“Analyzing Air Quality in Two Different Location in the Same Village”

Students Names: Adam Mifsud; Alvaro Carabott; Amy Spiteri; Benjamin Grech; Christian Vella; Elodie Zammit Agius; Evan Zammit; Evie Sant Mercieca; Forgiveness Nayina; Gabriel Gatt; Geordie Vella; George Buhagiar; George Camilleri; Gigi Agius; Jace Joseph Schembri; Kristina Marie Sacco; Leah Sant Mercieca; Lisa Kisling; Luke Sultana; Mattias Meilak; Miguel Meilak; Mohammed Ennaji; Nathaniel Pace; Nicolia Masini Kolev; Nikalai Galea; Nora Xerri; Rafael Grech; Sofia Grech; Soleil Grech; Therese Attard; Timothy Pace; Wayne Camilleri; Yamin Alqasem; Xhoel Koraqe; Zac Said

Teacher’s Name: Ms. Josephine Jesse Mercieca

School Name: Gozo College, Sir Arturo Mercieca Rabat Primary School

Country: Gozo, Malta

Date: February 25, 2025

Summary

During our scholastic years of 2022-2023, we performed an Air Quality Campaign (GLOBE, GLOBE Teacher Guide, 2024) while occupying **Vajringa Street** in Victoria, Gozo. Our school has recently moved into a new location – **Fortunto Mizzi Street** – staying within the same village of Victoria, Gozo (Fig. 1). We decided to check the air quality of the new local, which included taking atmospheric readings. Below you can see the old school location and the new school location (Fig. 1).

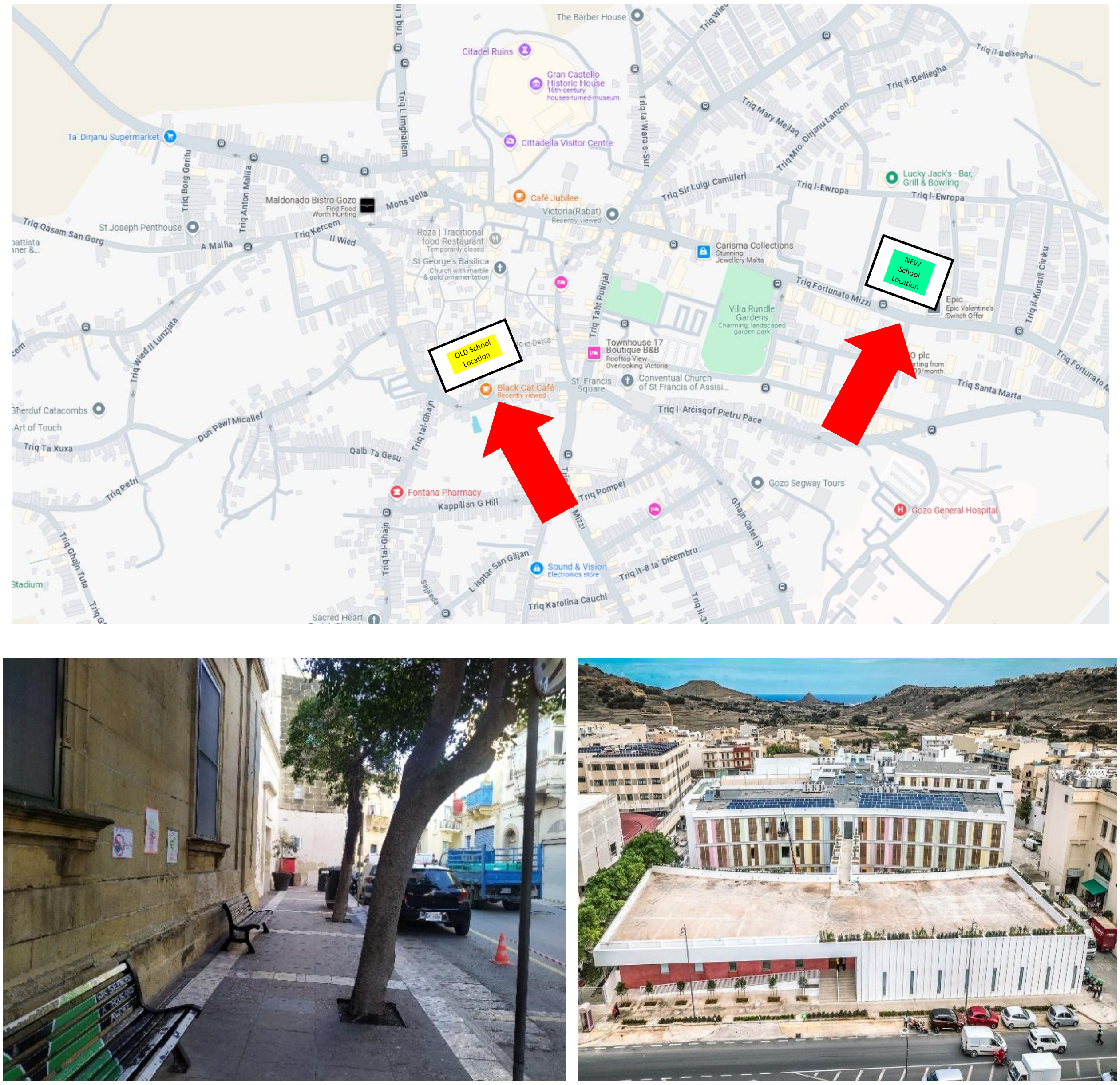


Figure 1: Vajringa Street & Fortunto Mizzi Street, Victoria, Gozo, Malta

Research Questions

We have researched and learned that Malta's air pollutants have been doubling in recent years. From ranking Malta, in the year of 2022 – 76th out of 118 countries (IQAir, 2022), we are now in the 49th place out of 134 countries for the worst air quality (Cummings, 2024).

Remembering what are air pollutants such as sulphates, black carbon, nitrates and ammonium is the main reason why it is important to find out our air quality in the new area. These microscopic particles can be damaging to our human health which can lead to asthma, cancer, strokes and lung disease linking everything around us such as car usage and construction.

The number of cars on the road has increased to 420,000 for this small island (Fig. 2). It comes to around 30 cars added to the road each day (Cummings, 2024). This is not the only reason why Malta has increased in pollutants.

Figure 2: Cars in Traffic on the Island of Malta

Malta has had an upswing in construction – building everywhere – which is increasing pollution in the air (Fig. 3). There has a boom on building permits from 224,00 in 2011 to as much as 297,000 in 2021 (Cummings, 2024).

Figure 3: Pollution in Malta more than double recommended threshold, report says, March 19, 2024, James Cummings, photo: Matthew Mirabelli

Climate change (weather) has also been a major factor in air pollution. Dust Storms/Sandstorms and wildfires (Fig. 4 & 5) have worsened due to the global temperature upsurges. It is also very important to collect the data and pass onto the GLOBE team for analysis.

