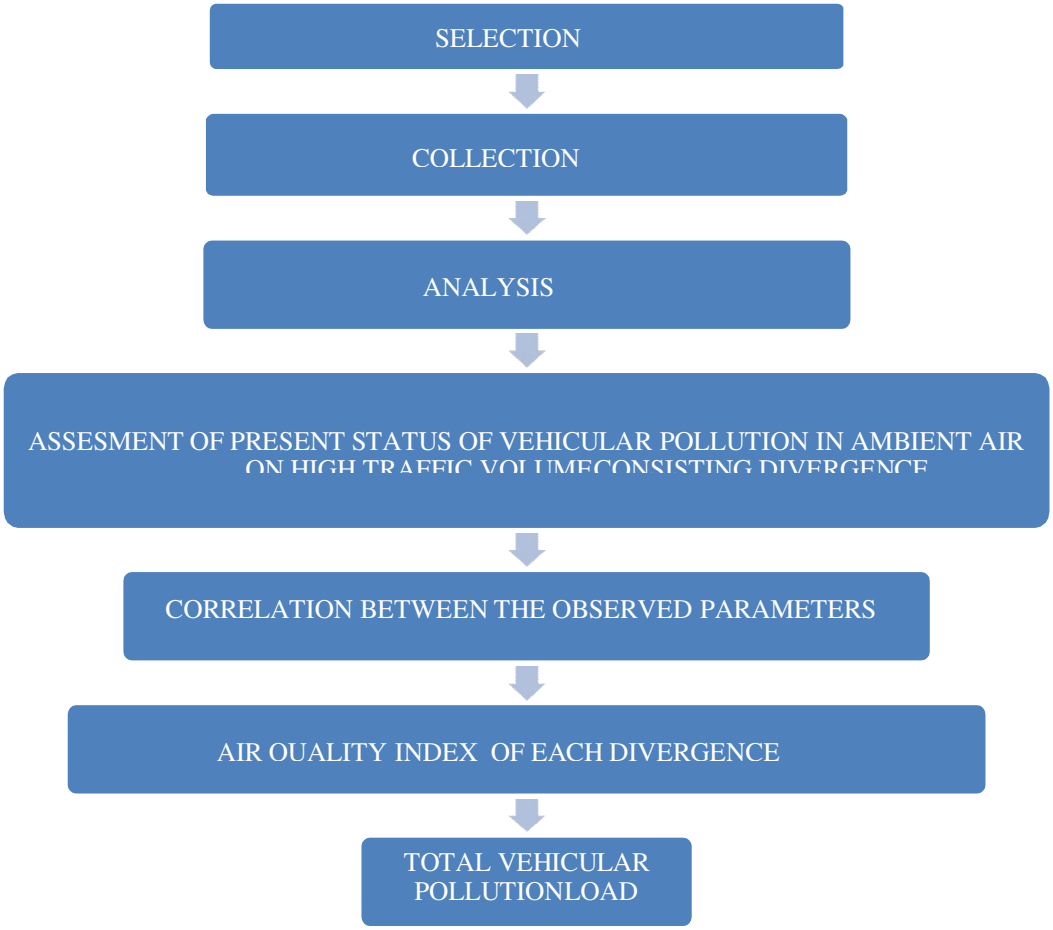
3) Gravimetric and Absorption principles will be employed for sampling /analysis has been adopted. [4] [5]. The methodology which has been conducted during the monitoring and analysisof pollutant concentration has been shown in Fig .1



Total Vehicular Pollution Load

Total vehicular pollution load at the study area has been calculated with the help of formula reported by CPCB

Y=0.841(X – 23.95)

Y=Estimated TPL in tons per day. [6]

Total Vehicular Pollution Load Of Some Mega Cities Of India Measured By CPCB.

