



Larkin Community College  
Coláiste Pobail Lorcáin

# NO<sub>2</sub> Levels – Dublin City Centre 2019-2021

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## Abstract

Nitrogen dioxide (NO<sub>2</sub>) is a green-house gas present in the air. It comes from the burning of fossil fuels that support the transport and production industry and the home heating or cooling industries, [Irish Times February 2021](#). It can be very dangerous for human health especially younger people or older people or others who have an underlying medical condition that might mean they are more vulnerable to the negative effects of breathing this gas on a regular basis or breathing in large amounts of it, [EPA Ireland Air Environment](#). A major concern is that high levels of NO<sub>2</sub> emissions from motor vehicles and the combustion of fossil fuels is a serious health concern for people who live and work in the city centre. Students with young developing lungs have specific vulnerabilities with regular exposure to this emission. People with respiratory conditions such as asthma or COPD are also very vulnerable and repeat exposure could have long-term negative effects, [European Respiratory Journal](#).

## Research Question

A Comparison of NO<sub>2</sub> Levels  
Dublin City Centre  
Feb 2019, Oct 2019, Oct 2021

## Introduction

Nitrogen dioxide (NO<sub>2</sub>) is an air pollutant that comes from the combustion of fossil fuels and especially from cars and other motor vehicles using fossil fuels. It is a greenhouse gas meaning that it contributes to global warming by adding more greenhouse gases to the Earth's atmosphere and preventing heat from escaping back out to space. [NASA Global Climate Change](#) reported that the year 2020 tied with 2016 for the warmest year on record since record-keeping began in 1880. This results in the Earth's average temperature rising and as more fossil fuels are burned the rise in temperature is set to continue. [National Geographic](#) asks the question that can cleaner air since COVID-19 lockdown policies encourage governments to do better with new legislation to reduce the combustion of fossil fuels? Can citizens be sufficiently incentivised to switch and swap away from industries and transport systems that have large fossil fuel combustion requirements? Can private industries respond to the public purse or can the public purse respond to private industries? Could electric cars and transport vehicles become the new normal and can societies ditch the fossil fuel habit for good or is a blended approach needed to meet the Humans' insatiable hunger for more energy?

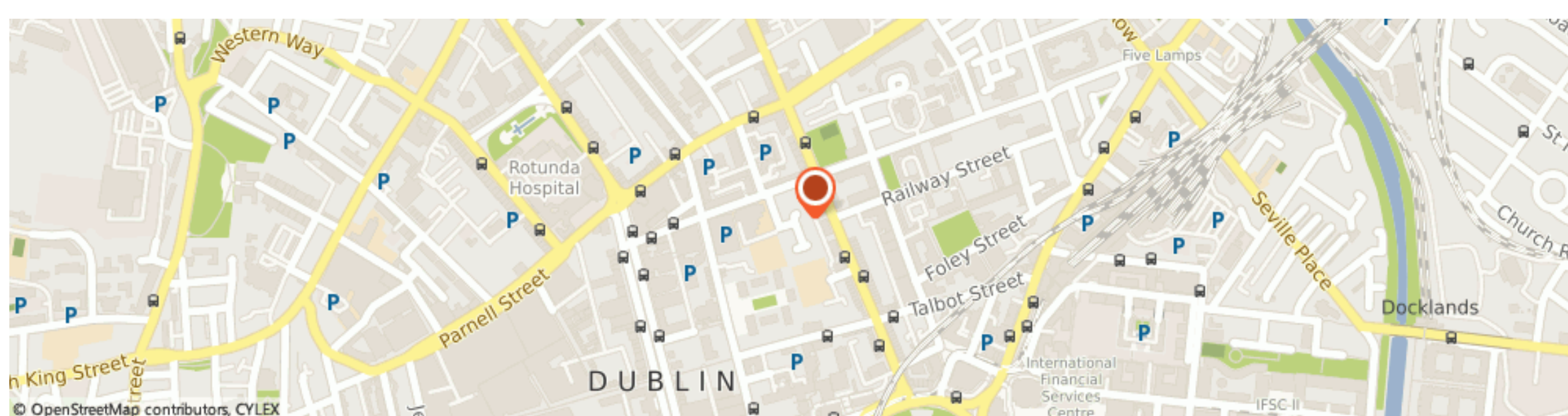
The Irish EPA monitor [Air Quality Data](#) in Dublin hourly and this data is useful when town planners and city managers are trying to coordinate their traffic plans. Traffic congestion and idling of motor vehicles can lead to spikes in NO<sub>2</sub> that could have a serious implication for human health. Bringing government legislation and incentives to Irish motorists for more electric cars on the road might help to reduce this greenhouse emission. [The Irish Climate Action Plan](#) includes actions designed to have a significant impact on reducing NO<sub>2</sub> emissions and improving air quality including:

