

CITIZEN SCIENCE @ ROCKFORD MANOR SECONDARY SCHOOL

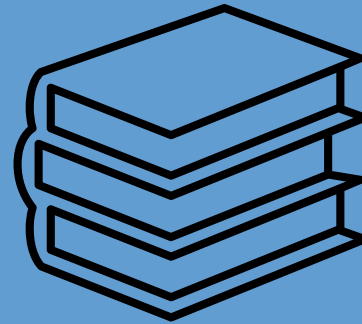
Air Quality Monitoring Campaign

By: Lily Kohout & Caitlyn Kelly



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.



INTRODUCTION



Today, we would like to tell you about the **Air Quality Project** that our TY students have carried out over the past 4 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.



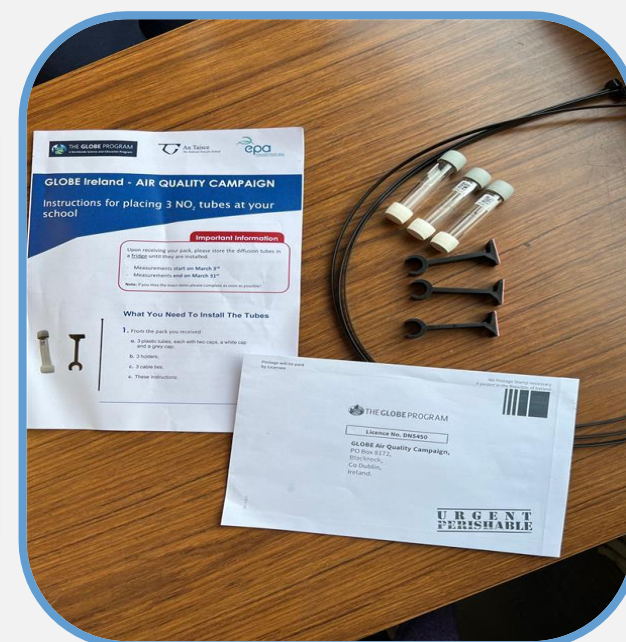
OUR AIM - RESEARCH QUESTIONS

1. How much NO_2 is there in different parts of our outdoor school environment?
2. Is our school air quality within the WHO recommended level (less than $10 \mu\text{g}/\text{m}^3$) of healthy NO_2 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 three 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**

