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CASE STUDY OF VEHICLES ON KATRAJ CHOWK TO NAVALE BRIDGE

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Abstract: - Outdoor air pollution is attributed to 3.2 million premature deaths worldwide and is one of the top ten health threats. Outdoor air pollution is primarily caused by motorised transportation. The sum of sulphur and nitrogen oxides, carbon dioxide and monoxide, ozone gases, and dust up to 2.5 microns in size are all used to assess air quality. For the entire month of March 2020, the PM10 concentration was above 100g/m3 at all of the tracked locations for a period of 24 hours. For the entire 24 hour period, the concentration of SO2 and NO2 pollutants is less than 80 G/m 3. Pune is located on a high ridge, and it has a unique natural beauty and a diverse biodiversity. Pune is located on the lower side of the Sahyadri mountain range and the Western Ghats, at 560 metres above sea level.

Keywords- *AIR QUALITY, NAVALE BRIDGE, Vehicular density, High Volume Sampler*

I.INTRODUCTION

Exposure to outdoor air pollution is related with 3.2 million early deaths globally and is among the top ten health risks worldwide. Motorized transportation is a major source of outdoor air pollution. The impact of global air pollution on climate and the environment is a new concern in atmospheric science. Pune is an important city in the state of Maharashtra in the western part of Maharashtra on the banks of two rivers, Mula and Mutha and is the administrative headquarters of Pune district. After Mumbai, Pune in Maharashtra is a leader in Maharashtra in terms of civic amenities and development.

Geographical information of Pune city

Pune city is 560 m above sea level on the lower side of Sahyadri mountain range and Western Ghats. The city of Pune is situated on a high place and the city has a unique natural beauty and rich biodiversity. The two rivers of the city are Pavana and Indrayani these two rivers flow through the northwestern boundary of the city, while on the southern boundary of the city are the Sinhagad-Katraj-Dive Ghat mountain ranges. The city of Pune is situated between 18^0 25' and 18^0 37' north latitude and 73^0 44' and 73^0 57' east longitude.

According to 2011 census, the total population of Pune city was 31.24 lakhs. With the addition of 11 new villages to the Corporation in 2017, the population has increased by 2.78 lakhs to 34.02 lakhs . Air quality is determined by the amount of sulfur and nitrogen oxides, carbon dioxide and monoxide, ozone gases, and dust up to 2.5 microns in size. Air pollution is a major cause of air pollution from polluted gases and naturally occurring dust storms.

Problem Statement

As per the data of Regional transport office Pune region from the year 2016-2017 to 2017-2018 total no. of vehicles registered in Pune city increases by 10.7%. Increase in vehicles due to migration of people from sub-urban and urban area due to employment opportunities. 'Navale bridge' to 'Katraj chowk' is the major road of about 3.8 kms connecting highway and other major adjoining job sector areas. Due to this, heavy congestion in the areas ultimately expose the people in such areas to pollutants released from the vehicles. Long term and continuous exposure ultimately leads to several air-borne related health issues as also affecting the surroundings.

II CASE STUDY OF KATRAJ CHOWK TO NAVALE BRIDGE

The stretch from Katraj Chowk to Navale bridge starts from 18^o26'53"N 73^o51'29"E and extends upto 18^o27'34"N 73^o 49'27"E which is considered end-to-end distance of 3.8km approximately. On the particular road stretch, it can observed that there are residential buildings, commercial complexes, function halls and lawns, educational institutes, schools and colleges. This particular stretch is also the prime area for connecting to the Pune-Mumbai highway. The residential cum commercial complexes on the particular road ranges from single storey structure to multi-storeyed building of upto 15 floors. Katraj chowk is at the height of 661 meters from the sea level and Navale bridge is at the height of 591 meters from sea level. Thus, it can be said that the Katraj chowk is at higher elevation as compared to Navale bridge by 70 meters.