Figure 4: Wildfires in Greece and Turkey

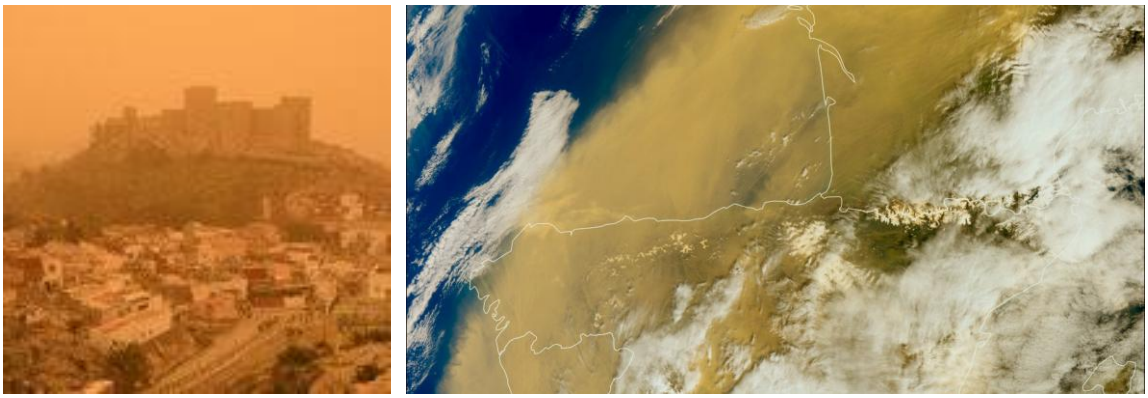


Figure 5: Dust Storms and Sandstorms

Research Methods

Again, we were interested to find out what is the nitrogen dioxide level around our new school in Victoria, Gozo and participated in the GLOBE Air Quality Campaign 2024-2025. The best way to do this is we would take on the task of carrying out a daily traffic survey comprising of counting each motor vehicle that pass in front of our school within a certain time frame (10-15 minutes) beginning November 11, 2024 till December 5, 2024. This experiment would happen during our second break – 12:00pm-12:30pm instead of early mornings like we did in 2022 (Fig 6). We also incorporated the daily atmospheric conditions to see if this potentially had an impact on our air quality.

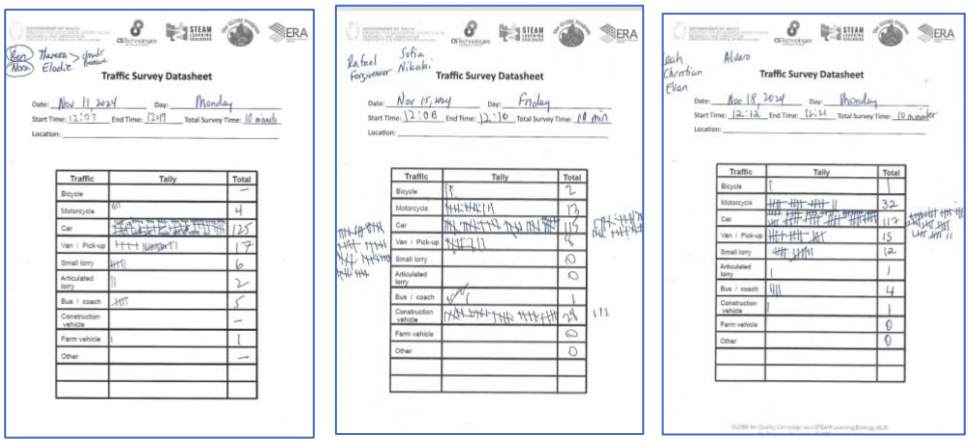


Figure 6: Samples data sheets of traffic and weather survey done by the GLOBE students

Also, with the help of Ms. Ramona, our GLOBE Deputy Coordinator, she acquired a nitrogen dioxide diffusion tube which we hung up for 4 weeks at the beginning of our school street. We placed the NO_2 diffusion tube in front of our school on Fortunato Mizzi Street in Victoria, Gozo (Fig. 7). This street is a major artery in the capital city of Gozo where cars and heavy/construction vehicles pass – HIGH TRAFFIC. After the monitoring period, the diffusion tube was sent to Passam Laboratory in Switzerland for analysis.

Figure 7: Where the diffusion tube was placed and views of the street which we are taking readings.

This year we participated in the STEAM Learning Ecologies with other schools in Malta. We took VOC (Volatile Organic Compounds), CO_2 (Carbon Dioxide) & PM (Particulate Matter) readings daily for one month. We came together in a meeting in Pembroke, Malta (Fig. 8).

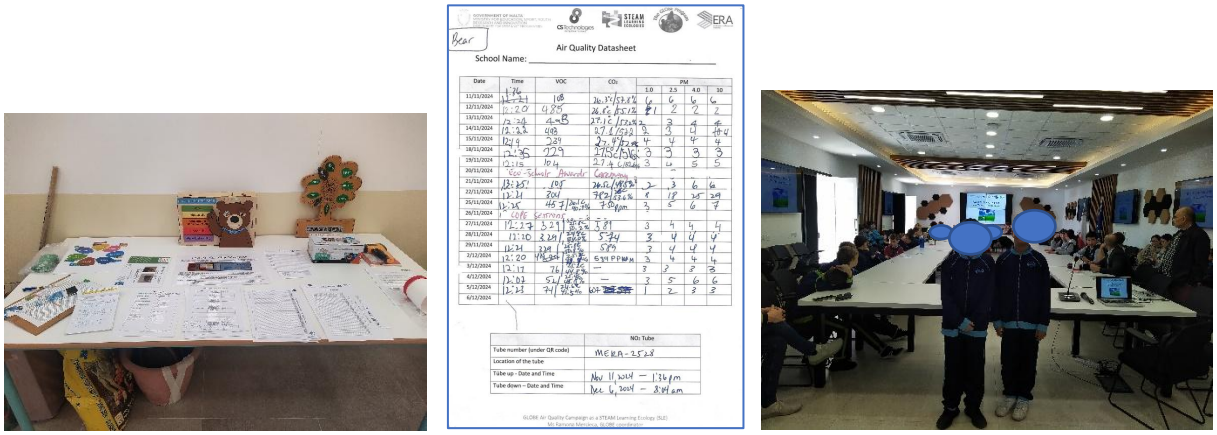


Figure 8: The GLOBE – Air Quality Campaign as a STEAM Learning Ecologies

The atmospheric conditions we have collected from 2022 & 2024 have been passed on to the GLOBE website. It is essential for our students to input all our data collected into the GLOBE database (Fig. 9).

