

Impact of the School Run on Air Quality

Mt. St. Michael Secondary School, Rosscarbery

Co. Cork

Ireland

This is our school. It is on a hill by the sea, and is surrounded by farmland.



© Tom Vaughan - www.OakwoodAerialPhotography.ie

Background Research

NO₂ is a traffic related pollutant. Proof of this comes from a study done by the EPA which found in Ireland **NO₂ levels dropped by 50% during lockdown**

The EPA report 'Air Quality in Ireland 2023' states that '1600 people die prematurely in Ireland due to poor air quality'.

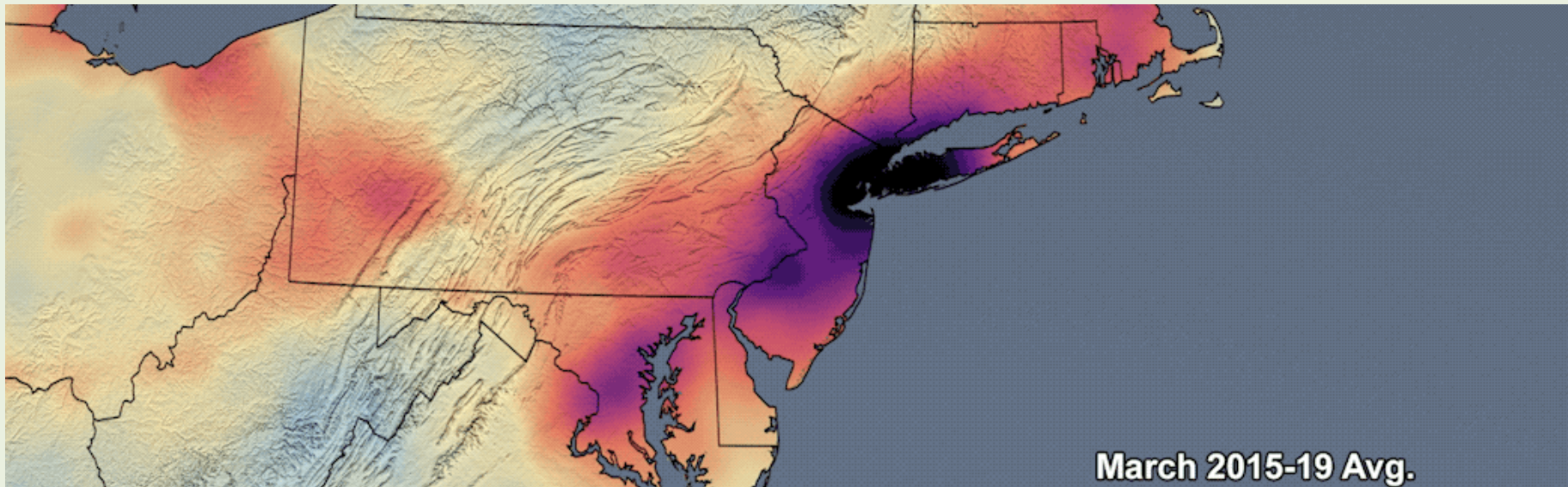
NO₂ affects the throat and lungs by inflaming the linings. It can lead to asthma, emphysema and cardiovascular problems.

nt on Global Air Quality



The NASA Aura OMI Satellite continually monitors NO_2 as it orbits around the world. As Citizen Scientists we can help to fill in the gaps by providing local data collected according to strict Globe protocols

NO₂ Levels from 2015 to 2020 in Eastern USA



This shows a big reduction in NO₂ during lockdown

Introduction

We took part in the Globe Ireland Air Quality Campaign 2023 and 2024.

The National School and Secondary School are beside each other. This means that there is a lot of traffic at starting and finishing times.

The main air pollutants are Nitrogen Dioxide which can cause the pH of rainwater to decrease, and Particulate Matter.

Last year the LCA class found the main road had 102% higher NO₂ levels than the wooded recreation area at the back of the school.



Lesser Yellowlegs
26/09/2023



Greenshank
03/01/2024



Eurasian Oystercatcher
04/02/2024

Birds on Rosscarbery Estuary

We were concerned that our air is being polluted. More concerning is that the schools are beside the lagoon which is home to many native and migratory birds.

Research Questions

Have the NO₂ levels increased since the same time last year?

How many vehicles and what type, pass through each area at starting and finishing times?

We believe they have as the number of students has increased

This map shows our NO₂ tube locations and our survey points. We placed three tubes: on the main road by the drop off area, on a minor road by the national school drop off and in the wooded area at the back of our school near the recreation area.





