



Rockford Manor School
Adorate Dominum In Atrio Sancto Eius - AD 1777



Citizen Science @ Rockford Manor Secondary School

Air Quality Monitoring Campaign

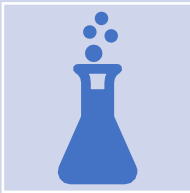
***By: Carla McCullough, Andrea Moldvaji
& Transition Year Students***



Introduction



Today, we would like to tell you about the Air Quality Project that our TY students have carried out over the past 3 academic years.

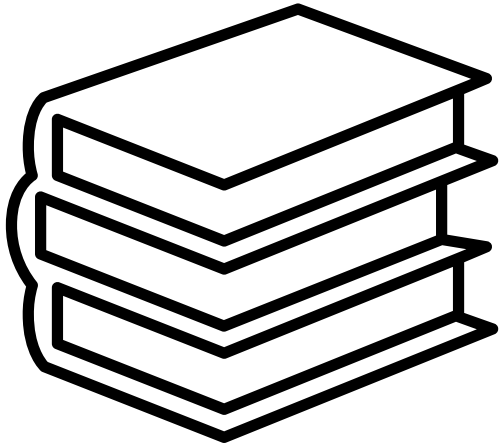


During this project we measured the concentration of Nitrogen Dioxide, NO_2 gas in the air around our school.



NO_2 is red-brown gas that is produced by vehicles. High levels of this pollutant can cause respiratory health issues and damage to our atmosphere.





Our School

Rockford Manor is a secondary school located in Blackrock, County Dublin. Our school is a Green-School and is located in an urban setting next to a busy road and roundabout.

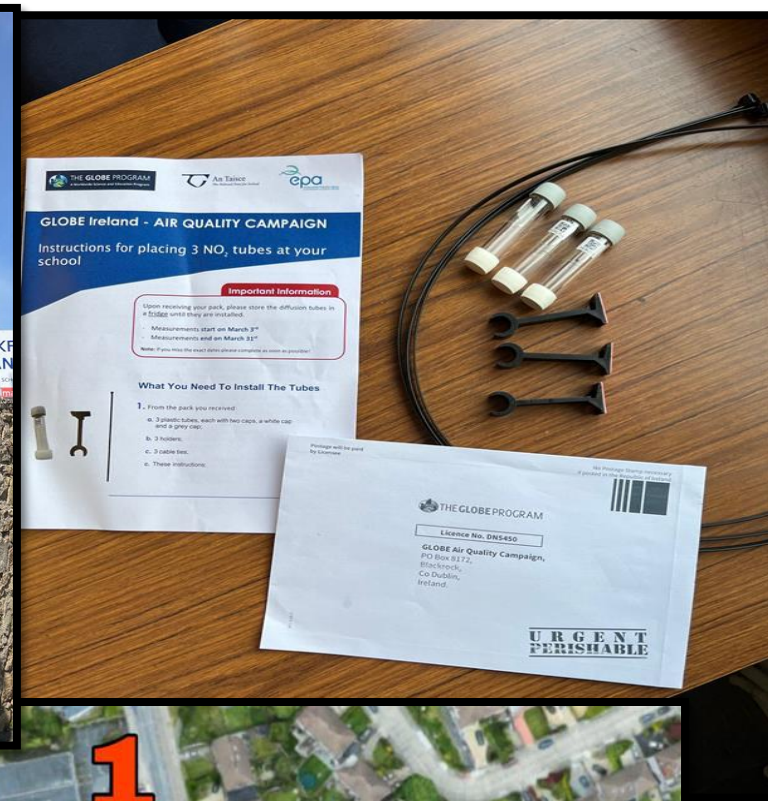
Our Aim - Research Questions

1. How much NO₂ is there in different parts of our outdoor school environment?
2. Is our school air quality within the WHO recommended level (less than 10 µg/m³) of healthy NO₂ exposure?
3. Do weather conditions such as wind speed and direction affect our air quality?
4. How do our current results compare with our previous results?
5. Can we improve air quality for our students and staff around our school?



