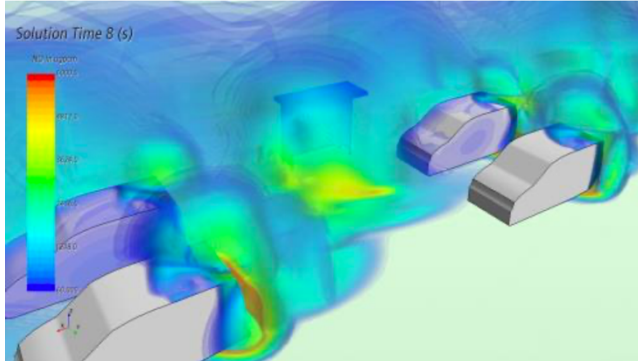# 3D Modelling of Pollutant Dispersion and Exposure around Bus Stop Shelters



The aim of this short-term project was to develop further an existing high-resolution Oxford Brookes 3D model of traffic related pollution and momentary exposure. It was then used to investigate personal exposure at bus stops, contributing to the TRANSITION Clean Air Network's effort to characterise newly emerging challenges associated with transport dicarbon- isation, and protect the vulnerable public.

## What did we do?

A large scale, 3D Computational Fluid Dynamics (CFD) model of parts of Oxford city centre was created in Siemens Star CCM+ code using LiDAR mapping. This enabled modelling of pollutant dispersion around different bus shelter designs.

The experimental campaign released a known amount of Nitric Oxide (NO) from a moving vehicle and measured the dispersed NO at the roadside using high-speed Cambustion CLD50 equipment. 69 repeats were conducted.

## Full Report

https://transition-air.org.uk/di-bonatesta-report

## Data

https://transition-air.org.uk/di-bonatesta-data

## Key Messages

- Design of our public spaces really matters for air pollution exposure.
- In day-to-day life, people using bus stop shelters (or spending time in other roadside environments) may be repeatedly exposed to very high air pollutant concentrations for short time periods (< 10 seconds).

## Next Steps

- Need for statistical understanding of the relationship between emissions, exposure and health impacts for bus users.
- Need to involve stakeholders in bus shelter design to consider user safety, comfort and air pollution protection.
- Further improvements of the model, including incorporation of traffic data and reduction of computational demands.

## What did we learn?

- A well-matched CFD model showing pollutant dispersion around different bus shelter designs was achieved. This could be extended to other street layouts and different urban scenarios.
- Simple changes to bus shelter design and/or orientation can improve air quality both in and around the shelter.
- Repeated very high concentration, but short duration, exposure of people to pollutants was observed as a result of nearby traffic.
- A high-quality experimental dataset of NO dispersion from a moving vehicle is freely available (e.g., for the validation of further models).