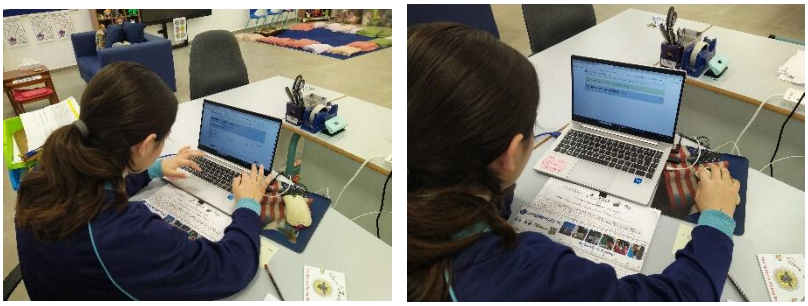
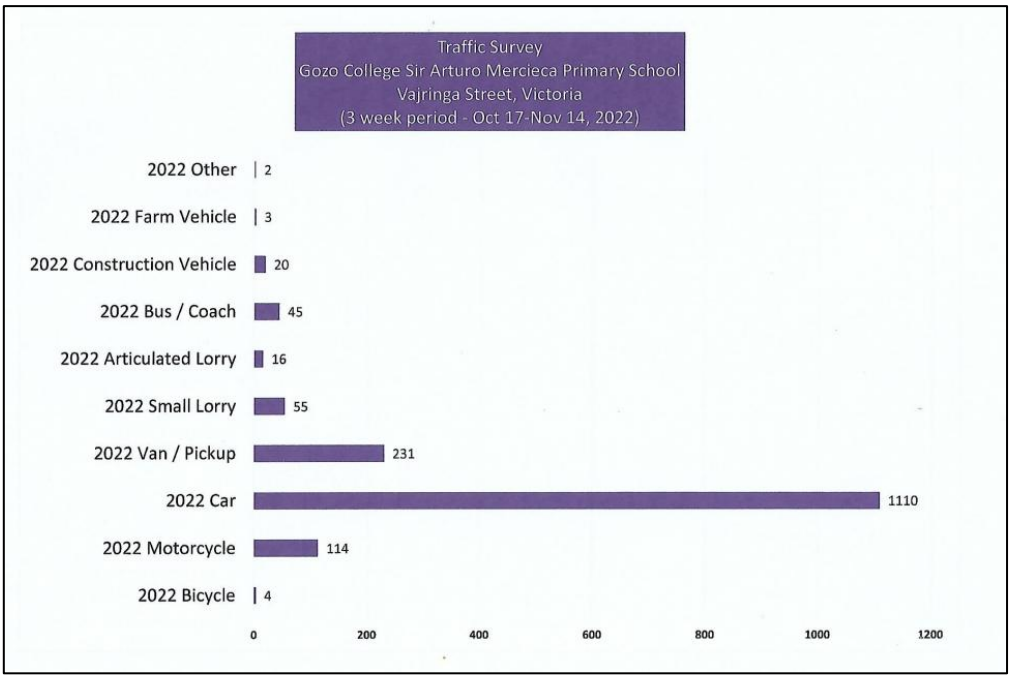
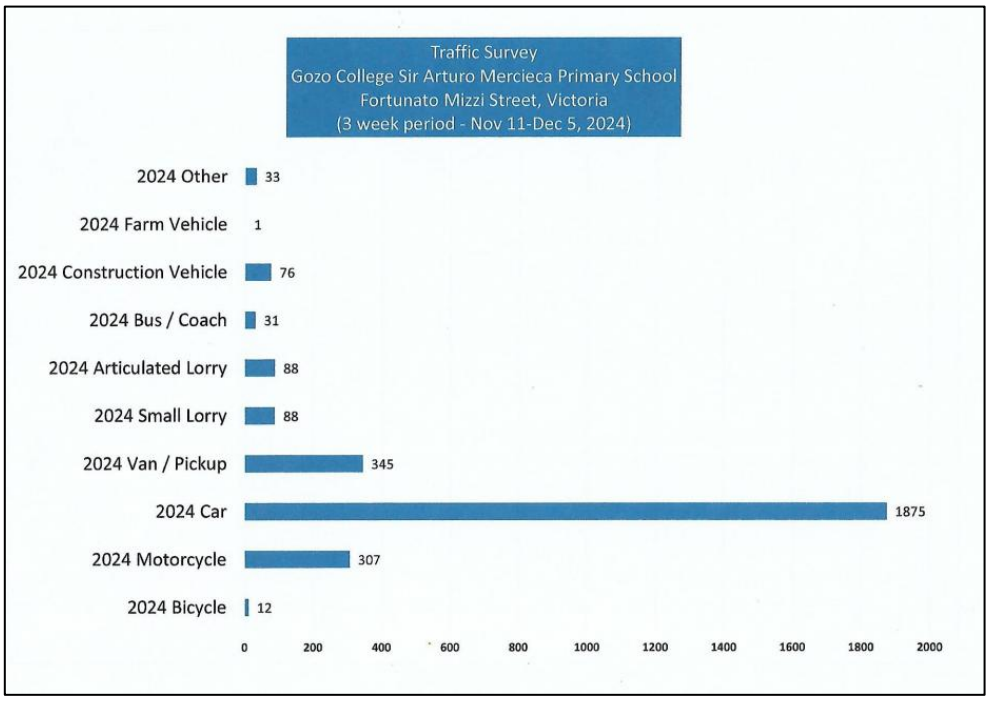


Figure 9: Uploading data to GLOBE database

Conclusion

First, looking at our traffic survey, we observed that our school's new location has much more traffic than our old location to the point of 1,260 more vehicles on the road even though the surveys was taken at different times of the day – 2022 early mornings and 2024 in the afternoons. The biggest number of vehicles was regular cars at a trend of 765 more cars in a one-month period. Where we were surprised is that Bus/Coaches and Farm vehicles were less on this street, which is the main artery in Victoria, Gozo (Fig. 10),


Traffic Survey
Gozo College Sir Arturo Mercieca Primary School
Vajringa Street, Victoria
(3 week period - Oct 17-Nov 14, 2022)
2022 Other
2
2022 Farm Vehicle
3
2022 Construction Vehicle
20
2022 Bus / Coach
45
2022 Articulated Lorry
16
2022 Small Lorry
55
2022 Van / Pickup
231
2022 Car
1110
2022 Motorcycle
114
2022 Bicycle
4
0
200
400
600
800
1000
1200


Traffic Survey
Gozo College Sir Arturo Mercieca Primary School
Fortunato Mizzi Street, Victoria
(3 week period - Nov 11-Dec 5, 2024)
2024 Other
33
2024 Farm Vehicle
1
2024 Construction Vehicle
76
2024 Bus / Coach
31
2024 Articulated Lorry
88
2024 Small Lorry
88
2024 Van / Pickup
345
2024 Car
1875
2024 Motorcycle
307
2024 Bicycle
12
0
200
400
600
800
1000
1200
1400
1600
1800
2000

