Air Quality Index (AQI) Report

Data Source: West Bengal Pollution Control Board
Station: Bhasa,2nd Campus of Asutosh College
(August 2024)

In August, the Air Quality Index (AQI) for South 24 Parganas is largely influenced by the monsoon season, which generally leads to improved air quality. Frequent rains during this period help in dispersing pollutants such as particulate matter (PM $_{2.5}$, PM$_{10}$), nitrogen dioxide (NO$_2$), and sulphur dioxide (SO$_2$), keeping the AQI mostly in the "Good" to "Moderate" range. However, during dry spells or in areas with heavy traffic and industrial activities, temporary spikes in pollution levels can occur, raising the AQI to "Unhealthy for Sensitive Groups." The region's coastal proximity also plays a role in ventilating pollutants, particularly in South 24 Parganas, where sea breezes help maintain cleaner air. Overall, August generally sees lower pollution levels due to the combined effects of rainfall and favourable wind patterns, making it a relatively healthier period for air quality.

Despite the overall improvement in air quality during August, localized sources of pollution such as vehicular emissions, construction activities, and small-scale industries in Kolkata and urbanized pockets of South 24 Parganas can still contribute to periodic increases in pollutant levels. The presence of high humidity and fluctuating temperatures may occasionally trap pollutants close to the ground, causing short-term declines in air quality, especially in congested areas. Additionally, while rural and coastal regions experience better air circulation, urban centres like Kolkata may still witness moderate pollution levels due to the dense population and infrastructure. Overall, while the monsoon provides relief, continuous monitoring of AQI is essential for sensitive groups, particularly on days with minimal rainfall.

Description of the Data

Table 1 Description of the data

| August	AQI	PM $_{2.5}$ AVG ($\mu g/m^3$)	PM $_{10}$ AVG ($\mu g/m^3$)	REL HUMI (%)	TEMPERATURE (°C)
Min.	33.57	19.60	33.57	82.72	27.71
1st Qu.	43.88	25.63	43.87	86.82	28.95
Median	48.88	28.26	48.78	89.36	29.84
3rd Qu.	61.17	35.07	61.18	91.46	30.41
Max.	74.00	42.68	73.90	94.50	31.41
Mean	52.09	30.26	52.02	88.95	29.69
St. d.	11.17	6.32	11.19	3.19	1.04

Source: PCB (Station: Bhasa ,2nd Campus of Asutosh College)

The table provides a detailed statistical summary of the air quality and environmental parameters for August in Kolkata and South 24 Parganas, focusing on the Air Quality Index (AQI), concentrations of particulate matter (PM $_{2.5}$ and PM$_{10}$), relative humidity, and temperature. The AQI ranged from a

minimum of 33.57 to a maximum of 74.00, with an average of 52.09, indicating air quality that generally fell within the "Good" to "Moderate" categories. The particulate matter levels, both PM $_{2.5}$ and PM$_{10}$, followed a similar pattern, with PM $_{2.5}$ averaging 30.26 $\mu g/m^3$ and PM$_{10}$ averaging 52.02 $\mu g/m^3$. These values highlight that pollution levels were within acceptable limits for most of the month, though occasional spikes were observed.