As per the studies by CPCB vehicular emissions are responsible for most of the hydrocarbon (90 to 95%), nitrogen oxide (60 to 65 %), and carbon mono oxide (70 to 75%). CPCB has calculated the vehicular pollution load in some major cities in 1994 which has shown in Table 3 [7]

Table 1 Vehicular Pollution Load of Different Cities of India by CPCB in previous Years

S.NO.	CITY	VEHICULAR POLLUTION LOAD (TONNES/DAY)
1	DELHI	1046.3
2	MUMBAI	659.6
3	BANGLORE	304.5
4	KOLKATA	293.7
5	CHENNAI	226.3
6	JAIPUR	89.0
7	KANPUR	86.2

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IV. LOCATION OF AIR MONITORING STATIONS ON BUSIEST DIVERGENCE POINT AT ASIAN HIGHWAY 47 CORRIDOR INDORE REGION

The main concern of the project is to measure the concentration of PM10 with the help of respirable dust sampler at respective divergence points.The particulate pollutants are likely to have in very high concentration at the divergence points.

1) *IDTL Toll Manglia:* It is one of the most busiest traffic divergence point situated on AH 47 Indore region and surrounded by many residential township .The number of vehicles which ply from this divergence point is around 40,224 in twenty four hours.

V. RESULTS & DISCUSSIONS

The concentration of RSPM at IDTL Toll Manglia sampling station the RSPM concentration in morning detected as lowest was 168 µg/m^3 and 190 µg/m^3 as highest.

The concentration of RSPM in evening at the sampling station has been observed higher according to prescribed guidelines of CPCB

The average concentration of RSPM (Evening & Morning peak hours) has been shown in Table 1 and the variation trends with respect to time for the location IDTL Toll Manglia has been shown in fig. 2 &

Table 2 Average Concentration of RSPM (PM10) at IDTL Toll Manglia during Morning &Evening peak hours

RSPM-IDTL Toll Manglia		
Date	Morning(µg/m^3)	Evening(µg/m^3)
20.11.22	116.65	190.82
21.11.22	124.38	185.19
27.11.22	103.17	168.58
28.11.22	130.49	181.16
4.12.22	156.06	183.16
5.12.22	127.55	176.52
11.12.22	145.32	183.82
12.12.22	125.31	187.97

Table 3 Permissible guideline prescribed by CPCB

Pollutant	e WeightedAverage	Industrial, Residential, Rural and Other Areas	Ecologically Sensitive Area
Sulphur Dioxide SO2 µg/m 3	24 hours*	80	80
Nitrogen Dioxide(NO2), µg/m 3	24 hours*	80	80
Particulate Matter(size less than 10 µm) or PM 10 µg/ m 3	24 hours*	100	100

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1) Defined as 24 hourly or 8 hourly or 1 hourly monitored values, as applicable ,shall be compiled 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 [8]

