How can we improve air quality at our school and its surroundings?

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Summary

Air quality refers to how clean or polluted the air is. Monitoring air pollution is essential for protecting both human health and the environment. Poor air quality can lead to serious health issues, including respiratory diseases, heart conditions, and lung cancer, especially for vulnerable populations. It also harms ecosystems, contributes to climate change, and reduces overall quality of life. By tracking air pollution levels, we can identify sources of contamination, implement effective regulations, and take action to improve air quality, ensuring a healthier and safer environment for everyone. The Air Quality Index (AQI) is used to measure air quality, with values of 100 or below generally considered satisfactory. When AQI exceeds 100, air quality is deemed unhealthy. Major sources of human-made air pollution include vehicle emissions, the burning of fuel oils and natural gas for heating, industrial by-products, coal-powered plants, and chemical production fumes. The impact on health varies based on factors such as age, location, and preexisting conditions.

So, how can we help improve air quality? The GLOBE Malta Air Quality Campaign aimed to educate students on the causes and effects of air pollution, encouraging them to reflect on its impact on their lives and explore possible solutions. Through data collection, analysis, and critical thinking, students developed insights and proposed actions to ensure cleaner, safer air for everyone. This is the second time our school has participated in this project. This time, we had the opportunity to analyse more aspects, including comparing our results with those from the first project as well as with data from newly participating schools.

Research Questions

- What are the levels of nitrogen dioxide in front of the school?
- Are there any differences in nitrogen dioxide levels from those analysed some years ago?
- What can be done to improve the air quality around us?

Research Methods

Gozo College, Ġuże Aquilina, Sannat Primary and Special Unit is situated in Sannat, a small village on the island of Gozo (Fig. 1). The school aimed to reassess the air quality in its surroundings and chose to participate once again in the GLOBE Malta Air Quality Campaign, which took place between November and December 2024. A selected group of students from different year levels formed the GLOBE team and collaborated with their teachers through multiple meetings to plan and conduct the investigation (Fig. 2).

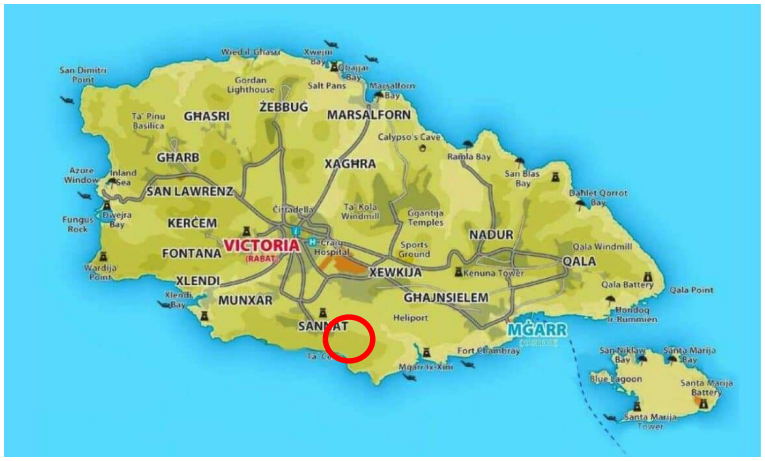

Figure 1 Map of Gozo with our School Locality marked in red

Figure 2 Meeting with GLOBE team

A diffusion tube was once again installed at our school, positioned near the main road leading to the main entrance of the locality (Fig. 3) to measure air quality in the most polluted area. It remained in place for four consecutive weeks before being sent to a specialised laboratory for analysis, along with tubes collected from other nearby schools in Gozo and Malta.

Figure 3 Diffusion tube being installed

The students also conducted daily recordings of various modes of transport (Fig. 4) passing through the same area where the NO_2 tube was installed. Additionally, they measured air temperature, humidity, rainfall, and observed cloud types (Fig. 5).

Figures 4 & 5 Students conducting the traffic survey and taking daily measurements.

Results

The screenshots below display data uploaded to the GLOBE website during the observation period in November and December 2024 (Fig. 6 and 7). Following the GLOBE Protocols guide, students recorded daily measurements of air temperature and humidity.

