Project: National Air Quality

The increasing level of pollutants in the air has recently deteriorated India's air quality at an alarming rate. The Central Pollution Control Board has appointed you as a Data analyst. You have to perform a detailed analysis of a given dataset.

Dataset

The Central Pollution Control Board has given you a subset of a [dataset](#) to start your analysis with. The dataset contains air quality data and Air Quality Index (AQI) daily across multiple cities in India.

Note: The [dataset](#) used in this project is a part of a dataset that has been made publicly available by the Central Pollution Control Board.

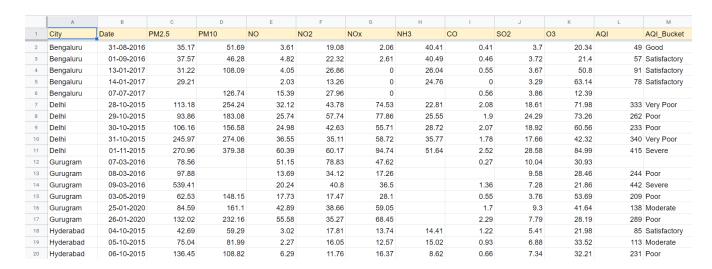|	A	B	C	D	E	F	G	H	I	J	K	L	M
1	City	Date	PM2.5	PM10	NO	NO2	NOx	NH3	CO	SO2	O3	AQI	AQI_Bucket
2	Bengaluru	31-08-2016	35.17	51.69	3.61	19.08	2.06	40.41	0.41	3.7	20.34	49	Good
3	Bengaluru	01-09-2016	37.57	46.28	4.82	22.32	2.61	40.49	0.46	3.72	21.4	57	Satisfactory
4	Bengaluru	13-01-2017	31.22	108.09	4.05	26.86	0	26.04	0.55	3.67	50.8	91	Satisfactory
5	Bengaluru	14-01-2017	29.21		2.03	13.26	0	24.76	0	3.29	63.14	78	Satisfactory
6	Bengaluru	07-07-2017		126.74	15.39	27.96	0		0.56	3.86	12.39		
7	Delhi	28-10-2015	113.18	254.24	32.12	43.78	74.53	22.81	2.08	18.61	71.98	333	Very Poor
8	Delhi	29-10-2015	93.86	183.08	25.74	57.74	77.86	25.55	1.9	24.29	73.26	262	Poor
9	Delhi	30-10-2015	106.16	156.58	24.98	42.63	55.71	28.72	2.07	18.92	60.56	233	Poor
10	Delhi	31-10-2015	245.97	274.06	36.55	35.11	58.72	35.77	1.78	17.66	42.32	340	Very Poor
11	Delhi	01-11-2015	270.96	379.38	60.39	60.17	94.74	51.64	2.52	28.58	84.99	415	Severe
12	Gurugram	07-03-2016	78.56		51.15	78.83	47.62		0.27	10.04	30.93		
13	Gurugram	08-03-2016	97.88		13.69	34.12	17.26			9.58	28.46	244	Poor
14	Gurugram	09-03-2016	539.41		20.24	40.8	36.5		1.36	7.28	21.86	442	Severe
15	Gurugram	03-05-2019	62.53	148.15	17.73	17.47	28.1		0.55	3.76	53.69	209	Poor
16	Gurugram	25-01-2020	84.59	161.1	42.89	38.66	59.05		1.7	9.3	41.64	138	Moderate
17	Gurugram	26-01-2020	132.02	232.16	55.58	35.27	68.45		2.29	7.79	28.19	289	Poor
18	Hyderabad	04-10-2015	42.69	59.29	3.02	17.81	13.74	14.41	1.22	5.41	21.98	85	Satisfactory
19	Hyderabad	05-10-2015	75.04	81.99	2.27	16.05	12.57	15.02	0.93	6.88	33.52	113	Moderate
20	Hyderabad	06-10-2015	136.45	108.82	6.29	11.76	16.37	8.62	0.66	7.34	32.21	231	Poor

Figure 1: Snapshot of the given National Air Quality Dataset

Subject matter expert guidance

As a Data Analyst, you may need help understanding the Air Quality domain. Discussing with the **subject matter experts**, you have gained knowledge and noted the following points.

- The give dataset contains **City names, Date, PM2.5, PM10, NO, NO2, NOx, NH3, CO, SO2, O3, AQI Index and AQI Bucket**. The 'Date' column describes the sampling date. Other parameters give their individual concentration of air.

- Nitrogen Oxides **(NO, NO2, NOx)**, Ammonia **(NH3)**, Carbon Monoxide **(CO)**, Sulphur Dioxide **(SO2)**, and Ozone **(O3)** are different types of Pollutants in ambient air.

- **PM:** PM stands for Particulate matter. PM is a mix of solids and liquids, including carbon, complex organic chemicals, sulphates, nitrates, mineral dust, and water suspended in the air. Particulate matter includes microscopic matter suspended in air or water. Airborne particles are called aerosols.

- **PM10** includes particles less than 10 μm in diameter and **PM2.5** less than 2.5 μm.

- **AQI:** To communicate to the public how polluted the air currently is, government agencies use the air quality index (AQI). There are six AQI categories: Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe (see the "AQI_Bucket" column in Fig.1).

AQI	Associated Health Impacts
Good (0–50)	Minimal Impact
Satisfactory (51–100)	May cause minor breathing discomfort to sensitive people.
Moderately polluted (101–200)	May cause breathing discomfort to people with lung disease such as asthma, and discomfort to people with heart disease, children and older adults.
Poor (201–300)	May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease
Very Poor (301–400)	May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases.
Severe (401-500)	May cause respiratory impact even on healthy people, and serious health impacts on people with lung/heart disease. The health impacts may be experienced even during light physical activity.

Figure 2: Air quality index (AQI), its categories and associated health impacts

Now you have all the required knowledge to start your Analysis. Answer the questions in the following section based on the given dataset and this document.

References

- https://aqicn.org/map/india/
- https://cpcb.nic.in/
- https://pib.gov.in/newsite/printrelease.aspx?relid=110654
- https://en.wikipedia.org/wiki/Air_quality_index
- https://en.wikipedia.org/wiki/Air_pollution_in_India

Central Pollution Control Board also has a real-time monitoring app. You can explore more here: app.cpcbccr.com/AQI_India/