Relative humidity was notably high, with a mean value of 88.95%, and ranged from 82.72% to a peak of 94.50%, reflective of the humid monsoon conditions. The temperature remained relatively stable, with a mean of 29.69°C, ranging between 27.71°C and 31.41°C. The statistical spread of the data, as indicated by the standard deviations, was relatively low for temperature and humidity, suggesting consistent weather patterns. However, the higher standard deviations for AQI and particulate matter suggest more variability in air quality, with periodic increases in pollution due to localized factors. Overall, the data paints a picture of moderately clean air and typical monsoon weather conditions.
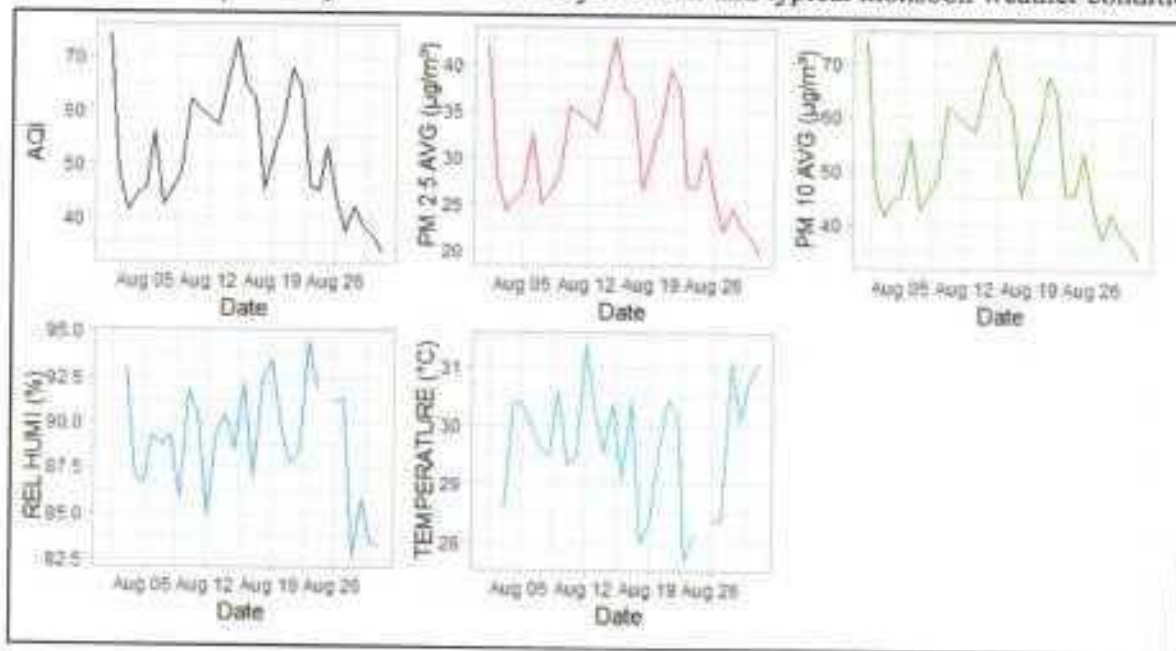
The diagram consists of five-line graphs, each representing different environmental parameters over the course of August. The x-axis in all graphs shows dates, ranging from August 5 to August 26, while the y-axis varies depending on the parameter being measured. Here is a detailed breakdown of each graph:

AQI (Air Quality Index):

This graph (in black) shows the variation of the AQI over time. The AQI fluctuates significantly, peaking around August 6 and 13 with values nearing 70 and gradually decreasing towards the end of the month to around 40. The general trend shows some high AQI days in the middle of the month, followed by a gradual decrease in pollution levels.

PM $_{2.5}$ AVG ($\mu g/m^3$):

The second graph (in red) indicates the average concentration of fine particulate matter (PM $_{2.5}$). The values range from about 20 μg/m³ to almost 50 μg/m³. There are distinct peaks around August 13 and 20, with a noticeable decline toward the end of August, following the trend of the AQI.

PM $_{10}$ AVG (μg/m³):

The third graph (in green) shows the average concentration of larger particulate matter (PM$_{10}$). The values range between 40 and 70 μg/m³. The fluctuations are somewhat similar to the PM $_{2.5}$ graph, with prominent peaks around August 6, 13, and 20, and a downward trend toward the end of the month.

REL HUMI (%) (Relative Humidity):

This graph (in blue) tracks the relative humidity over the same period. The humidity levels remain consistently high throughout August, fluctuating between 82.5% and 94.5%. There is no clear downward trend, as the humidity appears to oscillate throughout the month, with no significant decline toward the end of the period.

TEMPERATURE (°C):

The final graph (in cyan) displays the temperature variations. The temperature remains relatively stable throughout August, fluctuating between 27°C and 31°C. The temperature shows minor peaks and troughs but is relatively steady, with no drastic changes over the period.

