

# Assessment of Air Quality in Belagavi City

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**ABSTRACT:** Air is the building block, apart from which life itself would not exist. It is the basic requirement for all living organisms. But Nowadays due to the increased industrialization, urbanization, unplanned growth and development has lead to more air pollution and due to which human is exposed to polluted air, which may cause respiratory diseases such as Asthma, Bronchitis etc. Pollutants which are responsible for the air pollution include Particulate matter, Carbon monoxide, Ozone, Nitrogen dioxide and Sulphur dioxide which may cause a serious threat to human health. In the present study, prime air pollutants ( PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub>& NH<sub>3</sub>) were estimated in some areas of Belagavi city of Karnataka. An attempt has been made to express the ambient air quality of Belagavi city in the form of air quality index (AQI). Autonagar and Hindalco Industrial area was monitored using a set of dust sampler viz., APM- 460 & APM-550. The sampling was carried out for 24 hours on 8 hourly basis to evaluate Particulate Matter (PM<sub>10</sub>), Particulate Matter (PM<sub>2.5</sub>), Sulphur dioxide (SO<sub>2</sub>), Nitrogen dioxide(NO<sub>2</sub>) & Ammonia(NH<sub>3</sub>). AQI values in our study revealed that monitored areas were categorised as good to a moderate level by CPCB. Concentrations of all pollutants were within the permissible limit.

**KEYWORDS:** Air quality Index (AQI), Particulate matter (PM<sub>10</sub>), Particulate matter (PM<sub>2.5</sub>), Nitrogen dioxide (NO<sub>2</sub>), Sulphur dioxide (SO<sub>2</sub>), Ammonia (NH<sub>3</sub>). Respirable suspended particulate matter (RSPM).

## I. INTRODUCTION

Belagavi is popularly known as "Chotamahabaleshwar" as it has a pleasant climate, population is around 6 lakh and is located in Northwest part of Karnataka state. Belagavi city lies on the Geographical coordinates 15° 53' 4" North latitude and 74° 32' 2" East longitude . Belagavi city is situated in the eastern region of Western Ghat which observes heavy to moderate rain fall. Currently many things are changing at faster pace like industrialization, urbanization, changing of life style, and more vehicles etc. this is causing undesirable substances which enters into atmosphere causing air pollution. National ambient air quality provides the ranges of Air Quality Index standards with respect to type of areas and the Major pollutants (SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, NH<sub>3</sub>) are formed due to the presence of industries so This project involves the checking of ambient air quality of the industrial areas and providing the remedial measures to protect the environment from harmful pollution.

## II. RELATED WORK

In India air pollution is one of serious health issues. It has been recognized as the most polluted country in the world, In 2019 it has been found that 21 cities of India were highly polluted. In India ambient air quality has progressively deteriorated due to anthropogenic sources like rapid urbanization, industrialization, uncontrolled increase of vehicles in poor road conditions, construction debris, garbage burning, domestic cooking or heating and seasonal causes such as dust storms. Due to the pollutants let out by the industries and automobiles have suppressed the nature and it has also caused premature deaths of 2 million Indians every year. Various works were carried out in an order to study the ambient air quality status in India.[3] studied status of air quality in Jaipur. [4]Studied ambient air quality using AQI of Vapi city.[5]Studied ambient air quality using AQI in Kolhapur city, they found that AQI was less during rainy season (June to August) as to compared to summer and winter. [6] Studied six year trend of air pollution of Bangalore city.[7] Studied ambient air quality of Belagavi city(2015) using AQI ,their study revealed that locations near bus stand and Macche industrial area lie in the range of moderate air pollution and Autonagar, Sadashivnagar lied in the range of light air pollution.[8]Studied GIS based air quality mapping of Dharwad city.[9]Studied ambient air quality monitoring of Pune city.[10]Studied status of air pollution of Hyderabad city.

Therefore there is a need for the awareness of common people especially in the urban areas regarding vehicular pollution and industrial pollution. In view of above facts, the level of air pollution was measured in Autonagar and Hindalco Industrial area of Belagavi city of Karnataka.