- Putting 180,000 electric vehicles on our roads by 2025.
- Decarbonising the public transport fleet.
- Develop cycling strategy and 200km cycle lanes through bus connects.
- Develop Park/Ride Strategy to reduce congestion, lower journey times.
- Developing a regulatory framework on low emission zones.
- Legislating for no new fossil fuel vehicles to be sold from 2030 onwards.

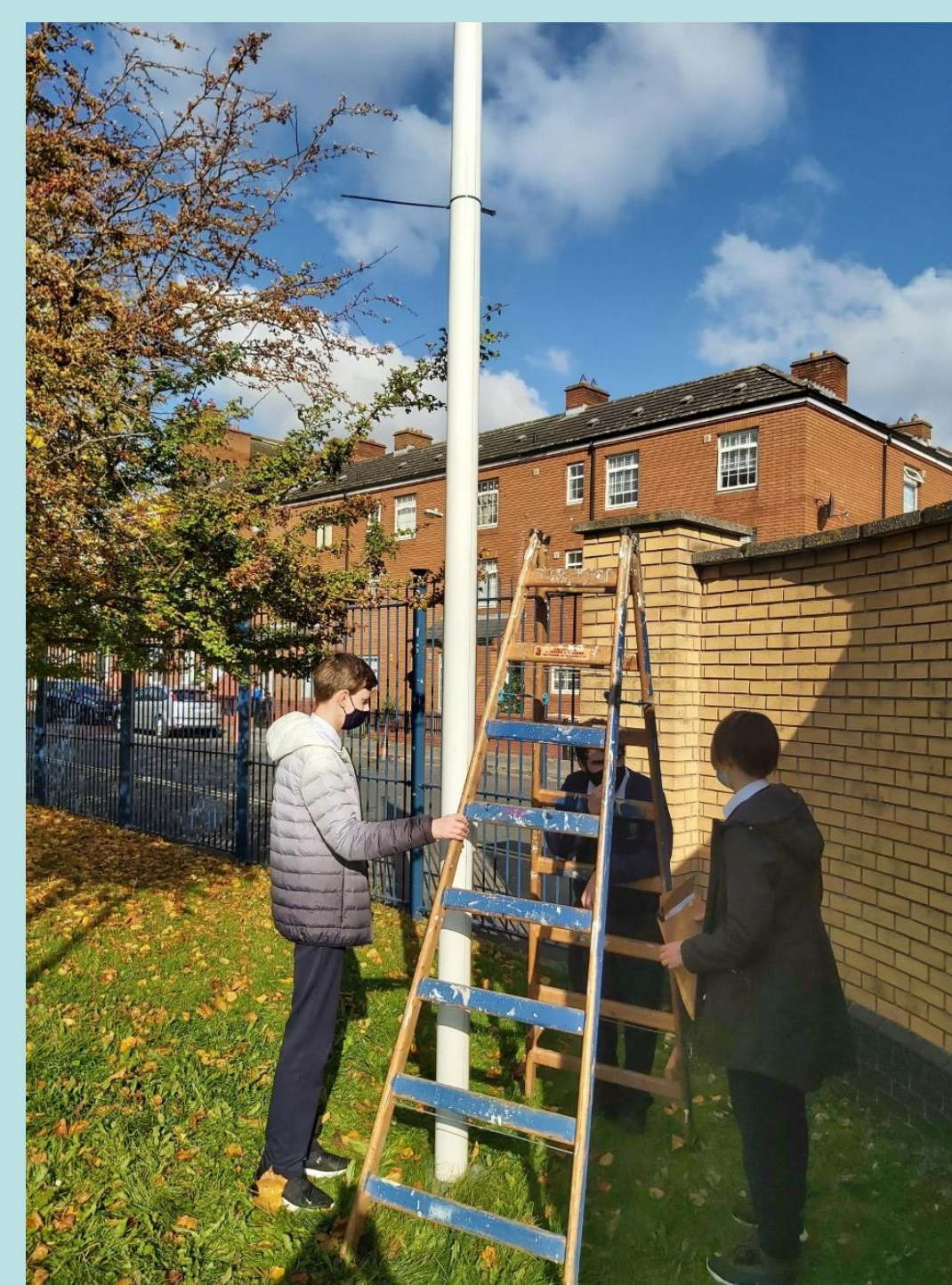
## Methods

[Larkin Community College](#) is a secondary school located in Dublin city centre and has a lot of daily traffic under normal conditions and it is classed as an urban environment. It is mostly surrounded by business streets and residential areas with some small green spaces such as the [Diamond Park](#) or [Remembrance Garden](#) Parnell Street.