The AQI, PM $_{2.5}$, and PM$_{10}$ graphs are closely correlated, showing significant peaks in the middle of the month, suggesting increased pollution levels during those days. Toward the end of the month, there is a noticeable improvement in air quality.

Humidity remains high throughout the month, with minor fluctuations, characteristic of monsoon conditions.

Temperature remains relatively stable, with minor daily variations, consistent with typical weather patterns in August.

The box plots provided offer a clear statistical summary of five environmental variables: AQI, PM $_{2.5}$, PM $_{10}$, relative humidity, and temperature, based on the interquartile range (IQR) and central tendencies for the month of August. Here's a detailed interpretation of each plot:
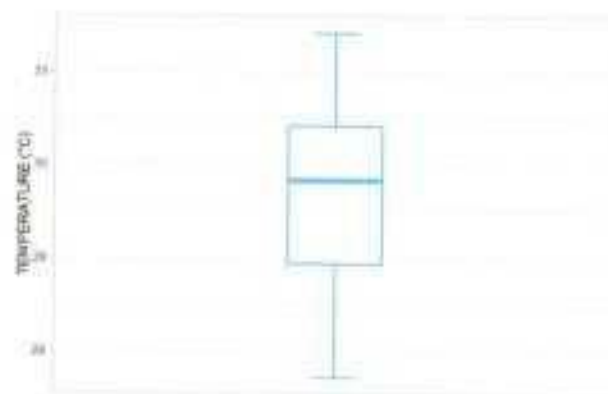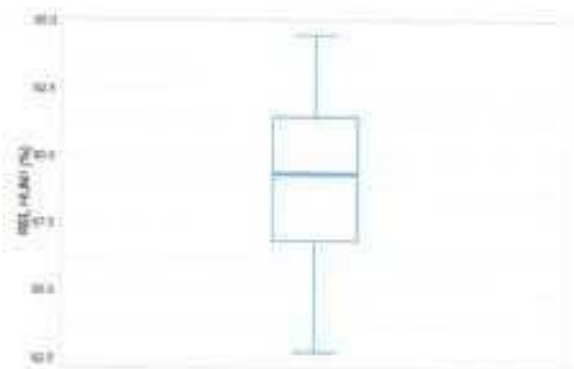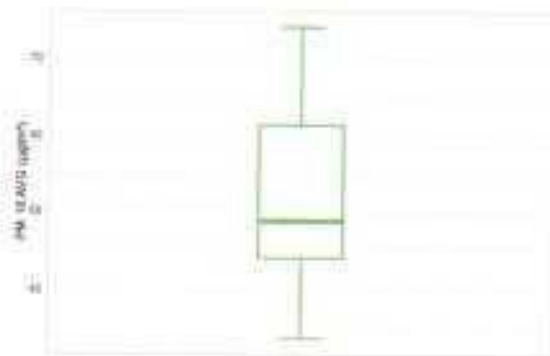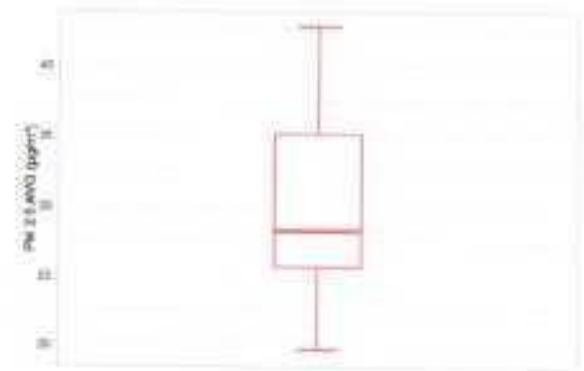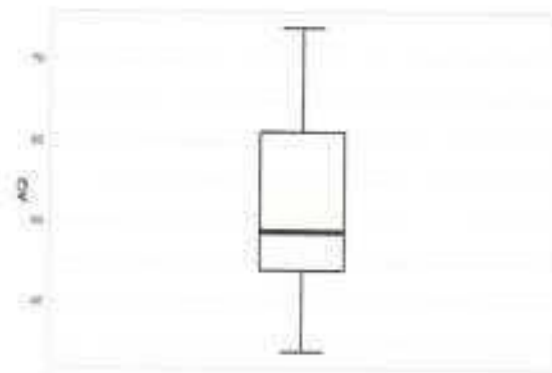
AQI (Air Quality Index):