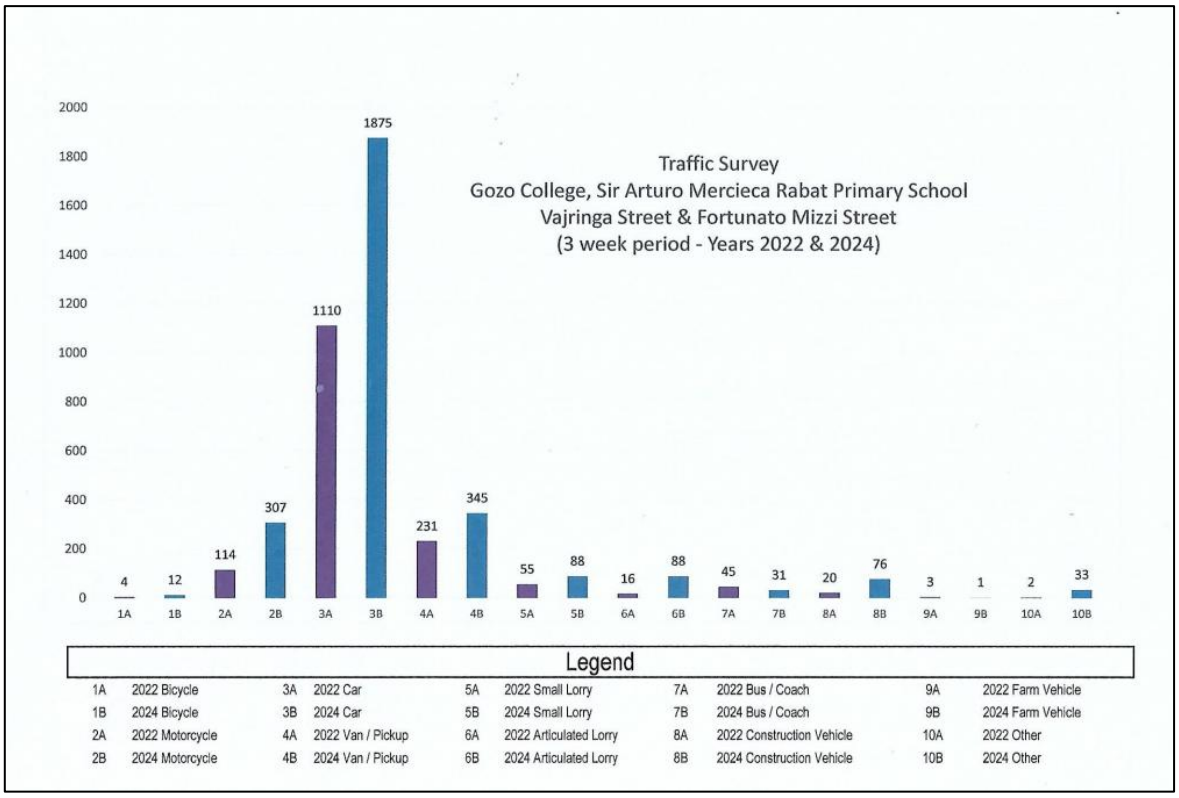
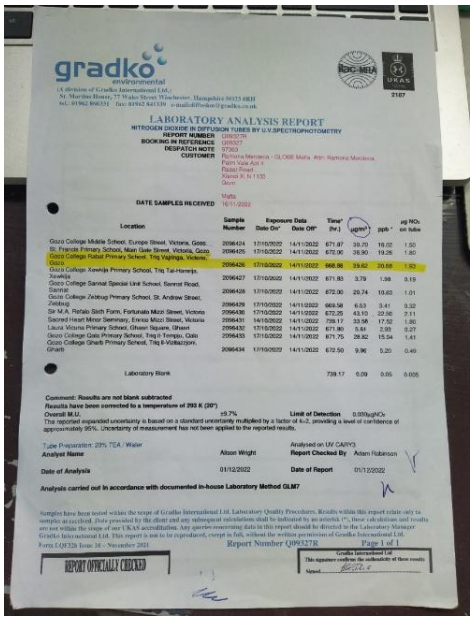


Figure 10 Bar graph showing traffic count results for 2022 & 2024 & COMBINATION of 2022 & 2024

Secondly, examining our results from both laboratories Year 2022 – Gradko Labs in the U.K. and Year 2024 – Passam Labs in Switzerland, we discovered that our old school area had a higher NO_2 than our new school area by a difference of +1.5% NO_2 (Fig, 11). Noteworthy, compared with the seven other schools on the Island of Malta and one school on the Island of Gozo, we are still the **HIGHEST** in CO_2!!


gradko
environmental

LABORATORY ANALYSIS REPORT
NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

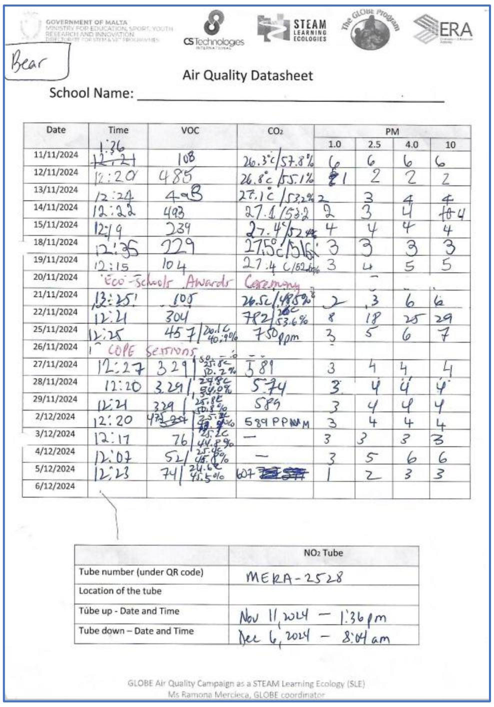
REPORT OFFICIALLY CHECKED

Passam Laboratory
Switzerland

School name	Tube ID	Start date	Start time	End date	End time	NO_2 (µg/m^3)
Handaq Middle School	MERA-2506	11/11/2024	8:10	06/12/2024	8:05	13.9
Maria Regina College - Mosta Secondary	MERA-2491	11/11/2024	12:35	06/12/2024	8:58	14.1
St. Michael School, St. Venera	MERA-2538	11/11/2024	8:00	06/12/2024	7:50	34.8
Sannat Primary & Special Unit	MERA-2535	11/11/2024	12:35	06/12/2024	9:00	8.7
St. Margaret College - Erin Serracino Inglott, Middle School	MERA-2501	11/11/2024	8:04	06/12/2024	8:05	30.1
Stella Maris College	MERA-2507	11/11/2024	7:30	06/12/2024	7:30	36.2
Sir Arturo Mercieca Rabat Primary School	MERA-2528	11/11/2024	13:36	06/12/2024	8:04	38.1
St. Paul's Bay Primary	MERA-2503	11/11/2024	6:50	06/12/2024	7:00	7.9
St. Nicholas College Rabat Middle School	MERA-2525	11/11/2024	10:00	06/12/2024	9:00	9.2

Figure 11 Gradko Environmental Laboratory in the U.K. and Passam Laboratory in Switzerland

Thirdly, we analysed/averaged our VOC and PM where we are at good levels – VOC of 270.0 and PM at 5. Our CO_2 readings (Fig, 12) were inconclusive because we were having problems with the mechanics of the machine reading correctly. Nonetheless, the information collect was digitally sent to Malta for their analysis.


