

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

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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).

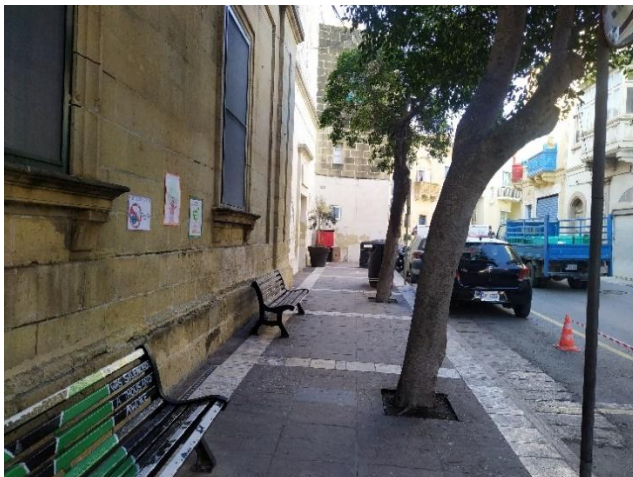
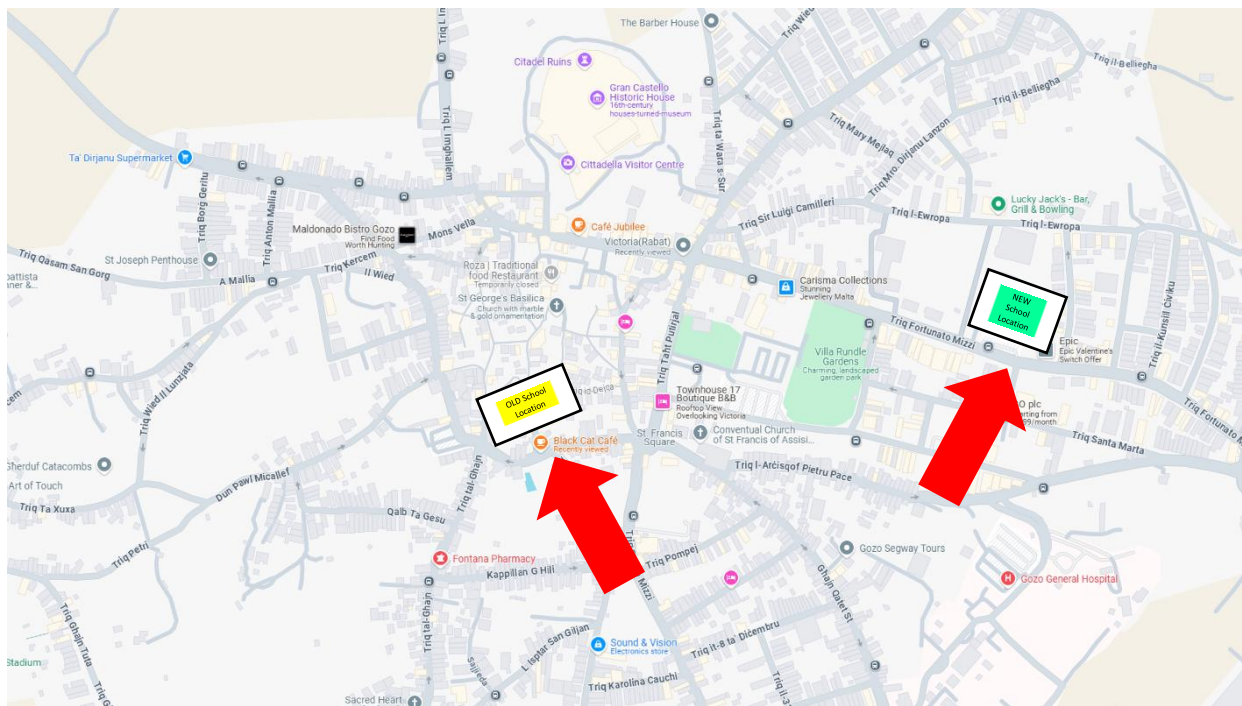


