



## TITLE: COMPARATIVE STUDY OF AIR QUALITY INDEX OF PUNE AND MUMBAI CITY

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### ABSTRACT:

Urban air quality issues have emerged as a major concern impacting quality of life. India is ranked as one of the worlds' most polluted countries, with 14 cities in the top 20 most polluted cities globally, according to the 2018 Global Ambient Air Quality Database of the World Health Organisation. An Air Quality Index is defined as an overall scheme that transforms weighted values of individual air pollution related parameters into a single number or set of numbers. Air quality indicates the state of air around us. Like the weather, air quality can change from day to day or even hour to hour. Air Quality Index of Mumbai and Pune City is considered for the present research. The Paper attempts to analyze the variations in air quality Index in year 2018. The average RSPM concentration was 87.8  $\mu\text{g}/\text{m}^3$  at Karve road Pune and 128.49 $\mu\text{g}/\text{m}^3$  at Sion, Mumbai in 2018. Both Cities have significant variations in topographical and meteorological factors. The observation and analysis reflects that the Mumbai city has higher concentration of NO<sub>x</sub> and RSPM as compared to Pune during the year 2018. According to the, Central Pollution Control Board, PM 10 and PM 2.5 levels in Mumbai have been steadily increasing. The data shows that the city's level of PM 10 in 2018 was the highest in over 20 years.

**Key words:** - Air quality, Pune, Mumbai.

### INTRODUCTION:

Pune city is located on the western margin of the Deccan Plateau, at an altitude of 560metres above the Sea level. Mumbai is located on the western coastal plains of India. Mumbai lies on the windward side of Western Ghats and receive more rain during monsoon than Pune. Because Pune is located on the leeward side of Western Ghats of India, which forms a barrier from the Arabian Sea. Pune is a hilly city, with Vetal Hill rising to 800 m (2,600 ft) above sea level. Pune has a hot semi-arid climate (type BSh) bordering with tropical wet and dry (type Aw) with average temperatures ranging between 20 °C and 28 °C

Mumbai lies at the mouth of the Ulhas River on the western coast of India, in the coastal region known as the Konkan. It sits on Salsette Island (Sashti Island), Mumbai is bounded by the Arabian Sea to the west. Many parts of the city lie just above sea level, with elevations

ranging from 10 m (33 ft) to 15 m (49 ft) the city has an average elevation of 14 m (46 ft). Mumbai has a tropical climate, specifically a tropical wet and dry climate (Aw) . The average annual temperature is 27.2 °C (81 °F), and the average annual precipitation is 2,167 mm (85 inch) In the Island City, the average maximum temperature is 31.2 °C (88 °F), while the average minimum temperature is 23.7 °C (75 °F).

Both cities have variations in topographical features. The present study aims to find the impact of the topographical factors and geographical location on the air quality of Mumbai and Pune city. The present study compares the Air quality index of Mumbai and Pune for year 2018. This paper reflects the variations in concentration of SO<sub>2</sub>, NO<sub>x</sub> and RSPM (Repairable suspended particulate Matter)

In Sion air quality monitoring station of Mumbai and Karve road air quality monitoring station of Pune. Seasonal variations in air quality index is considered for the comparative study. Mumbai is the largest metropolitan city and Pune is the ninth largest city in India. Pune is second largest city in Maharashtra. Both cities have industrial clusters and commercial organizations. Mumbai city has very good network of public transport as compared to Pune. Study shows that both cities have increasing trends in air pollution. Air quality is declining every year and the concentration of RSPM was above the permissible limit in year 2018.

Information about the Air Quality Index is useful for people who suffer from illness aggravated or caused by air pollution. Thus it enables them to modify their daily activities at times when they are informed of high pollution levels.

#### OBJECTIVES:

- 1) The present paper has attempted to study the temporal variation of concentration of air pollutants at two main air quality monitoring stations of Mumbai and Pune City.
- 2) The paper also attempts to find the causes of variation in Air quality Index of these two cities.