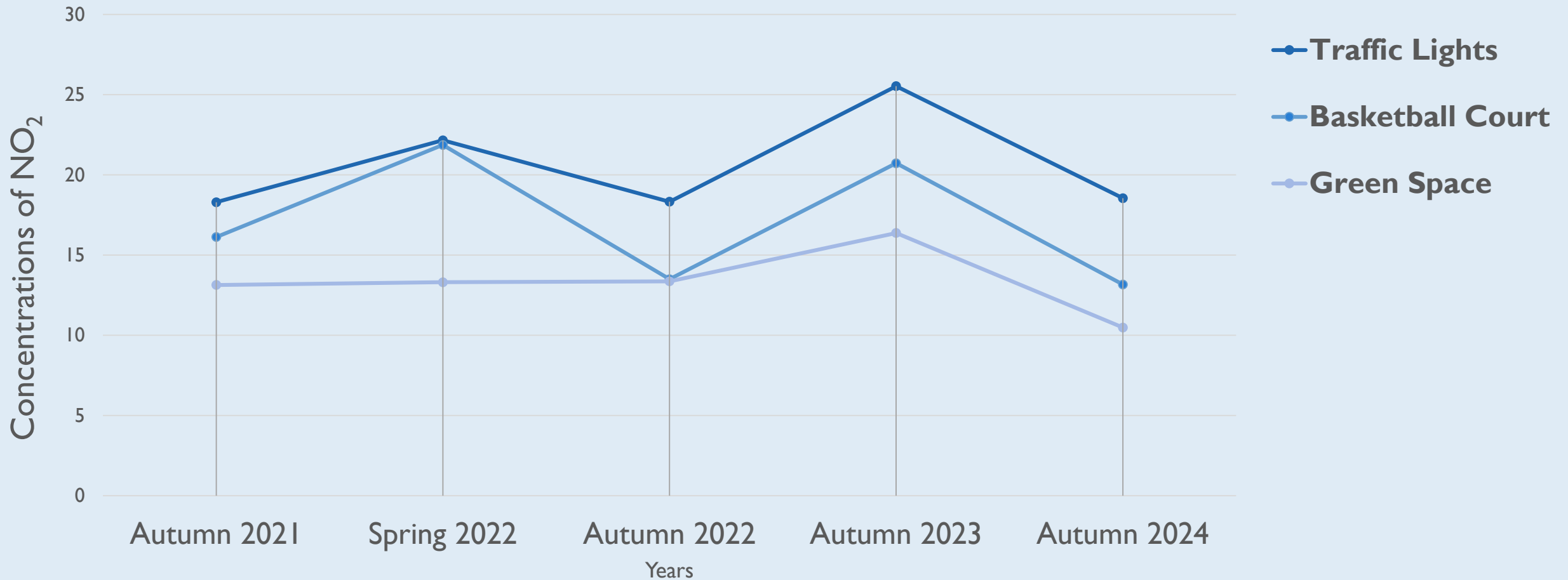


RESULTS: CONCENTRATIONS OF NO₂ (µg/m³)

Location	Autumn 2021	Spring 2022	Autumn 2022	Autumn 2023	Autumn 2024	Average per location
Tube 1- traffic lights	18.29	22.15	18.32	25.52	18.54	20.56
Tube 2- basketball court (elevated)	16.12	21.86	13.49	20.72	13.16	17.07
Tube 3- sheltered	13.13	13.30	13.36	16.37	10.48	13.33
Average per season	15.85	19.10	15.06	20.87	14.06	

1. Traffic lights – highest concentrations of NO₂ **Average = 20.56**
2. Sheltered location - lowest concentrations of NO₂ **Average = 13.33**
3. Highest overall average concentrations of NO₂ measured **Autumn 2023**
4. Lowest overall average concentrations of NO₂ measured **Autumn 2024**

RESULTS: CONCENTRATIONS OF NO₂ (μg/m³)



TRAFFIC SURVEY ROCKFORD MANOR

11.20 TO 11.40 AM

Motor Vehicle Total 195 = 585 per hour

Cars	165
Jeep/SUV	5
HGV	6
Van	19
Bus	0
Pedestrian	12
Cyclists	10
Motorcyclists	3
Dog 3	

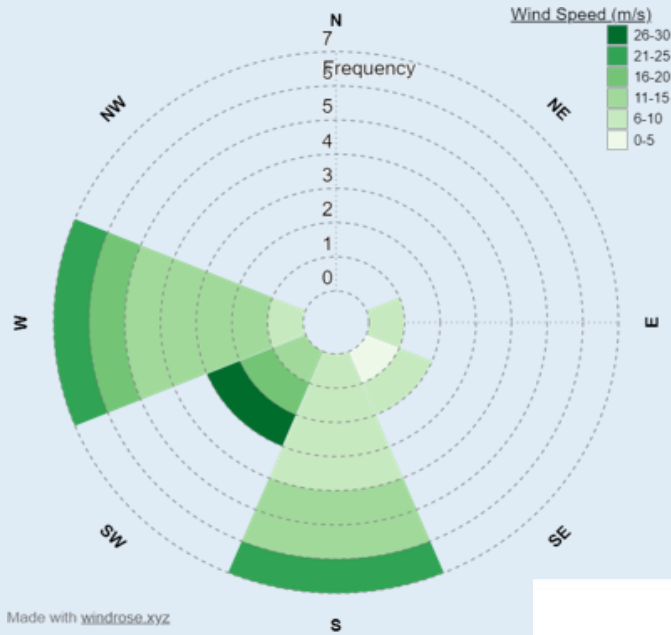
Note – we did not specify Electric vehicles – less emissions – however there is still pollution from Particulate matter (PM) (tyre and brake wear)

Particulate Matter Pollution is not to be underestimated.