Figure 1: Vajringa Street & Fortunto Mizzi Street, Victoria, Gozo, Malta

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 been 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

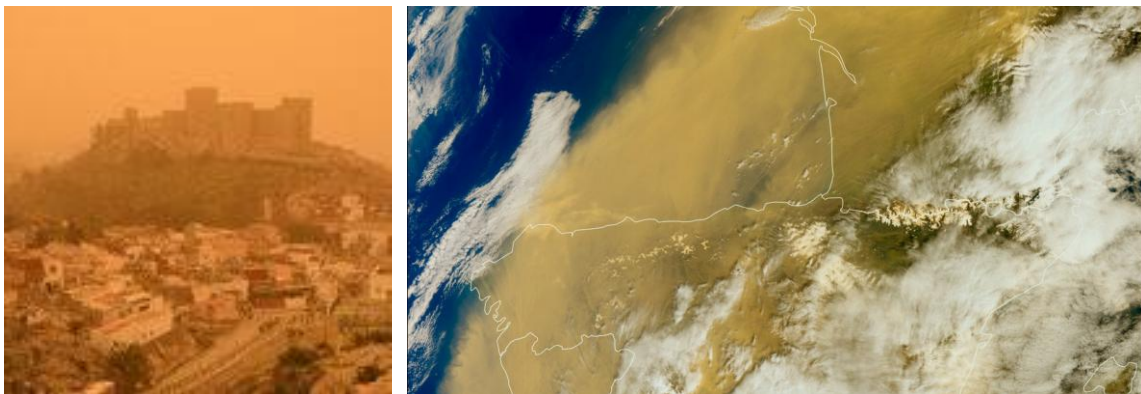


Figure 5: Dust Storms and Sandstorms

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.

Traffic Survey Datasheet		
Traffic	Tally	Total
Bicycle		1
Motorcycle		4
Car		125
Van / Pick-up		17
Small lorry		6
Articulated lorry		2
Bus / coach		5
Construction vehicle		4
Farm vehicle		1
Other		1

Traffic Survey Datasheet		
Traffic	Tally	Total
Bicycle		1
Motorcycle		19
Car		115
Van / Pick-up		14
Small lorry		0
Articulated lorry		0
Bus / coach		4
Construction vehicle		5
Farm vehicle		0
Other		0

Traffic Survey Datasheet		
Traffic	Tally	Total
Bicycle		1
Motorcycle		32
Car		112
Van / Pick-up		15
Small lorry		12
Articulated lorry		1
Bus / coach		4
Construction vehicle		1
Farm vehicle		0
Other		0

Atmospheric Conditions & Cloud Type Datasheet

 School Name: Sir Arthur Mercieca Rabat Primary School

Enter on Dec 29, 2025 by Jaleel Grech

Date	Time	Cloud Type			Air Temperature (°C)	Humidity (%)	Rainfall		Wind			Soil Surface Temperature
		High	Mid	Low			Yes	No	Strong	Light	Calm	
10.06.24	11/11/2024				23.4	67.5	✓					
12.07.24	12/11/2024	✓			22.5	71.4			✓			
18.10.24	18/11/2024	✓			20.7	68.3			✓			
18.10.24	18/11/2024	✓			24.5	72.4			✓			
18.10.24	18/11/2024	✓			23.3	67.6			✓			
18.10.24	18/11/2024	✓			25.1	65.1			✓			
18.10.24	18/11/2024	✓			26.2	63.2			✓			
18.10.24	18/11/2024	✓			23.6	66.9			✓			
18.10.24	18/11/2024	✓			20.9	64.8			✓			
18.10.24	18/11/2024	✓			28.4	69.8			✓			
18.10.24	18/11/2024	✓			24.2	60.3			✓			
18.10.24	18/11/2024	✓			26.4	67.5			✓			
18.10.24	18/11/2024	✓			25.3	67			✓			
18.10.24	18/11/2024	✓			24.7	68.9			✓			
18.10.24	18/11/2024	✓			23.1	66.4			✓			
18.10.24	18/11/2024	✓			23.3	65.8			✓			
18.10.24	18/11/2024	✓			21.8	63.5			✓			
18.10.24	18/11/2024	✓			20.8	61.8			✓			

