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Orange Sky, Red Alert:

A Review of Air Quality Emergencies in NYC

July 2023

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Introduction/Foreword

This June, storms from Nova Scotia pushed smoke from the raging wildfires in Canada south toward New York City, turning the historic skyline of New York City into something out of a post-apocalyptic film. The event earned the City of New York a spot on the list of cities with the worst air quality in the world. Unfamiliar with the effects of wildfire smoke, New York City was wholly unprepared to respond to this crisis, leaving city officials scrambling.

Throughout the air quality crisis, we utilized our website, a blog post with Air Quality safety resources, social media platforms, and our text bot service to convey emergency information about dangerous air quality levels to the public.

In the weeks that followed, my office started corresponding and meeting with officials from the following West Coast municipalities: San Francisco, Los Angeles, Santa Barbara, and San Diego in California and Seattle, Washington. These West Coast American cities have grappled with wildfires and the impact on their air quality. The government officials we interacted with were very generous with their time and provided us with plenty of information. We gathered the best practices and resources on how New York City can best respond to this crisis when it arises in the future. As we've seen over these past few weeks, with a mere shift of the wind, wildfire smoke has the ability to impact New Yorkers' daily life, and we must be prepared to meet those instances as they arise.

It is important to note that for decades, scientists have warned about the impending effects of climate change. From record-breaking temperatures across the globe to melting ice caps and rising sea levels, the signs are clear: climate change is rapidly reshaping natural hazards at an alarming rate and uncontrolled wildfires are one of the consequences.

While New York City has been pounded by its fair share of Nor'easters, during the past decade, it has felt the impact of climate change with storms such as Hurricane Sandy (2012) which led to a days-long blackout that impacted hundreds of thousands of New Yorkers living and working south of Manhattan's 39th Street. More recently, Hurricane Ida (2021) left 150,000 homes without power and further resulted in 13 known deaths, many of whom were trapped in basement apartments in Queens. In addition to soaring heat during the summer, New York City has experienced freezing arctic blasts during the winter including a Bomb Cyclone (February 2018) and Polar Vortex (2023).

The City of New York can and must do better to address unprecedented climate change consequences. In the wake of Hurricane Sandy, we saw New York City work on a variety of coastal resiliency projects that are currently being implemented throughout the five boroughs. More importantly, we've seen the City of New York step up and double down on its efforts to address winter storms after the lackluster response to the 2010 snowstorm that left some city streets unplowed for days, creating medical emergencies. Likewise, New York City must own up to its disappointing response to the air quality crisis

created by the Canadian wildfires. Like our West Coast sister cities, New York City should implement a citywide response system that is automatically triggered when the air quality hits dangerous levels.

This paper, **Orange Sky, Red Alert: A Review of Air Quality Emergencies in New York City**, details recommendations our city should implement moving forward to avoid health impacts on our most vulnerable New Yorkers and spikes in emergency room visits.

In advocacy,

Jumaane Williams

Background

Since the start of Canadian wildfire season in April, hundreds of wildfires have spread across Canada, with almost 500 fires burning across nearly every province. Half of these fires were considered to be out of control, as of June 7, 2023.[1] A record 30,000 square miles—an area almost the size of South Carolina—have burned, and Quebec, the province directly north of New York and New England, has had the most active wildfires in the country.[2]

With tens of thousands of Canadians forced to evacuate their homes, Canada has invoked "national preparedness level 5," which indicates full commitment of national resources to fight the fires.[3] In addition to the full weight of national resources, other countries including the U.S., Australia, New Zealand, France, and South Africa, have lent resources and support personnel to combat the flames. These fires are likely to continue throughout the country's wildfire season (that runs from April to October), with much of the region "abnormally dry" or under a "moderate drought."[4]

In the days leading up to the first week of June, winds from a storm in Nova Scotia pushed smoke from these wildfires south along jet streams to parts of the northeastern and central U.S., as well as throughout the Great Lakes region—including New York City and New York State. The smoke that blanketed the city was the result of a stalled weather pattern known by meteorologists as an "Omega Block:" a big ridge of high pressure over the center of North America with flanking low pressure areas over the East and West Coasts.[5]

While shifting wind patterns pushed the orange haze out of the city in just a few days, the ongoing fires and changing weather patterns mean that hazardous air quality will persist at least throughout the summer. Furthermore, climate change guarantees that we will see more frequent and intense wildfires, making a comprehensive plan to respond to fires and protect people from their smoke an urgent task for municipal, state, and federal leaders.