Method

- NO₂ Diffusion Tubes placed at various locations around our school for 4 weeks during each monitoring period
- Mix of monitoring locations – roadside, sheltered from traffic and elevated
- TY students completed traffic surveys
- Daily weather (wind speed & direction) recorded

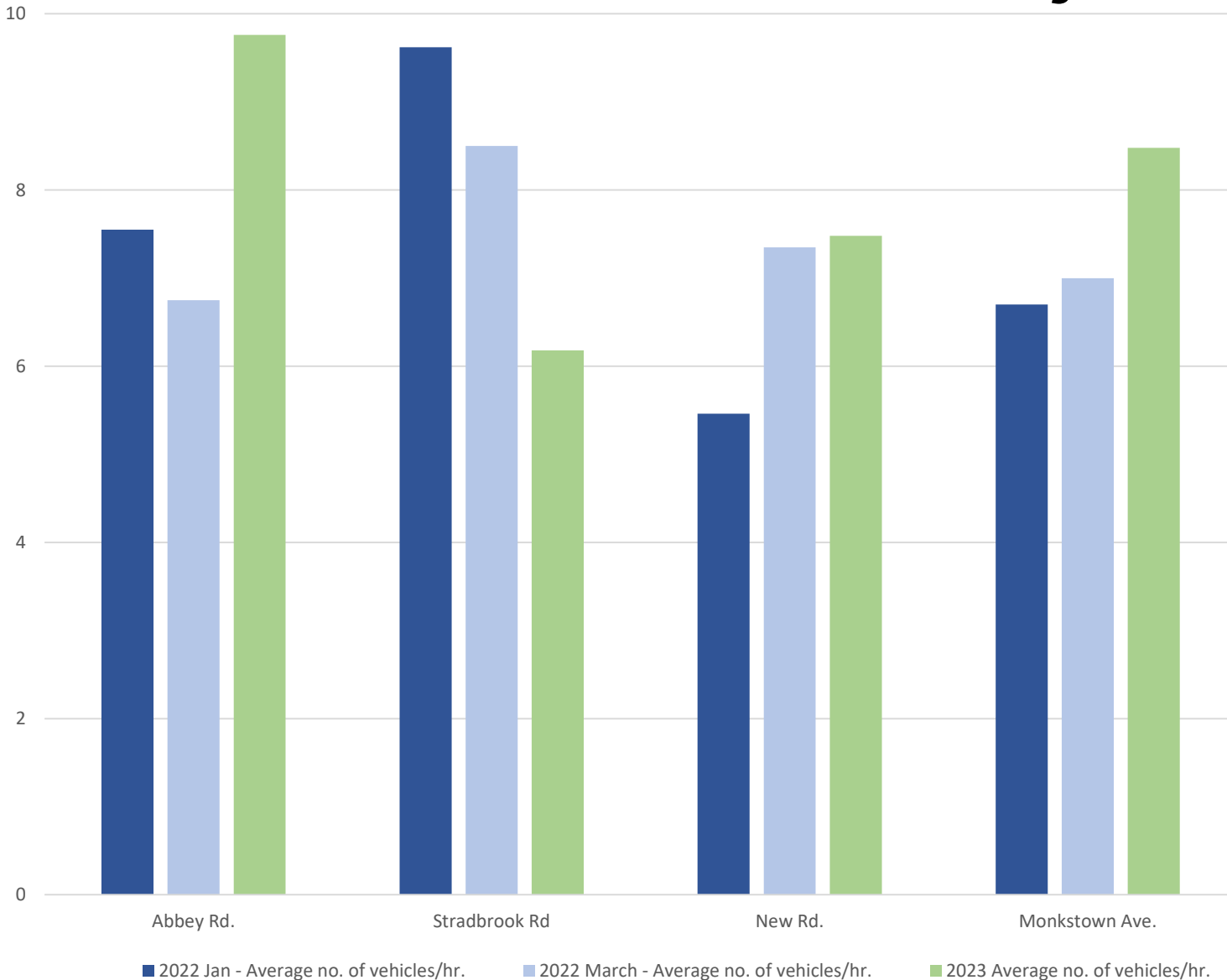


Results: Concentrations of NO₂ (µg/m³)