[NO<sub>2</sub> diffusion tubes](#) were used to sample levels of this green-house emission from fossil fuel combustion in the air. The tubes were in location for a month and then taken down and sent to a laboratory for analysis. The tubes were placed in different locations within and around the school campus. Some of the tubes went missing but some remained in place and produced data. The [Passive Sampler 4Sfera](#) was used to record the location of each of the diffusion tubes.



## Photographs



## Results

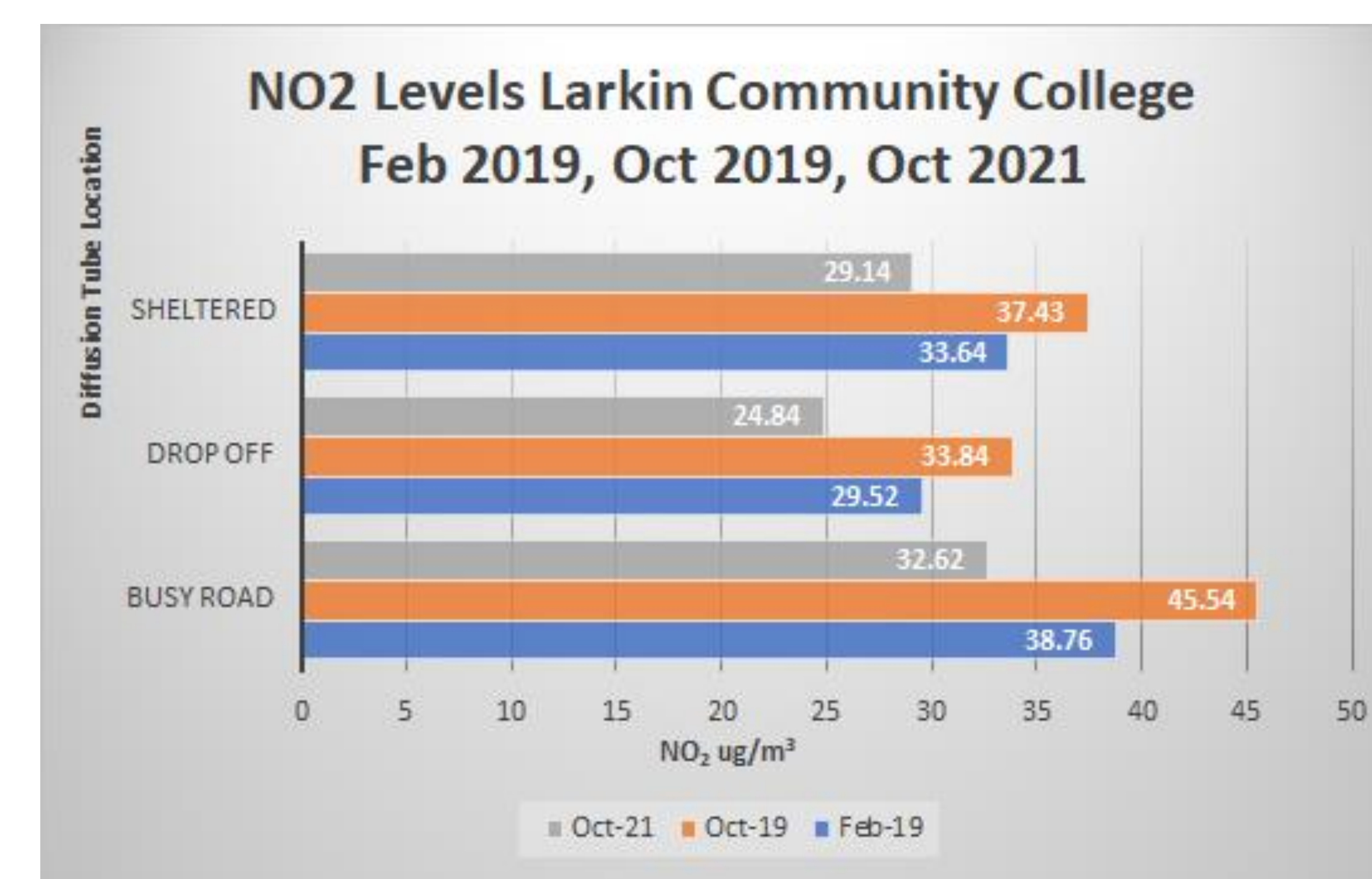
### Oct 2021

School	Tube Number	NO <sub>2</sub> µg/m <sup>3</sup>	Latitude (app)	Longitude (app)
Larkin Community College	1645942	23.32	53.352352	-6.257157
	1645973	24.84	53.35146	-6.257559
	1645962	32.67	53.35257	-6.258385
	1645985	29.14	53.353287	-6.257899

### Feb 2019, Oct 2019, Oct 2021

NO <sub>2</sub> Diffusion Tube Locations			
Date	Busy Road	Drop Off	Sheltered
Feb 2019	38.76	29.52	33.64
Oct 2019	45.54	33.84	37.43
Oct 2021	32.62	24.84	29.14

### Graphic Display



## Discussion

This report investigates Nitrogen dioxide (NO<sub>2</sub>) levels at [Larkin Community college](#) (LCC) in Dublin city centre for October 2019, February 2019 and October 2021 and presents conclusions about the levels and behaviour of this gas from the patterns presented in the data. NO<sub>2</sub> passive diffusion tubes were placed at different locations in or near the school campus. The three key locations used for comparison purposes include the busy-road, drop-off and sheltered locations.

High levels of NO<sub>2</sub> were recorded at the busy-road location at 38.76µg/m<sup>3</sup> for February 2019 and 45.54µg/m<sup>3</sup> for October 2019. These values are close to or exceed the [European Union air quality standards](#) of 40 µg/m<sup>3</sup> as an annual mean. Busy-road levels of NO<sub>2</sub> levels dropped to 32.62µg/m<sup>3</sup> for October 2021 possibly due to lower levels of traffic as part of the COVID-19 pandemic restrictions. NO<sub>2</sub> levels were also reduced from 29.52µg/m<sup>3</sup> to 24.84µg/m<sup>3</sup> at the drop-off location and from 33.64µg/m<sup>3</sup> to 29.14µg/m<sup>3</sup> at the sheltered location. This reduction is a positive result for the quality of air in the city centre and continued sampling would indicate if these levels have been sustained once COVID-19 restrictions are lifted.