Tubes Up Day 25th
September 2024

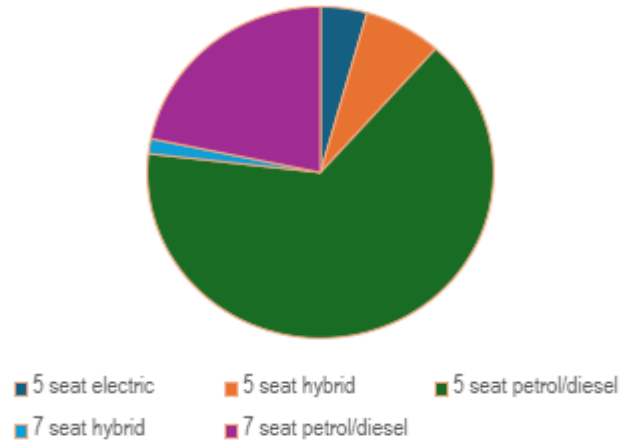


Tubes Down Day
24th October 2024



Surveys

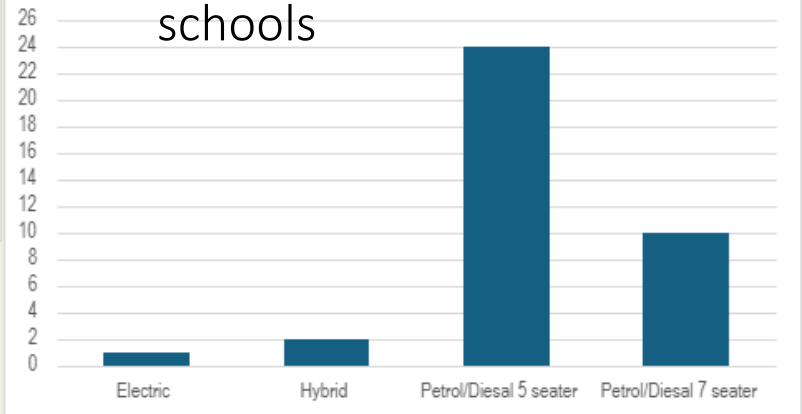
Bus Stop 8:25 - 9:15



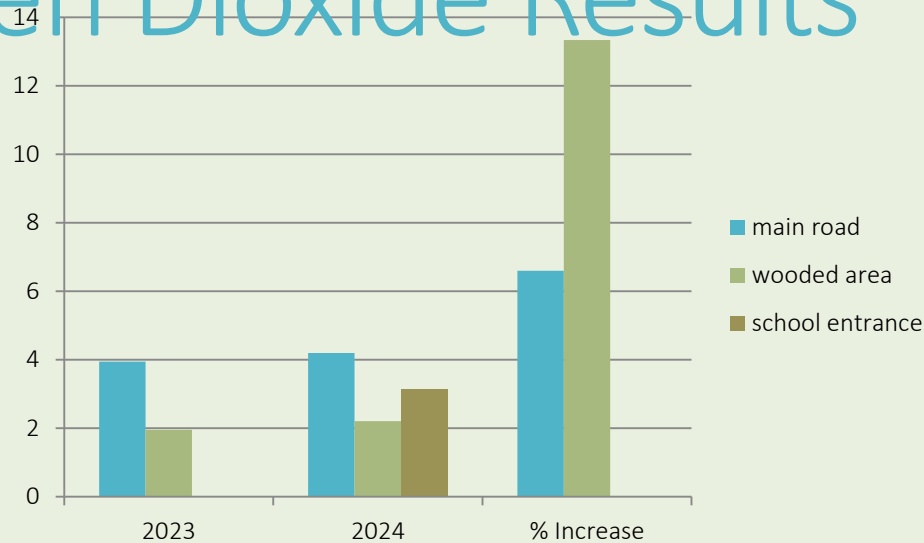
7. How would you feel about getting dropped by the busses and walking an extra 150 steps to school, instead of being dropped at the steps or around the back? (0 point)



The majority of cars are still fossil fueled. There was no change in number of electric cars from 2023 to 2024. 84% of students supported moving the drop off location further from schools