1. Roadside sites higher concentrations of NO₂ than sheltered green space sites
 - Average road side - 20.9 µg/m³
 - Average sheltered - 14.7 µg/m³
2. Highest overall average concentrations of NO₂ measured Autumn 2023
 - Autumn 2021 – 15.8 µg/m³
 - Spring 2022 – 19.1 µg/m³
 - Autumn 2022 - 15 µg/m³
 - Autumn 2023 – 20 µg/m³
3. Elevated site relatively close to traffic - average 18 µg/m³

Location	Autumn 2021	Spring 2022	Autumn 2022	Autumn 2023
Tube 1-traffic lights	18.29	22.15	18.32	25.52
Tube 2-basketball court (elevated)	16.12	21.86	13.49	20.72
Tube 3-green space	13.13	13.30	13.36	16.37
Tube 4-front gate	N/A	N/A	N/A	20.46
Tube 5-outdoor classroom sheltered	N/A	N/A	N/A	17.19

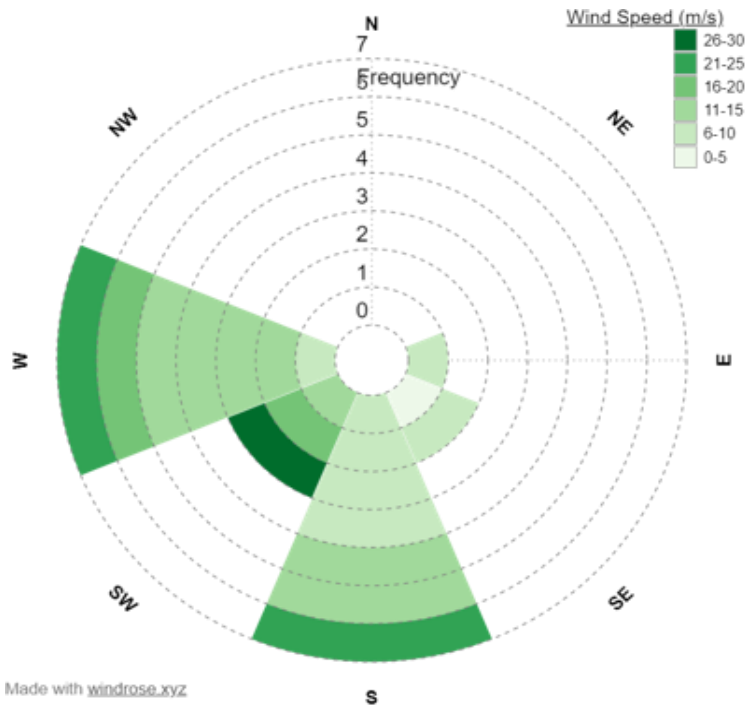
Traffic Survey 2022 -2023



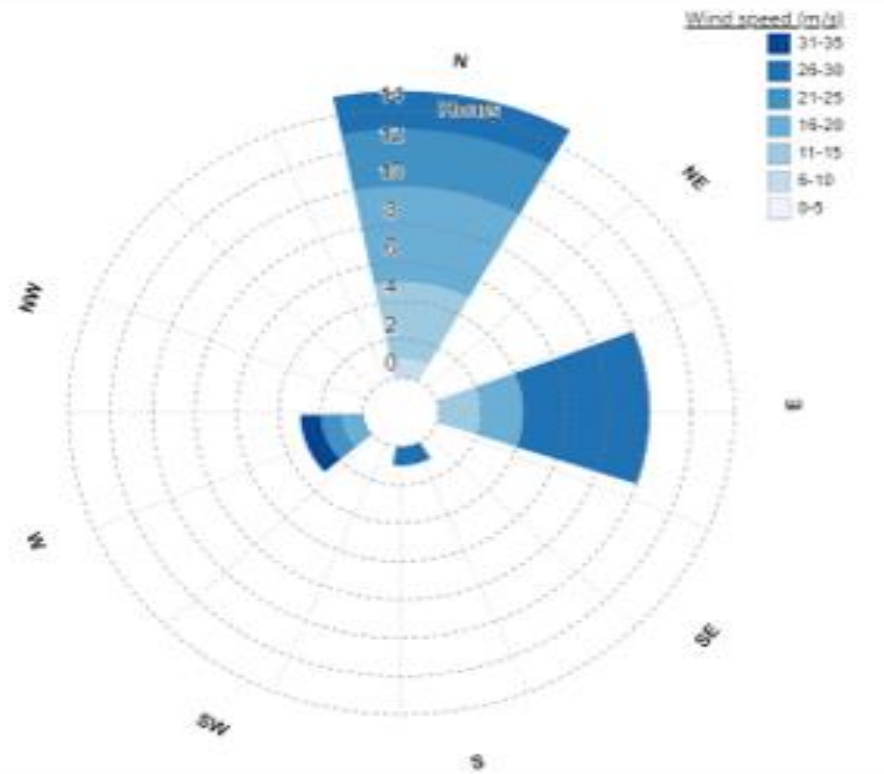
- **Jan 2022 – Dark Blue**
- **March 2022 – Light blue**
- **Oct 2023 - Green**
- **Increase in traffic levels 2022-2023**

