

An Investigation into Levels of Traffic-Related Air Pollution Around our School.

Green Schools Committee, 1st & 2nd Class Monaghan Model School.



Introduction

Although it is hard to see, air pollution is around us and responsible for serious diseases and even death. According to the World Health Organisation it is the 'single biggest environmental health risk'. In Ireland over 1,510 premature deaths each year are attributable to air pollution. This is 10 times more than road deaths!

Air pollution can worsen symptoms for sufferers of asthma, lung disease, cardiovascular (heart) disease. Everyone is affected by air pollution but some are more at risk than others; Unborn babies, pregnant women and older adults. Children in particular are more likely to be more vulnerable to exposure as their lungs are still growing and developing, their immune and metabolic systems are still developing, they suffer from frequent respiratory infections and they are more active outdoors than adults and therefore breathe in higher doses of outdoor pollutant.

Many of the sources of air pollution are also strongly linked to environmental damage and climate change. So we need to raise awareness about this very serious health and environmental problem.

Research Questions

In Ireland, the main pollutants of concern for human health are particulate matter (PM) and nitrogen dioxide (NO₂). The main source of NO₂ are diesel powered vehicles (cars, buses, lorries and trains).

NO ₂ concentration (µg/m ³)	Description
50 +	Extremely bad
45 - 50	Very bad
40 to 45	Bad
35 - 40	Substandard
30 - 35	Mediocre
25 - 30	Average
20 - 25	Pretty good
15 to 20	Good
10 to 15	Very good
0-10	Excellent

By measuring the nitrogen oxide we can see the impact of vehicles on the air quality around our school. We will investigate levels of NO₂ in several locations on the school site and grade it using this table (curieuzeneuzen 2016).

We will also monitor the level of traffic outside our school to see if it gives an indication of the level of air pollution recorded.

Weather impacts air pollution in different manners and we will monitor weather patterns over the period of the NO₂ monitoring.

Research Methods

The levels of NO₂ were measured by diffusion tubes over the measurement period of 1st February to 1st March and sent to the laboratory for analysis

- The grey cap contains the material that absorbs NO₂ over the measurement period.
- The plastic tube channels the air and the white cap was removed during the measurement period and put back on at the end of it before posting.

Tube #	Tube Location
1	Main road (Main gate)
2	Near moving traffic (Side gate)
3	Sheltered area (Back courtyard)

Three locations were chosen on the school grounds. Two located on exposed routes and one in a sheltered area.

We undertook **Traffic Surveys** at Tube #1 and Tube #2. 2nd Class took turns in 15min slots to count the traffic.

Weather Measurements: 1st Class recorded the weather over the month of February. A rain gauge was used to record the amount of rainfall on a daily basis. Measures of wind speed and wind direction were recorded using the Met Eireann website

