

Case Study

IASS, Berlin

Client

The Institute for Advanced Sustainability Studies (IASS) is a research institute that brings together scientists and partners to understand and reflect on pressing sustainability policy issues. Through transformative research, its researchers aim to act upon problems with the introduction of sustainable development with a view to implement Germany's Sustainable Development Strategy.

Overview

The IASS wanted to understand how the introduction of a cycling lane on a main road in Berlin would affect air quality and impact cyclists' exposure to pollution. To do this, researchers used static and mobile Zephyr® air quality monitors to measure air quality levels prior to and post introduction of the cycle lane and published a report which discussed their findings.

The Challenge

An infrastructural overhaul in Berlin was recently introduced through the Mobility Act of 2018, favouring economically friendly modes of transport over polluting vehicles. Part of the revamp has seen a new cycling lane built along Kottbusser Damm, a car centric main road in the

city and researchers at the IASS wanted to test the impact of the development on air quality.

The Solution

For researchers at the IASS to understand how the introduction of the new cycling lane would affect cyclists' exposure to air pollution, Zephyr® air quality monitors were used pre and post development of the cycle lane. Using an active sampling mechanism, the monitors measured ambient air pollutants in real-time, taking readings every 10 seconds which are subsequently released back into the ambient air and uploaded into EarthSense's MyAir® web application.



Figure 1: Zephyr® monitor mounted to a lighting column.

A total of eight Zephyr® monitors were employed to measure the levels of nitrogen dioxide (NO₂), ozone (O₃) and particulate matter (PM_{2.5}, PM₁₀) at specific locations along the road, as well as on bicycles in the city to capture exposure along journeys. Four static Zephyr® units were deployed at varying heights on to lighting columns, one on the façade of a four-floor building and one outside a school building on a side-street. By using static monitors, researchers were able to gain insights into the way pollution flows through the street canyon.

Two mobile Zephyr® units were also attached to bicycles which travelled up and down the cycling lane through two separate routes. The addition of mobile units helped to provide researchers with an understanding of how cyclists using the new cycling lane were exposed to particulates and gases in the air.

To access Zephyr® measurements, researchers made use of the MyAir® web application. MyAir® provides its users with their mapped Zephyr® locations, visualisations of real-time pollution concentrations, pollution sources and historical air quality measurements. Researchers used the app to understand and compare baseline air quality concentrations with concentrations after the new cycling infrastructure had been introduced to understand the impact on personal pollution exposure.

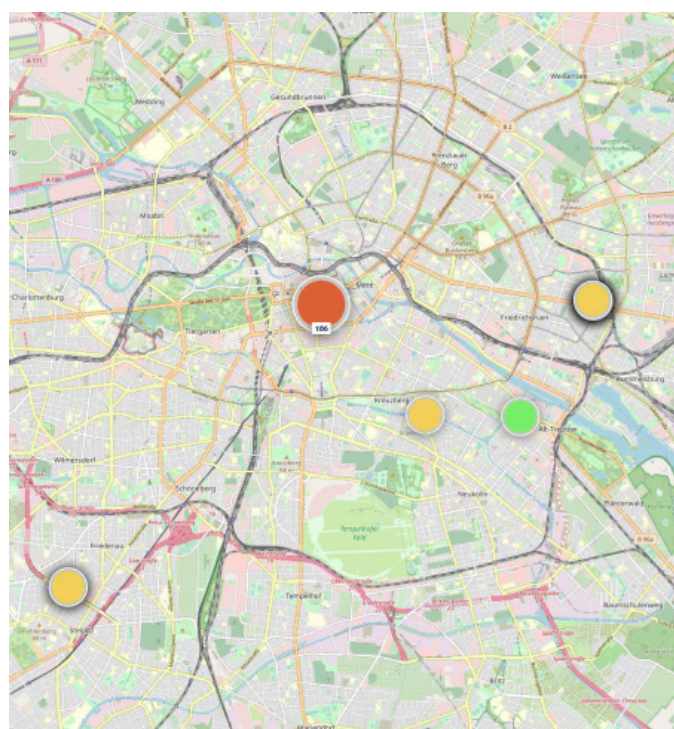


Figure 2: Mapped Zephyr® locations in MyAir® for Potsdam, Berlin, Germany.

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After several years using EarthSense's Zephyrs for our air quality experiments, it's clear that these instruments can be a valuable tool for atmospheric science. Their practicality and versatility make them flexible for use in a wide range of atmospheric measurements and EarthSense's technical support enhances their longevity and accuracy.

Séan Schmitz

Research Associate, IASS

Outcomes

Following the introduction of the Zephyr® network, the IASS have written a [report](#) discussing their findings. Researchers collated pollution measurements to detect how cyclists' exposure to air pollution changed after the cycling lane was introduced.

The Zephyr®, installed on a side-street that was temporarily turned into a community space and closed to traffic on Wednesdays, measured a 10µg/m³ reduction in NO₂ concentrations. However only 3.7µg/m³ of this was attributed to the road closure. This small, but significant reduction was associated with the implementation of the road closure. It was found that removing vehicle traffic, even at a small-scale, was found to reduce NO₂ concentrations locally.

Researchers also found that cyclists were exposed to 22% lower concentrations of NO₂ along the cycling route. However, due to a lack of traffic data linked with the coronavirus pandemic, researchers could not make any evidence-based conclusions as to why air pollution exposure was lower for cyclists. Researchers believe the reductions are due to the greater distance on the road between cars and cyclists when riding on

the cycling lane. With cyclists no longer being hindered by traffic, they can travel along the street quicker, helping to reduce stop-start journeys for cars and time spent in front of vehicle exhausts.

Although a positive measure for cyclists, the effect of the bike lane on overall air quality across Kottbusser Damm could not be determined due to the outbreak of the coronavirus pandemic. Related measures had an impact on local air quality conditions, so researchers could not collect representative pollution data to come up with a conclusive outcome.

Long-term Health Benefits

When travelling on roads, cyclists are often in close proximity to vehicles that emit ambient air pollutants such as NO₂, PM_{2.5} and PM₁₀. When they're nearby to vehicles, such as cars, lorries and motorbikes, cyclists are prone to inhaling these pollutants which can get trapped in the lungs and become harmful to human health. Exposure can contribute to and worsen symptoms of already existing health effects including asthma, lung disease and COPD.

After carrying out their research and finding that removing vehicle traffic helps to reduce NO₂ concentrations locally, the IASS have been able to show reduced personal exposure of pedestrians in Berlin and lower the risk of individuals inhaling toxic air pollution, meaning reduced risk of them suffering from the subsequent negative impacts.

Future Plans

Researchers at the IASS continue to use the Zephyr® air quality monitor as part of another measurement campaign about air pollution at Friedrichstraße in Berlin and plan on launching further exposure measurements in the future.

Get in Touch

Want to learn how our complete air quality monitoring service can help you manage implement cleaner infrastructure in your city? Email us at:

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www.earthsense.co.uk