Clean Air Tonbridge

Clean Air Tonbridge is a community project for measuring improvements in air quality throughout Tonbridge. We use citizen science to collect and publish realtime open data on levels of air pollution in the town.

Project Aim

The purpose of the Clean Air Tonbridge initiative is to provide residents with better information about the levels of harmful air pollution in the town. We want to help stimulate a post COVID-19 economic recovery of local businesses, encouraging people back to the town centre by making it a more pleasant place to be. At the same time we want to improve long-term public health prospects and physical/mental well-being in a sustainable way, to reduce the burden on our National Health Service.

We believe that if we can make the town centre a more relaxing, peaceful and attractive place to spend time then people will spend with local businesses rather than driving to an out-of-town complex of national chains. As you can't improve what you don't measure, the first step is to understand the extent of the problem and record a baseline that improvements can be compared to.

The Problem

Tonbridge town centre has poor air quality and has been designated an Air Quality Management Area. This means that the local council is obliged to measure the air quality and take actions to improve it.

A realtime sensor was missing for some time but a gas monitor was installed in late 2019 (at McDonald's). Unfortunately, as McDonald's has now closed, the sensor has been removed after only nine months of operation.

The gas sensor showed a large improvement in air quality (at least in regard to gases) from late March, due to the COVID-19 outbreak. The value of the sensor has been demonstrated but we can't now see if or when pollution levels will return back to the previous harmful levels.

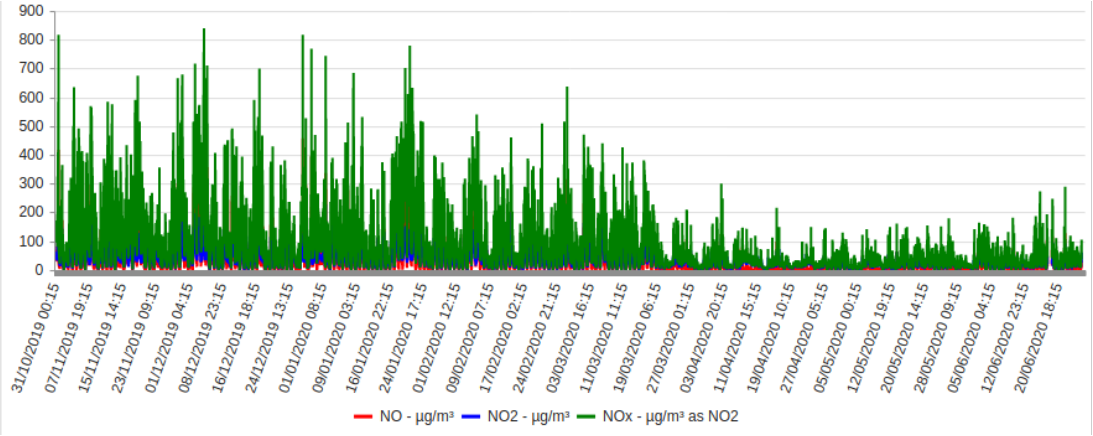

Figure 1: Tonbridge Roadside 2 CLOSED (31 Oct 2019 - 26 Jun 2020)

The council sensor had many other problems in addition to not being present. It did not detect Particulate Matter (e.g. PM10, PM2.5, PM1) and it regularly went offline for long periods, diminishing the realtime value of the data.

A Solution

We propose to supplement the council measurements (if they return) with data collected from a swarm of cheap Particulate Matter (PM) sensors. What they lack in fidelity or availability will be made up for in quantity. For example, if one were to go offline or produce erroneous readings then there would be many others available to compensate.

We aim to initially focus on PM, as this is not currently measured and the negative health implications are clear. PM is more localised than gas pollution and so would benefit from a suite of sensors. PM is primarily produced from the combustion of dirty fuels (e.g. coal fires or diesel vehicles, which also produce Nitrogen Dioxide gas - NO2 - that the council was measuring).

PM is also produced by tyre and brake pad wear, and gets kicked up from the road. Electric Vehicles (and hybrids) have lower PM emissions due to electric drives and also due to regenerative braking reducing the need for brake pad use. However, they still cause more PM pollution than active travel (walking and cycling) and so are not a panacea.

In order to measure PM levels, we require locations across town to host and sponsor these sensors. These host locations where the sensors will be installed could be businesses, homes, schools, charities or other enterprises.

Pollution Measurement

The monitors comprise of a WiFi micro-controller and two sensors. The first of these sensors detects Particulate Matter by drawing air in with a small fan and analysing it with a laser. It then produces data on the size and quantity of the particles.

The second sensor measures ambient temperature, humidity and barometric pressure. This is useful for context, as the weather has a large impact on how long air pollution hangs around for.

The device is contained in a weather resistant housing so that it can be mounted externally. However, it should still be shielded from excessive water and heat exposure.

Sponsor a Sensor

We are seeking businesses or other endeavours to sponsor monitors by covering the cost and providing a location to operate them from. The cost of a monitor is £50 (ex. VAT), which is significantly lower than commercially available sensors. Please contact air@tonbridge.net if you would like to sponsor a sensor.