#### DATABASE AND MYTHOLOGY:

The data for the present study was obtained through Maharashtra state pollution control board's (MPCB) pollution monitoring stations at Sion station of Mumbai and Karve road station of Pune City.

MPCB provides every daily mean concentration of NO<sub>x</sub>, SO<sub>2</sub> and RSPM for said stations. The air quality data for the year 2018 has been taken

from Sion, Mumbai and Karve Road, Pune air quality monitoring stations for the comparative analysis. To Study the temporal variations the data for premonsoon, monsoon, post monsoon and winter season has-been considered. Averages of monthly and annual concentration of SO<sub>2</sub>, NO<sub>x</sub> and RSPM have been calculated. Average minimum and maximum concentration of these pollutants has been calculated. Monthly and annual Average Air Quality Index has been calculated for both the station of main locations of Mumbai and Pune City. Annual and monthly averages are plotted on temporal scale. Scale for the year 2018. Comparative temporal graphically represented. Results are obtained after observation, comparative analysis and interpretation of graph and tables.

#### RESULTS AND DISCUSSION:

Fig 1. Shows the concentration of SO<sub>2</sub>, NO<sub>x</sub> and RSPM at Karve road air quality monitoring station of Pune city. Maximum, minimum and annual average concentration is graphically represented.

Figure 2 shows the concentration of SO<sub>2</sub>, NO<sub>x</sub> and RSPM at Sion air quality monitoring station of Mumbai.

In year 2018 average concentration of SO<sub>2</sub> was 4.99 µg/m<sup>3</sup> at Sion station of Mumbai. But average concentration of SO<sub>2</sub> was 16.81 µg/m<sup>3</sup> at Karve Road Pune. Observation shows that SO<sub>2</sub> has decreased at Sion as compared to Karve road Pune. SO<sub>2</sub> is the outcome of industrial area. It indicates that most of the manufacturing industries from Sion had closed or shifted from the town.

Figure 1 and 2 indicates the that average concentration of NO<sub>x</sub> was 76.13 µg/m<sup>3</sup> at Sion and 47.04 µg/m<sup>3</sup> at Karve Road, Pune. Sion

monitoring station of Mumbai has higher concentration of NO<sub>x</sub> at compared to Karve Road Pune.

NO<sub>x</sub> is mainly outcome of vehicular motion. It shows that Sion has high density traffic as compared to Karveroad, Pune. In the past five years Mumbai has seen a 56% rise in number of vehicles.

In 2018 the average concentration on of RSPM was 128.49  $\mu\text{g}/\text{m}^3$  at Sion air pollution monitoring station of Mumbai. But at Karve road Pune, the average concentration of RSPM was 87.80  $\mu\text{g}/\text{m}^3$ . As compared to Sion station of Mumbai, Karve road, Pune has low contraction of RSPM per  $\mu\text{g}/\text{m}^3$ .

#### **Temporal Analysis of Air Quality Index at Mumbai and Pune:**

- 1) During the year 2018 AQI show that air quality status was moderate in winter and summer at Sion observation station.

But during the monsoon air quality was satisfactory at Sion station. In August the average AQI value was 76  $\mu\text{g}/\text{m}^3$ . It was lowest during the rainy months. AQI was satisfactory in June, July, August and September at Sion air pollution monitoring station of Mumbai.

Air quality in winter was just moderate in both the cities. Because during the winter atmospheric pressure is high due to low temperature. High Pressure increases the stability of atmosphere

RSPM and other traces gas are retained in the locality. It is because very low dispersal of air and high concentration of pollutants. Mumbai is surrounded by Sea water on three sides, the wind reversal is higher as compared to Pune.