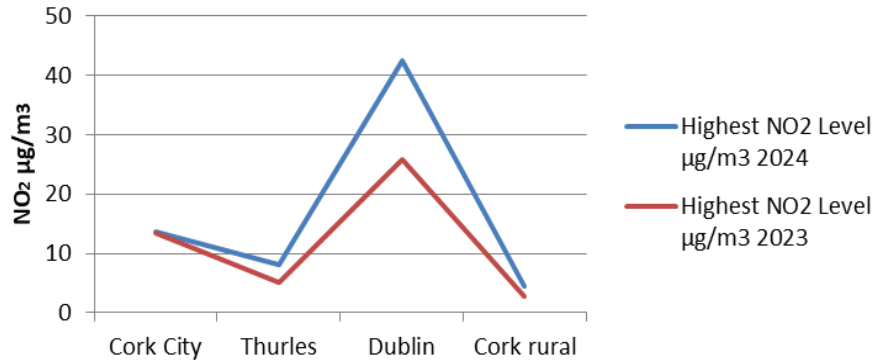


Nitrogen Dioxide Results



The increase in NO₂ on the main road did not surprise us. We are shocked at the % increase in NO₂ levels in our wooded area. We did not expect this. The school entrance is a very quiet road except for the school run. There is less NO₂ but the results suggest that it must be very high at school run times.

Comparison of Highest NO₂ Levels recorded in Four Types of Location in 2023 and 2024

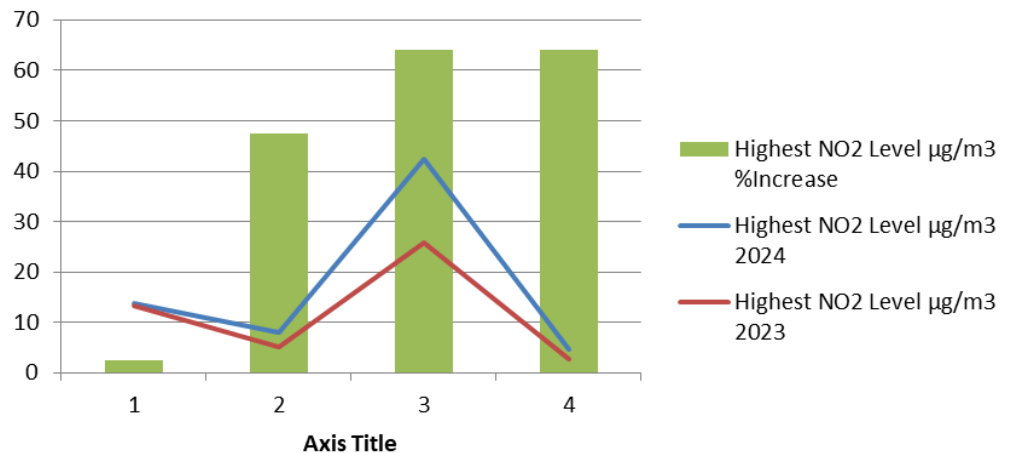


While NO₂ levels appear to have stayed similar in the Cork city and Cork rural schools, the other two locations had higher levels.