GLOBE Air Quality Campaign as a STEAM Learning Ecology (GLE)

 Ms Ramona Merviska, GLOBE coordinator

Cloud Type, Atmospheric Conditions & Soil Surface Temperature Data Sheet

Date	Time	Cloud Type			Air Temperature (°C)	Pressure (hPa)	Humidity (%)	Rainfall			Wind			Soil Surface Temperature
		High	Mid	Low				Yes	No	Strong	Light	Calm		
December 9, 2024	9:00	None			15.8	1016.4	53.0	✓					16.5	
December 9, 2024					19.8	1013.3	48.6	✓						

The GLOBE® Program

 Bloom & Buzz Project

 Ms R. Mercieca GLOBE Malta DCC



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 NO₂ 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), CO₂ (Carbon Dioxide) & PM (Particulate Matter) readings daily for one month. We came together in a meeting in Pembroke, Malta (Fig. 8).

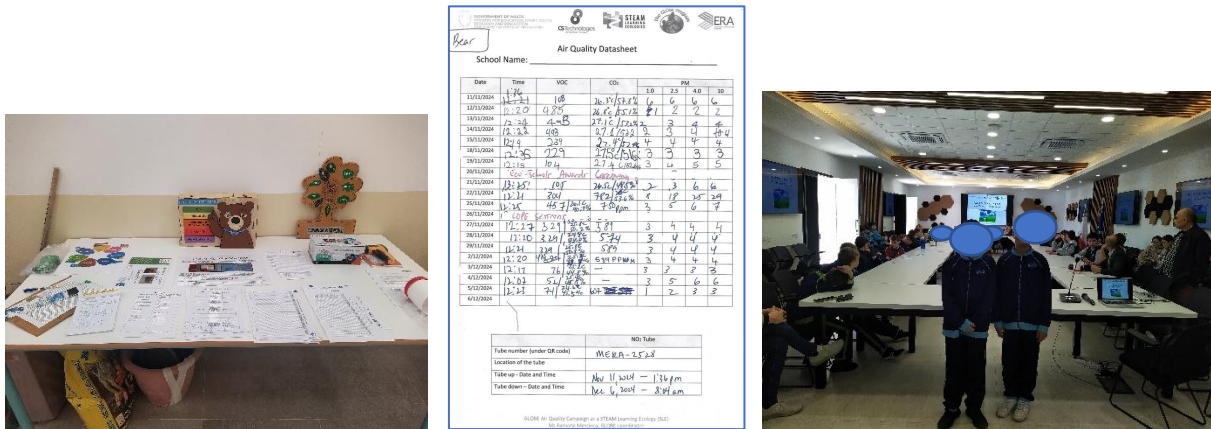


Figure 8: The GLOBE – Air Quality Campaign as a STEAM Learning Ecologies

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).