Benefits

The benefits of sponsorship include promotion of your business on the Clean Air Tonbridge website and other channels, helping to increases the volume of customers and trade. You will be contributing to improved air quality and public health, also leading to increased footfall.

Sponsorship includes free installation and setup of the monitoring device (if required), and support / repair if the device should fail. A self-install option is available if you would like to do it yourself. You will also receive regular updates on the progress of the initiative.

Requirements

In order to host a monitor at your premises you will require a standard WiFi internet connection (2.4GHz b/g etc.) and a standard USB socket (5 volt female A) power supply close to the measurement location (e.g. front entrance). The WiFi signal must be reasonably strong at the proposed sensor location.

If you only have a 13A socket available then a USB power supply can be included for an additional £5 (ex. VAT). We assume that you will already have a spare USB power supply and we want to minimise waste as much as possible. Please contact air@tonbridge.net if you would like to host a monitor.

Publication

The measurements from the sensors will be published in near realtime to the project website and the Sensor.Community global sensor network map of Open Environmental Data. We also plan to communicate the results of the project by email list, social media, newspapers and local television.

Actions

The first step is to get a handle on the severity of the problem and publicise this, so that we know how bad it is and if our interventions have helped. However, we also have ideas for simple and low cost actions to improve air quality.

We propose increasing the number of trees and other plants in polluted areas, as these have been shown to reduce the localised levels of harmful air pollution reaching your lungs. For example, large trough planters filled with hedges could be placed on the edge of the pavement between pedestrians and motor traffic. These would form a physical barrier to protect people from the harmful effects of vehicles.

Encouraging more active travel (e.g. walking and cycling) is a priority. Active travel creates a virtuous circle, as it makes the environment more attractive for additional active travel. Planters would not only make the environment more attractive but could provide extra seating for pedestrians and objects to lock a bike to while visiting a shop.

