Europe Eurasia Air Quality Conference

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CASTLETROY COLLEGE

UT SINT UNUM

Limerick CITY & COUNTY COUNCIL

epa Environmental Protection Agency

An Taisce

The GLOBE Program Ireland

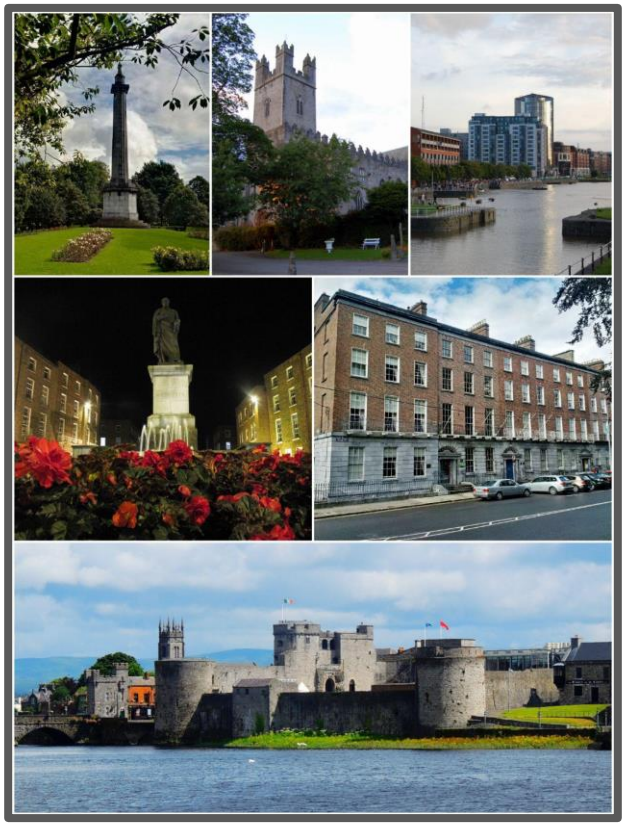
Introduction

Castletroy College is a secondary school in Limerick, Ireland.

We are 4th year students that have been working on our air quality project trying to identify and understand the factors that impact air quality.

Main Focus for this Project

- We are very excited to do this work investigating the air quality around our school and to try and identify the factors that may impact it and are delighted to get the opportunity to be part of this pilot project with the EPA and An Taisce.
- We were curious to find out if our air quality is within the recommended ranges and also if there are times in our day where air quality is poorer than others.



Why Air quality is important

We should care about air pollution because it affects:

- Human health – causes respiratory diseases, heart problems, and worsens asthma.
- Children’s development – young lungs are more vulnerable to pollutants.
- The environment – harms wildlife, damages crops, and contributes to climate change.
- Quality of life – reduces visibility, creates bad odors, and makes outdoor activities less enjoyable

How did we collect our Data?

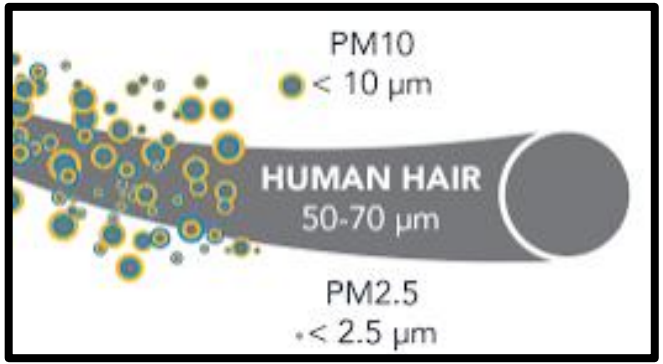
A Davis Weather station was placed on the roof of our school.

The weather station measured temperature, wind speed, wind direction, humidity to name a few.

A low cost air quality sensor was placed on a pole on the grounds of our school close to the road.

The air quality sensor measured, NO2, PM2.5 and PM10 values as well as temperature.

The Pollutants



NO2, PM 2.5 and PM 10 are the three main pollutants that we focused on for this project.

They were the 3 pollutants that were being measured by our air quality sensor.

Exposure to air pollution is seen as the most important environmental risk to human health of the European population .

Europe's most serious pollutants, in terms of harm to human health, are particulate matter, nitrogen dioxide and ground-level ozone.

PM2.5 - Particulate matter that is 2.5 micrometers or less in diameter. Comes from combustion of solid fuels, wood etc. Some comes from friction between types of cars and the road while driving.braking.