The box plot for AQI shows a central concentration between 50 and 65, with the median value around 55. The lower whisker extends just below 40, and the upper whisker reaches approximately 70, indicating some variability. Most values lie within the interquartile range, suggesting moderate air quality for the majority of the month.

PM 2.5 AVG (μg/m³):

For PM 2.5, the median value is just below 30 μg/m³, with the interquartile range between 25 and 35 μg/m³. The whiskers extend from about 20 to just above 40 μg/m³, indicating that there were instances where the concentration of fine particulate matter fluctuated. However, the middle 50% of the data lies in the lower to moderate range.

PM 10 AVG (µg/m³):

The PM 10 box plot shows a wider spread, with the median value closer to 50 µg/m³. The interquartile range is between 45 and 60 µg/m². The whiskers show a larger variability, extending from around 40 to nearly 70 µg/m³, suggesting that PM 10 levels experienced more significant fluctuations during August.

RELATIVE HUMIDITY (%):

The relative humidity plot has a median close to 90%, with the interquartile range between 87.5% and 92.5%. The whiskers show that the humidity fluctuated between approximately 82.5% and 94.5%, but the middle 50% of the data stayed consistently high, indicating a humid environment typical of the monsoon season.

TEMPERATURE (°C):

The temperature plot has a median value just below 30°C, with the interquartile range between 29°C and 30.5°C. The whiskers show that temperatures fluctuated between 28°C and 31°C, with minimal variability, which suggests a stable and warm temperature range throughout the month.

AQI, PM 2.5, and PM 10 experienced moderate variability, with occasional increases, particularly in PM 10, indicating some pollution peaks during the month.

Relative humidity remained consistently high, typical for August in a monsoon climate.

Temperature showed little variation, remaining warm but relatively stable, typical for the monsoon season.

The box plots summarize that while pollution levels fluctuated, the environmental conditions in terms of temperature and humidity were stable, with a humid and warm monsoon atmosphere prevailing in August.


AQI

PM 2.5 AVG (µg/m³)
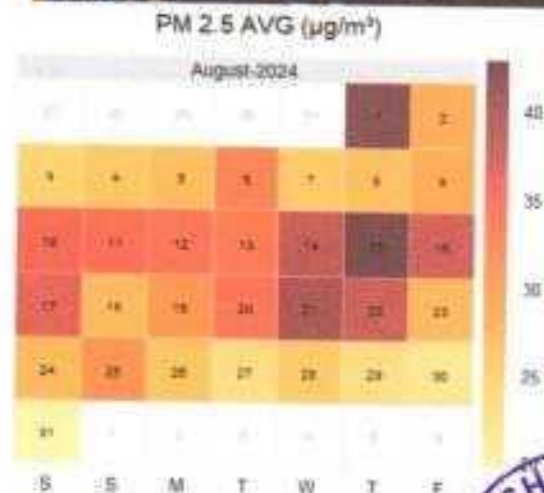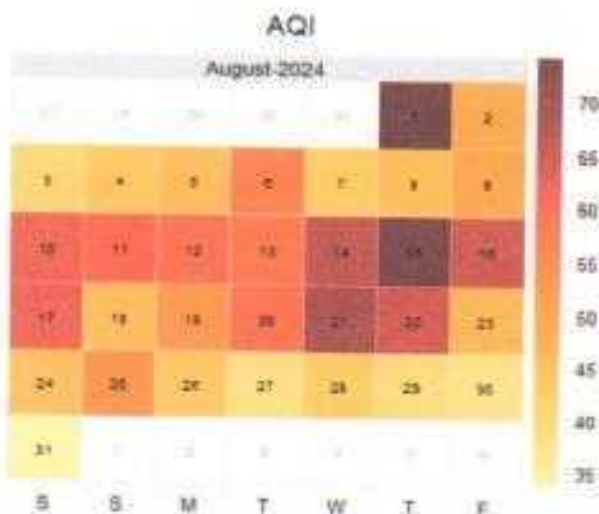
The heat maps provide a detailed visual representation of air quality in terms of AQI (Air Quality Index) and PM $_{2.5}$ concentrations throughout August 2024. The first half of the month shows elevated pollution levels, particularly between August 1st and 8th and again during August 10th to 16th, where AQI values peaked at nearly 70 and PM $_{2.5}$ concentrations reached up to 40 µg/m³. These dark red patches on both maps indicate periods of poor air quality, particularly on August 1st, 2nd, 10th, 11th, 14th, and 16th, suggesting elevated pollution during these days.

