



Investigating SO₂ Levels Near our School

4th Year Physics

St. Nathy's College Ballaghaderreen



Introduction

The results of the Globe survey into Nitrogen Dioxide levels came back in April 2019. St. Nathy's College displayed **Low** levels of this gas in all areas around the school.

The average value was 4.21ppm which is considered excellent.

In comparison to other towns of the same size the school is in and around the average level. (In particular the Connaught region displays low levels of the pollutant)

For more densely populated areas the levels were much higher. This was likely caused by the much greater number of cars that would be travelling in the more populated areas. In addition to the greater number of cars there are usually more industrial processes happening near these larger population centres.

We wanted to see if this was repeated with other gasses associated with Car emissions and factory pollutants. We chose to test the air in the local area for Sulfur dioxide gas. We also added two further locations- in the local town square and beside the new main road bypass.

Research Question(s)

Are the Sulfur Dioxide levels in the air around St. Nathy's College as low as the Nitrogen Dioxide Levels?

Will the levels be higher in areas with more traffic?

Are the levels near the Main Road(which takes the majority of Lorries etc) higher than at the school or in the town?

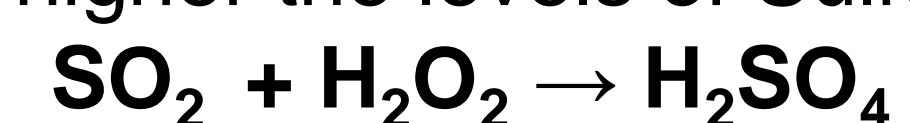
If the levels are different across the local area what could be the cause of these changes?