At Karve Road Pune AQI was moderate in status during the summer and winter. But during the monsoon AQI was good in status. Average AQI was below 50  $\mu\text{g}/\text{m}^3$  in July and August, but in December it was 136  $\mu\text{g}/\text{m}^3$ . In June, August and September AQI Show satisfactory status at Karve road, Pune. In July average AQI was 47.21  $\mu\text{g}/\text{m}^3$  and In August AQI was 44.10  $\mu\text{g}/\text{m}^3$ . AQI below 50 indicates good status of air quality.

#### **CONCLUSION:**

- i) Air quality Index shows the considerable variation in status of Pune and Mumbai Cities during the year 2018.
- ii) At Karve road Pune monitoring station shows that AQI status was moderate in winter and summer. But during the monsoon AQI status was good. The concentration of pollutants is considerably low during the monsoon due to windy atmospheric condition and regular rains. High and continuous rainfall washes away different anthropogenic pollutants. But at Sion station of Mumbai show the satisfactory status during the monsoon and moderate status during the winter and summer.
- iii) Average annual concentration of NO<sub>x</sub> is more at Sion air quality monitoring station of Mumbai as compared to Karve road Pune.
- iv) But Average annual concentration of SO<sub>2</sub> is more at karve road Pune as compared to Sion Mumbai
- v) Average RSPM concentration was 87.80  $\mu\text{g}/\text{m}^3$  at Karve Road Pune and 128.49  $\mu\text{g}/\text{m}^3$  at Sion station of Mumbai. Observation shows that

average RSPM concentration at Sion Mumbai has increased significantly and crossing given standard limit.

- vi) There is an overall increasing trend RSPM in Mumbai, despite having the advantage of the sea breeze. Vehicular and industrial emission, construction dust and solid fuel emissions are the highest threats.
- vii) The rising air pollution trend is a clear indicator that monitoring and enforcement are not being balanced. To curtail this rise, fossil fuel consumption has to be restricted at source and regulating industries by implementing stricter emission standards.

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Figure [1] (Concentration of air pollutants in  $\mu\text{g}/\text{m}^3$ )