Wind direction and speed

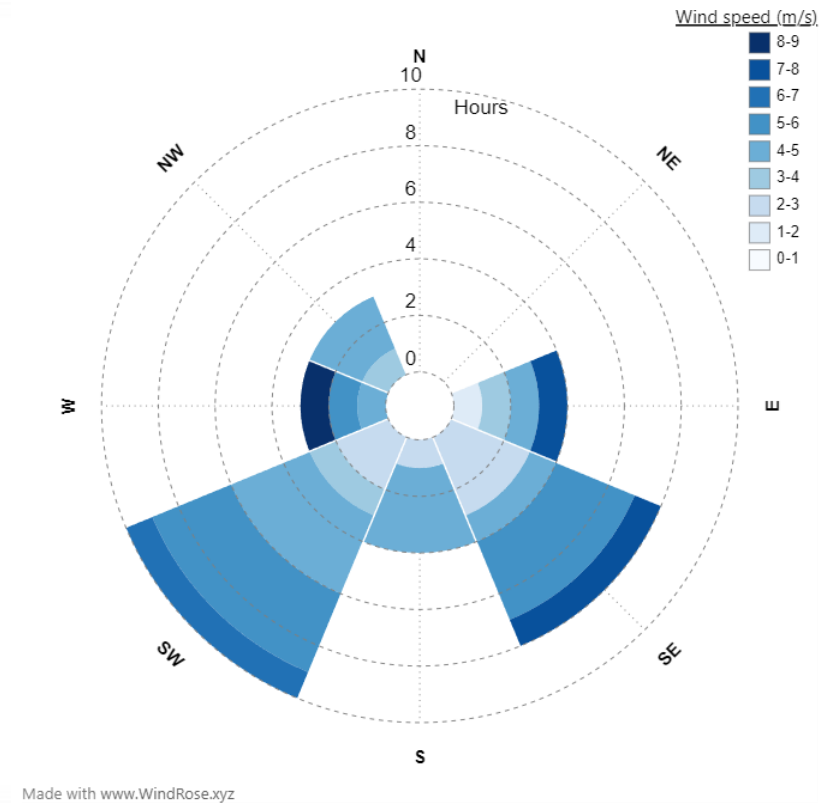
Autumn 2021



Autumn 2022



Autumn 2023



These wind roses show the speed and direction of winds during these monitoring time periods.

Conclusion – Analysis of our Results

$\mu\text{g}/\text{m}^3$	Colour Code	NO ₂ Pollutant Level
>40	Red	High
< 40 EU recommendation		
30-40	Orange	Medium to High
20-30	Yellow	Medium
10-20	Green	Low to Medium
< 10 WHO recommendation		
0-10	Blue	Low



Our data indicate that the air quality around Rockford Manor is in the Low-Medium and Medium categories. These values exceed the limit set by the World Health Organisation. This means that the NO₂ levels may be too high and action is required. If they keep increasing in the area due to exhaust fumes and human activity around the school, it could have a serious long-term effect on our respiratory health.