Research Methods

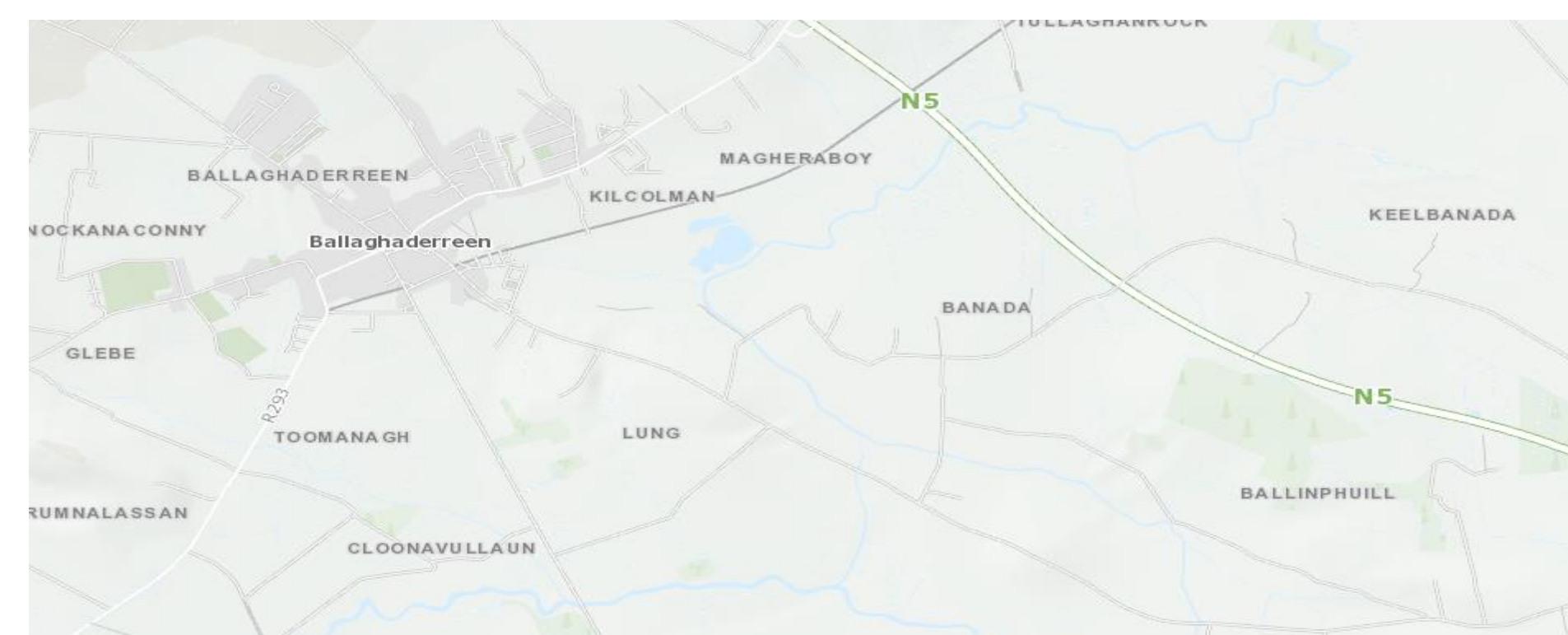
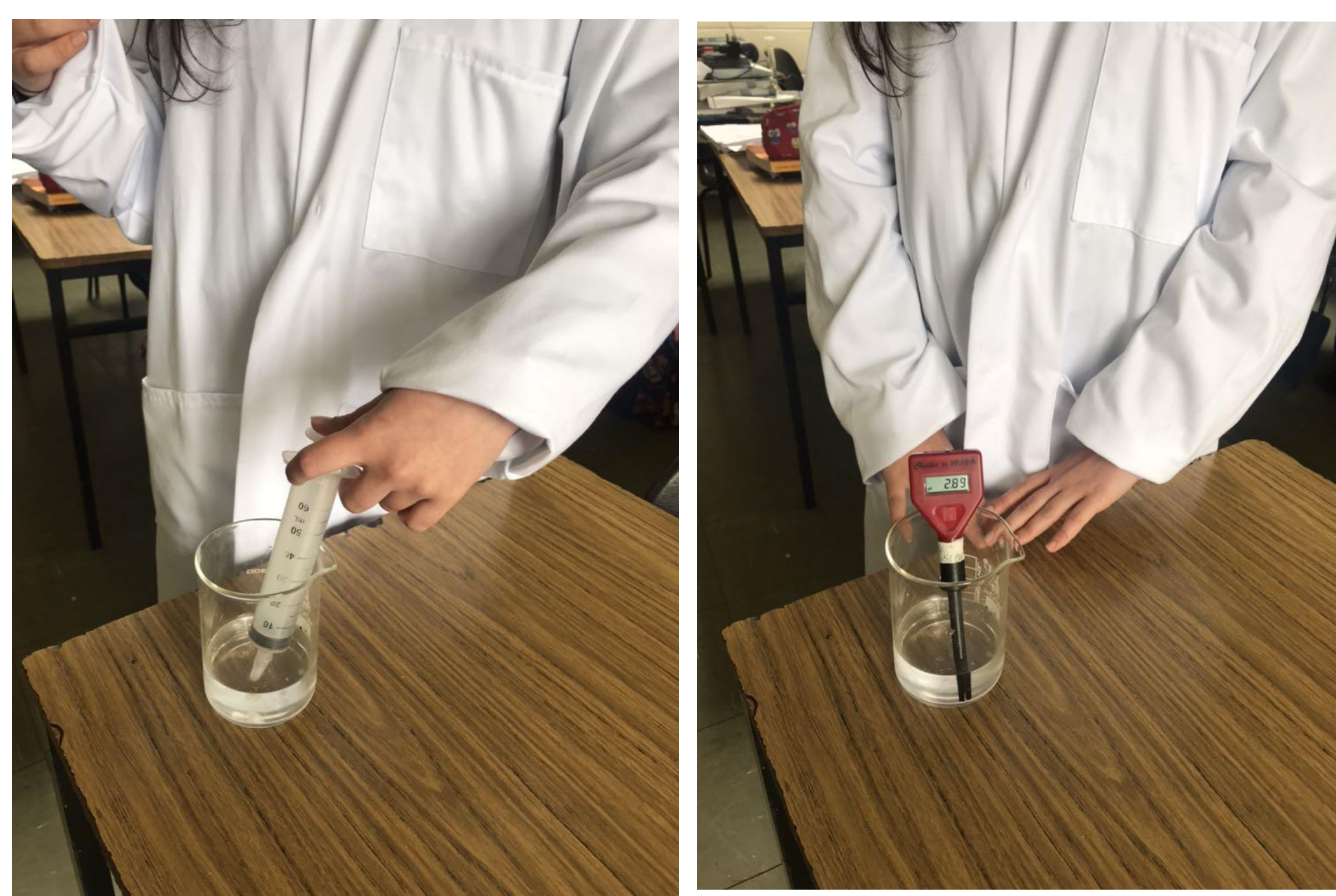
We used a similar Strategy to the Globe programme- Air collecting tubes were left in the 5 locations. In our case we used 50cm³ gas syringes.

These syringes were left out for 2 weeks. They were sealed and brought back to the lab.

The air collected was then passed(bubbled) through a 50cm³ sample of 30% Hydrogen Peroxide (pH 3.15) When Sulfur Dioxide(SO₂) reacts with Hydrogen Peroxide(H₂O₂) it forms Sulfuric Acid. This will cause the pH level of the solution to drop. The greater the drop, the higher the levels of Sulfur dioxide present.