Bear

Air Quality Datasheet

School Name: ____________________

Date	Time	VOC	CO_2	PM 1.0	PM 2.5	PM 4.0	PM 10
11/11/2024	1:36	108	26.3°c/57.8%	6	6	6	6
12/11/2024	12:20	485	26.8°c/55.1%	1	2	2	2
13/11/2024	12:24	4[illegible]	27.1°c/53.2%	2	3	4	4
14/11/2024	12:22	493	27.1/53.2	2	3	4	4
15/11/2024	12:19	239	27.4°/52%	4	4	4	4
18/11/2024	12:35	229	27.5°c/51.6	3	3	3	3
19/11/2024	12:15	104	27.4 c/52.6%	3	4	5	5
20/11/2024	Eco-Schools Awards Ceremony						
21/11/2024	13:25	105	26.5c/48.5%	2	3	6	6
22/11/2024	12:21	304	782/26c 53.6%	8	18	25	29
25/11/2024	12:25	457/20.1c 40.9%	750ppm	3	5	6	7
26/11/2024	COPE Sessions						
27/11/2024	12:27	329/25.8c 50.2%	581	3	4	4	4
28/11/2024	12:20	329/24.8c 54.0%	574	3	4	4	4
29/11/2024	12:21	329/25.8c 50.8%	589	3	4	4	4
2/12/2024	12:20	475/[illegible]	589 PPM	3	4	4	4
3/12/2024	12:17	76/25.2c 44.8%	–	3	3	3	3
4/12/2024	12:07	52/25.4c 45.8%	–	3	5	6	6
5/12/2024	12:23	74/24.6c 45.5%	607	1	2	3	3
6/12/2024							

	NO_2 Tube
Tube number (under QR code)	MERA-2528
Location of the tube	
Tube up – Date and Time	Nov 11, 2024 – 1:36pm
Tube down – Date and Time	Dec 6, 2024 – 8:04am

GLOBE Air Quality Campaign as a STEAM Learning Ecology (SLE)
Ms Ramona Mercieca, GLOBE coordinator

Figure 12 Data sheet for STEAM Learning Ecologies

Finally, we then evaluated the atmospheric conditions from years 2022 (Fig. 13) to 2024 (Fig. 14). We noticed that average temperature during 2022 was 25.5 and in 2024 was 23.5. It was 2^{o} less this year from previous years – meaning that our temperature is decreasing. The humidity in 2022 was an average of 55% and in 2024 was 44%. Telling us that it was 11% less in 2024 from 2022. Even though studies show that temperatures are getting warmer (Jenkins, 2009), Malta has shown the opposite effect. But we need to say everything, in 2022 temperature & humidity readings were taken in the morning 8:00am-8:15am and in 2024 readings were taken in the afternoon (12:00pm-12:15pm). This makes a significant difference since the earth warms up in the

afternoon compared to the mornings. We uploaded all data collected during the observation period between November and December 2024 onto the GLOBE Website which were plotted in graph format (Figs. 15-20).