Air Temperature

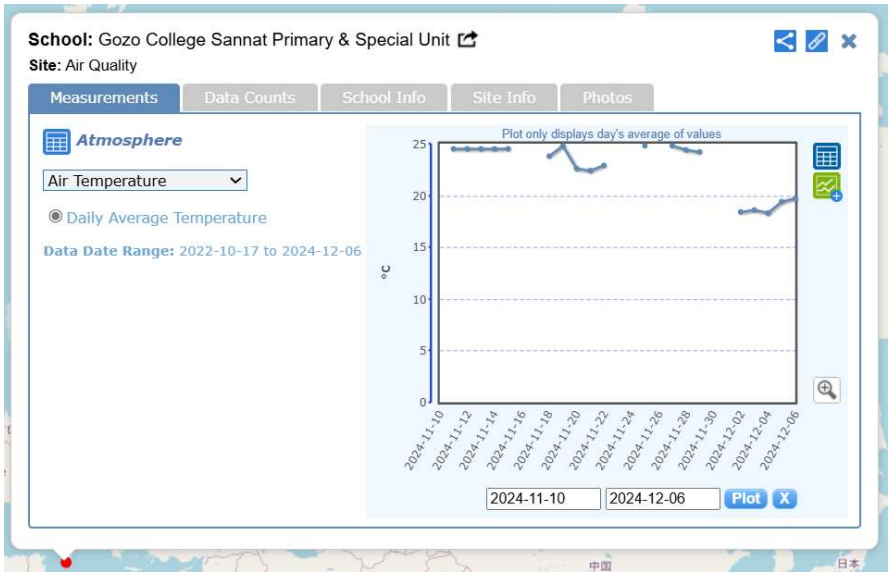

Figure 6 Air temperature plot of VIZ GLOBE

Relative Humidities

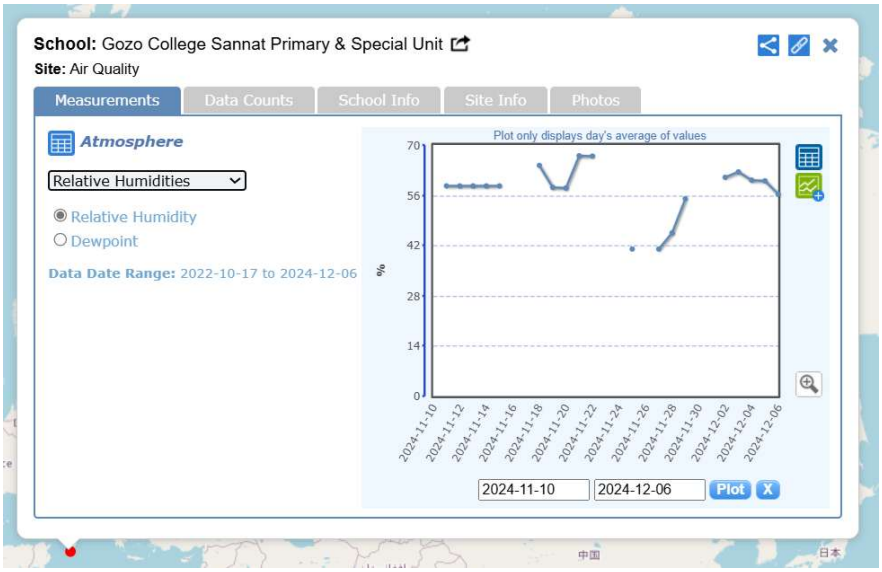

Figure 7 Relative Humidities plot of VIZ GLOBE

The data collected from the traffic survey was analysed and uploaded on excel. The chart below (Fig. 8) shows the results with the most popular vehicle observed being the private car.