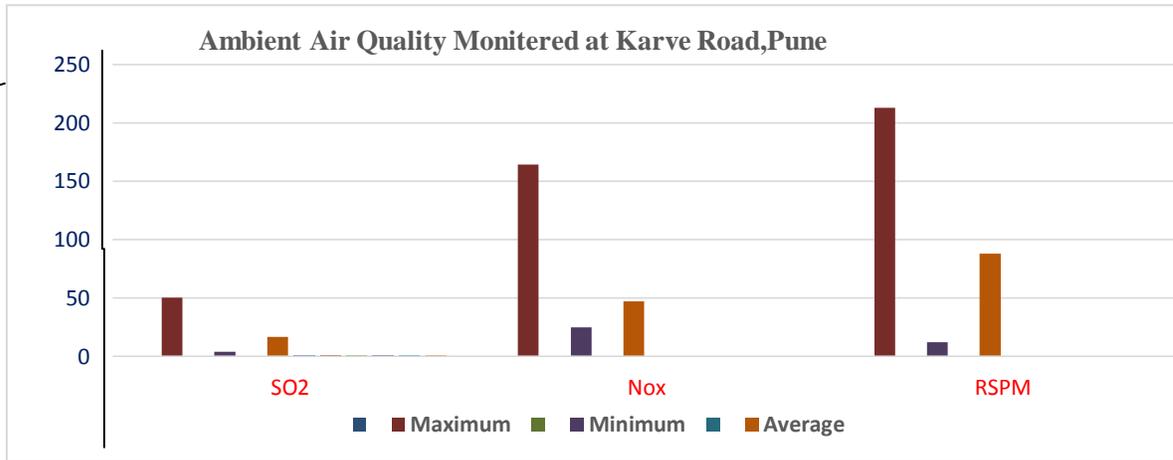


Figure [ 2.] Concentration of air pollutants in  $\mu\text{g}/\text{m}^3$

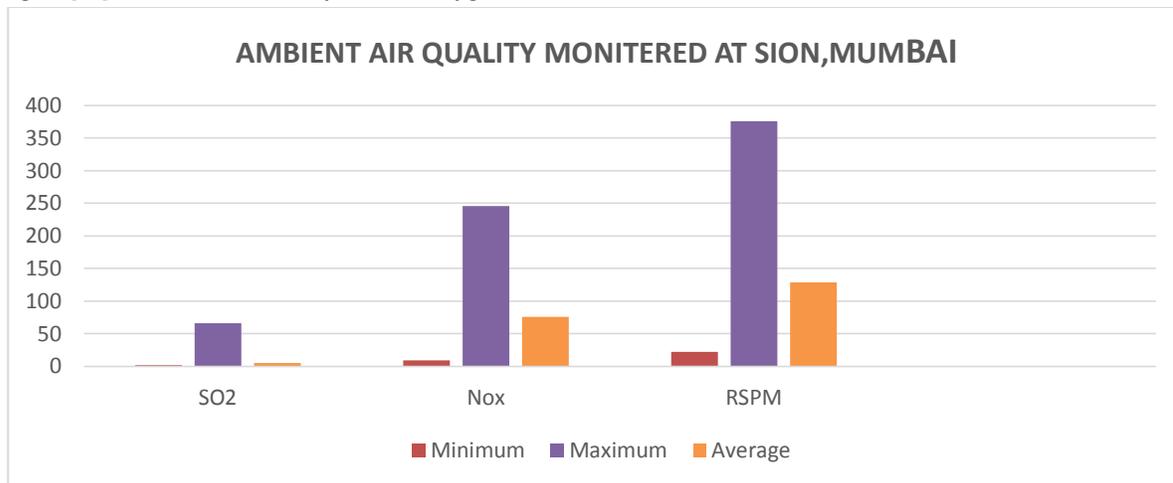
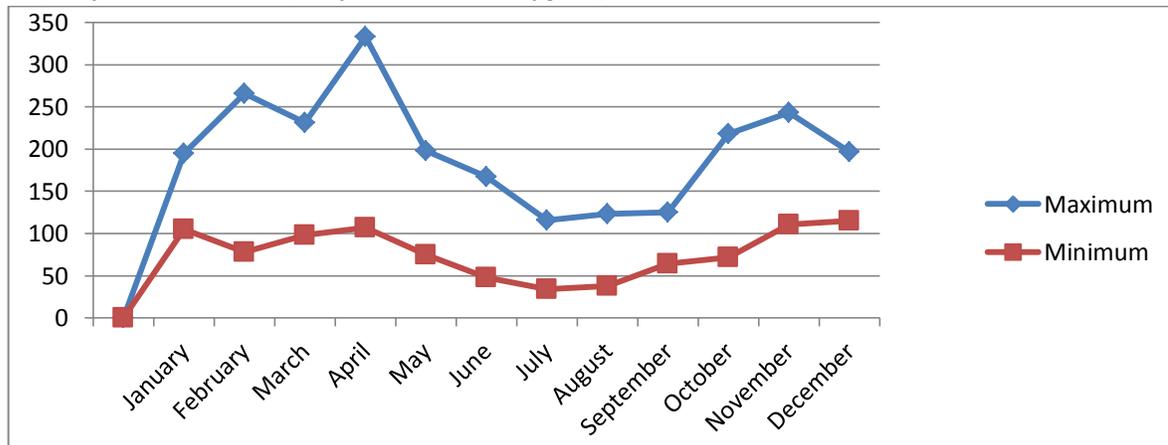
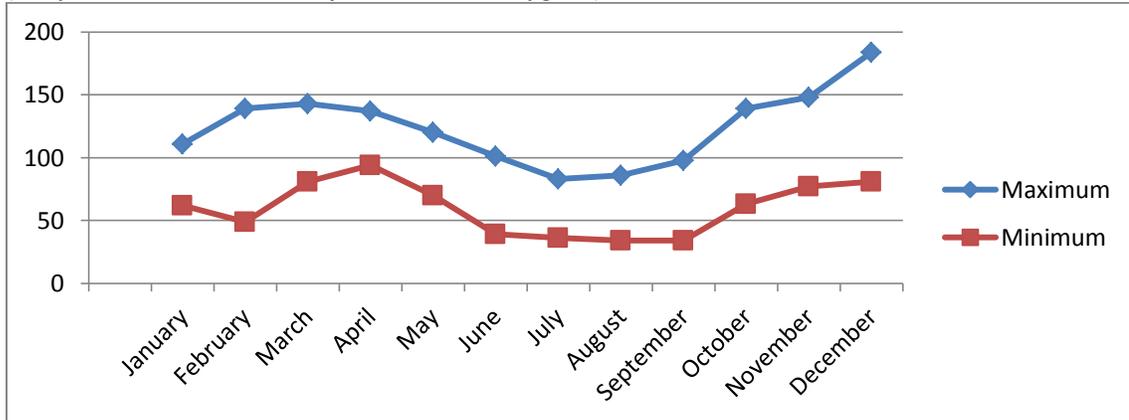