PM10 - Particulate matter that is 10 micrometers or less in diameter. It comes from dust from construction sites, landfills, wind blown dust from open lands.

NO2 - Nitrogen Dioxide is one of a group of highly reactive gases known as oxides of nitrogen or nitrogen oxides .NO2 primarily gets in the air from the burning of fuel. NO2 forms from emissions from cars, trucks and buses, power plants, and off-road equipment.

What data did we analyse

For this project we investigated if a relationship existed between

i) quantity of the air pollutants and air temperature

ii) quantity of air pollutants and wind speed

iii) quantity of air pollutants and rainfall levels.

iv) quantity of air pollutants and wind direction

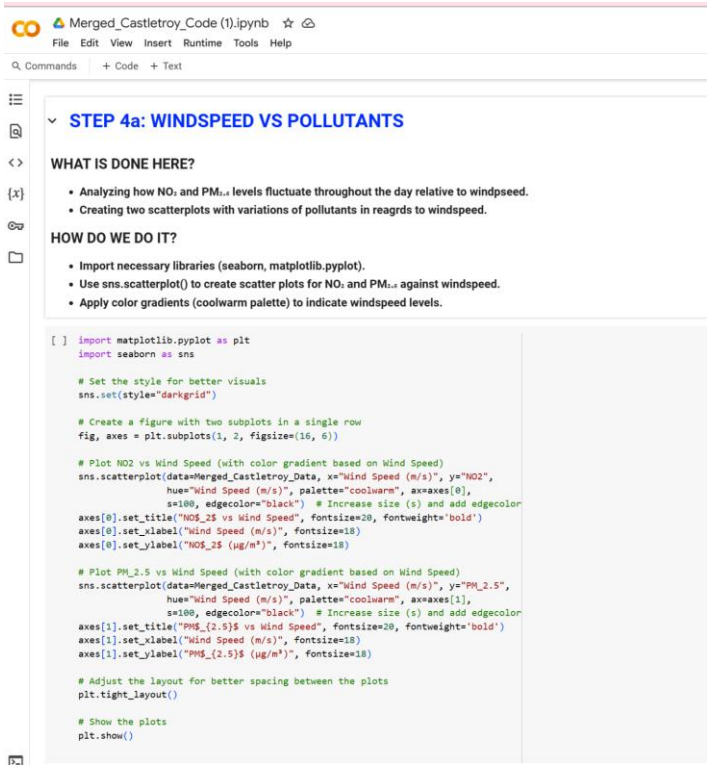
v) quantity of air pollutants and traffic levels.

We examined our data over a 3 month period to identify trends or patterns with levels of NO2, PM2.5 and PM10 and the factors listed above.

How did we analyse our data?

Clarity Dashboard Looked for trends and patterns.

Google Colab using python code.



A sample of our data analysis

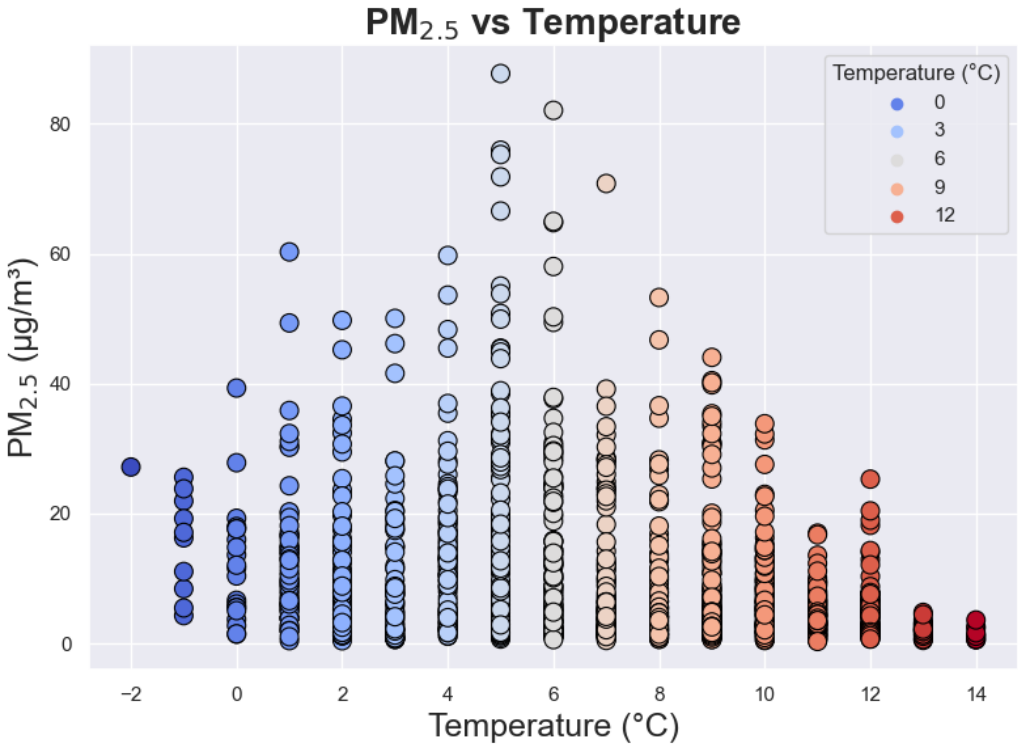
Some of the finding that we found most interesting.