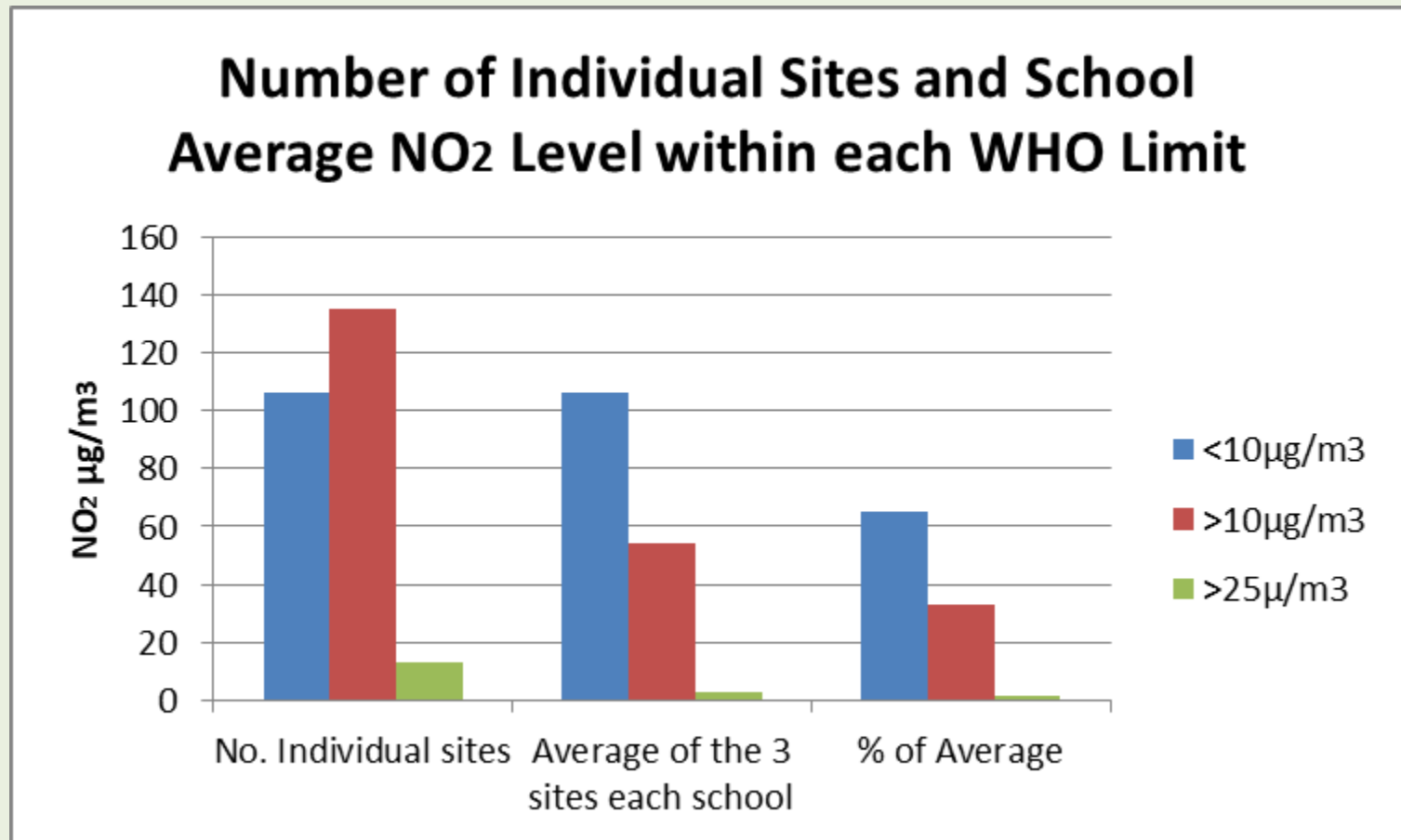
However, if we look at the %increase, the picture is very different.

The increase in three of our locations is shocking to us. This indicates **we have a growing problem from NO₂ Pollution in Ireland.**

% Increase in NO₂ levels in Four Types of Location from 2023 to 2024



Many Irish schools had levels above $10\mu\text{g}/\text{m}^3$ of NO_2



Factors affecting Air Quality

DATA TABLE										
	Date	Time (hrs 24-hr interval)	Rainfall (mm)	Wind Direction	Wind speed (km/hr)	Cloud Cover (%)	Cloud Types	Traffic Count (no. of cars)	Cars per min (cars/min)	Idling Cars (cars/min)
Example	11/11	11:30	0 mm	South West	30	30-35%	Cumulus	40	8	12
Week 1 Day 1	25/9	12:00	0	31.7°	28.8	91.2	nimbo cumulus			
Week 1 Day 2	26/9	12:00	0	309.5	35.5	91.2	"			
Week 2 Day 3	27/9	12:00	0	336.6	36.4	87.1	Cumulus			
Week 2 Day 4	28/9	12:00	0	169.9	24.1	87.6	"			
Week 3 Day 5	29/9	12:00	0.6	117.7	55.2	87.1	nimbo cum.			
Week 3 Day 6	30/9	12:00	0	325.8	29.2	58.5	cumulus no.			
Week 4 Day 7	1/10	12:00	0	320.3	20.7	46.4	cumulus			
Week 4 Day 8	2/10	12:00	0	61.1	28.8	61.2				

Wind Direction: Our prevailing wind is SW but during our study it varied from ENE all the way round to NNW. There was wind every day.

Wind Speed: Ranged from 12.3 to 66.2 km/hr

Rainfall: Very little for time of year. It was measurable on 5 days

Cloud Cover: There was cloud every day. Mostly cumulus or nimbo cumulus. These low level clouds could have prevented the dispersal of NO₂.

Landscape: Our school is 33m above sea level, facing the sea so it gets a lot of wind. The entrance to the school is at sea level and is sheltered by tall trees.