Site Map



Tube Locations and Diffusion Tube #2 in Situ

Field Photos



Side Gate Tube #2 Location



Undertaking Traffic Survey at the Front Gate, Tube #1 Location

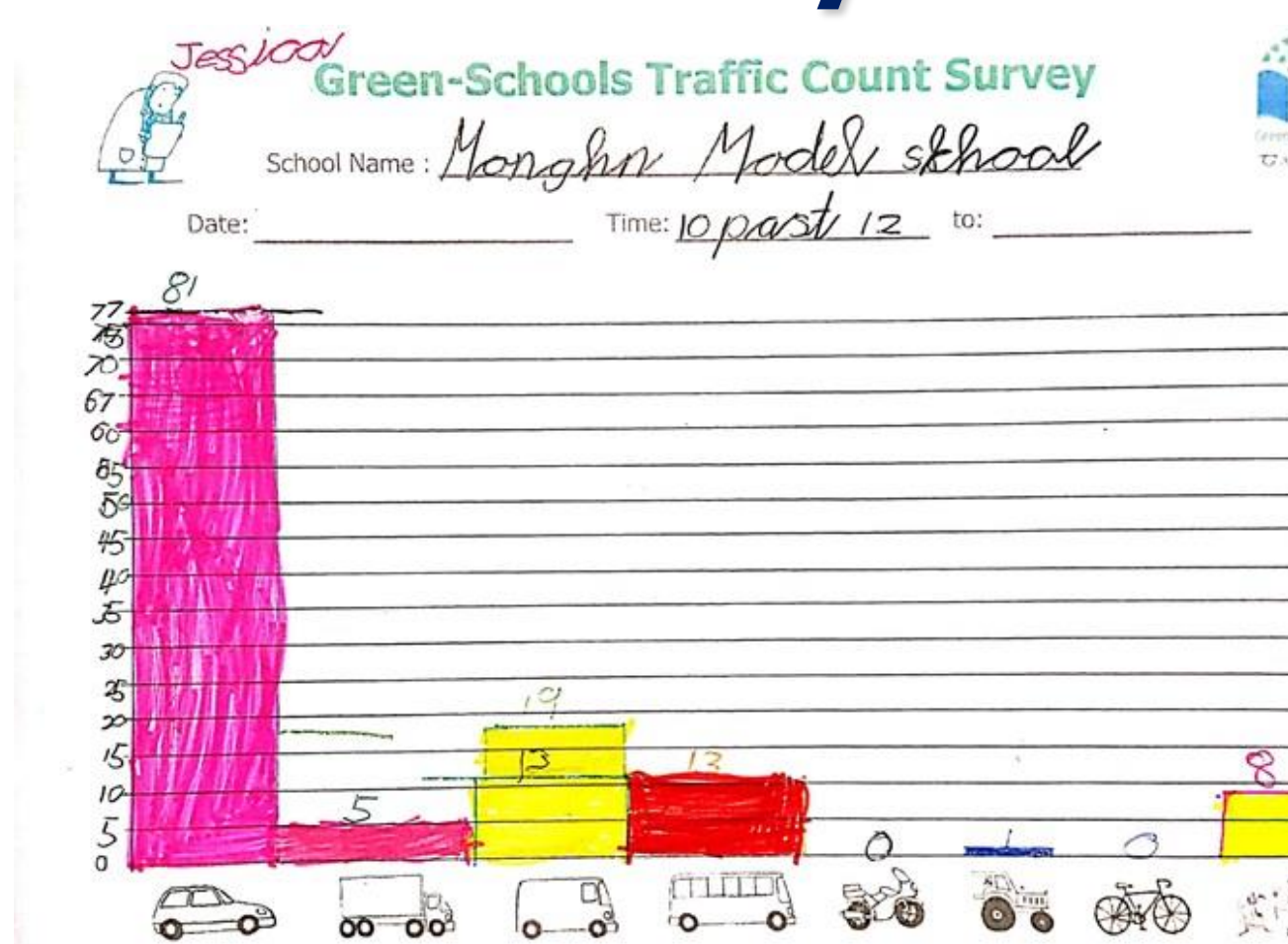
Results

NO₂ Concentration Results:

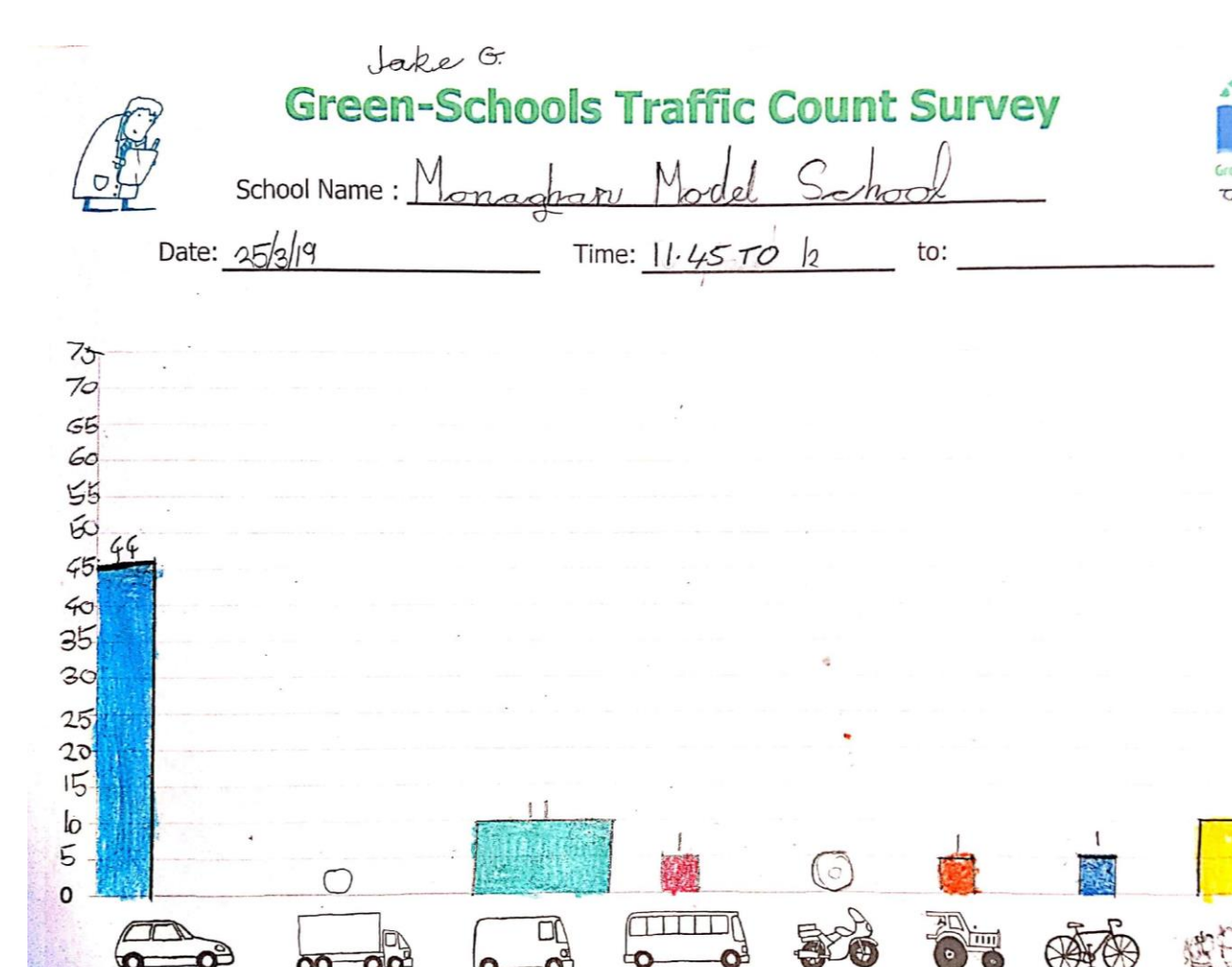
The laboratory measured accumulated NO₂ level in the diffusion tubes and applied a calculation to find out what this means for the air near the tube. This is expressed in micrograms per cubic meter of air (µg/m³). The results are ranked by the Curieuzeneuzen scale.