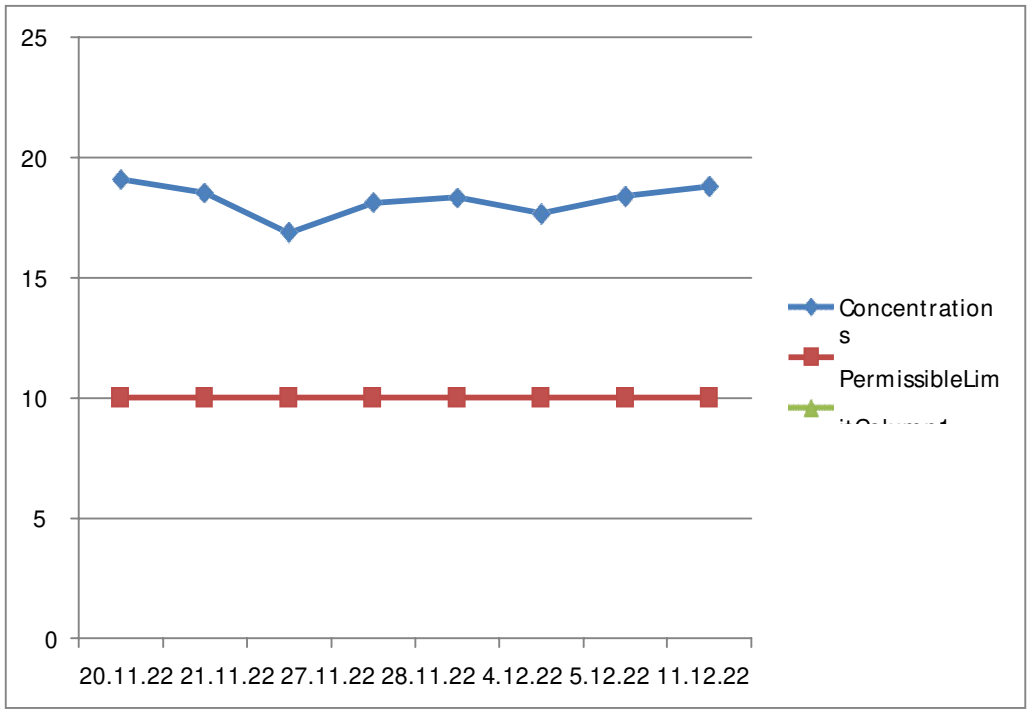

Fig2: Variation of RSPM with respect to time during the month (IDTLToll Manglia in Morning)

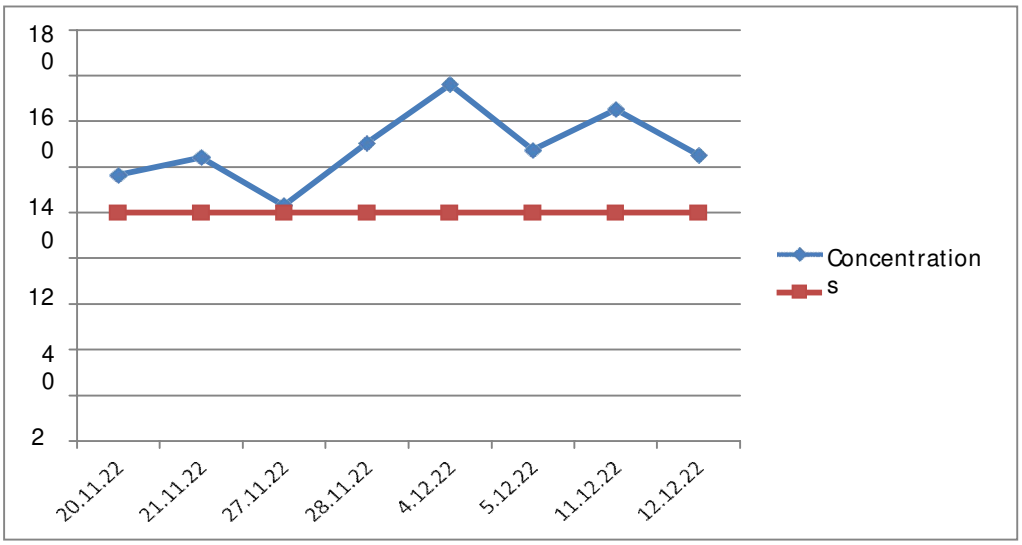

Fig3: Variation of RSPM with respect to time during the month (IDTLToll Manglia in Evening)

Total Vehicular Pollution Load Of Study Area

PLACE	NO.OF VEHICLES PASSES OR PRESENT	TOTAL POLLUTION LOAD IN TONNES/DAY
IDTL Toll Manglia Corridor	40,224	13.68

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VI. CONCLUSIONS

1) The RSPM concentration in morning at IDTL Toll Manglia divergence point is higher as well as crossing the permissible limit. On the other side the concentration in evening at IDTL Toll Manglia is highest and reaching to the double of the Permissible limit of RSPM prescribed by CPCB.

2) The other side the concentration in evening at IDTL Toll Manglia is highest and reaching to the double of the Permissible limit of RSPM prescribed by CPCB.

3) The variation of the concentration during morning and evening hours is due to vehicles passes from the corridor more at evening and less in morning peak hours.