(Some) Results of our Investigation - PM2.5

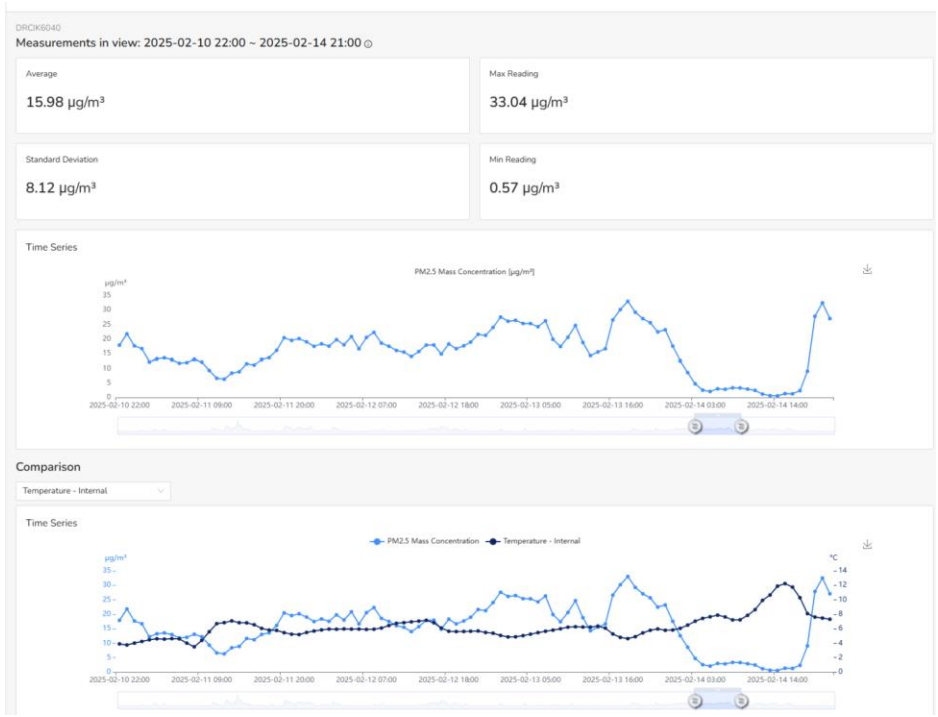
The main factors that affect PM2.5 levels are
i) temperature,
ii) time of day and iii) wind direction.

Temperature:

Generally, when temperature decreases, PM2.5 levels rise, and vice versa. People may be using wood stoves, fireplaces, or other combustion-based heating methods, increasing particulate emissions.This also suggests that cold weather traps pollutants closer to the ground, limiting air dispersion



School Week V's Midterm break- PM2.5



- The school being **open** appears to correlate with **higher** PM2.5 concentrations.
- The school being **closed** leads to a noticeable **drop** in pollution levels.