Our Clean Air Plan:

#Local Actions for Global Change



1. Our school has laid a Pathway around the school grounds and installed picnic tables in our green space
2. WOW – Walk On Wednesdays
3. Green-Schools - #AndSheCycles

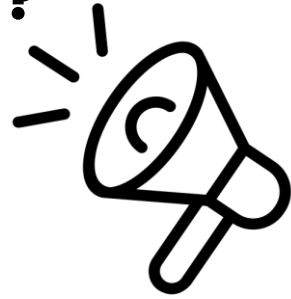


To Do:

1. Plant trees around school grounds
2. Talk to politicians/councilors – reducing traffic




How Did We Engage Our School & Community?



"Science isn't finished until it's communicated"



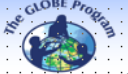


Rockford Manor School
Presentation Secondary School

Air Quality (NO₂) Monitoring Campaign Autumn 2022

Rockford Manor Secondary School

Alicena Jose, Imane Belkhen and Aziza Rezaie - Transition Year



Abstract

During Autumn 2022, our Transition Year students continued to participate in a citizen science project to monitor the air quality of our outdoor school environment. Students from other schools in Ireland have also measured the NO₂ levels around their school grounds. Diffusion tubes were placed at three different locations to measure NO₂ concentrations. We compared the results to our previous results and to the Nitrogen Dioxide Scale, which indicates that the average Nitrogen Dioxide levels around Rockford Manor are in the intermediate range.

Research questions

1. What is Nitrogen Dioxide and how much NO₂ is there?
2. Is our school air quality within the recommended level of healthy NO₂ exposure?
3. Do weather conditions affect our air quality?
4. How do traffic results compare to our previous data?

Introduction

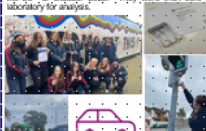
Rockford Manor is a Presentation Secondary School located on Sligo Road, Blackrock, Co. Dublin. The school is situated next to a main road and a busy residential area, as shown in our site map. The school is in a suburban area, which has mixed commercial and residential use. Due to the location of the school, we think that there could possibly be higher NO₂ levels in the air at the front of the school grounds and lower NO₂ levels in the green space to the rear of our school building as it is sheltered from traffic.


NO₂ (Nitrogen Dioxide) is a red-brown gas that is produced when fuel is burned in the engines of vehicles such as cars, trucks and buses. Elevated levels of NO₂ can lead to damage to the human respiratory tract and an increase in the risk of asthma and respiratory infections. NO₂ can also react with other chemicals in the air to form particulate matter, and ozone which are harmful when inhaled.⁴⁴

We conducted an analysis of the levels of NO₂ in our school using standardized diffusion tubes which we obtained from An Taisce and The Globe Program. During our air monitoring campaign, we also recorded local daily weather conditions and conducted a traffic survey to gain insight into the factors that may affect our air quality.

Research Methods

We placed three diffusion tubes at different locations to measure the NO₂ levels in the air around our school grounds. The first tube was secured to a traffic light at the front of our school on the main road, a location that is exposed to a lot of traffic. The second was placed at the basketball court which had some exposure to the traffic but not as much as the first tube. The basketball court is on an elevated position. The remaining tube was placed behind the school hall in a green space which is sheltered from the traffic. The tubes were put up on the 20th of September and taken down four weeks later on the 20th of October 2022. They were then sent to a laboratory for analysis.





During this time, we recorded daily local weather conditions, temperature, pressure, wind speed and direction. We think wind speed and direction may influence the concentration of nitrogen dioxide lingering around the school. We also conducted traffic surveys on the roundabout and the two roads adjacent to our school to gain insight into the levels of traffic in our area.

Site Map



Results 4.5

Diffusion tube results - average NO ₂ concentration	Spring 2022	Autumn 2022
Tube 1 (on main road)	13.8	13.3
Tube 2 (Basketball court)	11.8	11.8
Tube 3 (Sheltered)	11.2	11.2

As expected, the tube by the road and exposed to the most traffic (tube 1) had the greatest concentration of NO₂. The tube that was placed in the green open space behind our school (tube 3) was the furthest from the road and was in the most remote and isolated area of the school. It should also be noted that the results are average values over a four-week period. Nitrogen dioxide concentrations fluctuate depending on the amount of traffic in the area at any given time.