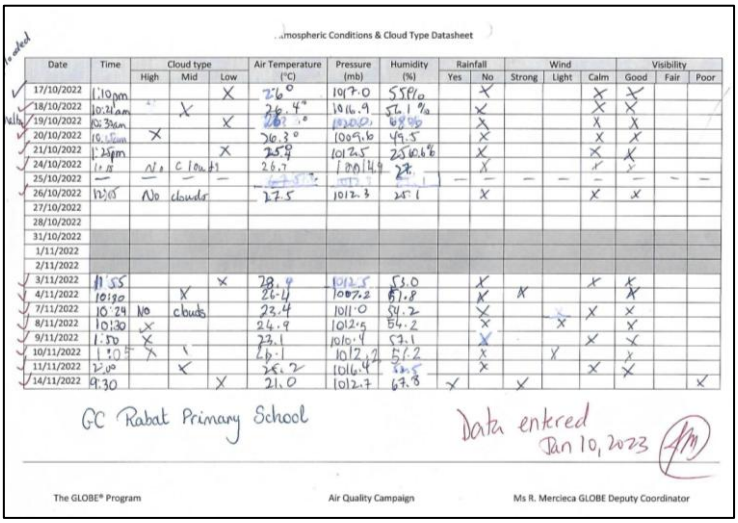


Figure 13 Atmospheric Conditions Year of 2022 – Student's Readings

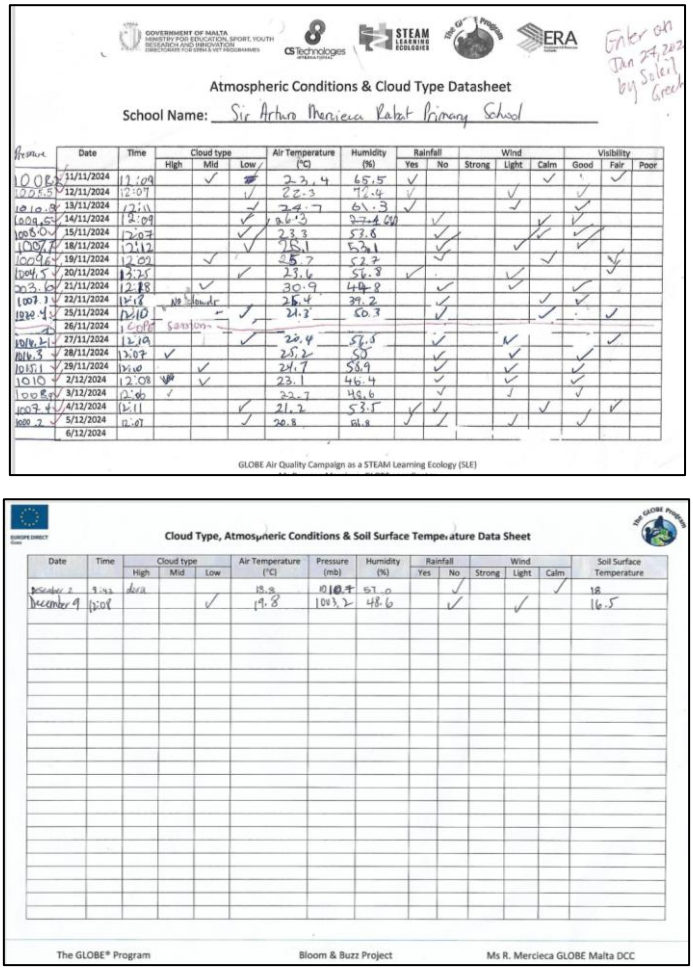


Figure 14 Atmospheric Conditions Year of 2024 – Student's Readings

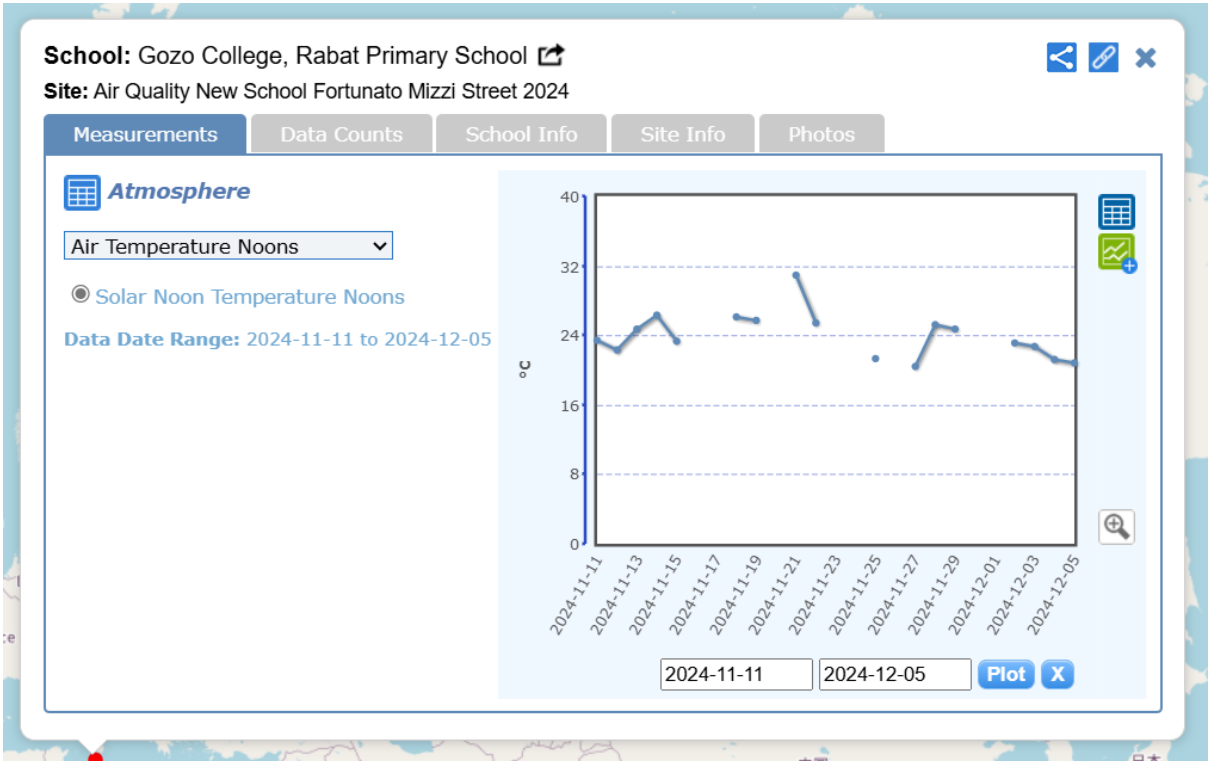


Figure 15 Atmosphere: Air Temperature Noons (GLOBE, GLOBE Science Data Visualization, 2025)

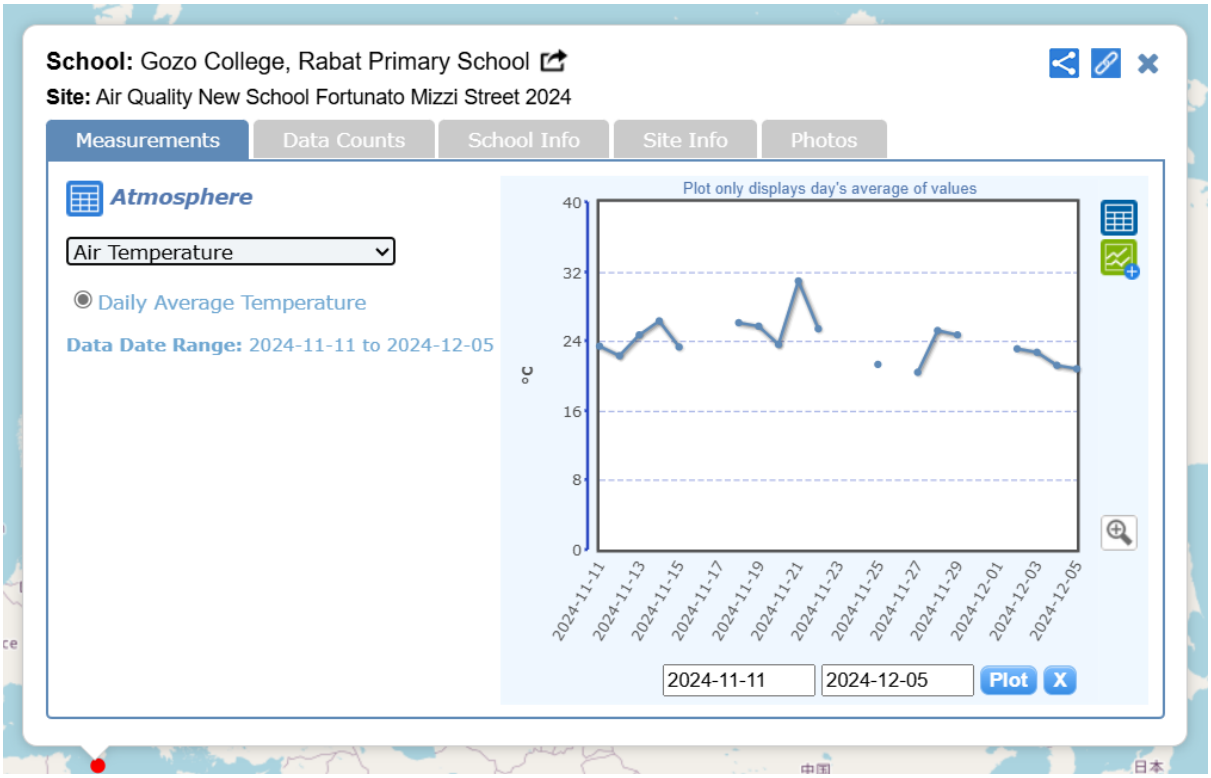


Figure 16 Atmosphere: Air Temperature (GLOBE, GLOBE Science Data Visualization, 2025)