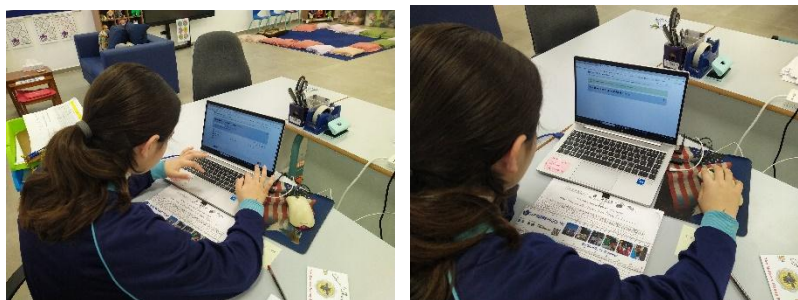
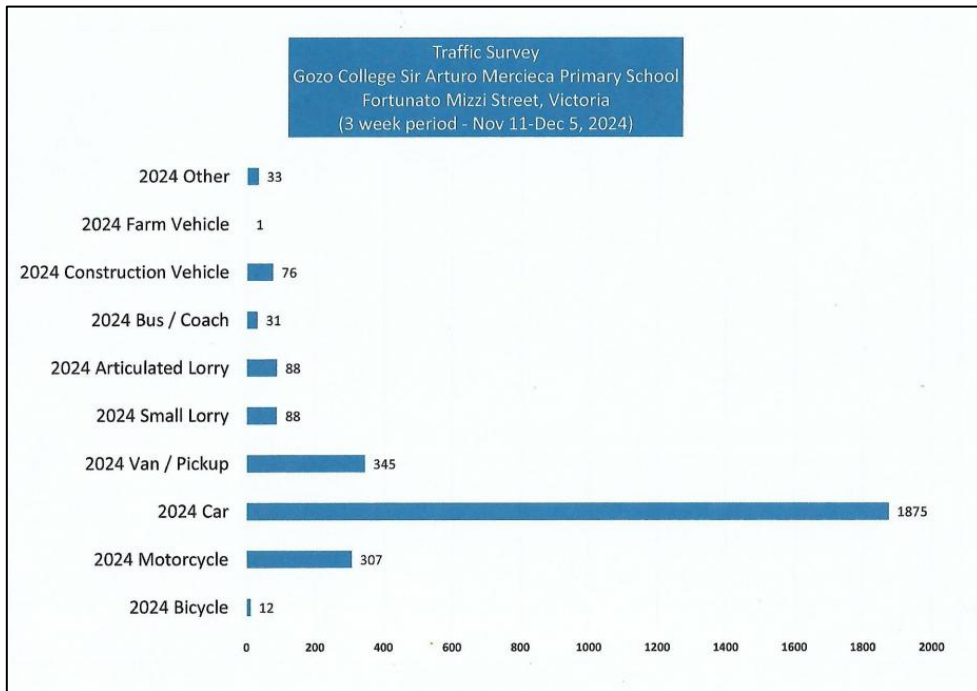
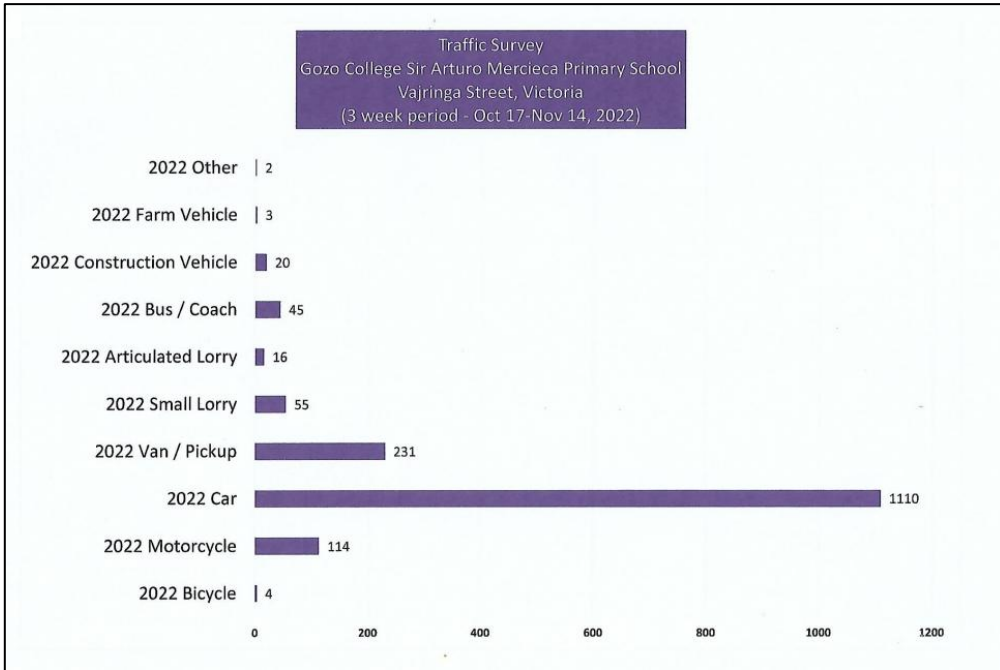