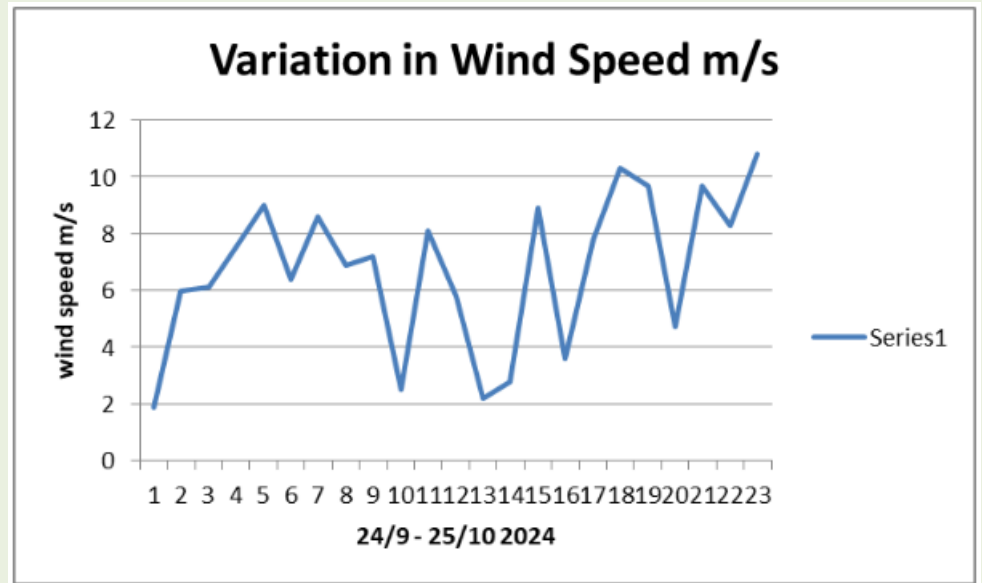
Wind Speed

There was wind every day which is a positive effect for our school as wind clears NO_2 quickly. Wind Speed varied from 7km/hr (1.9m/s) on 24th September to 39km/hr(10.8 m/s) on 25th October.

Our average speed was 6.7m/s.

We used the Globe ADAT system to compare our wind speeds with a school on the Kerry west coast by the Shannon Estuary.

They recorded a minimum wind speed of 0.2m/s and a maximum of 13.9m/s on 20th October.





ACTIONS : 2-day trial run

We moved the drop off to a safe parking area 200m away from the schools.

This was successful.

Next step. Work with Parents Committee to make this standard procedure

Tree Planting

Over the last 5 years our TY students have helped the park manager to plant 1000 trees in our neighbouring Community Park, Pairc aTobair.



They have also planted hedging along the new bioswale.

We used a carbon storage calculator sheet to calculate the carbon stored in 100 native trees

If we planted 100 Oak, Beech and Horse Chestnut saplings they would remove 1.35kg of carbon from our atmosphere. In 5 years' time, they would have stored 210kg of carbon. The 1000 trees already planted by students in our school are storing approximately 2100kg of carbon. This means they are removing excess CO₂ from the atmosphere and so helping to reduce the greenhouse effect in our locality.

Cyfoeth Naturiol Cymru
Natural Resources Wales

Worksheet

	Tree A	Tree B	Tree C
1 Species	OAK	BEECH	HORSE CHESTNUT
2 Circumference (cm)	1.5	1.5	1.5
3 Age (circumference ÷ growth rate)	$\frac{1.5}{1.88} = 0.80$	$\frac{1.5}{2.5} = 0.60$	$\frac{1.5}{2.5} = 0.60$
4 Dry weight (kg) (see conversion table)	0.009	0.009	0.009
5 Carbon stored (kg)	0.0045	0.0045	0.0045
6 How do we produce this amount of carbon? (see Resource cards: Carbon equivalents)			

circumference after 5 yrs carbon stored

$5 \times 1.88 = 9.4$	$5 \times 2.5 = 12.5$	$5 \times 2.5 = 12.5$
$= \frac{1.4}{2} = 0.7$	$= \frac{1.6}{2} = 0.8$	$= \frac{1.4}{2} = 0.7$

3 x 100 x 0.7 = 2100kg

For more learning resources, information and data? Contact: education@naturalresourceswales.gov.uk or go to <http://naturalresourceswales/learning>



BT YOUNG SCIENTIST COMPETITION Jan 8th-11th 2025

We shared our project
with Judges and the
Public



Meeting our Taoiseach
Micheal Martin. He was
very interested in our
findings.



The NO₂ level has increased around our school since last year. The % increase is larger than can be accounted for by an increased student population.



Our weather is very changeable, but it is nearly always windy. This is good for diluting air pollutants. We are lucky to live by the sea as our air is very clean compared to many Irish schools.



Extremely worrying is the finding that nearly a third of AQ measurements in the 163 Irish schools who took part in the campaign are above the recommended levels by WHO & EU.



There has been very little change in electric vehicle use. There are still not enough services to charge the car on Irish roads.

Conclusions