Scientists install sensors in Glasgow, Scotland schools to monitor greenhouse gases in real time

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Scientists will install sensors in primary and secondary schools across Glasgow, Scotland to monitor levels of the greenhouse gas (GHG)

carbon dioxide (CO_2) which contribute to climate change.

The network of 25 sensors are to be installed by scientists from the University of Strathclyde, Scotland, as part of a trial to provide Glasgow City Council, for the first time, with real-time information on emissions of CO_2 and various noxious gasses in the city's air.

The goal is to help city leaders measure progress against the city's target to become carbon neutral by 2030 and see the near-immediate impact of policy decisions.

The trial is part of the Global Environmental Monitoring and Measurement (GEMM) initiative, a collaboration between the University of Strathclyde; Stanford University, U.S.; the University of California at Berkeley (UC Berkeley), U.S.; The Optical Society (OSA); the American Geophysical Union (AGU); the Met Office, UK and the National Physical Laboratory, UK.

"This project will deliver the type of data necessary to drive efforts in Glasgow and other cities to reduce emissions and greenhouse gasses," said Elizabeth Rogan, CEO, The Optical Society (OSA). "The GEMM initiative is developing measurement technologies to improve climate change models and inform decision-making in both the public and private sector."

Early results of the monitoring will be shared with the leaders of other global cities at a virtual conference in November 2020, and will be presented at the COP26 environmental summit, now scheduled to take place in Glasgow in 2021, to encourage other cities to set up their own sensor networks.

Glasgow City Council already monitors air pollution levels across the city for a range of common pollutants, including nitrogen dioxide (NO_2)

and particulate matter (PM10, PM2.5). These are the main pollutants of concern in Glasgow, with the primary source being road traffic, especially in busy city center streets such as Hope Street.

This monitoring is conducted as part of the Council's statutory obligations on air quality and does not include CO_2. Data on CO_2 levels in the city are based on historic consumption of fuels for traffic, power and so on, and is only made available by the UK Government two years in arrears.

A dense network of sensors will provide a more detailed picture of where atmospheric CO_2 is being produced at source, allowing for more nuanced decision-making on climate change policies. The sensors will also track levels of carbon monoxide, nitrogen oxide, nitrogen dioxide, ozone and PM2.5.

The additional measurements will support identification of specific sources of CO_2.

Professor Allister Ferguson, University of Strathclyde and co-lead of the project said, "As the climate changes rapidly, public and private decision-makers around the world are facing an ever-increasing need for more accurate environmental data, improved measurements, and forecasting models to predict the future course of the environment and, where possible, develop strategies to adapt to or mitigate these environmental and climate-change caused disruptions. Developing and deploying new, low-cost and improved measurement instruments in dense networks can provide more precise data and greatly improved models for appropriate and effective government policies and better evaluation of the risks of public and private investments."

Co-lead Dr. Thomas Baer, Director of Stanford Photonics Research Center at Stanford University, U.S. and a Visiting Professor at

Strathclyde said, "While efforts to reduce GHG emissions have made great strides, particularly when it comes to electricity generation, heating and transport remain two challenging areas. Being able to monitor in real-time the GHG emissions caused predominately by traffic, policymakers will be able to make informed decisions and see near-immediate results."

By demonstrating the effectiveness of the Glasgow network, scientists hope city leaders will retain and expand it as a permanent legacy of the COP26 summit. Glasgow is already part of the Carbon Neutral Cities Alliance, a collaboration of global cities working to cut GHG emissions by 80-100% by 2050 or sooner.

Scientists leading the project will also engage with students on issues around pollution and the science involved in air quality monitoring, with a Ph.D student assigned to each school.

Glasgow City Council Leader Susan Aitken said, "When we agreed to host COP26, we knew there would be opportunities to learn from climate specialists around the world and so help Glasgow's own response to the climate emergency. Getting involved in the GEMM project is exactly the kind of collaboration that we hoped for and can help us reach our goal of becoming a net zero city."

A similar network has been operating in the San Francisco area, through Professor Ron Cohen at UC Berkeley, U.S. who has developed the sensors for nearly 10 years. That network, of 70 sensors, has been able to track the reduction in CO_2 and noxious gasses emitted by traffic following the COVID-19 lockdown in California.

Professor Cohen said, "During these times when we see the predictive power of data being used in real time to prevent the worst COVID outcomes, it makes sense to be equipping ourselves with observations that will help manage the equally challenging task of managing the

climate. We look forward to providing the observations that will help Glasgow manage its contributions to greenhouse gas reductions in a manner that can be a model for every city on the planet."

More information: For more information about the GEMM initiative, visit www.gemminitiative.org/en-us/

Provided by The Optical Society

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