Air Quality trends in San Jose California

Data Brief
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Chandler Kilpatrick

Introduction

Air quality is a major factor in determining human health. Exposure to poor air quality or air with high levels of airborne pollution, can directly lead to serious health concerns. These health concerns result in increased mortality from lung cancer, acute respiratory disease, stroke, heart disease, and chronic obstructive pulmonary disease[3]. Due to the importance of air quality in determining public health, the Environmental Protection Agency (EPA) measures the air quality of over 500 towns and cities throughout the U.S. on a daily basis. Based on the data collected by the EPA, this data brief will focus on the air quality trends in San Jose, California in 2020.

How is air quality measured?

In order to measure air quality levels with both accuracy and precision, the EPA has developed a system that takes scientific data and presents it in a way that is easily understood. This method is called the Air Quality Index (AQI) which has values that range from 0 to 500, it is then broken into six groups. Moving from safest to most dangerous, these groups are; Good, Moderate, Unhealthy for sensitive groups, Unhealthy, Very Unhealthy, and Hazardous. This scale is meant to indicate how clean or polluted the air is in a way that everyday people can understand. The AQI measures four pollutants that impact human health. These include ground-level Ozone , nitrogen dioxide (NO_2), $PM_{2.5}$, and PM_{10}. As can be seen in Figure 1, the pollutants do not impact air quality at a balanced rate. Instead, we can observe that ground-level ozone and $PM_{2.5}$ are recorded to impact daily air quality at a significantly higher rate. Ground-level Ozone and $PM_{2.5}$, can be caused by several factors, however, two of the most common factors are the combustion of fossil fuels (gasoline, oil, diesel) and smoke from wildfires.

Figure 1: Number of days that each pollutant was the main contributor to air pollution and impacted the AQI.

Main Pollutants in San Jose

In 2020, how many days was each pollutant measured to be the main pollutant?

Pollutant	Number of days as main pollutant
NO2	4
Ozone	190
PM10	4
PM2.5	168

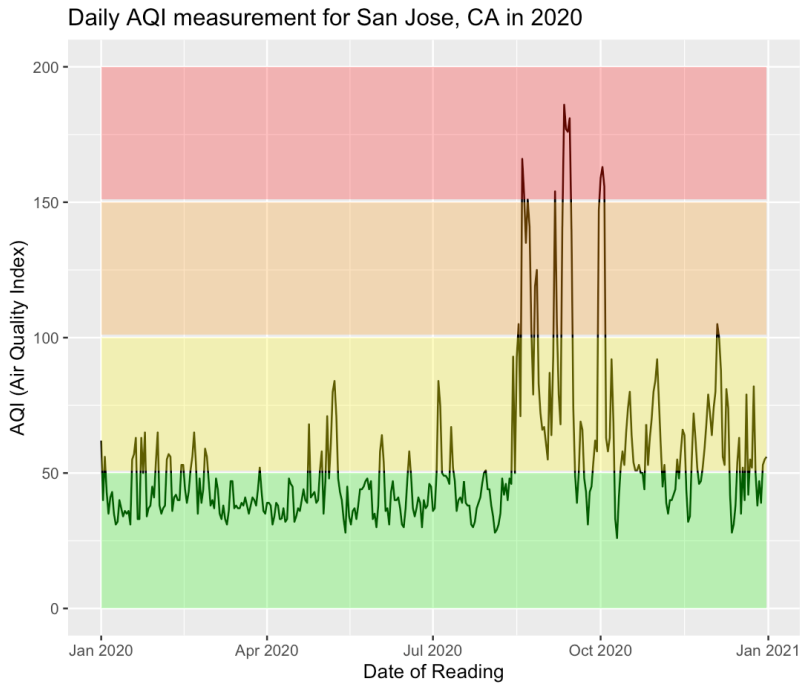
Table: Created by Chandler Kilpatrick • Source: EPA • Created with Datawrapper

What are the air quality trends in San Jose?

As the data indicates, AQI fluctuates throughout the year. Figure 2 shows the daily AQI levels in San Jose, CA in 2020. Figure 2 is broken into four sections from top to bottom, each of these sections is displayed in a different color and represents a different air quality category. Green (the bottom) indicates what the EPA considers to be “safe”. Yellow represents the “moderate”, while orange specifies “unhealthy for sensitive groups”. Finally, the red (top) section designates what the EPA classifies as “unhealthy” for all people. When considering the numerous factors that affect air quality such as different pollutants and weather conditions, it begins to make sense why air quality is constantly changing. The data tells us that although it is continuously shifting, the average AQI for San Jose was 54.04 in 2020. The AQI sharply increases in August and remains at that level throughout September. On September 10, the AQI reached its highest recorded level for 2020 at a value of 186. When exposed to air quality of that level for 24 hours, it is equivalent to smoking 6 cigarettes[1]. After the spike in August and

September where the AQI exceeded 3 times the 2020 average, air quality proceeded to improve.

Figure 2 shows the 2020 AQI values in San Jose, CA with the green shaded regions indicating AQI levels that the EPA considers safe.



Graph created by Chandler Kilpatrick Source: EPA

What is causing these trends?

As previously mentioned, air quality can be influenced by a multitude of factors. On any given day in 2020, there is a 97.8% chance that ground-level Ozone or $PM_{2.5}$ is the main source of air pollution in San Jose. The pollutants are reported to be the main air pollutant at different times throughout the year. The fact that there is a sharp increase in AQI levels in the months of August, September, and October is expected when looking at the source of the $PM_{2.5}$. Particulate Matter (PM) $_{2.5}$, which is the main source of pollutant for 46% of days in 2020, is caused mainly by the smoke of wildfires. According to the State of California, they were fighting 367 known wildfires in August alone[2]. Wildfire season occurs roughly between June and November, with August and

September being the months with the highest number of wildfires. The wildfire season can be seen in the data when we look at the time of year that each pollutant is most potent. Of the 168 days that recorded having $PM_{2.5}$ as the main air pollutant, a vast majority of these days fall within the traditional fire season.

The data makes it clear that Ozone is the most common pollutant in the non-fire season months. A large percentage of the 190 days with Ozone as the main air pollutant occur from February to June. Although Ozone isn't directly released into the air, the main cause of Ozone creation is from the combustion of fossil fuels.

Conclusion

According to the World Health Organization (WHO), over 99% of all humans are exposed to air quality levels that exceed WHO guideline limits[3]. As a direct result of ambient (outdoor) air quality, 4.2 million deaths occur each year. These deaths can be seen in San Jose as well. Nearly 2,000 deaths occur every year as a result of air pollution in the Bay Area. Due to this fact, San Jose has begun to take steps to reduce the sources of air pollution by reducing the carbon footprint of the city and regulating CO2 emissions.

Sources

1: Webb, J. (2020, September 18). *How many cigarettes did we smoke on the West Coast This Week?* Medium. Retrieved October 20, 2021, from https://medium.com/@jasminedevv/i-made-an-aqi-to-cigarettes-calculator-f407177c85c2.

2: California Department of Forestry and Fire Protection (CAL FIRE). (n.d.). *2020 incident archive*. Cal Fire Department of Forestry and Fire Protection. Retrieved October 20, 2021, from https://www.fire.ca.gov/incidents/2020/.

3: World Health Organization. (n.d.). *Air Pollution*. World Health Organization. Retrieved October 20, 2021, from https://www.who.int/health-topics/air-pollution#tab=tab_1.