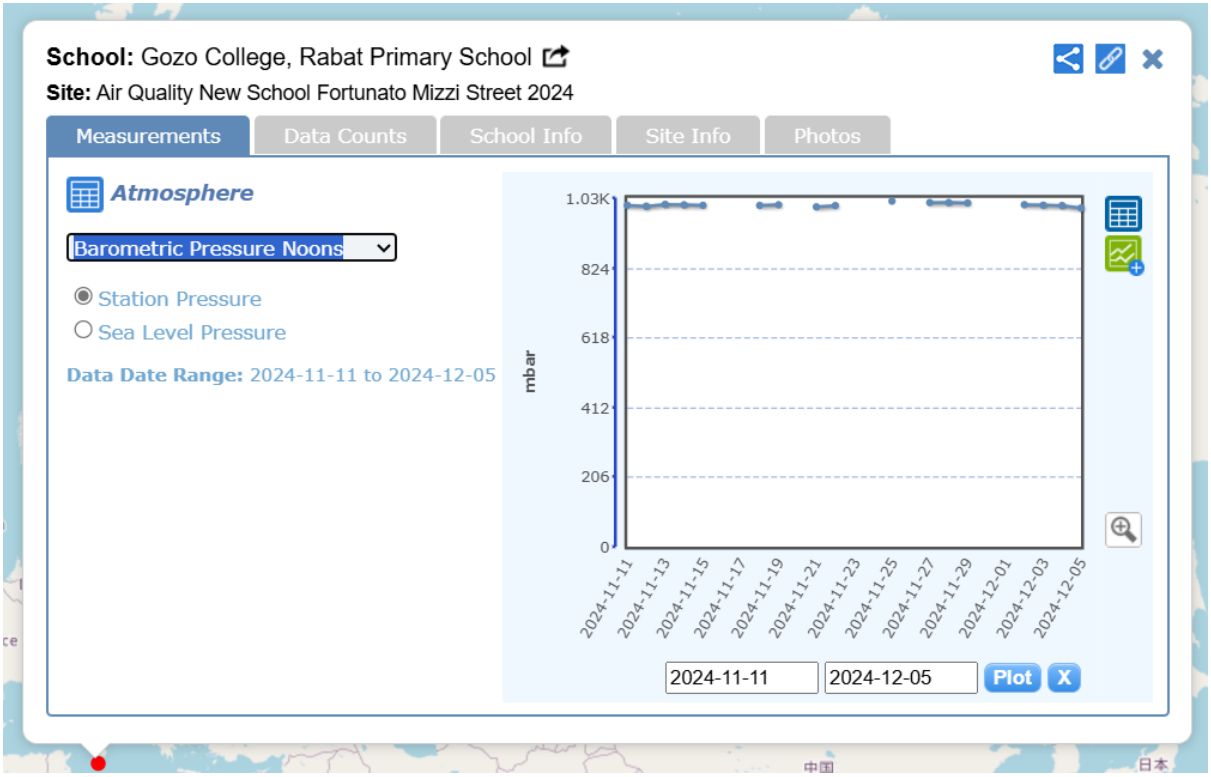


Figure 17 Atmosphere: Barometric Pressure Noons (GLOBE, GLOBE Science Data Visualization, 2025)

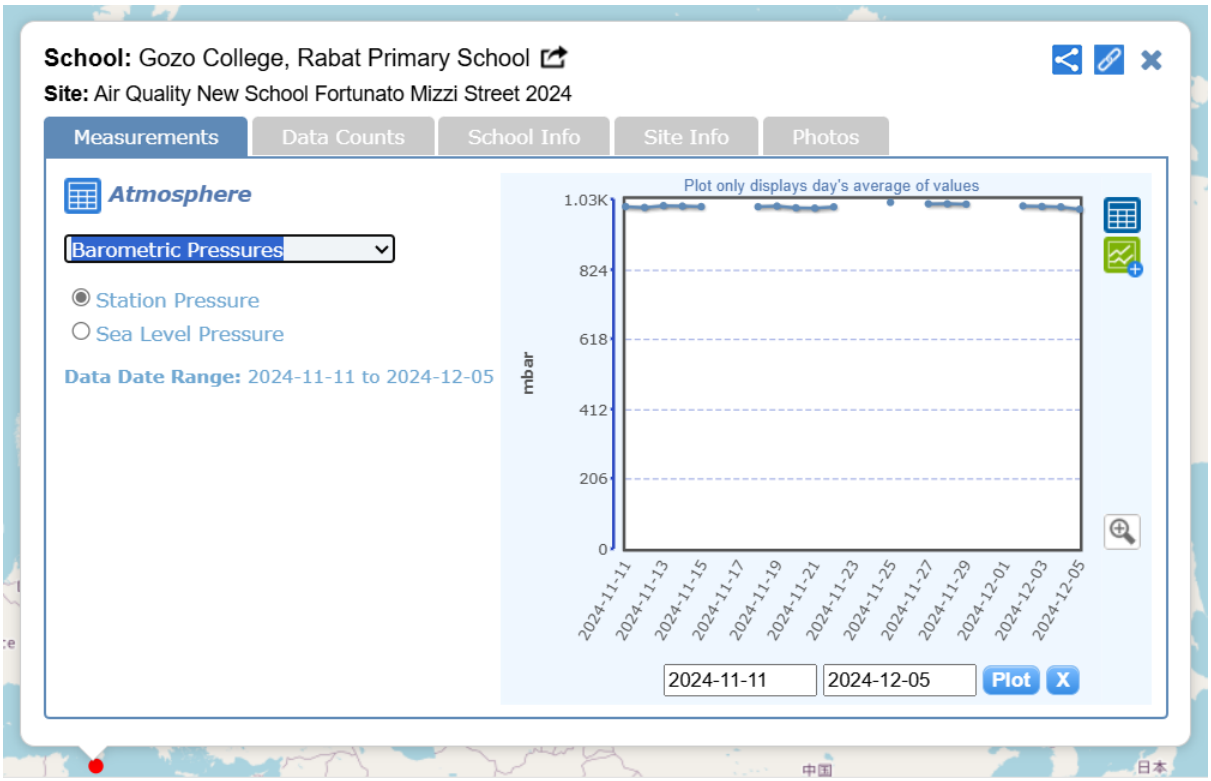


Figure 18 Atmosphere: Barometric Pressures (GLOBE, GLOBE Science Data Visualization, 2025)