As the month progressed, there is a noticeable improvement in air quality, especially from August 24th onward, where both the AQI and PM $_{2.5}$ levels decreased significantly. The color gradient shifts from darker reds and oranges to lighter yellows, representing AQI values in the lower 40s and PM $_{2.5}$ concentrations dropping to around 20-25 µg/m³. This trend indicates that air quality improved in the latter part of the month, likely due to favourable meteorological conditions such as increased rainfall or better dispersion of pollutants.
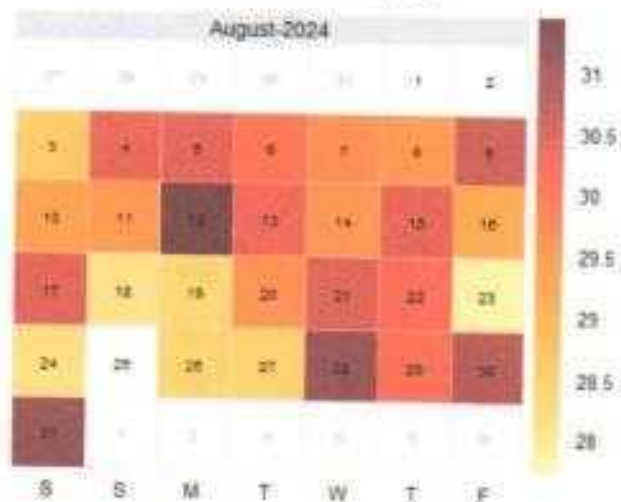

PM 10 AVG (µg/m³)
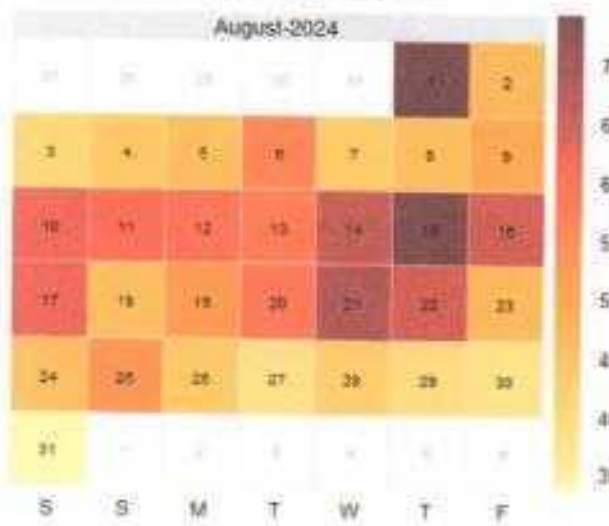
REL HUMI (%)
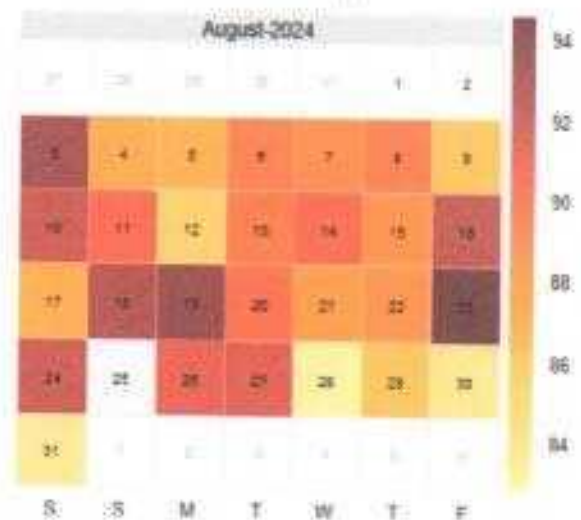
TEMPERATURE (°C)