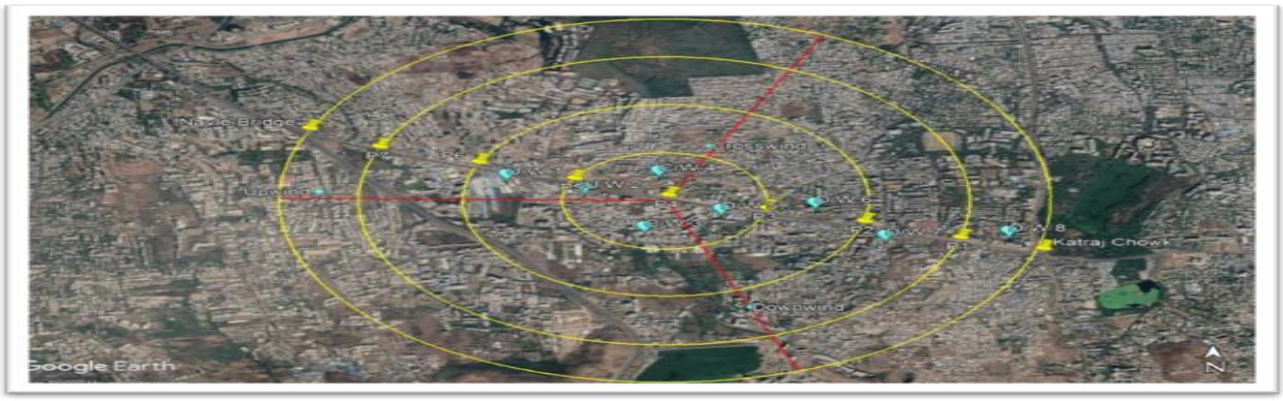

Figure Geographic data Katraj Chowk to Navale Bridge

We collet Meteorological data from various officials site.

The mean monthly wind speed over the year in Pune, India (meters per second). * Data from nearest weather station: Mumbai, India (124 KM)

Sr. No.	Month	Wind Speed (m/s)
1	January 2020	1 m/sec
2	February 2020	1 m/sec
3	March 2020	1-2 m/sec
4	April 2020	1m/sec
5	May 2020	1-2 m/sec
6	June 2020	1-2 m/sec
7	July 2020	1-3 m/sec
8	August 2020	1-3 m/sec
9	September 2020	1 m/sec
10	October 2020	1 m/sec
11	November 2020	1 m/sec
12	December 2020	1 m/sec
13	January 2021	1 m/sec
14	February 2021	1 m/sec

PRIMARY DATA COLLECTION FROM FIELD

Stationary and Mobile sources:

As per the observation on the site, the stationary sources for pollutants includes the commercial complexes which has construction materials loading unloading, new building construction activities, the widening road construction activity, etc. Whereas, the mobile sources includes the vehicles passing from the particular stretch which are observed more dense at the office and school-college timings. The source of emission of pollutants is more, particularly at the signals where the vehicles hault for the particular time.

Vehicular data and estimation:

The vehicular density data was collected physically with the count of vehicles for about 1 hour at morning peak time, afternoon and evening peak duration for a particular week. The vehicle count was divided into working weekdays and weekends.

Weekday count i.e. Monday 14/10/2019 Table Towards Navale bridge (Weekday count i.e. Monday 14/10/2019)

Type ofvehicle	Time: 9:30 to 10:30	Time: 2:00 to 03:00	Time: 6:00 to 07:00
2 wheelers	4550	3044	4655
4 wheelers	1855	1357	1782
Light motorvehicles	670	643	643
Heavy dutyvehicles	395	254	305

Table Approximate estimation of the vehicles on weekdays fora month and a year for (Weekday count i.e. Monday 14/10/2019)

Sr. No.	Sumation of 3hrs count	Average vehicle countper hour	12 hours vehic le count	5 week days	26 days	1 year
1	12249	4083	48996	244980	1273896	15286752
2	4994	1665	19976	99880	519376	6232512
3	1956	652	7824	39120	203424	2441088
4	954	318	3816	19080	99216	1190592
		TOT AL	80612	403060	2095912	25150944

Weekday count i.e. Friday 11/10/2019

Table towards Karaj chowk Weekday count i.e. Friday 11/10/2019

Type of vehicle	Time: 9:30 to 10:30	Time: 2:00 to 03:00	Time: 6:00 to 07:00
2 wheelers	3785	2080	4467
4 wheelers	1766	1290	1689
Light motor vehicles	567	572	733
Heavy duty vehicles	288	214	312

Table Approximate estimation of the vehicles on weekdays for a month and a year Weekday count i.e. Friday 11/10/2019

Sr. No.	Sumation of 3 hrs count	Average vehicle count per hour	12 hours vehicle count	5 week days	26 days	1 year
1	10332	3444	41328	206640	1074528	12894336
2	4745	1582	18980	94900	493480	5921760
3	1872	624	7488	37440	194688	2336256
4	814	271	3256	16280	84656	1015872
		TOTAL	71052	355260	1847352	22168224