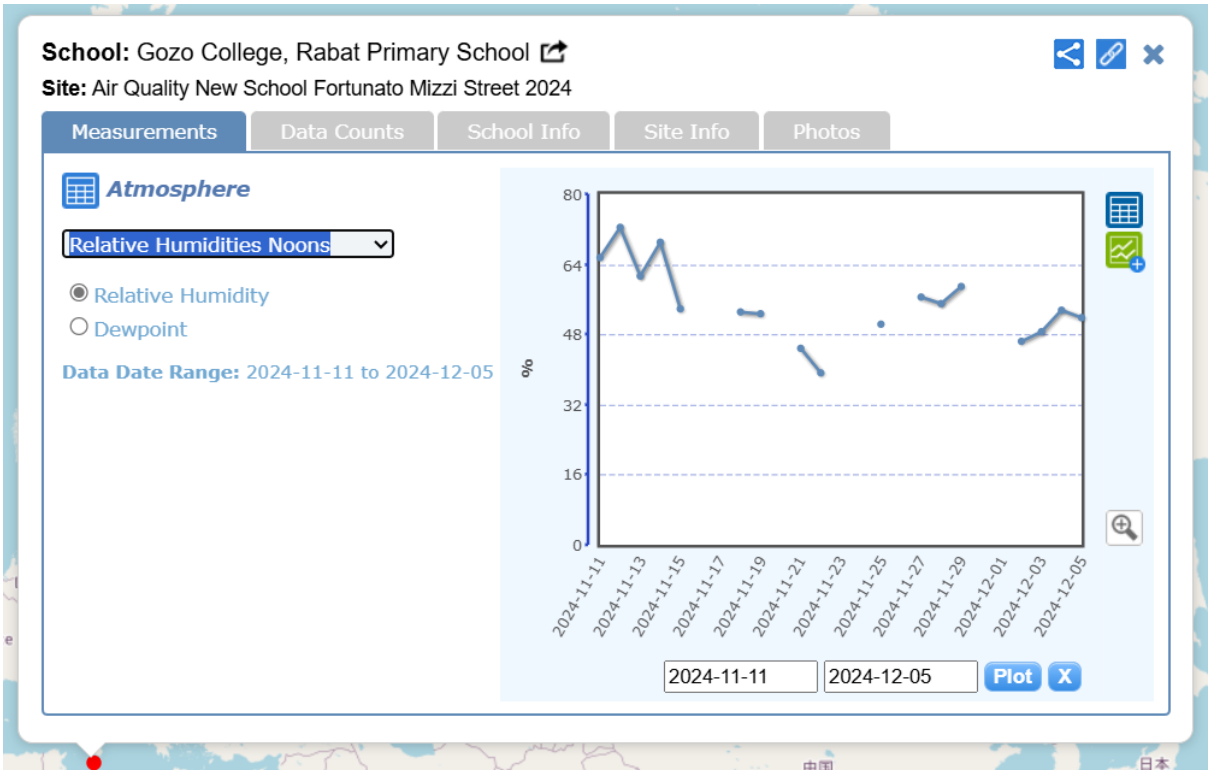


Figure 19 Atmosphere: Relative Humidities Noons (GLOBE, GLOBE Science Data Visualization, 2025)

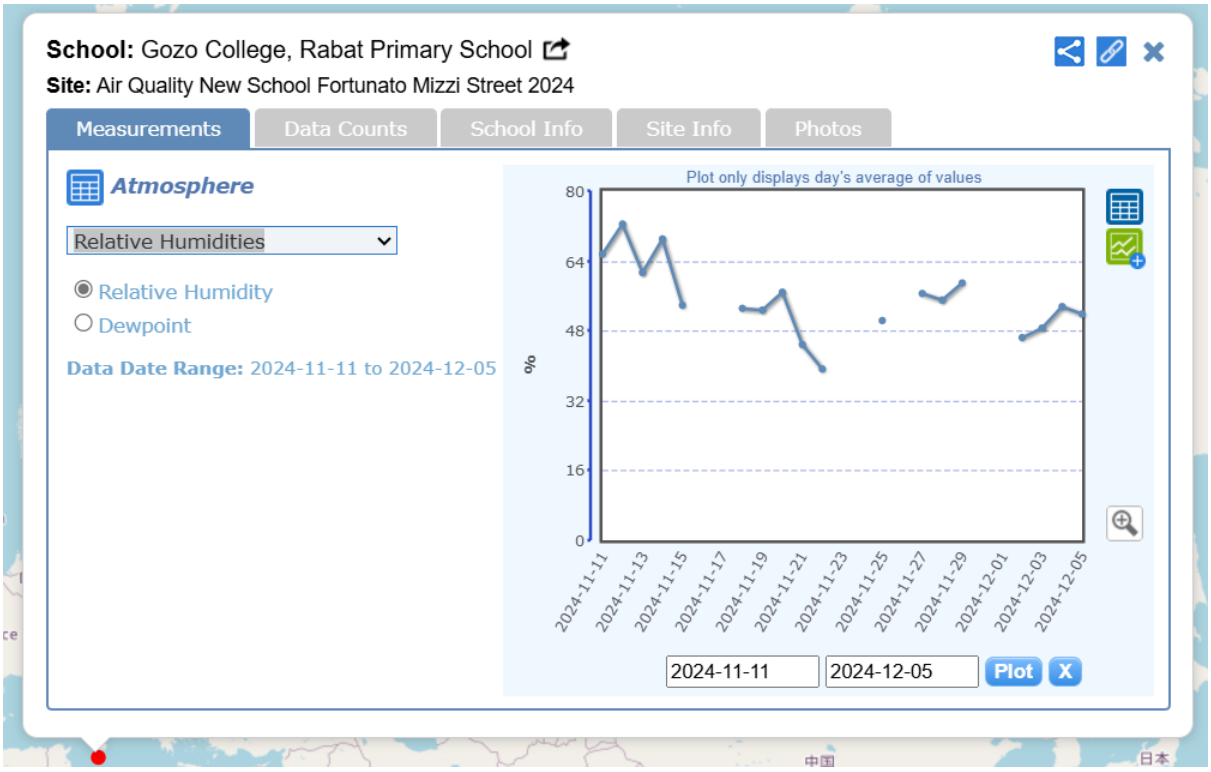


Figure 20 Atmosphere: Relative Humidities (GLOBE, GLOBE Science Data Visualization, 2025)

Taking all of this into account, atmospheric conditions 2% colder; traffic increased by 126% and our NO_2 levels are still the worst on the islands, we needed to come up with some kind of solution.

Our new school has been built with the intent of producing more oxygen for our community. With that said, our school has more trees and plant life than our old school (Fig. 21). We have decided to put planters on each of the school levels (3 levels) to reduce carbon dioxide and increase room oxygenation (Picard, 2023).

Figure 21 Greener new school

Also implementing sustainable mobility by using our bicycles, on foot, school transport and car-pooling by parents. Our Head of School, Mr. Lelio Spiteri encourages students to ride their bicycles and walk to school.

Our school transport now has 5 minivans and 2 coaches with a total of 127 students riding compared to 2 years ago when we only had 4 minivans with a total of 45 students.

And to take it a step further, we will be contacting our local council to put up signs in front of our school and on the side road for cars not to idle in our school area which should reduce car emissions.

Thank you for listening!

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Badge Description/Justification:

I make an Impact

Our school has made an impact with the construction of the new school by considering planting more trees and shrubs to combat air pollution. As well, we will be planting indoor plants inside our school on each level. Also, having days where students are allowed to ride their bicycles and walk to school is another way to get the word across. The increase in school transport from 4 mini-vans – 45 students to 5 mini-vans and 2 coaches with a total of 127 students riding. We will be contacting the Victoria local council to put up signs for cars not to idle in front of our school. This should combat some of the car emissions.

I am a data scientist

Our students did the traffic surveys during their 2nd break and hung a diffusion tube for testing. They collected and analysed their own data. Our data has been shared with the GLOBE team, STEAM Learning Ecologies and Scientix EU. Data collected was used during a Maths lesson.

I am a STEM storyteller

Our students shared their findings with the whole school community through noticeboard and social media. They also entered this report into the Scientix Climate Gamechanger Award.

Scientix EU's Post

Scientix EU
February 11 at 7:00 PM ·

Embrace sustainability with the #Scientix Climate Gamechanger Award. Spark student interest in climate change through inquiry-based activities. Pin a Learning Scenario or Story of Implementation to the #SDC25 Map for chance to attend a workshop in Brussels
Supported by #CarbonAct, co-organised by NBS Eduworld & Scientix.
bit.ly/scx_awards

SCIENTIX STEM DISCOVERY CAMPAIGN 2025

Implement an inquiry-based activity for the teaching of climate change and create either a:
- Learning Scenario
- Story of Implementation of a Carbon Act Learning Scenario

Write a comment...