Across Europe [COVID-19 related traffic](#) has brought about less NO<sub>2</sub> emissions and this has brought about cleaner air. The base data was very high in 2019 and a more vigorous and enhanced approach to reducing and sustaining these reductions is needed. Another benefit may be highlighted where studies suggest that air pollution may be a vector for the transfer of viruses in a community where the virus gets a ride into respiratory systems attached to the particulate matter PM2.5 or PM10 [Air pollution by NO2 and PM2.5 explains COVID-19 infection severity](#). It seems that more [sustainable energies](#) such as solar, geothermal and wind energies could offer improved environmental and medical health to our communities and that more engagement in [serious environmental debates](#) about benefit all of society in mapping the ways forward.

## Conclusions

Air pollution is an ongoing concern and as populations rise throughout the world it seems likely that the demands on this resource are also likely to rise putting further strain on the quality of our air. The results from this survey show that air pollution levels decreased during the COVID-19 pandemic restrictions but they were coming from a high base in February and October of 2019. Government policies and initiatives should accelerate and incentivise the private and public sectors towards a blend of sustainable energies that favour the reduction of fossil fuel combustion and offer societies cleaner air and citizens an opportunity to become engaged as active custodians of their environment. Young people are the future and schools are integral in the development of communities offering an opportunity to educate and engage students in finding positive pathways into careers that support societies in becoming sustainable responsible and pregressive. The [EPA citizen science initiatives](#) partners with other national, European and global organisations such as the [European Environmental Agency](#) citizen science on air quality and the [GLOBE Programme](#) worldwide science and education programme to offer citizens an opportunity to take part and contribute to recording and reporting environmental data. Continual real-time monitoring of air pollution levels can offer a valuable service to public health monitoring where citizens can readily access information about environmental indicators.

## Bibliography

[SEAI](#)  
[National Geographic](#)  
[Ireland 2050](#)  
[EPA Air Quality Bulletin No2 January 2021](#)  
[GLOBE Program Ireland](#)  
[Larkin Community College](#)  
[NASA Global Climate Change](#)