EARTHSENSE

Case Study

Southampton City Council

Domestic woodburning behaviour change project

Overview

Southampton City Council commissioned EarthSense to provide air quality services; as part of its innovative DEFRA-funded project to monitor particulate matter emissions from domestic woodburning, and to campaign to inform residents about the impact of woodburning on their health and the health of the community.

8.6 estimated tonnes of $PM_{2.5}$ saved a year as a result of this campaign

Using EarthSense's air quality services, 18 EarthSense Zephyr® air quality monitors, an air quality data model of Southampton City and surrounding areas, and the web application MyAir® including a portal of real-time air quality data available to the public. The project won the Best Air Quality Strategy (Public Sector) in the Westminster Commissions for Road Air Quality Awards.

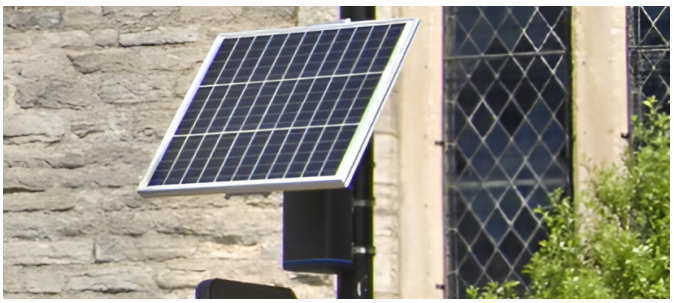

Figure 1: Zephyr® monitor deployed to a lighting column on Waterloo Road in Southampton.

The Challenge

Woodburning has come back into fashion as a heating source for many UK homes, a trend accelerated as energy prices have soared. Home woodburning causes 21 percent of fine particulate matter ($PM_{2.5}$) emissions in the UK, despite the fact only around eight percent of UK households burn wood at home.

$PM_{2.5}$ has been linked to heart and lung disease and other health conditions. According to a 2022 report year from the European Public Health Alliance, air pollution from wood-burning in homes is responsible for £0.9 billion (US$1.1 billion) a year in health-related damages in the UK and €9 billion (US$9.7 billion) across the EU.

After receiving an Air Quality Grant from the Department for Environment, Food and Rural Affairs (DEFRA), Southampton City Council developed an innovative woodburning campaign as part of its Air Quality Action Plan (AQAP), with the aim of educating members of the public about the harms of burning wood and helping them take steps to burn better and cleaner, moving to more sustainable methods of heating homes where possible.

The Solution

As a part of the project, funded by DEFRA, Southampton City Council and local charity, the Environment Centre selected EarthSense to provide specialist air quality services, to support its efforts to reduce domestic woodburning emissions and generate insights into how woodburning is contributing directly to poor air quality in the community.

EarthSense provided Southampton City Council with an innovative, real-time air quality model of Southampton City and surrounding areas, enabled with detailed emission source information including domestic wood burning. The MappAir® air quality model provided Southampton with real-time and forecast air quality data at an extremely high resolution. Integrating datasets such as Zephyr® measurements and data from Automatic Urban and Rural Networks (AURN).

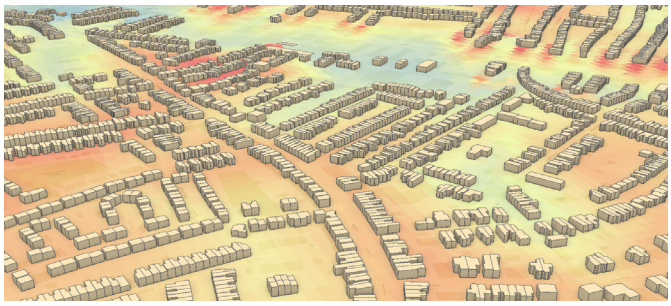

Figure 2: 3D City Model of Southampton's $PM_{2.5}$ Woodburning Pollution created with EarthSense's MappAir®.

The MappAir® model provided an innovative source apportionment module that distributes woodburning emissions both spatial and temporally, offering extended levels of detail to air quality data throughout the colder months. With real-time, hourly source apportionment fractions from road traffic, non-road transport and regional contributions are published alongside the model outputs.