III. METHODOLOGY

**INSTRUMENTS AND SAMPLE COLLECTION:** PM<sub>10</sub> and PM<sub>2.5</sub> pollutant samples are collected through the set of dust samplers of Envirotech Model 460 and 550. instrument station should be selected where obstacles are not to be found and station point should be 10 feet above the Ground level. Time setting of instrument should be maintained for 24 hour & continuously runs with electric power. A glass fiber filter paper of size 20.3 x 25.4 cm (8 x10 inch) is used to collect the samples of PM<sub>10</sub> & 47 mm diameter filter paper with polypropylene ring for PM<sub>2.5</sub>. Initial weight of the filter paper should be recorded through analytical balance before the fixing of paper to the instrument & operated for 24 hr on 8hr basis, afterwards papers are collected and conserved in desiccators for 24 hrs. final weight of filter paper was recorded and calculated the average concentration of pollutants using gravimetric method .

Gaseous pollutants (NO<sub>2</sub>, SO<sub>2</sub>, NH<sub>3</sub>) : Gaseous pollutant set-up is connected with the instrument and calibrated with distilled water before the placing of absorbing solutions in an impingers. Gaseous pollutants samples are collected in the test tubes at an interval of 4 hrs and calculated the average concentration of pollutants using Improved west & Gaeke method for SO<sub>2</sub> , Modified Jacob method for NO<sub>2</sub> , & Indophenol method for NH<sub>3</sub>.

IV. EXPERIMENTAL RESULTS

Monthly average concentrations of air pollutants namely SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub> & NH<sub>3</sub> are depicted in Table 2. According to the data presented in Table 2&3 ( Autonagar) and Table 4 ( Hindalco Industrial area). Values of SO<sub>2</sub> concentration at Autonagar was below the detectable limit and in Hindalco Industrial area it was seen as nil.

**NO<sub>2</sub>:** In Autonagar area NO<sub>2</sub> concentration ranged between 12 µg/m<sup>3</sup> and 15µg/m<sup>3</sup>. Maximum concentration was observed in February and minimum concentration was observed in January and for Hindalco Industrial area NO<sub>2</sub> concentration was found to be 51.95 µg/m<sup>3</sup> (Table 2, 3 & 4).

**PM<sub>10</sub>:** Concentration of PM<sub>10</sub> in Autonagar was ranged between 80 µg/m<sup>3</sup> (January) to 142 µg/m<sup>3</sup> (February) Maximum & Lowest value was found in monsoon due to intermittent precipitation. Concentration of PM<sub>10</sub> in Hindalco industrial area was found to be 51.95µg/m<sup>3</sup>. AQI level categorized as satisfactory to moderate in respective study area (Table 2, 3 & 4).

**PM<sub>2.5</sub>:** Concentration of PM<sub>2.5</sub> in Autonagar ranged between 35µg/m<sup>3</sup> (Jan) and 51 µg/m<sup>3</sup> (Feb). In Hindalco Industrial area concentration of PM<sub>2.5</sub> was found to be 35µg/m<sup>3</sup> (Table 2, 3 & 4).

**NH<sub>3</sub>,** Concentration of NH<sub>3</sub> in Autonagar ranged between 7µg/m<sup>3</sup> (Jan) and 11 µg/m<sup>3</sup> (Feb). In Hindalco Industrial area concentration of PM<sub>2.5</sub> was found to be 35µg/m<sup>3</sup> (2, 3 & 4)

Overall air quality index in Autonagar and in Hindalco industrial area, AQI was categorized as satisfactory to moderate as per the ambient air quality standards presented in Table 1

Table 1 Ambient Air Quality Standards

<b>Good</b>	Minimal Impact	<b>Poor</b>	Breathing discomfort to people on prolonged exposure
<b>(0–50)</b>		<b>(201–300)</b>	
<b>Satisfactory</b>	Minor breathing discomfort to sensitive people	<b>Very Poor</b>	Respiratory illness to the people on prolonged exposure
<b>(51–100)</b>		<b>(301–400)</b>	
<b>Moderate</b>	Breathing discomfort to the people with lung, heart disease, children and older adults	<b>Severe</b>	Respiratory effects even on healthy people
<b>(101–200)</b>		<b>(&gt;401)</b>	



Table 2: Calculation of AQI for the month of January- 2020

Location	Pollutants	Concentration in $\mu\text{g}/\text{m}^3$	Air Quality Index value
Autonagar industrial area	PM <sub>10</sub>	80.00	
	PM <sub>2.5</sub>	35.00	AQI=80
	SO <sub>2</sub>	2.00	Satisfactory
	NO <sub>x</sub>	12.00	
	NH <sub>3</sub>	7.00	