Figure 9: Uploading data to GLOBE database

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),



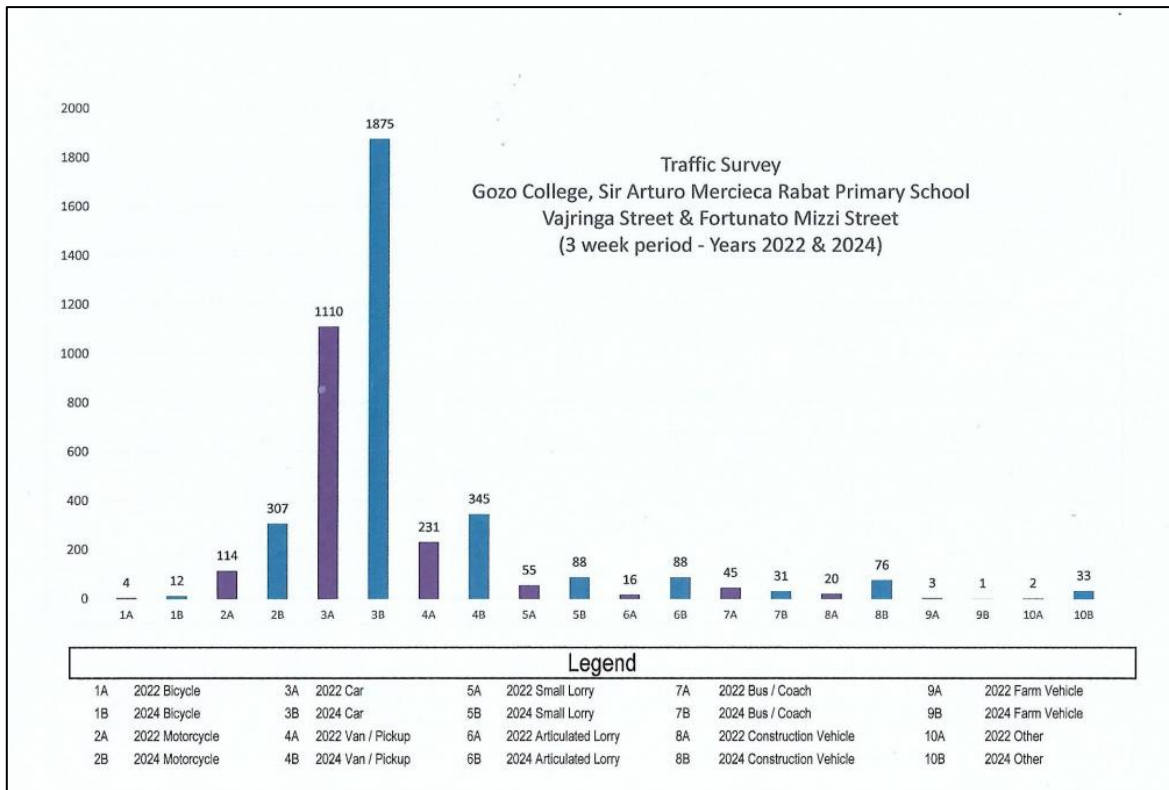


Figure 10 Bar graph showing traffic count results for 2022 & 2024 & COMBINATION of 2022 & 2024

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 NO₂ than our new school area by a difference of +1.5% NO₂ (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 CO₂!!

