**Citizen Science**

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**Rockford Manor Secondary School**

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**Air Quality Monitoring Campaign**

Student Report

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***& Transition Year Students***



**Abstract**

Since Autumn 2021 our TY students have participated in this citizen science project to monitor the air quality of our outdoor school environment. Students have installed diffusion tubes at different locations to measure nitrogen dioxide (NO2) concentrations. Data collected over the past three years indicate that NO2 pollutant levels are in the low to medium and medium range. As these levels exceed those recommended by the WHO, students have worked with our Green-Schools committee and staff to find ways to reduce emissions and their impact.

**Introduction**

Rockford Manor is a Secondary School located on Stradbrook Road, Blackrock, Co. Dublin, Ireland.  The school is situated next to a main road and a busy roundabout, 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.

Map

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NO2 is a red-brown gas that is emitted into the air by traffic and other harmful human activity. High levels of this gas can cause respiratory health issues and damage to our atmosphere.  Longer exposures to elevated concentrations of NO2 may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. 1,3

With this project, we aim to gather and analyse data in efforts to reduce NO2 levels around our school area and therefore improve air quality for our staff and fellow students.

**Our 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**

* Diffusion tubes supplied by Globe Ireland were installed at several locations around our school campus to measure NO2 levels.
* Locations close to traffic at the front of our school next to the main road and to the rear of our school in the green space were chosen to compare pollutant levels in areas exposed to traffic and those sheltered from traffic.
* Diffusion tubes were installed at these locations for a 4-week period and then sent to a laboratory for analysis.
* During this monitoring period traffic surveys were conducted and daily weather conditions recorded.

Text, letter

Description automatically generatedA hand holding a small plastic tube with a qr code on it

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**Results: Concentrations of NO2  (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 |

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** μ**g/m3**

**Wind speed and direction**

The wind rose shows the wind speed and direction during our Autumn 2023 monitoring campaign. This chart shows that wind came mostly from the southeast and southwest. The prevailing winds in Autumn 2021 were from the south and southwest, while in 2022 they were from the north and east. These data may be used to show the impact of wind direction on the spreading of pollution from traffic next to our school towards or away from our school grounds.

Autumn 2021 Autumn 2022

Chart, radar chart

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Autumn 2023

A screenshot of a computer

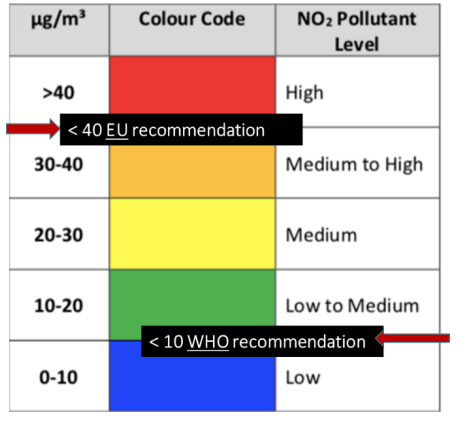
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**Traffic Survey Results: 2022-2023**



**Discussion**

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.  The EU and World Health Organization (WHO) have created the nitrogen dioxide scale for good health.4 The EU has set an annual mean limit of 40 µg/m3 NO2 and the WHO has set an annual mean limit of 10 µg/m3 NO2 for good health.  Our results indicate that the air quality around Rockford Manor is in the low-medium (10-20 µg/m3.) and medium (20-30 µg/m3.) categories on the scale. 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.



We propose that recent overall increases in NO2 levels may be due to increased traffic levels. There is more traffic on the roads now, compared to the last few years due to Covid restrictions. A greater number of people were working from home during 2021 and 2022 than during Autumn 2023. This is something we would like to investigate further.

**Conclusion – Our Clean Air Plan**

Our school community has implemented the following actions to improve air quality and reduce the impact of NO2 pollution on our health.

* We have a new pathway around our school to encourage students to hang out in our green space where air quality is better.
  + WOW : Walk on Wednesdays, students are encouraged to walk to school on Wednesdays or any other day of the week to reduce our reliance on vehicular transport to school
  + A group of girls holding signs

    Description automatically generated #AndSheCycles : cycle to school campaign. Three of our students are ambassadors of this national campaign which supports and encourages our students to cycle more.



Future Plans

* + Plant more trees and greenery on our campus to improve our air quality
  + Anti-Idling campaign to reduce NO2 emissions from cars waiting outside our school

References

* 1. The Globe Program Health and Environment Impacts
  2. The Globe  Program Air Quality Model
  3. EPA Website https://www.epa.gov/no2-pollution/basic-information-about-no2
  4. https://www.eea.europa.eu/data-and-maps/figures/nitrogen-dioxide-annual-limit-values-for-the-protection-of-human-health
  5. www.met.ie

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