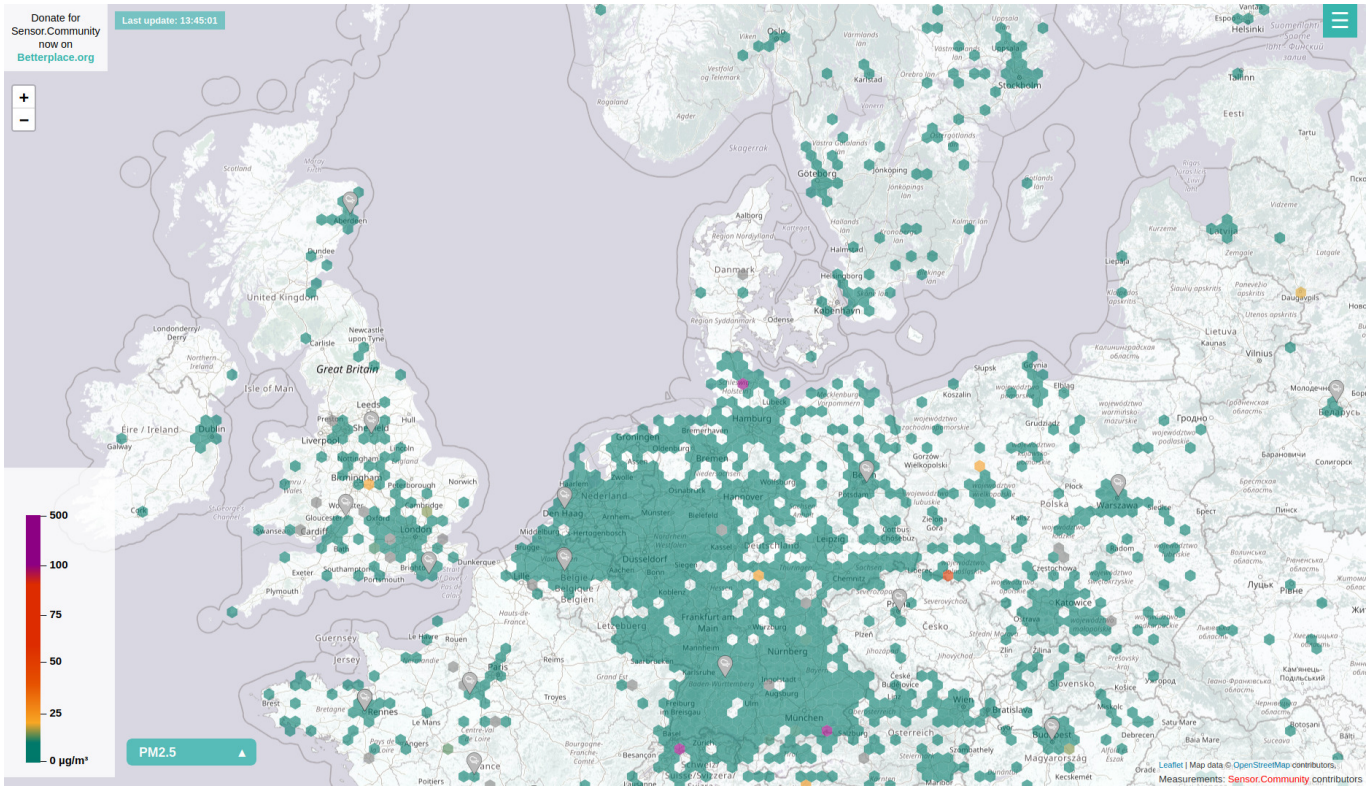

Figure 2: Map of Sensor Community Northern Europe

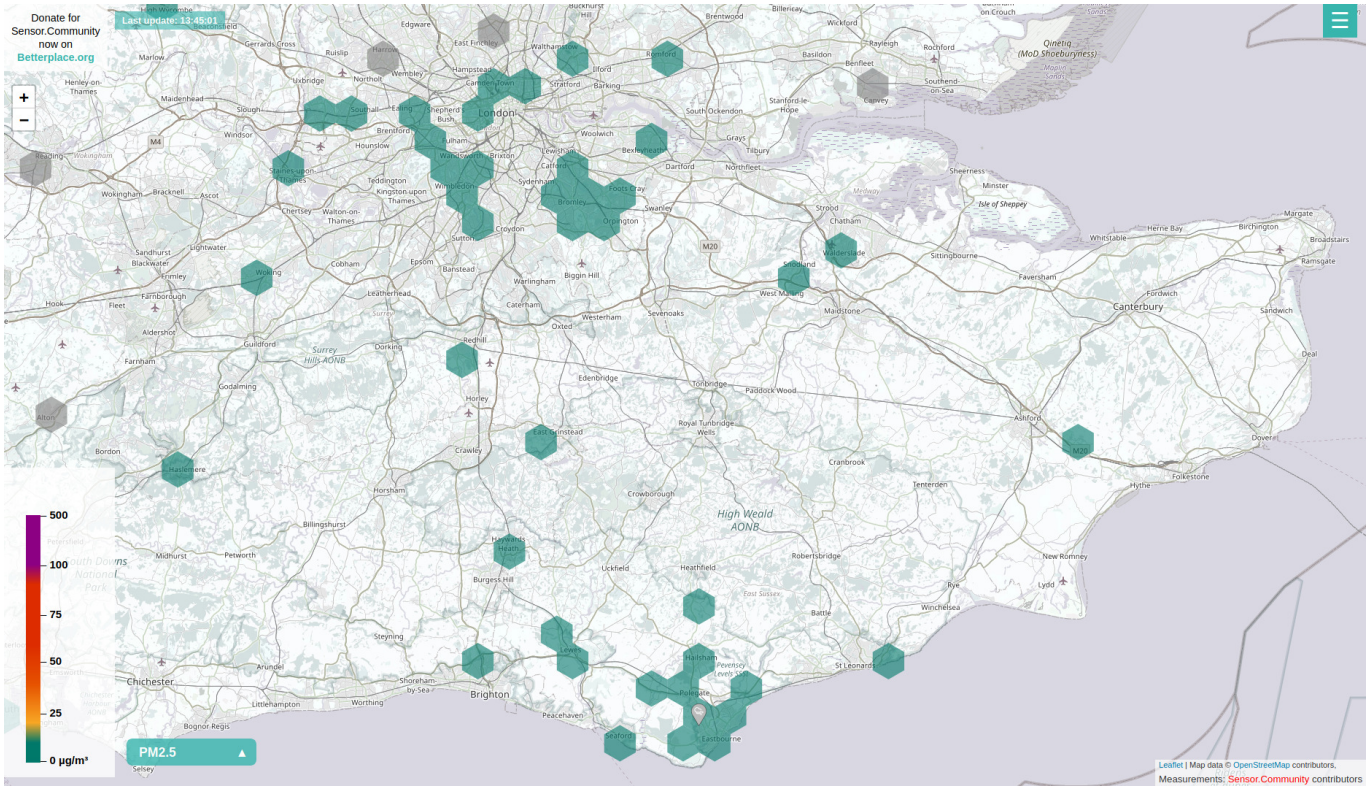

Figure 3: Map of Sensor Community SE England

Some face masks (designed for DIY, not surgical masks) can also help a little with filtering PM, although basic ones don't filter gases such as NO2. People have got used to wearing these indoors for other reasons and they could potentially help with outdoor PM pollution hotspots or choke-points if people know where these are.

Inexpensive HEPA and carbon filters are better at filtering pollutants than masks but are not as portable. These could be installed indoors so that bad air from outside does not persist for long inside shops and other enclosed spaces next to a busy road.

Future

If the initial trial proves to be a success then we plan to expand the sensor network. We could also add additional low-cost sensors to detect the presence of harmful gases (e.g. NO2/VOC/CO2) and noise levels.

Get Involved

If you want to sponsor a sensor then we will need your contact details initially, preferably an email address. If you choose to host a monitor then we will need your WiFi network name and password when we install it.

Please contact: air@tonbridge.net