

Understanding How the Air Quality Index Works



Air quality levels have received a lot of attention in recent years.

In the wake of COVID-19 lockdowns, many places reported a marked increase in air quality. Northern India captured the world's attention when it was reported that the Himalayan mountain range was visible for the first time in decades.

On the flipside, later that summer, wildfires swept over the Pacific Northwest, British Columbia and California, blanketing entire regions with a thick shroud of smoke that spanned hundreds of miles.

How is air quality measured, and what goes into the health scores we see'

Measuring the Air Quality Index

When we see that air quality is 'good' or 'unhealthy', those public health categories are derived from the Air Quality Index (AQI).

In North America, the AQI is calculated using five major air pollutants:

- Ground-level ozone
- Carbon monoxide
- Sulfur dioxide

- Particle pollution, also known as particulate matter
- Nitrogen dioxide

Some countries have a slightly different way of calculating their scores. For example, India also measures levels of ammonia and lead in the air.

To make these readings more accessible, the AQI has a scoring system that runs from 0 to 500, using data collected from air monitoring stations in cities around the world. Scores below 50 are considered good, with very little impact to human health. The higher the score gets, the worse the air quality is.

To make communicating potential health risks to the public even easier, ranges of scores have been organized into descriptive categories.

AQI Score Range	AQI Category	PM2.5 ('g/m')	Health Risks
0-50	Good	0-12.0	Air quality is satisfactory and poses little or no risk.
51-100	Moderate	12.1-35.4	Sensitive individuals should avoid outdoor activity.
101-150	Unhealthy	35.5-55.4	General public and sensitive individuals in particular are at risk to experience irritation and respiratory problems.
151-200	Unhealthy	55.5-150.4	Increased likelihood of adverse effects and aggravation to the heart and lungs among general public.

AQI Score Range	AQI Category	PM2.5 ('g/m')	Health Risks
201-300	Very Unhealthy	150.5-250.4	General public will be noticeably affected. Sensitive groups should restrict outdoor activities.
301+	Hazardous	250.5+	General public is at high risk to experience strong irritations and adverse health effects. Everyone should avoid outdoor activities.

Particulate Matter

While all the forms of atmospheric pollution are a cause for concern, it's the smaller 2.5'm particles that get the most attention. For one, we can see visible evidence in the form of haze and smoke when PM2.5 levels increase. As well, these fine particles have a much easier time entering our bodies via breathing.

There are a number of factors that can increase the concentration of a region's particulate matter. Some common examples include:

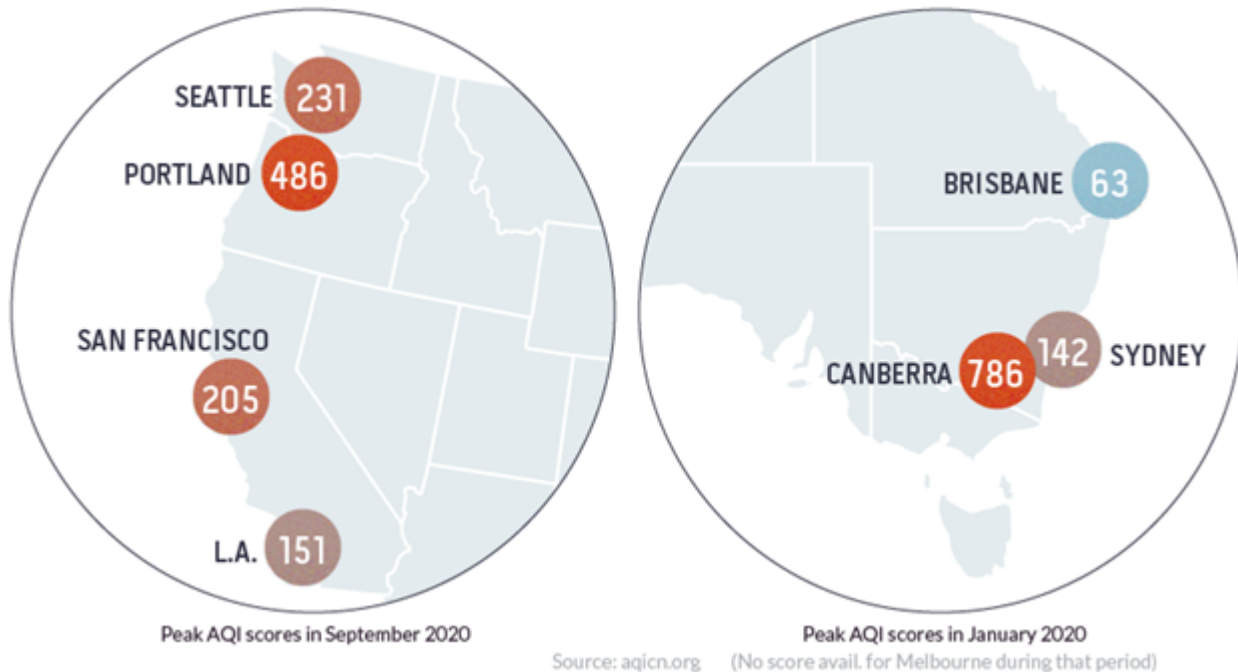
- Coal-fired power stations
- Cooking stoves (Many people around the world burn organic material for cooking and heating)
- Smoke from wildfires and slash-and-burn land clearing