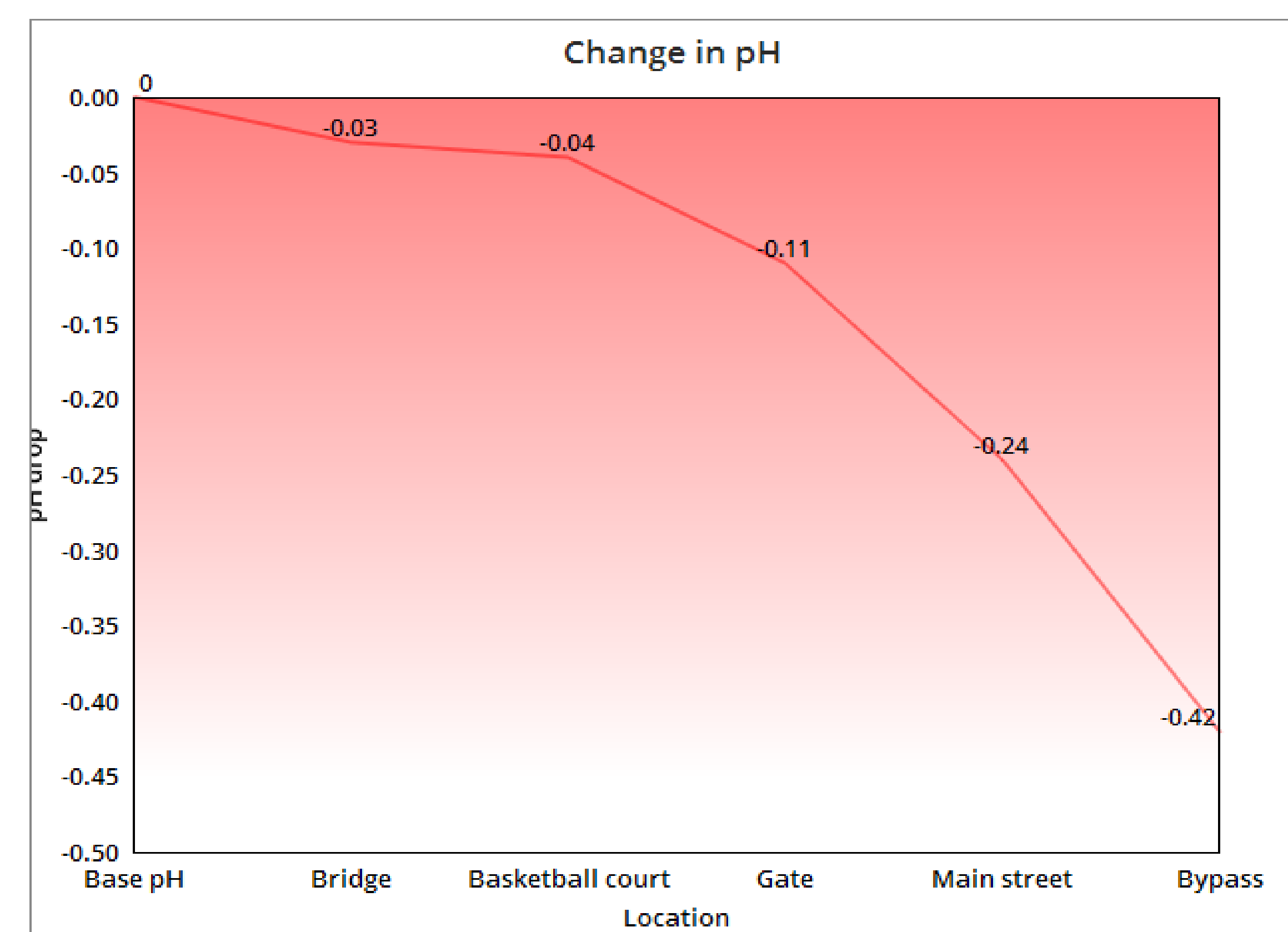
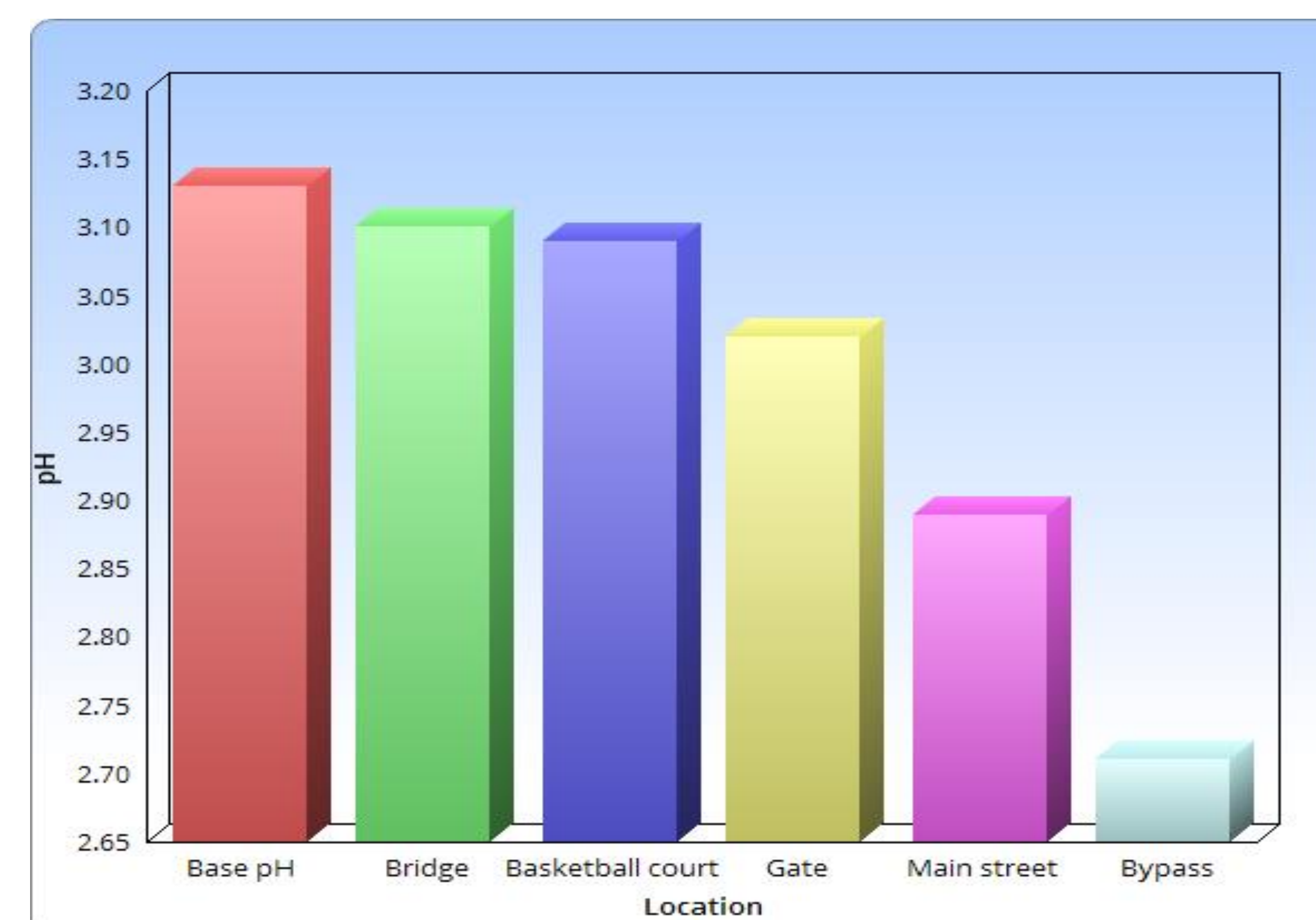