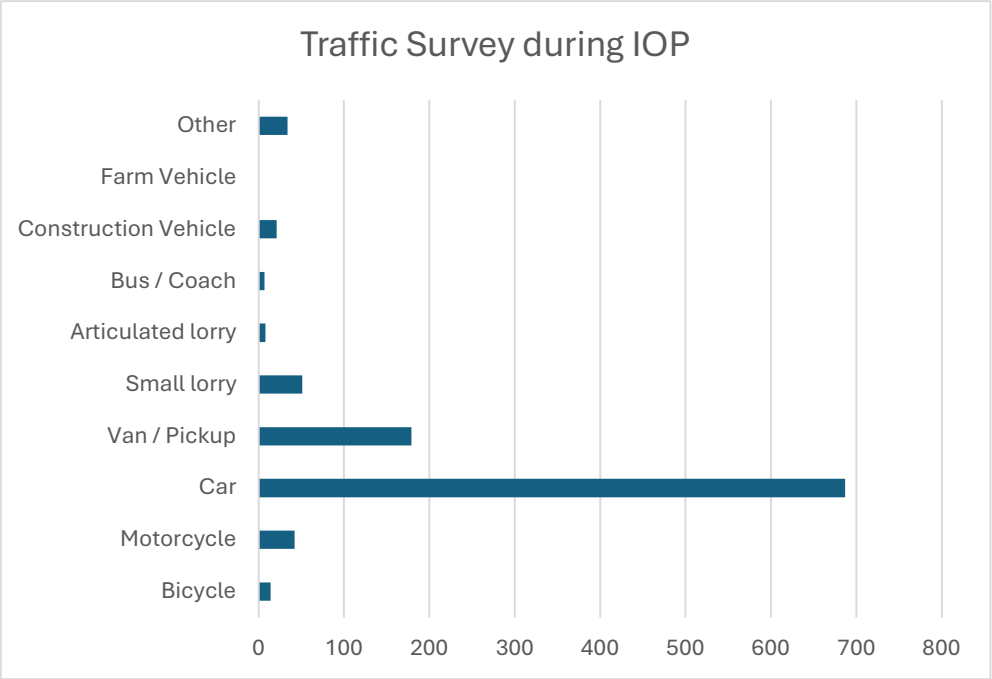

Figure 8 Traffic Survey

Conclusion

After receiving the results from Passam laboratories, Switzerland, we were able to compare NO_2 levels based on the location where each tube was installed. It was evident that the highest nitrogen dioxide levels were recorded in tubes placed along one of the busiest main roads in Victoria, Gozo—the island's capital and primary urban area. In contrast, tubes installed in smaller villages surrounded by the countryside, such as Sannat (where our school is located), St. Paul's Bay, and Rabat, Malta, showed the lowest NO_2 levels (Fig. 9).

GLOBE project NO2 results

School name	Start date	Start time	End date	End time	NO2 (µg/m3)
Handaq Middle School - QORMI	11/11/2024	8:10	06/12/2024	8:05	13.9
Maria Regina College - MOSTA Secondary	11/11/2024	12:35	06/12/2024	8:58	14.1
St. Michael School, ST. VENERA	11/11/2024	8:00	06/12/2024	7:50	34.8
SANNAR (GOZO) Primary & Special Unit	11/11/2024	12:35	06/12/2024	9:00	8.7
St. Margaret College, Middle School - COSPICUA	11/11/2024	8:04	06/12/2024	8:05	30.1
Stella Maris College - GZIRA	11/11/2024	7:30	06/12/2024	7:30	36.2
Sir Arturo Mercieca RABAT Primary School	11/11/2024	13:36	06/12/2024	8:04	38.1
ST. PAUL'S BAY Primary	11/11/2024	6:50	06/12/2024	7:00	7.9
St. Nicholas College RABAT Middle School	11/11/2024	10:00	06/12/2024	9:00	9.2

Figure 9 Results of NO2 of all participating Schools

These results, clearly indicate that nitrogen dioxide (NO_2) levels in Sannat have doubled over the past two years (In 2022 NO_2 was 3.79). This significant rise raises concerns about increasing air pollution in what was previously considered a low-pollution area.

The diffusion tube installed near the main road leading to the school entrance recorded NO_2 concentrations that were twice as high as those measured during the initial study two years ago. In contrast, previous data had shown that Sannat, being a rural village surrounded by the countryside, had some of the lowest NO_2 levels compared to more urbanised areas like Victoria, Gozo.