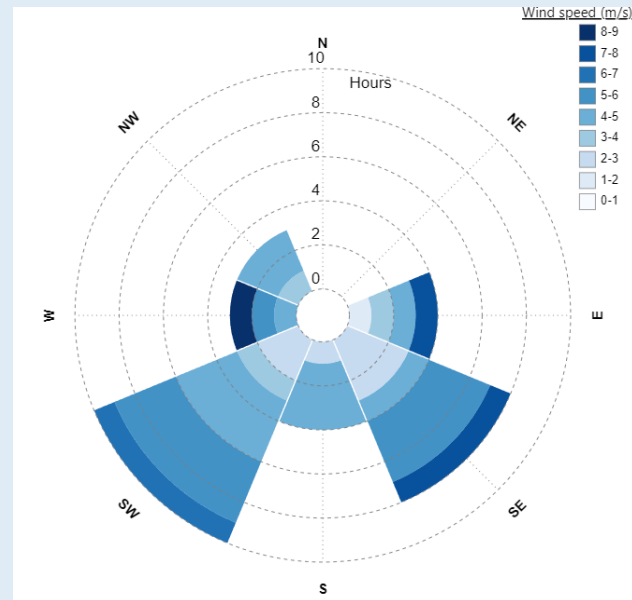


WIND DIRECTION AND SPEED

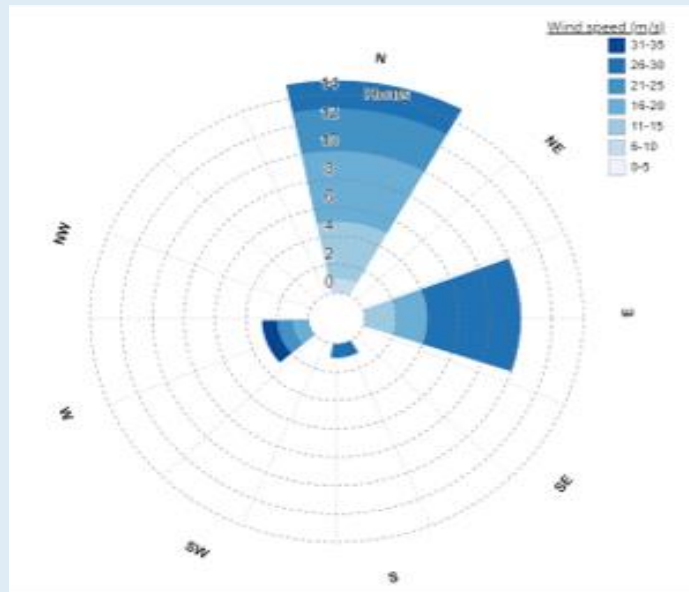
Autumn 2021



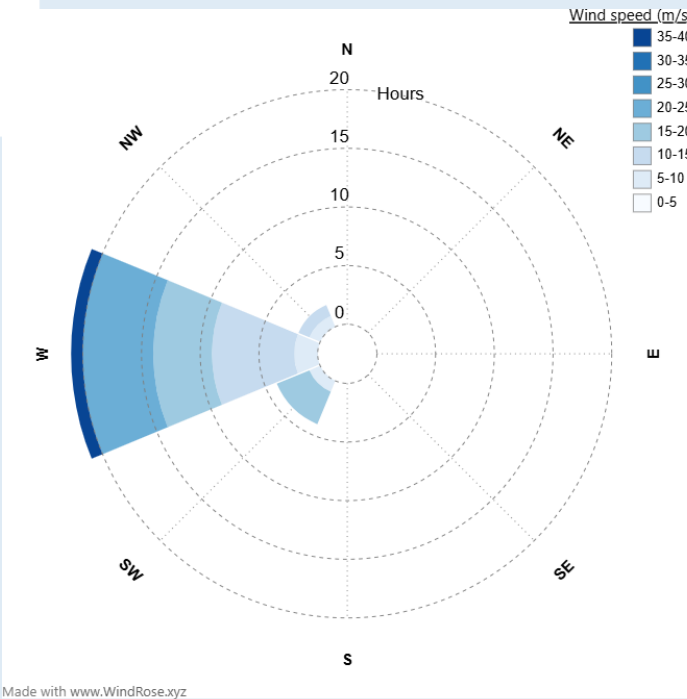
Autumn 2023



Autumn 2022



Autumn 2024



Conclusion – Analysis of our Results

Short-term exposure limit

Constant exposure to anything above this for **over a day** is deemed unsafe by WHO

25 $\mu\text{g}/\text{m}^3$

Long-term exposure limit

Constant exposure to anything above this for **over a year** is deemed unsafe by WHO