1 "Where are the Canadian wildfires, how did they start and could more smoke be on the way?" NBC Chicago. https://www.nbcchicago.com/weather/where-are-the-canadian-wildfires-how-did-they-start-and-could-more-smoke-be-on-the-way/3176687/

2 Ogwude, Haadiza. "Why are there wildfires in Canada? When did they start? Everything to know." The Columbus Dispatch. https://www.dispatch.com/story/news/fire/2023/06/10/what-started-canada-wildfires-when-did-they-start-everything-know/70309095007/

3 Nature Resources Canada. "National Wildland Fire Situation Report: June 7". https://cwfis.cfs.nrcan.gc.ca/report

4 "Where are the Canadian wildfires, how did they start and could more smoke be on the way?" NBC Chicago. https://www.nbcchicago.com/weather/where-are-the-canadian-wildfires-how-did-they-start-and-could-more-smoke-be-on-the-way/3176687/

5 Braate, Eric. "Smoke map: When will smoke clear in NYC and why is it worse in the afternoon?" NBC New York. https://www.nbcnewyork.com/news/local/smoke-map-when-will-smoke-clear-in-nyc-and-why-is-it-worse-in-the-afternoon/4405882/

Explaining AQI

Since 1976, the United States Environmental Protection Agency (EPA) has issued a nationally uniform air quality index to provide daily reports on air quality from state to state, as required by the Clean Air Act, 42 U.S.C. §7401 et seq. (1970). This air quality index, or AQI, has been updated several times to reflect the latest health-based air quality standards. As depicted, AQI utilizes a range of numbers corresponding with a color and is divided into six categories, with each category corresponding to a different level of health concern. The higher the AQI values are, the more hazardous of a health risk the air will pose to everyone.[6]

AQI Basics for Ozone and Particle Pollution

Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

One designation in the AQI chart that may need further clarification is “sensitive groups.” According to the EPA, sensitive groups include people with heart and lung disease, older adults, children, people with diabetes, and people of lower socio-economic status (SES) for particle pollution.[7]

The Environmental Protection Agency established an AQI for five major air pollutants regulated by the Clean Air Act.[8] The AQI for each pollutant is generally based on the health-based national ambient air quality standard for that pollutant and the scientific information that supports that standard.

1. ground-level ozone
2. particle pollution (also known as particulate matter, including PM2.5 and PM10)
3. carbon monoxide
4. sulfur dioxide
5. nitrogen dioxide

6 “What Is the AQI?” Air Now. https://www.airnow.gov/education/students/what-is-the-aqi/
7 United States Environmental Protection Agency. “Patient Exposure and the Air Quality Index”. https://www.epa.gov/pmcourse/patient-exposure-and-air-quality-index#what
8 “Air Quality Index (AQI) Basics”. AirNow. https://www.airnow.gov/aqi/aqi-basics/

Particulate matter can vary widely in size, shape, and chemical composition. Composed of solids and aerosols, particulate matter is often defined by its diameter for air quality regulatory purposes. Those with a diameter less than 10 microns or less (PM10) are easily inhaled and can cause adverse health effects while finer particulate matter are defined as having a diameter of 2.5 microns or less (PM2.5).[9]

Particle pollution represents a main component of wildfire smoke, which may also contain a mixture of gaseous pollutants, hazardous air pollutants (also commonly known as polycyclic aromatic hydrocarbons [PAHs]), and water vapor. Because of the small size of these particles, pollutants can easily enter the home, making 'clean air rooms' or 'clean air centers' a vital part of best practices when it comes to addressing poor air quality.

Macroscale Impact

Metropolitan areas with a population of more than 350,000 such as the New York Tri-State area are required to report the daily AQI. On Wednesday, June 7, 2023, the measurements of the daily-average PM2.5 in New York City reached a record breaking 117 µg m-3 (micrograms/cubic meter of air). This measurement is three times higher than the standard set by the EPA National Ambient Air Quality Standards (NAAQS) table (35 µg m-3), and over eight times higher than the standard set by the World Health Organisation (15 µg m-3). This same day, AQI levels reached a record 484, falling just short of the 500 cutoff. This is incredibly troubling when you look at the hospitalization data from that week. Between June 6 and June 7, the hospitalization rate in New York City jumped 81% with 175 asthma-related ER visits on June 6 and 317 ER visits on June 7.[10] For June 8 and June 9, ER visits remained in the 200s.[11]