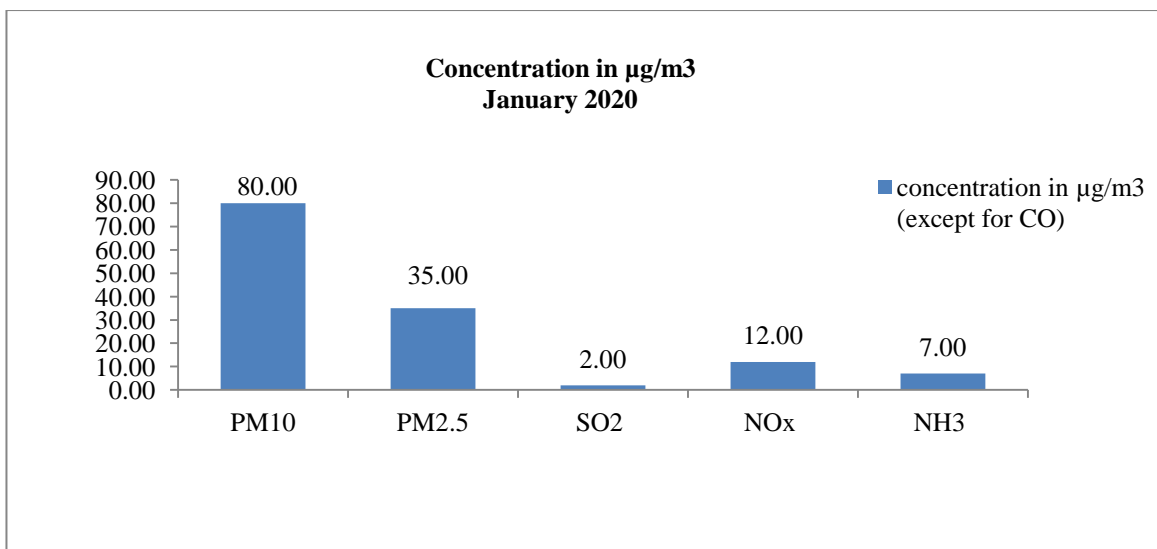


Table 3: Calculation of AQI for the month of february - 2020

Location	Pollutants	Concentration in $\mu\text{g}/\text{m}^3$	Air Quality Index value
Autonagar Industrial area	PM <sub>10</sub>	142.00	
	PM <sub>2.5</sub>	51.00	AQI=128
	SO <sub>2</sub>	2.00	Moderate
	NO <sub>x</sub>	15.00	
	NH <sub>3</sub>	11.00	

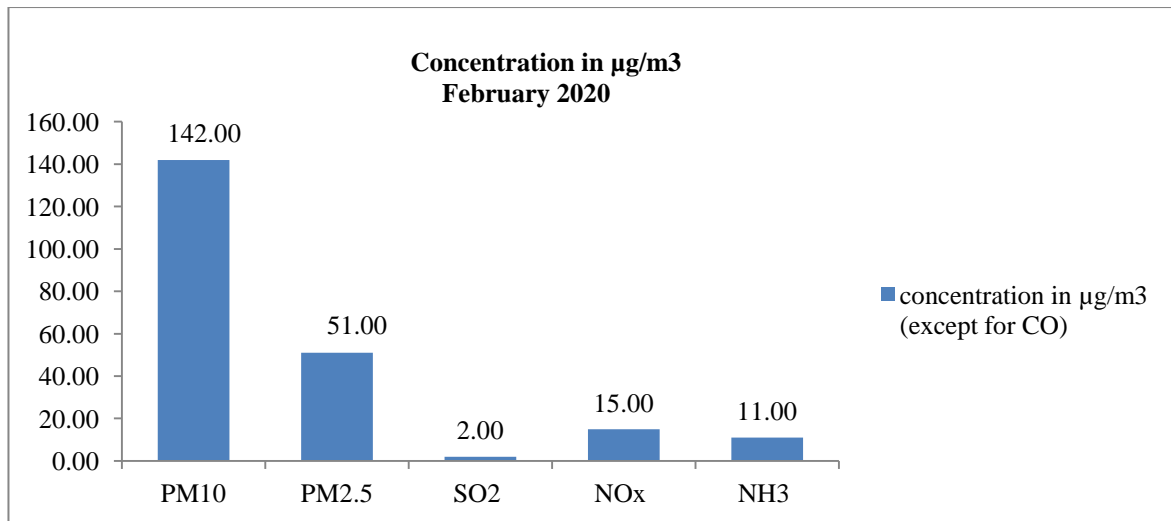
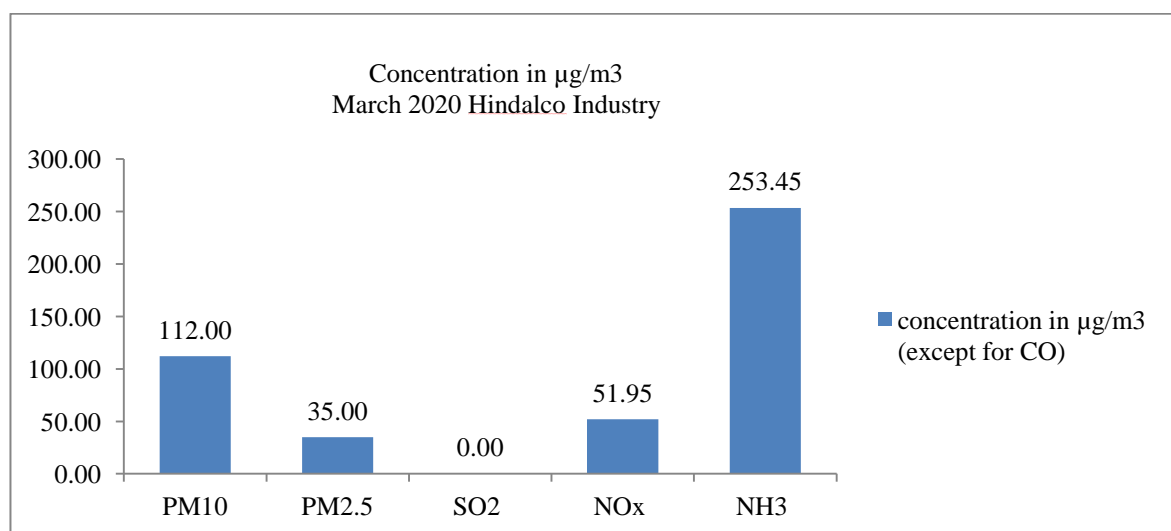