Southampton was also provided access to the leading air quality platform, MyAir® as part of the project. The platform offers a comprehensive solution for understanding and monitoring air quality in the area, providing real-time data from the installed Zephyr® air quality monitors with advanced modelling to provide accurate insights into the air quality. MyAir® allows Southampton to view its air quality and see the modelled air quality data in action, allowing source apportionment, in an intuitive and easy-to-navigate platform.

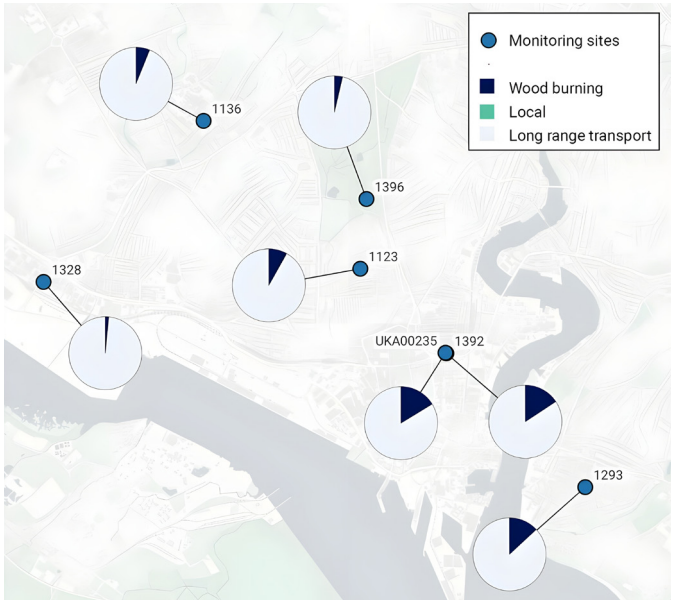

Figure 3: $PM_{2.5}$ source apportionment visualisation created with EarthSense's MappAir®.

Using MyAir® southampton can create customised alerts with pollutant thresholds using the MyAir® platform. Colour scales are applied to modelling maps and monitoring data in MyAir®, to help show the boundaries where pollutant levels change. As a part of the MyAir® package, Southampton was also provided with Virtual Zephyrs® (VZ's), an innovative virtual product from EarthSense that allows a location to be selected on the map, like dropping a pin on the map and start recording air quality information utilising EarthSense's advanced MappAir® Model, just like a monitor would.

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Alongside the digital solutions, a large network of 18 Zephyr® real-time air quality monitors was strategically installed around residential areas within Southampton and neighbouring surrounding areas to gather localised, real-time measurements of pollutants. The locations were evaluated and selected using available air quality data from the model, ensuring the monitors were placed in areas of best interest to the project, such as dense resendetial housing areas with suspected high levels of woodburning pollution. The certified (MCERTS) monitors measure Particulates (PM_{10}, $PM_{2.5}$ and PM_{1}) as well as NO_2, NO and O_3 providing a range of air quality measures for residents. The $PM_{2.5}$ sensor data plays a pivotal role in this project, due to the limited existing monitoring infrastructure for this key pollutant. The sensor data is systematically used to evaluate the model outputs ensuring consistent and reliable accuracy.

To help drive behaviour change, all data is communicated to residents via a customised public portal through MyAir®. With free public access and informative educational material, the community now has an access point to understand local air quality and how their behaviour influences concentrations, enabling informed decision-making on emission-causing activities, such as wood burning.

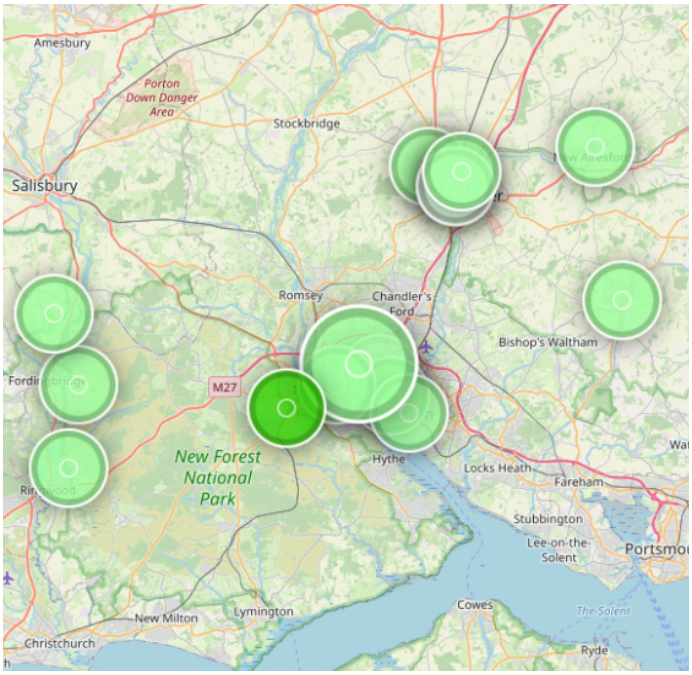

Figure 4: MyAir® web application showing live Zephyr® locations.