Location	Sample Number	Exposure Date	Exposure Date OP	Temp (°C)	ppb	µg NO ₂ on filter
Rabat College Maria School, Europa Street, Victoria, Gozo	2096416	17/10/2022	14/11/2022	671.87	35.70	16.22
St. Francis Primary School, Main Gate Street, Victoria, Gozo	2096415	17/10/2022	14/11/2022	675.95	28.80	13.26
St. Andrew's Primary School, The Village, Victoria, Gozo	2096420	17/10/2022	14/11/2022	668.98	33.62	15.52
Gozo College, Kermela Primary School, The Ta-Hermiti, Kermela	2096427	17/10/2022	14/11/2022	671.83	37.9	1.8
Gozo College, Sarmel Special Unit School, Sarmel Road, Sarmel	2096428	17/10/2022	14/11/2022	672.30	25.74	12.01
Gozo College, Zebbug Primary School, St. Andrew Street, Zebbug	2096429	17/10/2022	14/11/2022	689.56	45.5	2.41
Sir M.A. Parnis Sixth Form, Fortunato Mizzi Street, Victoria	2096430	17/10/2022	14/11/2022	672.25	43.10	22.56
Sarmel (Front Main Entrance), Sarmel Main Street, Victoria	2096431	14/11/2022	14/11/2022	688.17	33.36	17.52
Laura Victoria Primary School, Ocean Square, Victoria	2096432	17/10/2022	14/11/2022	671.96	5.8	0.29
Gozo College, Għajnsielem Primary School, Targħ T-Torrija, Għajnsielem	2096433	17/10/2022	14/11/2022	671.75	28.82	13.54
Gozo College, Għajnsielem Primary School, Targħ T-Torrija, Għajnsielem	2096434	17/10/2022	14/11/2022	670.90	9.80	0.20
Laboratory Blank					738.17	0.09

Comment: Results are not blank subtracted
Results have been corrected to a temperature of 20.0 °C (293 K) (20°C)
Chemical Reagent: 95.7%
This reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of 1.2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported result.
Type Preparation: 20% TGA / Water
Analyst Name: Alison Wright
Date of Analysis: 01/12/2022
Report Checked By: Adam Robinson
Date of Report: 01/12/2022
Report Number: QP02378

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 CO₂ 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.

GOVERNMENT OF MALTA
MINISTRY FOR EDUCATION, SPORT, YOUTH
RESEARCH AND INNOVATION

CS technologies STEAM LEARNING ECOLOGIES THE CO2 PROGRAM ERA

Air Quality Datasheet

School Name: _____

Date	Time	VOC	CO ₂	PM			
				1.0	2.5	4.0	10
11/11/2024	11:26	108	26.3°C/58.8%	6	6	6	6
12/11/2024	11:20	485	26.6°C/55.1%	1	2	2	2
13/11/2024	12:24	483	27.1°C/52.4%	3	4	4	4
14/11/2024	12:22	492	27.1°C/52.2%	3	4	4	4
15/11/2024	12:19	234	27.4°C/52.4%	4	4	4	4
18/11/2024	12:35	229	27.5°C/52.6%	3	3	3	3
19/11/2024	12:15	104	27.4°C/52.4%	3	4	5	5
20/11/2024	12:00	104	27.4°C/52.4%	3	4	5	5
21/11/2024	12:25	105	26.5°C/48.5%	2	3	6	6
22/11/2024	12:21	204	27.2°C/52.6%	8	18	25	29
25/11/2024	12:25	45	27.0°C/50.0%	3	5	6	7
26/11/2024	12:27	329	27.1°C/52.2%	3	4	4	4
27/11/2024	12:20	329	27.1°C/52.2%	3	4	4	4
28/11/2024	12:20	329	27.1°C/52.2%	3	4	4	4
29/11/2024	12:21	329	27.1°C/52.2%	3	4	4	4
2/12/2024	12:20	329	27.1°C/52.2%	3	4	4	4
3/12/2024	12:17	76	26.1°C/49.0%	3	3	3	3
4/12/2024	12:02	52	26.1°C/49.0%	3	5	6	6
5/12/2024	12:23	74	26.1°C/49.0%	1	2	3	3

NO ₂ Tube	
Tube number (under QR code)	MERA-2528
Location of the tube	
Tube up - Date and Time	Nov 11, 2024 - 1:36 pm
Tube down - Date and Time	Dec 6, 2024 - 8:04 am

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° 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).