Based on the hospitalization rates for these specific days, as well as spikes seen on the West Coast after wildfire smoke, it is critical that New Yorkers protect themselves and understand the severity of impact from these wildfires and associated air quality issues. Smoke can have an almost immediate effect on people's health, causing asthma, acute and chronic bronchitis, kidney problems, and poor mental health. Particulate matter can get deep into the lungs, damaging cells known as alveolar macrophages, an important line of immune defense in the lungs, and even entering the bloodstream. Long-term, it can increase the risk of respiratory disease, heart disease, lung damage, and even result in premature death. These concerning health impacts have been reported primarily in infants, children, and older adults, whose immune systems are still developing or otherwise weakened from pre-existing conditions.[12] The longer-term effects are less clear,

9 "Inhalable Particulate Matter and Health (PM2.5 and PM10)" California Air Resources Board. https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health

10 "NYC hospitals saw twice as many asthma ER visits as bad air blanketed city" Gothamist. https://gothamist.com/news/nyc-hospitals-saw-twice-as-many-asthma-er-visits-as-bad-air-blanketed-city

11 Ibid.

12 "Inhalable Particulate Matter and Health (PM2.5 and PM10)" California Air Resources Board. https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health

but early research suggests that severe exposure to wildfire smoke can cause measurable reductions in lung function that last for at least a couple of years. It has also been linked to premature death, particularly in people who have chronic heart or lung diseases.[13]

Administration's Response

The COVID-19 pandemic exposed critical gaps in our public messaging system, gaps that once again became apparent when the time came to communicate with the public about the air quality. Many New Yorkers only became aware that something was wrong when the air turned orange; the failure to communicate the coming smoke was not only a failure at the city level but at all levels of government.

On June 2, 2023, the New York State Department of Environmental Conservation (DEC) and the Department of Health (DOH) issued a joint statement which included the first air quality advisory for Long Island, New York City Metro, and Western New York.[14] The advisory, in effect throughout the day from 11 AM to 11 PM, cited 'ozone' as the primary pollutant of concern. Notify NYC also posted this notice on their social media but as of March 4, 2022, we know that only 1 million individuals in New York City were signed up to receive notifications from the official emergency communications program.[15] Furthermore, alerts from Notify NYC, as observed by our team, failed to provide necessary information about the advisory, the different categories that make up the Air Quality Index, and how each category affects the population. Additionally, while Notify NYC is available in over 14 different languages including American Sign Language (ASL) video format, we know there is a significant digital literacy gap in New York City, a divide that predominantly impacts our city's aging population and immigrant communities. As a result, many New Yorkers were still unaware of what was happening even as AQI levels spiked to record high levels.

On June 5, DEC issued a second advisory, first extending through June 6 until 11:59 PM and then issuing a following advisory on June 6 to extend through June 7 until 11:59 PM. These advisories, citing 'fine particulate matter' as a concern, would extend well into the weekend for the New York City metropolitan area. But on the evening of June 6, before the Mayor had issued an official statement on the poor air quality, the New York Yankees played against the Chicago White Sox at Yankee Stadium to an audience of 38,000 fans. The air quality at first pitch was higher than 150, considered 'unhealthy' to everyone. Shortly after the game ended, the AQI in the Bronx was higher than 200.[16] The game on

13 Ibid.

14 Air Quality Health Advisory Issued for Long Island, New York City Metro, and Western New York In Effect for Friday, June 2, 2023 https://www.health.ny.gov/press/releases/2023/2023-06-02_air_quality_health_advisory.htm

15 NYC EMERGENCY MANAGEMENT'S NOTIFY NYC PROGRAM SURPASSES 1 MILLION SUBSCRIBERS. nyc.gov/site/em/about/press-releases/20220304_pr-nycem-notify-nyc-surpasses-1-million-subscribers.page#:~:text=Notify%20NYC%20is%20the%20City's,Yorkers%20are%20now%20getting%20notified

16 Hoffman; Kepner. "Yankees Game Postponed Because of 'Hazardous' Air Quality." New York Times. https://www.nytimes.com/2023/06/07/sports/baseball/yankees-game-postponed.html

June 7 wouldn't be canceled until 4:30 PM EST that same day when the AQI in the Bronx registered at 413. This is just one high-profile example of how the city failed to proactively communicate the public health crisis that was unfolding before our very eyes.