> The EarthSense Zephyr® monitors have given us the opportunity to use local data and encourage residents to burn less and burn better. The MappAir® model has helped take this further with residents being able to get an indication of what air quality is like in any area of the city.
>
> The council is also delighted to have received the award for Best Air Quality Strategy (Public Sector) through our work with EarthSense on this project. The award recognises this innovative approach to monitoring and modelling air quality across the city to support the behaviour change and the wider Air Quality Action Plan. We're looking forward to making the most out of the system going forwards by using MappAir® in further projects including tackling pollution at schools and through
>
> **George O'Ferrall**
> Sustainable Projects Lead (Air Quality) | Southampton City Council

The campaign run by Southampton is utilising the air quality data provided by EarthSense along with a public-facing portal developed by EarthSense, to show members of the public where pollution levels are high due to woodburning. Using this information Southampton are providing events and leaflets to educate members of the public about the harms of $PM_{2.5}$ emissions and encourage them to change their everyday decisions to reduce domestic burning.

Supporting the campaign, The Environment Centre has also produced an educational short animation titled, 'The Hidden Harms of Wood Smoke' for social media and a video interview with Professor Stephen Holgate, Professor of Immunopharmacology at the University of Southampton to educate the public on the health harms of domestic woodburning.

Outcomes

According to the Environment Centre, on cold evenings in neighbourhoods where domestic wood burning is common, the levels of fine particulate matter were around four times higher than they were at midday. These levels were also far higher than they were in non-residential areas where woodburning is much less common. Southampton City Council's woodburning campaign has been successful so far, with the 2022 update of its AQAP reporting that it had been successful in engaging residents across Hampshire and helping them burn less and better.

Both the Council and residents can also use a public portal to view how $PM_{2.5}$ emissions are dispersing across the city in near real-time. The portal will help to inform where the behaviour change campaign should be targeted, and advice about how individuals can manage their exposure to particulates – particularly on colder days when use of woodburning may increase. Users can download air quality data, set alerts and click anywhere on a map and get an idea of the current air quality or view up to 72-hour forecasts. Allowing for proactive planning when concentrations are likely to be high, and therefore reduce their exposure to air pollution.

Figure 5: Southampton City Council & EarthSense at the Fleet Vision International Awards in London.

The Council also received an award for the Best Air Quality Strategy – Public Sector at the 2023 Fleet International Awards. The award was presented by The Westminster Commission for Road Air Quality and highlights the Council's commitment to addressing air quality issues and implementing measures to improve the wellbeing of local residents.

Long Term Benefits

The Zephyr® monitors were installed in 2020 and the short term outcomes have been promising. Residents have been engaging with the campaign and changing their behaviours to contribute to better air quality. The portal can also be used in the long term, so residents can continue to monitor air quality in their local area and see how it's improving over time.

Figure 6: Southampton's PM2.5 Woodburning campaign leaflets.

While it is difficult to attribute $PM_{2.5}$ concentration reductions directly to the campaign, it is estimated that it would result in an increase of 0.5 per cent in uptake of Ecolabel stoves and one per cent decrease of emissions per appliance through successful behaviour change, saving around 8.6 tonnes of $PM_{2.5}$ a year.

0.5% **estimated increase in uptake of Ecolabel stoves**

Using a holistic approach to monitor air quality moving forward, Southampton City Council has a wealth of data at its disposal so it can plan for both the short and long term. EarthSense's air quality service uses Zephyr® monitors for real-time insights into air pollution, bespoke MappAir® models, annual averages and data access web application, MyAir® to enable organisations such as local authorities, transport, and construction companies to pull actionable insights from air quality data. This data may identify where woodburning emissions are highest, peak times and locations for congestion across a city, or locating the most polluted schools across an area of interest.

Get in Touch

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