Wildfires and Air Quality

Air quality scores can fluctuate a lot from season to season. For example, regions that are reliant on coal for power generation tend to see AQI score spikes during peak periods.

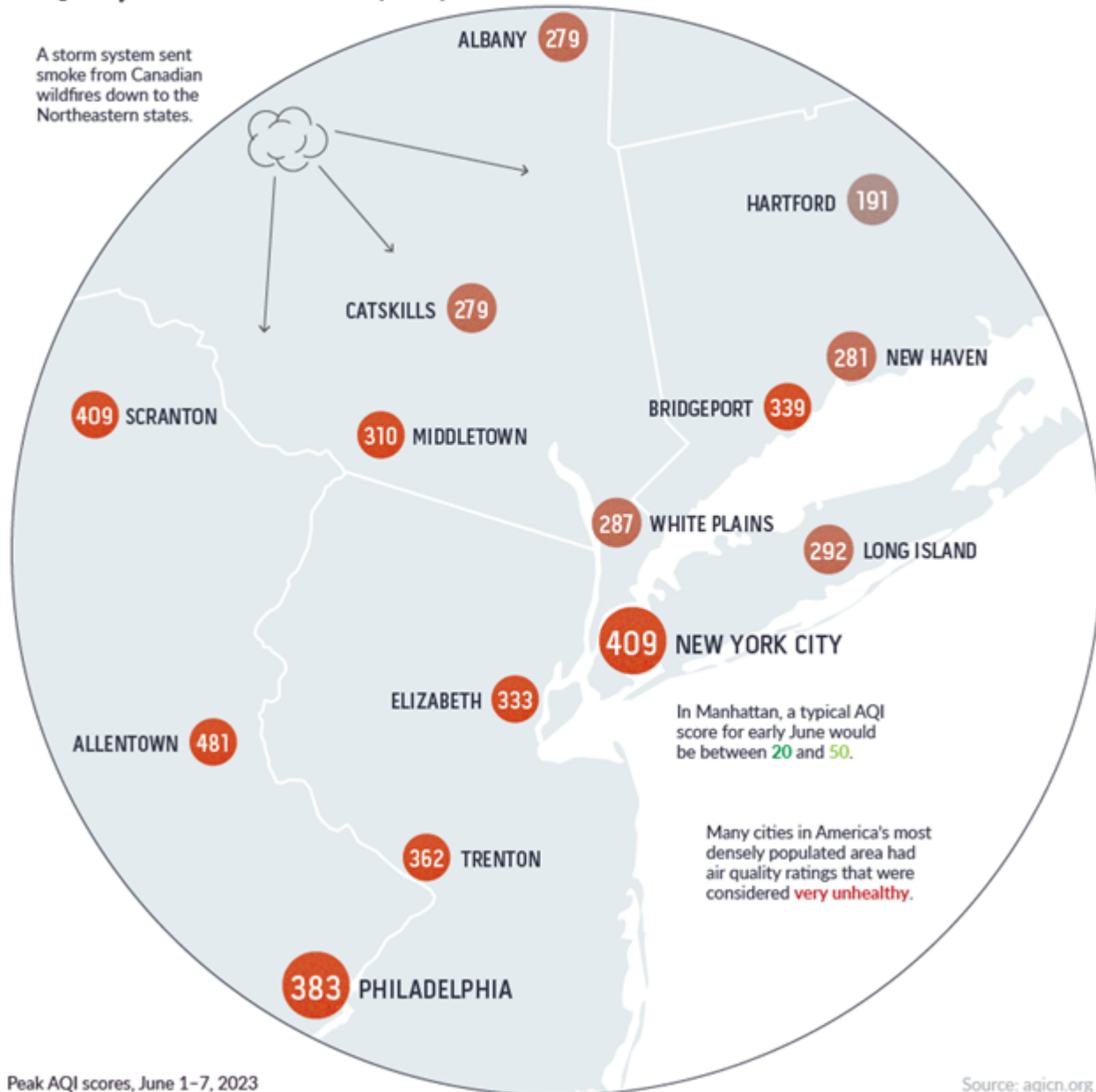
One of the biggest fluctuations occurs during wildfire season, when places that typically have scores in the 'good' category can see scores reach unsafe levels. In 2020, Eastern Australia and the West Coast of the U.S. both saw massive drops in air quality during their respective wildfire seasons.