Weekend count i.e. Sunday 13/10/2019

Table towards Navale bridge Weekend count i.e. Sunday 13/10/2019

	Type of vehicle	Time: 9:30 to 10:30	Time: 2:00 to 03:00	Time: 6:00 to 07:00
1	2 wheelers	1455	1278	1390
2	4 wheelers	989	856	914
3	Light motor vehicles	427	377	405
4	Heavy duty vehicles	248	179	218

Table Approximate estimation of the vehicles on weekends for a month and a year Weekend count i.e. Sunday 13/10/2019

Sr. No.	Sumation of 3 hrs count	Average vehicle count per hour	12 hours vehicle count	2 week ends	4 days	1 year
1	4123	1374	16492	32984	65968	791616
2	2759	920	11036	22072	44144	529728
3	1209	403	4836	9672	19344	232128
4	645	215	2580	5160	10320	123840
		TOTAL	34944	174720	908544	10902528

Weekend count i.e. Saturday 28/09/2019

Table towards Karaj chowk Weekend count i.e. Saturday 28/09/2019

Sr. No.	Type of vehicle	Time: 9:30 to 10:30	Time: 2:00 to 03:00	Time: 6:00 to 07:00
1	2 wheelers	1523	1140	2030
2	4 wheelers	1011	815	1345
3	Light motor vehicles	422	495	535
4	Heavy duty vehicles	273	230	305

Table Approximate estimation of the vehicles on weekends for a month and a year Weekend count i.e. Saturday 28/09/2019

Sr. No.	Sumation of 3 hrs count	Average vehicle count per hour	12 hours vehicle count	2 week ends	4 days	1 year
1	4693	1564	18772	37544	75088	901056
2	3171	1057	12684	25368	50736	608832
3	1452	484	5808	11616	23232	278784
4	808	269	3232	6464	12928	155136
		TOTAL	40496	202480	1052896	12634752

III.CONCLUSION

Findings

Based on the monitoring done with the Fine Dust Sampler instrument, following values of major air pollutants are obtained:In the month of January 2020, the PM10 concentration was above 100µg/m3 for the duration of 24 hours on all the monitored locations; whereas PM2.5 concentration was below 60µg/m3. Also, the concentration of SO2 and NO2 pollutants is below 80µg/m3for the 24 hours duration. In the month of February 2020, the PM10 concentration was above 100µg/m3 for the duration of 24 hours on all the monitored locations; whereas PM2.5 concentration was below 60µg/m3. Also, the concentration of SO2 and NO2 pollutants is below 80µg/m3 for the 24 hours duration.In the month of March 2020, the PM10 concentration was above 100µg/m3 for the duration of 24 hours on all the monitored locations; whereas PM2.5 concentration was below 60µg/m3. Also, the concentration of SO2 and NO2 pollutants is below 80µg/m3 for the 24 hours duration. From the above measured parameters in the vicinity area of Katraj chowk to Navale bridge, it is found that the concentration of PM10 is more in all the three months i.e. January, February and March and at all the locations selected. However, the concentration of PM2.5, SO2 and NO2 is within the limits of the standards given by Central Pollution Control Board. It is found that the concentration of PM10 is due the re-suspension of the particulate matter on the roads due to the dryness in the atmosphere. The problem of re-suspension of the particulate matter is observed less in rainy season as compared to the winter and summer time.

Conclusion

Major traffic on this road is city commuting and heavy/transport vehicles (Solapur-Baramati-Mumbai traffic) making frequent congestion on the road. Many city roads merge in to main road making it more congested.

1. Divert traffic of heavy vehicles (gradation of city traffic and pass through transport, traveller traffic)

2. Avoid stagnant traffic (flowing traffic)

3. Smart signals or signal less traffic using over bridges and underpasses for majority of traffic for uninterrupted flow.

4. Measures to quickly settle dust (trees, lawns, water sprinkles)

5. Separate signal less service road to facilitate uninterrupted local commuting

6. Install Wind Augmented Purifier Units (WAYU) at signals and selected locations

7. Schedule road sweeping and cleaning more frequently to clear off the dust.

8. Promote use of Electric vehicles.

9. Awareness and acceptance of public transport and vehicle sharing.

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