Possible contributing factors to this increase include a rise in traffic flow, changes in weather conditions affecting pollutant dispersion, and potential growth in local emissions from construction, heating, or industrial activities. Given the health risks associated with prolonged exposure to NO_2, including respiratory issues and environmental degradation, this increase calls for further investigation and proactive measures to mitigate pollution.

Moving forward, continued monitoring and analysis are essential to determine the causes of this trend. Community awareness, policy adjustments, and sustainable urban planning should be considered to help maintain cleaner air in Sannat and prevent further deterioration of air quality.

Given these findings from our air quality investigation, our school can take a proactive role in promoting cleaner air and raising awareness. A whole-school approach involves students, teachers, parents, and the wider community working together to reduce pollution and improve air quality. Here are some key actions we can take:

1. Educating and Raising Awareness

- Organize school-wide campaigns and assemblies to educate students on air pollution, its sources, and its impact on health and the environment.
- Integrate air quality topics into the curriculum across different subjects, including science and social studies.
- Involve students in projects, discussions, and research related to pollution and climate change.

2. Encouraging Sustainable Transport

- Promote walking, cycling, and carpooling to reduce vehicle emissions near the school.
- Suggest for a "Walk to School" or "No Car Idling" campaign to minimize pollution from waiting vehicles.
- Work with local authorities to improve pedestrian and cycling infrastructure around the school.

3. Green Initiatives and School Environment Improvements

- Plant more trees and greenery around the school to help absorb pollutants and improve air quality.
- Set up school gardens with plants known for their air-purifying properties.
- Create a designated “clean air zone” around the school to limit vehicle emissions near entrances and playgrounds.

4. Continued Monitoring and Data Collection

- Regularly measure air quality using diffusion tubes and digital sensors to track changes over time.
- Compare results with past data and discuss trends and solutions in science lessons.
- Collaborate with other schools to share findings and promote collective action.

5. Engaging the Community and Local Authorities

- Work with parents and local businesses to promote cleaner practices, such as reducing emissions from home heating and industrial activities.

- Recommend for improved public transportation and policies that support cleaner air in the community.
- Partner with environmental organizations and experts to bring real-world solutions into the school.

By implementing these initiatives, our school can play an active role in improving air quality, not just within school grounds but in the wider community. Through education, action, and collaboration, we can contribute to creating a healthier and more sustainable environment for everyone

References:

GLOBE teacher guide https://www.globe.gov/ (Accessed October 2024).

GLOBE Science Data Visualization https://vis.globe.gov/GLOBE/ (Accessed February 2025)

Badge description

I am a Data Scientist: Students analysed their own data from their own measurements (Fig. 10). They were able to interpret graphs. From the data analysis, the students answered their research questions.

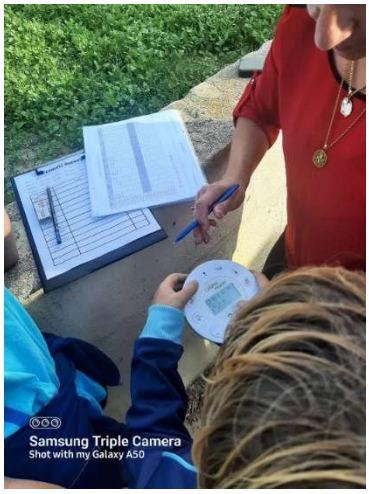

Figure 10 Students collecting data and recording it on the Data Sheets

I am a STEM storyteller

The GLOBE students shared their findings with the whole School population during morning assemblies. Moreover, they disseminated their findings with their family, friends and wider community through the Local Councils. The students also attended a students' conference held in the STEM & VET Curriculum Hub in Malta where they shared their findings (Fig. 11).

Figure 11 GLOBE students attending Conference held in Malta

I make an Impact

The research helped students and the whole school community to recognise the effect of air pollution. They wanted to be part of the solution and thus they planted more shrubs and plants (Fig 12). In the coming months, they will be organising walks and the use of bicycles as an alternative mode of transportation to help in improving the Air Quality.

Figure 12: GLOBE students adding more vegetation in the school garden.