Table 4: calculation of AQI for the month of March - 2020( Hindalco Industry)

Location	Pollutants	Concentration in µg/m <sup>3</sup>	Air Quality Index value
Hindalco industry	PM <sub>10</sub>	112.00	
	PM <sub>2.5</sub>	35	AQI=108
	SO <sub>2</sub>	0	Moderate
	NOx	51.95	
	NH <sub>3</sub>	253.45	



V. CONCLUSION

Air pollution monitored in the form of Air Quality Index gives the valuable assessment of air quality in the common human life. The recent study done at Belagavi city the locations of autonagar and hindalco industrial area shows that

details of all five parameters as SO<sub>2</sub>, NO<sub>2</sub>, NH<sub>3</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> which are under standard permissible limits for the duration of 24 hours.

- The concentration of PM<sub>10</sub> for the month of January ,February 2020 (autonagar) and march (Hindalco industry) values of 80µg/m<sup>3</sup> ,142µg/m<sup>3</sup>and 112µg/m<sup>3</sup> ,due to presence of dust on road ,burning of fossil fuels, industries, vehicle, exhausts, dust storms , wood burning, smoke.
- The concentration of PM<sub>2.5</sub> for the month of January , February 2020 (Autonagar ) and march (Hindlaco industry )values of 51µg/m<sup>3</sup> and 35µg/m<sup>3</sup> and 35µg/m<sup>3</sup>,due to presence burning leaves and brush, dust storms, industries.
- The concentration of SO<sub>2</sub> for the month of January , February 2020 (autonagar) and march (Hindalco industry) values of 2.00µg/m<sup>3</sup> and 2.00µg/m<sup>3</sup>and 0.00µg/m<sup>3</sup> , due to presence of burning of sulphur containing fuels, power plants, refineries.
- The concentration of NO<sub>2</sub> for the month of January , February 2020 (autonagar) and march (Hindalco industry) values of 12µg/m<sup>3</sup>,15µg/m<sup>3</sup>and 51.9µg/m<sup>3</sup> , due to presence of fuels, power plants, refineries.
- The concentration of NH<sub>3</sub> for the month of January , February 2020 (autonagar) and march (Hindalco industry) values of 7µg/m<sup>3</sup>,11µg/m<sup>3</sup>and 253.45µg/m<sup>3</sup> , due to presence of direct hydrogenation of coal and biomass char- nitrogen, manufacturing of fertilizers and other synthetic chemicals.

The present study clearly indicates that PM<sub>10</sub> is higher the standard value which gives the bad impact on human health as well the air quality, hence proper control measures should be taken to reduce the pollution otherwise may cause severely problems in future.

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