It should then be possible to work out the ppm value of Sulfur Dioxide in the areas tested.



Results

X Data	Y Data
Base pH	3.13
Bridge	3.10
Basketball court	3.09
Gate	3.02
Main street	2.89
Bypass	2.71



Discussion

The two graphs show the results we collected from two perspectives.

The bar chart represents the overall pH level of the Solution after the Air sample was passed through. All of them resulted in a decrease(showing SO₂ is present) but the value of pH is markedly different.

The line graph shows the actual change that was experienced in each of the areas. The range of change is quite dramatic(ph 0.02 to pH 0.42- 20 times higher).

These results indicate a large difference in the Sulfur Dioxide levels in the area around the school and the areas with a greater density of traffic.

It should be noted that the bypass location is also quite near the local Bacon Factory and this could account for the seemingly very high levels of Sulfur Dioxide indicated.

Though there is 20 times the difference in pH change this does not indicate 20 times the SO₂ concentration. Best estimates are that the lowest value of SO₂ is approx. 0.09ppm and the highest value is 0.4ppm. The high value is enough to have a noticeable smell but is well below the usual "dangerous" levels.

Conclusions

The Sulfur Dioxide levels in the air around the school are very low. This is in line with the results obtained by the Globe programme Nitrogen Dioxide levels.

Our experiment showed that not too far away(at locations in the town and near the bypass) that there were much higher concentrations of the gas. We surmise that the same would be true for Nitrogen Dioxide of the experiment was repeated there.

St. Nathy's College has a "minimal Car" campus in line with the Green Schools Travel initiative. Based on our results we believe this has made a great impact on the schools air quality. The addition of a bypass to take most of the trucks out of the area has also had a positive effect.

Bibliography

<http://www.deq.state.ok.us/factsheets/air/so2.pdf>

<http://butane.chem.uiuc.edu/pshapley/environmental/l16/1.html>

<https://www.irishtimes.com/news/health/irish-emissions-of-three-key-air-pollutants-getting-worse-epa-1.3444594>



Air quality Campaign Ireland 2019