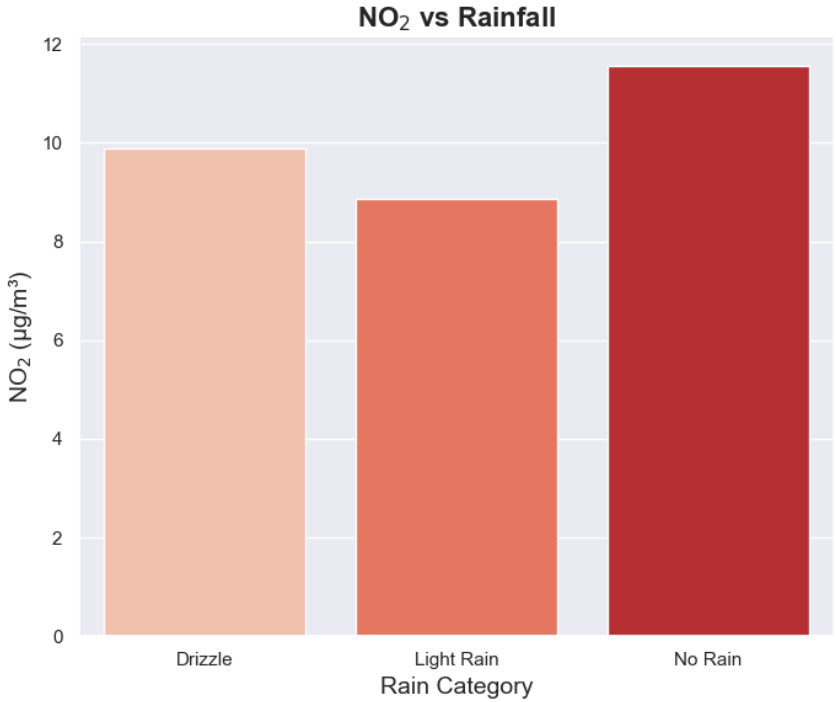
❖ **Comparison to a Typical School Week**

- ➢ In the first graph (a typical school week), PM2.5 levels are higher, especially during what appear to be school hours.
- ➢ More consistent fluctuations suggest regular activity, potentially from vehicle traffic (buses, cars), heating systems, and general human presence.

Some data on NO2

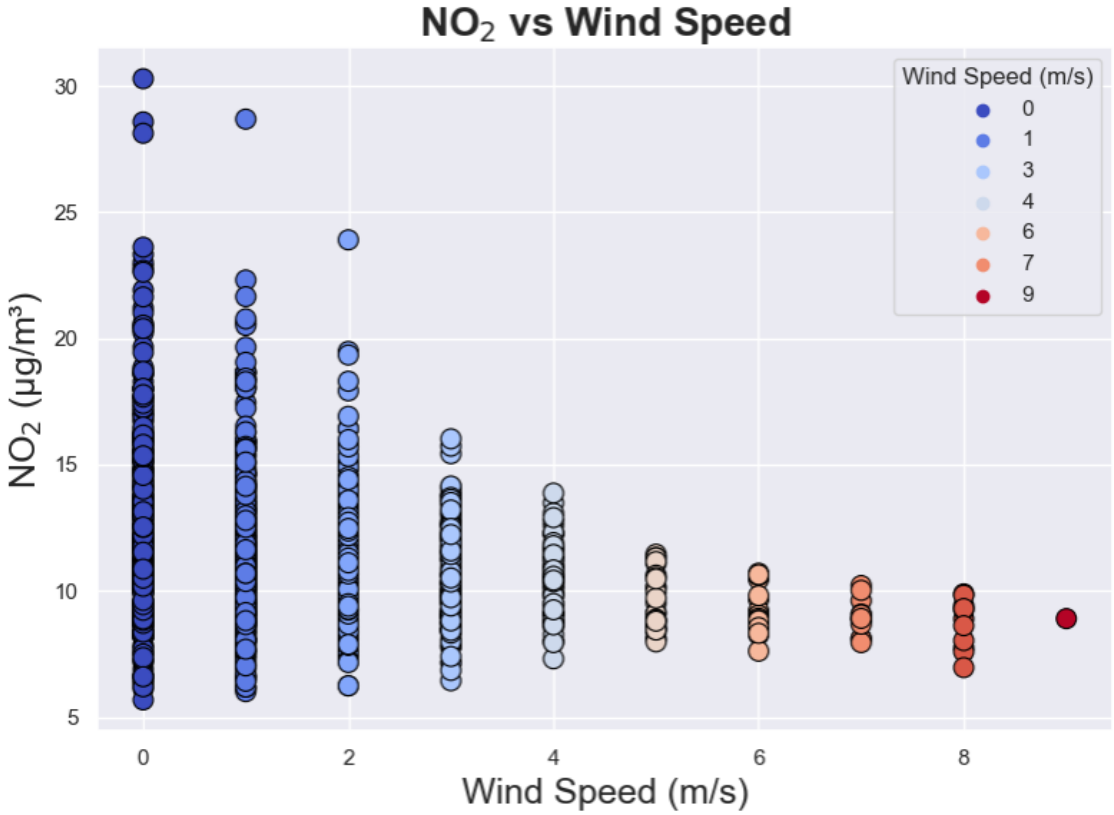
- The main things that affect NO2 levels are i) vehicle traffic, ii) wind speed and iii) rainfall levels.

