

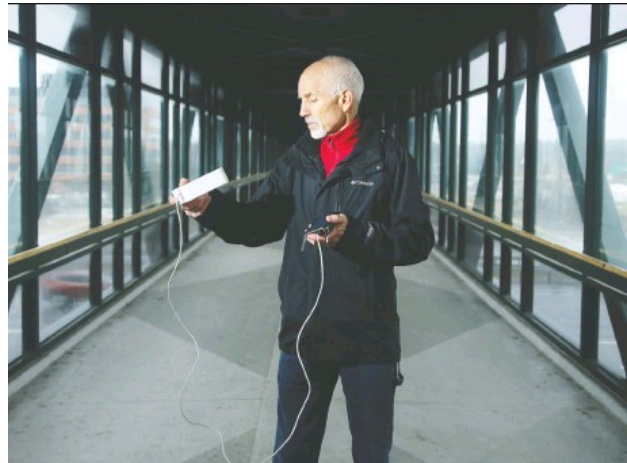
Preliminary report on Breathe Easy Ottawa project

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Overview

Air pollution leads to some 500 premature deaths in Ottawa every year, and about 14,600 across the country. These deaths, and the many other ailments associated with air pollution, such as asthma and heart disease, can be reduced or prevented by improving the air quality in our city.

The [Breathe Easy Project](#) is a volunteer-led initiative to make Ottawa residents and institutions more aware of the quality of the air that they and their families are breathing every day. Our hope is that residents and organizations will join together to learn more about the problem and to develop ways to improve the air quality in our nation's capital.



Although Ottawa has government weather stations that monitor air quality in real time, there are too few of them to highlight the variability in air quality across the city and they are often located away from major roadways. Consequently, while these government stations provide a useful baseline level for air quality, they cannot tell us much about air quality in the specific locations where residents work, play and live. Moreover, the last time the City of Ottawa did a detailed air quality study was in [2009](#), so there is a real need for an updated understanding of air pollution in the city.

The project draws on assistance from various community and health organizations, universities and colleges, all three levels of government, experts in the field, and others. We are training volunteers in the Ottawa area on how to collect and record air quality data. We are also bringing in volunteers to help communicate results and host events sharing the results of our work.

Our first event on December 3, 2020 attracted a large audience to hear from air quality expert Beth Gardiner. The study has been featured on the [front page of Ottawa Citizen](#).

Methodology

The [Air Quality Egg](#) is an open-source air quality monitoring tool designed specifically for citizen science initiatives. The Egg, which is wireless and can be held in the hand, monitors and displays pollutant levels in real time.

The Breathe Easy Project has acquired several Eggs to monitor air quality in Ottawa. Our volunteers take the devices to locations around the city and record the pollutant levels displayed by the device.

The Egg can measure a number of different pollutants, as well as temperature, humidity and other variables. For our project, we are specifically concerned with the pollutant **PM2.5**, which is made up of fine inhalable particles with diameters of 2.5 micrometers or smaller.

PM2.5 comes from a variety of sources, including vehicle exhaust, industrial emissions, wood fires and construction dust. The small particles in PM2.5 are a particular health concern because they can penetrate deep into the lungs, affecting breathing, heart and blood functions. Chronic exposure to PM2.5 is associated with a number of diseases, including [asthma risk in children](#).

Although other air pollutants, such as ozone (O₃) and nitrous dioxide (NO₂), also impact health, we have decided to limit the scope of the project to PM2.5 for two reasons. First, according to [Health Canada](#), PM2.5 alone is responsible for 9,700 premature deaths in Canada every year, making it the most consequential air pollutant. Second, limiting the scope of the project to one pollutant makes data collection and analysis more manageable for our volunteer team. Since PM2.5 is correlated with other pollutants, we believe that efforts to identify and ultimately to reduce particulate matter levels in our city will reduce other types of air pollution as well.

To highlight the variability of air quality across the city, we plan to collect data from two locations in each of Ottawa's 23 wards for a total of 46 unique locations. One location in each ward will be a public park or other area we would expect to find better air quality, and the other location will be a major intersection or other "hot spot" where we would expect to find lower air quality.

Data collection began in fall 2020 but has paused for the winter (according to the [device manual](#), "exposure to unusual heat or cold will result in inaccurate readings"). Data collection will resume in spring 2021. Once adequate data for every site has been collected, we will analyze it to highlight both the absolute air quality in different parts of the city as well as the relative air quality within and between different wards.

Primary data collection will be augmented with publicly available air quality data from government sensors and other sources.



Preliminary Results

The data collected thus far are anecdotal and therefore not statistically significant; however, these preliminary findings highlight potential issues that the project will investigate in further detail.

Downtown wards appear more polluted. On average, central wards have higher levels of PM_{2.5} than outlying wards. For example, our average sample for Ward 12 (Rideau-Vanier) was 22.4 µg/m³ (micrograms per cubic metre), which exceeds the annual mean standard for PM_{2.5} set out by the [Canadian Council of Ministers of the Environment](#). In comparison, the average for Ward 11 (Beacon Hill-Cyrville) was 2.9 µg/m³, which falls within the standard.

Pollution appears to vary by time of day. Samples taken at the same location at different times of day exhibited very different levels of air pollution. For example, a sample taken at St. Jean-Paul Elementary School (Ward 6) during morning drop-off, when many buses were idling outside, averaged 20.0 µg/m³. A sample taken in the same location during the afternoon when no buses were parked in front of the school averaged only 2.5 µg/m³.

Baseline air pollution appears to play a large role in local air pollution. On some days during our sample all our readings were high, even in parks and other places where we expect the air to be cleaner (e.g., the average sample for November 6th was 19.1 µg/m³). Conversely, on some days all our readings were low, even at hot spots like major intersections (e.g., the average sample for October 31st was 5.1 µg/m³). While we still observed site-to-site variability during these days, baseline ambient air pollution appears to play a significant role in determining day-to-day local air pollution.

Small events and behaviours appear to have a big impact on localized air pollution. Air quality monitoring projects tend to look at averages over time, but spikes in poor air quality can trigger acute reactions in sensitive populations. Our volunteers observed the impacts of seemingly innocuous events on their air quality for a short period of time. For example, someone lighting a cigarette nearby caused readings to spike for one volunteer; a bus driving by and stirring up road dust caused readings to spike for another volunteer; and the prevalence of wood-burning fireplaces raised pollutant levels across entire neighbourhoods.

Next Steps

More data are required to determine whether our preliminary findings hold true for the whole city over time and, if so, to what extent. We will conduct a more systematic data collection effort in spring 2021 based on the lessons learned during this initial phase of the project.

During the winter we will refine our methodology through a review of the relevant literature, including lessons learned from other citizen-led air quality initiatives around the world. The city of London, UK has published a [useful guide](#) on air quality monitoring best practices that will inform our work. We will also engage with experts in the field to better understand the impact of air pollution on Ottawa's residents as well as the options available to us for improving air quality in our city.

Throughout the process, we will continue to engage curious and concerned citizens in the project to help spread awareness and enthusiasm for improving air quality in our city.