4) The total vehicular pollution load at Idtl Toll Manglia Corridor has been calculated 13.68 tons/per day which indicate higher level of vehicular pollution on the sampling station.

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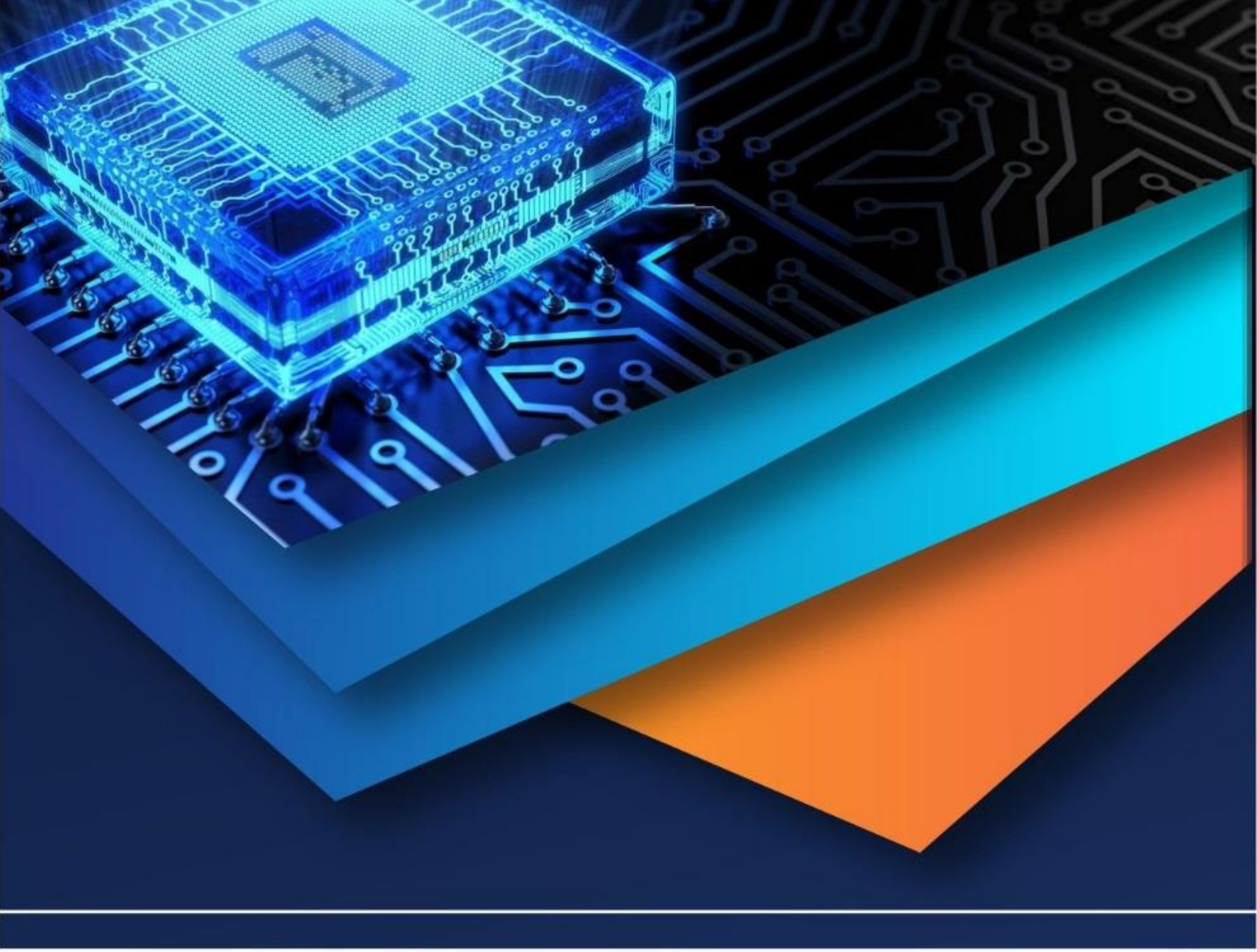

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