- **Rainfall** affects NO2 levels. When there is less rain there is more NO2. We see that with no rain the NO2 reaches 11µg/m³.



NO2 and Wind Speed.

- Higher wind speeds generally lead to lower air pollution levels for both NO2.
- The strongest pollution concentrations occur at low wind speeds (0-2 m/s), likely due to poor dispersion.



Some data on PM10

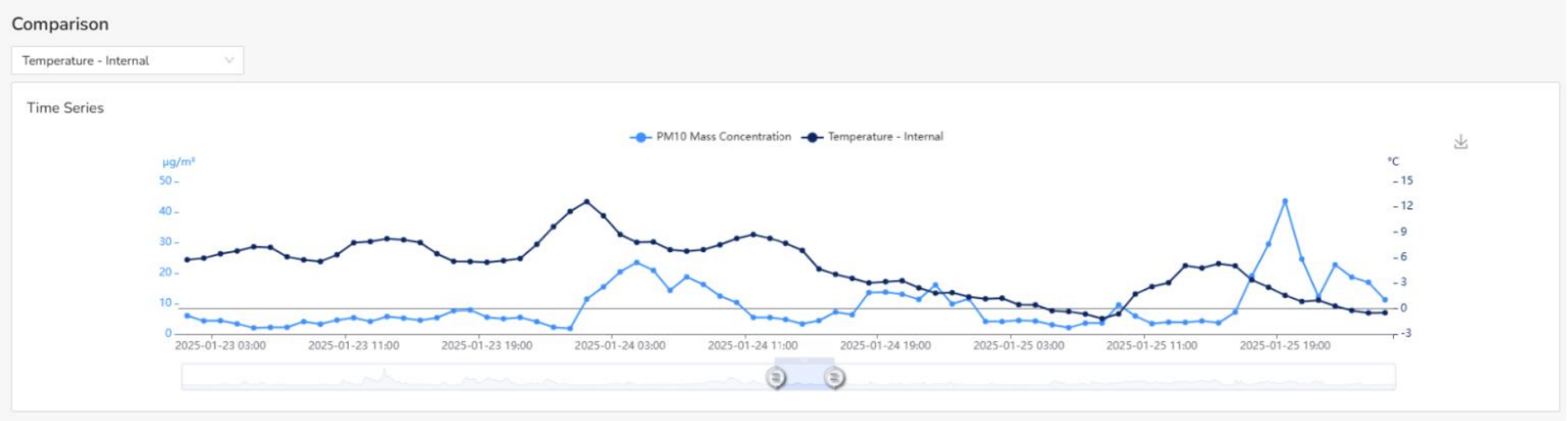
The factors that impact PM10 levels are

i) wind speed

ii) School week

Storms can stir up dust, debris, and pollutants, leading to higher PM10 levels.

PM10 during Storm ÉOWYN January 24th 2025.



Summary of our main ‘takes’ from this project.

Our aim at the start of this project was to identify causes and effects of air quality, analysing 3 main pollutants PM 2.5, PM10 and NO2.
We wanted to recommend steps that could be taken to improve the quality of the air in our communities.

Our main learning from this project is the impact ***human activity*** can have on air pollutant.

This was particularly evident to us when we analysed data on a typical school week v’s a mid-term break week.

Summary of our main ‘takes’ from this project.

Some actions that should be taken include

- **Promotion of public transport & cycling:** Encourage the use of buses, trains, or bicycles to reduce vehicle emissions, especially during rush hours. With most students living close to the school we need to encourage more of them to walk/cycle and reduce our use of cars to go to school.
- **Encourage electric vehicles (EVs):** Provide incentives for EV adoption to reduce NO2 emissions from combustion engines.
- **Shift to cleaner energy sources:** Reduce reliance on fossil fuels by transitioning to renewable energy like solar and wind.plus making our home more energy efficient. Solid fuel regulations need to be enforced also.
- **Increase green spaces & trees:** Trees and plants act as natural air filters, absorbing pollutants like NO2.

Thank you very much for your attention,

Lochlann, Tadhg, Eanna and Tom.