Air Quality in Regions Affected by Wildfires



In June 2023, a storm system sent a thick blanket of smoke from Canadian wildfires down to Northeastern states, blocking out the sun and turning the sky over Manhattan into a dull shade of orange.

Air Quality in Northeastern U.S. (2023)



Luckily, while these types of fluctuations are extreme, they are also temporary.



The air we breathe is made up of the gases that form Earth's atmosphere.

Primarily nitrogen and oxygen.

Composition of Earth's atmosphere



Of course, other particles are present in the atmosphere as well.

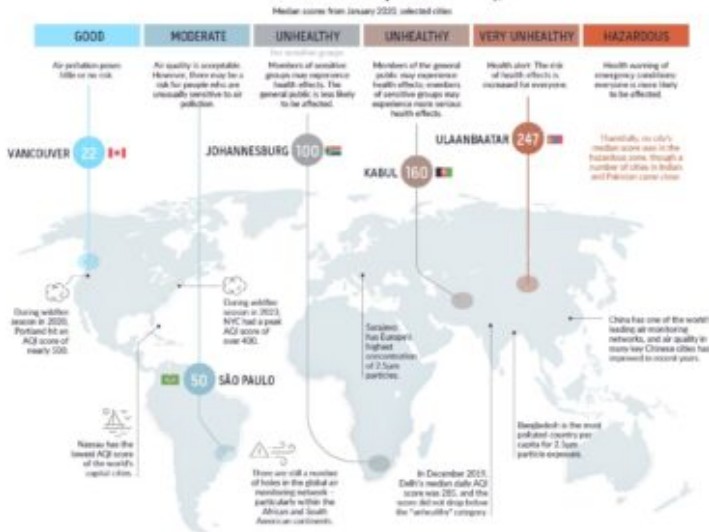


The concentration of these particles, along with other pollutants such as ozone and sulfur dioxide, is what dictates air quality.



...and segments of that scale are divided into six categories related to health impact.

Here are some real-world examples from January, 2020.



Source: IQAir, 2020

Correction: Graphics and article updated to include nitrogen dioxide.

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