10 $\mu\text{g}/\text{m}^3$

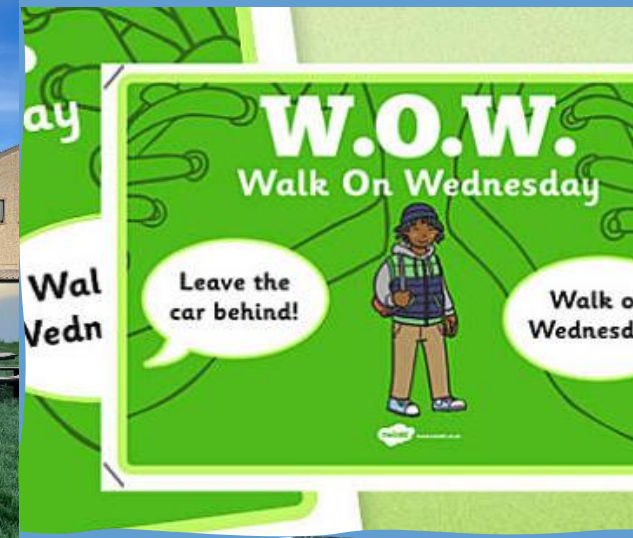
$\mu\text{g}/\text{m}^3$	Colour Code	NO ₂ Level Description
>40	Red	High
30-40	Orange	Medium to High
20-30	Yellow	Medium
10-20	Green	Low to Medium
0-10	Blue	Low



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
4. Planting trees



To Do:

1. Anti-idling campaign
2. Talk to politicians/councilors – reducing traffic and/or traffic speeds around our school



HOW DID WE ENGAGE OUR SCHOOL & COMMUNITY?



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



Rockford Manor School
Atkins Rd & New Road, Co. Dublin
15th September 2022

Air Quality (NO₂) Monitoring Campaign Autumn 2022

Rockford Manor Secondary School

Aleena Jose, Imane Belkhen and Aaiza Rezaie - Transition Year

Abstract

During Autumn 2022, 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 participated in this project. We placed three different locations around our school grounds 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 low-medium 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?
5. How do these results compare to our previous data?

Introduction

Rockford Manor is a Presentation Secondary School located on Blackrock Road, Blackrock, Co. Dublin. The school is situated next to a main road and a busy residential area. 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 specialised 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 located in a hedge 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 is in a green space which is sheltered from the traffic. The third tube was placed in the green open space behind our school building as it is sheltered from traffic. The tubes were put up on the 15th of September and taken down four weeks later on the 20th of October 2022. They were then sent to a laboratory for analysis.

Results

Diffusion tube results - average NO₂ concentration

Tube	Location	Result (ppb)
Tube 1	Front of school (Main road)	11.6
Tube 2	Basketball court (Green space)	11.6
Tube 3	Behind school (Green space)	11.6

As expected, the tube that was placed in the green space behind the school had the lowest NO₂ levels. The tube that was placed in the green space behind the school had the lowest NO₂ levels. The tube that was placed in the green space behind the school had the lowest NO₂ levels.

Conclusions

In conclusion, we found that the levels of NO₂ in the school were moderately low. There was an average of 11.6 ppb NO₂ over all three diffusion tubes. We noticed that there were higher NO₂ levels at the front of the school due to the location being next to a busy road. It would also seem that the NO₂ levels keep increasing in the area due to vehicle fumes and human activity around the school. It could have a serious long-term effect on our respiratory health.

Bibliography

1. Google Maps
2. The Globe Program (Health and Environment Impact)
3. The Globe Program (Air Quality Model)
4. Rockford Manor Student Traffic Survey
5. Rockford Manor Weather Analysis Report
6. EPA Website (https://www.epa.gov/pollution/pollution-information-overview)
7. https://www.epa.gov/pollution/pollution-information-overview

Rockford Manor School
Atkins Rd & New Road, Co. Dublin
15th September 2022

Air Quality (NO₂) Monitoring Campaign 2021/22

Rockford Manor Secondary School

Valentina Marin, Zoey Moloughlin & Jodie Brennan - Transition Year

Abstract

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Research questions

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As shown in the results, the tube that was placed in the green space behind the school had the lowest NO₂ levels. The tube that was placed in the green space behind the school had the lowest NO₂ levels.

Conclusions

In conclusion, we found that the levels of NO₂ in the school were moderately low. There was an average of 18.12 ppb NO₂ over all three diffusion tubes. We noticed that there were higher NO₂ levels at the front of the school due to the location being next to a busy road. It would also seem that the NO₂ levels keep increasing in the area due to vehicle fumes and human activity around the school. It could have a serious long-term effect on our respiratory health.

Bibliography

1. Google Maps
2. The Globe Program (Health and Environment Impact)
3. The Globe Program (Air Quality Model)
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6. EPA Website (https://www.epa.gov/pollution/pollution-information-overview)
7. https://www.epa.gov/pollution/pollution-information-overview

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 The Globe Program, An Taisce, Globe Ireland and Green-Schools 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**
- **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**