Tube #	Tube Location	NO ₂ concentration (µg/m ³)	Description
1	Main road (Main gate)	33.77	Mediocre
2	Near moving traffic (Side gate/Hospital Hill)	19.3	Good
3	Sheltered area (Back courtyard)	13.66	Very Good

Traffic Survey Results:



Vehicle	Tally
Car	81
Lorry	5
Van	19
Bus	13
Motorbike	0
Tractor	1
Bike	0
Walker	8



Vehicle	Tally
Car	44
Lorry	0
Van	11
Bus	1
Motorbike	0
Tractor	1
Bike	1
Walker	10

Weather Records:

Date	Amount of rainfall (mm)	Wind speed (km/hr)
4/2/19	0.1 mm	9.3km/hr
6/2/19	1.7mm	15.9km/hr
8/2/19	10.0mm	32.5km/hr
11/2/19	0.1mm	8.5km/hr
13/2/19	0.1mm	21.2 km/hr
15/2/19	0.1mm	17.0 km/hr
18/2/19	2.0mm	22 km/hr
20/2/19	2.0mm	16 km/hr
26/2/19	0mm	7km/hr
28/2/19	0mm	6 km/hr
1/3/19	0mm	7km/hr

Here are the results of our weather records taken from the 1st February to 1st March.

We were unable to obtain sunshine hours for the period but overall the weather was settled and bright.

Discussion

The quality of air collected from #1tube located at the main gate has been described as 'mediocre' – 33.77µg/m³. It is exposed to one of the main roads through the town and the traffic surveys shows high level of traffic at this location. #2tube located on the Hospital Hill entrance had a lower level of 19.3µg/m³ rated as 'good'. This is reflected in the traffic surveys that showed lower traffic levels here compared to the front gate. #3tube at 13.66µg/m³ was rated as 'very good'. This is not unexpected as it was placed in the back courtyard which is sheltered from traffic.

Weather impacts air pollution in different manners and the weather over the study period could have impacted the results. Rain cleans the air by washing pollutants down to the ground, however rainfall levels were quite low over the month of February (0-10mm). Wind can disperse local air pollution and it can also bring pollution from other areas. Over the period we recorded wind speeds ranging from gentle to fresh, and so while not very strong, the wind might have had a slight impact on findings.

Other factors that may have effected the results include: Mid-term break occurred during the test period. Secondary schools were closed from 18th -22nd February, and all primary schools were closed on 21st and 22nd February which meant that the volume of traffic passing our school and parked at the entrance would have been significantly lower for that period.

Conclusions

Our study shows very clearly the effects of traffic pollution on the quality of air around our school. Nitrogen Dioxide was detected in all three areas of the school that we investigated. This is air that we are breathing in on a daily basis. While long-term exposure to concentrations over 40 (µg/m³) are believed to have adverse health impacts it is now considered that any level of air pollution is not acceptable and poses a risk.

Our results show us that we need to take action in order to improve the quality of air around our school. The Green-Schools committee will be implementing actions to improve the air quality, including a 'No Idling' campaign to encourage drivers to turn off their engines while parked outside the school. We also hope to launch a Park & Stride initiative to reduce the volume of traffic coming to school every morning. This will not only help make our air cleaner, but will reduce our Carbon footprint.

To get a more accurate picture of the air quality around our school we would need to repeat this study monthly. This would allow us to investigate the impact of weather conditions and traffic levels on the air quality on a more long-term basis. It was also allow us to monitor the effectiveness of the actions and initiatives we will put in place to improve the air quality around our school.

Bibliography

Teachers Resource- Facts on Air Pollution; Globe Teacher Resource - Measurements _ Activities; Globe Air Quality Investigation - Tips for your project; Globe www.curieuzeneuzen.eu/en/