Traffic survey results

There is quite a lot of traffic passing our school. The levels of traffic vary greatly over a 24-hour period with the greatest amount of traffic occurring during the morning and evening rush hours. The traffic survey results show that there are a large number of cars and a smaller number of buses and trucks passing the school at any given time.

Wind direction and speed

Wind direction and speed data collected during the monitoring period show that the prevailing winds came from westerly and northerly directions. Traffic pollution from Sligo Road may be blown towards our basketball courts. The green space to the rear of the school building was rarely affected from traffic pollution from the main road adjacent to the school by the wind.



Discussion

The EU and WHO Health Organization (WHO) have created the nitrogen dioxide scale for good health. The EU has set an annual mean limit of 40 µg/m³ NO₂ for good health. Our results indicate that the air quality around Rockford Manor is in the low-intermediate category on the scale (10-20 µg/m³). This is safe for our health according to the EU Annual standards but exceeds the limit set by the WHO. This means that the NO₂ levels may be too high, and requires action if the NO₂ levels keep increasing in the area due to exhaust fumes and human activity around the school. It could have a serious long-term effect on our respiratory health.

Nitrogen dioxide scale 4.7




Conclusions


In conclusion, we found that the levels of NO₂ in the school area moderately low. There was an average of 12.5 µg/m³ over all three diffusion tubes. We noticed that there were higher NO₂ levels at the front of the school area but that the location is next to a busy road. Our traffic survey on the roads in the immediate vicinity of the school showed that Sligo Road was the busiest road with an average of 12.5 cars per minute and 0.5 larger vehicles per minute. It would also seem that weather and in particular wind conditions play an important role in our air quality. We would like to conduct further studies into the air quality around our school and plan to repeat our diffusion tube monitoring campaign in Spring 2023 to compare these results.

Bibliography

1. The Globe Program
2. The Globe Program Health and Environment Impact
3. The Globe Program Air Quality Report
4. Rockford Manor Students Traffic Survey
5. Rockford Manor Weather Analysis Report
6. EPA Website: https://www.epa.gov/air-quality/nitrogen-dioxide-no2
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Globe Ireland : Air quality Campaign Ireland 2022



An Taisce
The National Trust for Ireland



ROCKFORD MANOR
PRESENTATION SECONDARY SCHOOL

Air Quality (NO₂) Monitoring Campaign 2021/22

Rockford Manor Secondary School

Valentina Martin, Zoey McLaughlin & Jodie Brennan - Transition Year



Abstract

During Autumn 2021, our Transition Year students participated in a citizen science project to monitor the air quality (concentrations of Nitrogen Dioxide, NO₂) of our outdoor school environment. Students from other schools in Ireland have also measured the NO₂ levels within their school grounds. Diffusion tubes were placed at three different locations around our school grounds to measure NO₂ concentrations. We compared our results to the Nitrogen Dioxide Scale, which indicates that the average Nitrogen Dioxide levels around Rockford Manor are in the intermediate range.

Research questions

1. What is Nitrogen Dioxide?
2. How much NO₂ is there in different parts of our outdoor school environment?
3. Is our school air quality within the recommended level of healthy NO₂ exposure?
4. Do weather conditions affect our air quality?

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During this time, we recorded daily local weather conditions, temperature, pressure, wind speed and direction. We think wind speed and direction may have an effect on the concentrations of nitrogen dioxide lingering around the school. We also conducted traffic surveys on the roundabout and the two roads adjacent to our school to gain insight into the levels of traffic in our area.

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Air quality Campaign Ireland 2021/22



An Taisce
The National Trust for Ireland

Thank You

We would like to say thank you and acknowledge those who have organized this project and have assisted us with our research. Many thanks to An Taisce, Globe Ireland and the EPA for this opportunity. We have enjoyed learning about air quality and have had lots of fun being Citizen Scientists.





References

- The Globe Program health and Environment Impacts
- The Globe Program Air Quality Model
- Rockford Manor Students Traffic Survey
- Rockford Manor Weather Analysis Report
- EPA Website <https://www.epa.gov/no2-pollution/basic-information-about-no2>
- <https://www.eea.europa.eu/data-and-maps/figures/nitrogen-dioxide-annual-limit-values-for-the-protection-of-human-health>
- www.met.ie