The highest concentration of PM $_{10}$, above 70 µg/m³, is observed on the 1st and 2nd of August, marked in dark red, indicating poor air quality. The levels then drop to moderate (orange and yellow) values, ranging from 50–65 µg/m³, until mid-August, with some slight rises on the 17th and 23rd.The second half of August shows more fluctuations, with higher levels on the 24th to the 29th, indicating moderate pollution again.

The humidity levels in August mostly range between 88% and 94% (deep red to orange), indicating high humidity, especially on the weekends like the 17th and 18th.There are lower humidity levels on the 24th to 28th, where it drops to around 35%–45% (yellow), signifying drier conditions during that period. Humidity begins to pick up towards the end of the month, reaching back above 90%. The highest temperatures, marked in dark red, occur at the start of the month and again from the 19th to the 23rd, where they reach around 31°C.The temperature remains quite high, predominantly ranging from 29°C to 30.5°C for the majority of the month. There is a slight cooling period between the 12th and the 17th, where temperatures drop to around 28°C (yellow).

Overall, this heatmap suggests that August 2024 was characterized by fluctuating air quality with some high-pollution days, high relative humidity early in the month, and mostly warm to hot temperatures, with a slight decrease around mid-August.
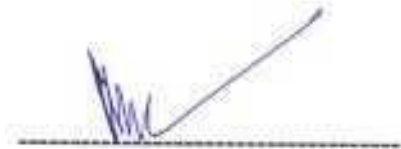
In August South 24 Parganas experienced fluctuating air quality levels, with significant concerns particularly in the first and last weeks of the month. The PM $_{10}$ concentration, a key indicator of particulate matter pollution, reached hazardous levels of over 70 µg/m³ on the 1st and 2nd, signalling poor air quality and potential health hazards for residents. This period likely posed risks for vulnerable groups such as children, the elderly, and individuals with respiratory conditions. As the month progressed, the PM $_{10}$ levels slightly improved but remained in the moderate range (50-65 µg/m³) during the second and third weeks, with intermittent spikes on days like the 10th, 17th, and 23rd, suggesting pollution from sources such as traffic, construction, or industrial activities.

The final week of August saw another rise in PM $_{10}$ levels, with concentrations climbing back to moderate and unhealthy ranges between the 24th and 29th. Overall, the air quality in Kolkata during August 2024 exhibited consistent pollution, indicating that residents were exposed to air quality levels that could exacerbate respiratory issues and decrease overall well-being. These trends highlight the need for ongoing monitoring and air quality control measures in the city to mitigate pollution.

Note: Report produced by Air Quality Monitoring System Committee

Name of the members	Signatures
Dr. Debasmrity Mukherjee (Nodal Officer) Dept. of Geography	Debasmrity Mukherjee 9.9.24
Dr. Bidisha Maitra Sen (Dept. of IFF)	Bidisha Maitra Sen 09/09/24
Dr. Sudip Dasgupta (Dept. of Geography)	Sudip Dasgupta 9/9/24
Sri Debabrata Chanda (Dept. of Geography)	Debabrata Chanda
Dr. Shramana Roy Barman (Dept. of Environmental Science)	Shramana Roy Barman
Dr. Sayanti Kar (Dept. of Environmental Science)	Sayanti Kar 9/9/24.

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