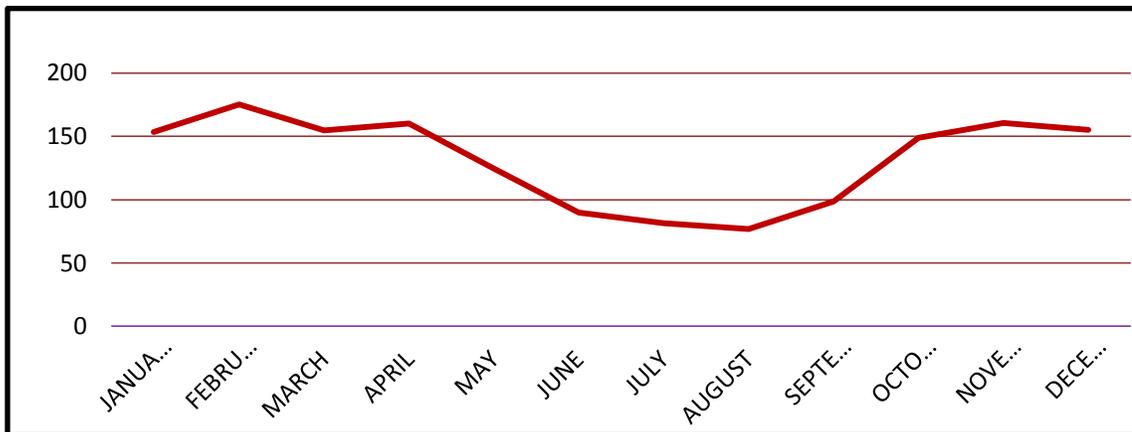
FIGURE [3] AMBIENT AIR QUALITY MONITORED AT SION, MUMBAI  
(Temporal variation Air Quality Index is shown in  $\mu\text{g}/\text{m}^3$ )



**FIGURE [4] AMBIENT AIR QUALITY MONITORED AT KARVE ROAD, PUNE**  
 (Temporal variation in Air Quality Index is shown in  $\mu\text{g}/\text{m}^3$ )



**FIGURE [5] MONTHLY AVERAGE AQI FOR AMBIENT AIR QUALITY MONITORED AT SION, MUMBAI**  
 (Temporal variation in Average Air Quality Index is shown in  $\mu\text{g}/\text{m}^3$ )



**FIGURE [6] MONTHLY AVERAGE FOR AMBIENT AIR QUALITY MONITORED AT KARVE ROAD, PUNE** [Average Air Quality Index is shown in  $\mu\text{g}/\text{m}^3$ ]