Mayor Adams first issued a statement shortly after the AQI hit 218 at 10 PM on the night of June 6. The following morning at 10 AM, he held a joint press conference with Commissioner Iscol from NYC Emergency Management and Commissioner Vasan from the New York City Department of Health and Mental Hygiene, where he urged vulnerable New Yorkers to stay indoors and wear high-quality masks when venturing outside. Later that afternoon, the New York City Department of Parks & Recreation issued a statement canceling and postponing all outdoor events. Schools remained open throughout June 7 with outside events canceled or postponed. It wouldn't be until June 9 that the transition to remote learning would be made as June 8 was previously scheduled as a non-attendance day for students, in observance of Chancellor's Day, with teachers and other school professionals working remotely throughout the day. While it is true that this crisis was an unprecedented event in our city, AQI levels should not have needed to hit 150 for this administration to recognize the threat posed to New Yorkers. It is no longer enough to be prepared for what we've encountered thus far, we must anticipate and prepare for the unforeseen in order to keep our city safe and healthy.

Recommendations

1. **Fund a scientific report** studying outdoor air quality in relation to urban infrastructure, similar to Miao et. al study – *'Assessing outdoor air quality vertically in an urban street canyon and its response to microclimatic factors.'*
2. **Establish a robust notification system**, based on existing notification models like the AMBER alert for automatic push notifications via television, radio, phone, etc.
3. **NYC Emergency Management must update Notify NYC alerts** to include additional information detailing AQI scale and how each category impacts the population. These alerts should also mention preventative measures that people should take in the event of poor air quality.
4. **The City of New York should establish an annual Air Quality Day of Action**, a public awareness event dedicated to providing the public with information and resources on how to prepare for poor air quality.
5. **The City of New York must have information available to the public on how to create clean air rooms in their homes.**
6. **Creating a network of air monitoring systems**, a "citizen's network," through the use of Purple Air Monitors to track air quality throughout the city at different elevations and in different neighborhoods.
7. **The City of New York must identify and establish 'clean air centers,'** public buildings designated to provide improved air quality to the public during a wildfire smoke event.
8. **City agencies should provide municipal employees and students with the appropriate KN95 or N95 masks in the event of wildfire smoke**; by request if AQI is above '100', mandatory if AQI is over 150.
9. **Established 'clean air centers' should be equipped and prepared** to provide members of the public with the appropriate KN95 or N95 masks.
10. **New York State should create a regulatory air quality board and/or agency**, similar to the California Air Resource Board (CARB). In lieu of or until a regulatory agency can be established, air cleaning devices purchased by the City of New York should be certified by the California Air Resource Board (CARB), the strictest regulatory air quality agency in the nation.
11. **NYC Emergency Management must update the Hazard Mitigation Plan** to reflect the impact of wildfire smoke in NYC and best practices for managing risks.
12. In addition to updating the Hazard Mitigation Plan, **NYC Emergency Management should also create an emergency operations plan** and/or document detailing step-by-step procedures and relevant agency contacts in the event of wildfire smoke.

13. **NYC Emergency Management should establish an 'Air Quality Information Officer' position**, whose primary responsibilities would be tracking air quality in New York City and being the primary point of contact for all air quality-related issues and correspondence.

14. In collaboration with city and state officials, the **New York Committee for Occupational Safety and Health (NYCOSH) must update existing protections for workers** and create guidelines for employers and employees following the issuing of Air Quality Health Advisories

    a. If operations are suspended due to poor air quality, construction workers and other outdoors municipal workers should be covered by paid time off and/or paid sick leave policies.

    b. If operations have not been suspended but conditions remain poor, hazard pay should be applied.

    c. Guidelines should also consider measures to help workers avoid prolonged exposure including staff rotations, extended and increased breaks, etc.

15. **If AQI levels exceed 150**—indicating that the air quality is 'unhealthy' to all—**New York City public schools should operate remotely**. This recommendation is based on existing precedent and the DOE policy for remote 'snow days.'

16. **The New York City Department of Education must upgrade HVAC systems, air filters, and carbon dioxide monitors at New York City public schools.**

17. Similar to schools, where possible, **municipal workers should work remotely if AQI is over 150** - 'unhealthy' to all.

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