Atmospheric Conditions & Cloud Type Datasheet

Date	Time	Cloud type			Air Temperature (°C)	Pressure (mb)	Humidity (%)	Rainfall		Wind			Visibility		
		High	Mid	Low				Yes	No	Strong	Light	Calm	Good	Fair	Poor
17/10/2022	1:10pm				26.0	1017.0	55.9	X				X	X		
18/10/2022	10:34am	X	X		26.4	1016.9	54.1	X				X	X		
19/10/2022	8:39am				26.5	1018.0	48.9	X				X	X		
20/10/2022	10:15am	X			26.3	1018.6	49.5	X				X	X		
21/10/2022	1:15pm			X	25.8	1012.5	25.6	X				X	X		
24/10/2022	11:05	No clouds			26.7	1011.4	28	X				X	X		
25/10/2022					27.5	1012.3	28.1								
26/10/2022	11:05	No clouds			27.5	1012.3	28.1	X				X	X		
27/10/2022															
28/10/2022															
31/10/2022															
1/11/2022															
2/11/2022															
3/11/2022	11:55		X		28.4	1012.5	53.0	X			X	X	X		
4/11/2022	10:10	X			26.1	1017.2	61.8	X	X			X	X		
7/11/2022	10:29	No clouds			23.4	1011.0	51.2	X			X	X	X		
8/11/2022	10:30	X			24.9	1012.5	51.2	X			X	X	X		
9/11/2022	1:50	X			23.1	1010.4	52.1	X			X	X	X		
10/11/2022	1:07	X			26.1	1012.7	52.2	X			X	X	X		
11/11/2022	12:02	X			26.2	1016.4	52.5	X			X	X	X		
14/11/2022	9:30		X		21.0	1012.7	67.8	X	X			X	X		X

GC Rabat Primary School
 Data entered Jan 10, 2023 [Signature]

The GLOBE® Program Air Quality Campaign Ms R. Mercieca GLOBE Deputy Coordinator

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

Atmospheric Conditions & Cloud Type Datasheet

School Name: Sir Arturo Mercieca Rabat Primary School

Date	Time	Cloud type			Air Temperature (°C)	Humidity (%)	Rainfall		Wind			Visibility			
		High	Mid	Low			Yes	No	Strong	Light	Calm	Good	Fair	Poor	
10/08/24	11/11/2024				23.4	65.5									
10/08/24	12/11/2024				22.3	72.6									
10/08/24	13/11/2024				24.7	65.3									
10/08/24	14/11/2024				26.3	57.4									
10/08/24	15/11/2024				23.3	52.6									
10/08/24	16/11/2024				25.1	52.1									
10/08/24	18/11/2024				25.7	52.2									
10/08/24	19/11/2024				23.6	52.8									
10/08/24	20/11/2024				30.9	44.9									
10/08/24	21/11/2024				26.4	39.2									
10/08/24	22/11/2024				21.2	60.3									
10/08/24	23/11/2024				23.4	56.5									
10/08/24	24/11/2024				25.2	59									
10/08/24	25/11/2024				24.7	53.9									
10/08/24	26/11/2024				23.1	46.4									
10/08/24	27/11/2024				22.7	46.6									
10/08/24	28/11/2024				21.2	52.5									
10/08/24	29/11/2024				26.8	61.8									

Enter on Jan 27, 2023 by Selen Grech

GLOBE Air Quality Campaign as a STEAM Learning Ecology (SLE)

Cloud Type, Atmospheric Conditions & Soil Surface Temperature Data Sheet

Date	Time	Cloud type			Air Temperature (°C)	Pressure (mb)	Humidity (%)	Rainfall		Wind			Soil Surface Temperature
		High	Mid	Low				Yes	No	Strong	Light	Calm	
December 2	9:00				15.8	1010.4	57.0					18	
December 9	11:07				14.8	1013.2	48.6					16.5	

The GLOBE® Program Bloom & Buzz Project Ms R. Mercieca GLOBE Malta DCC

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

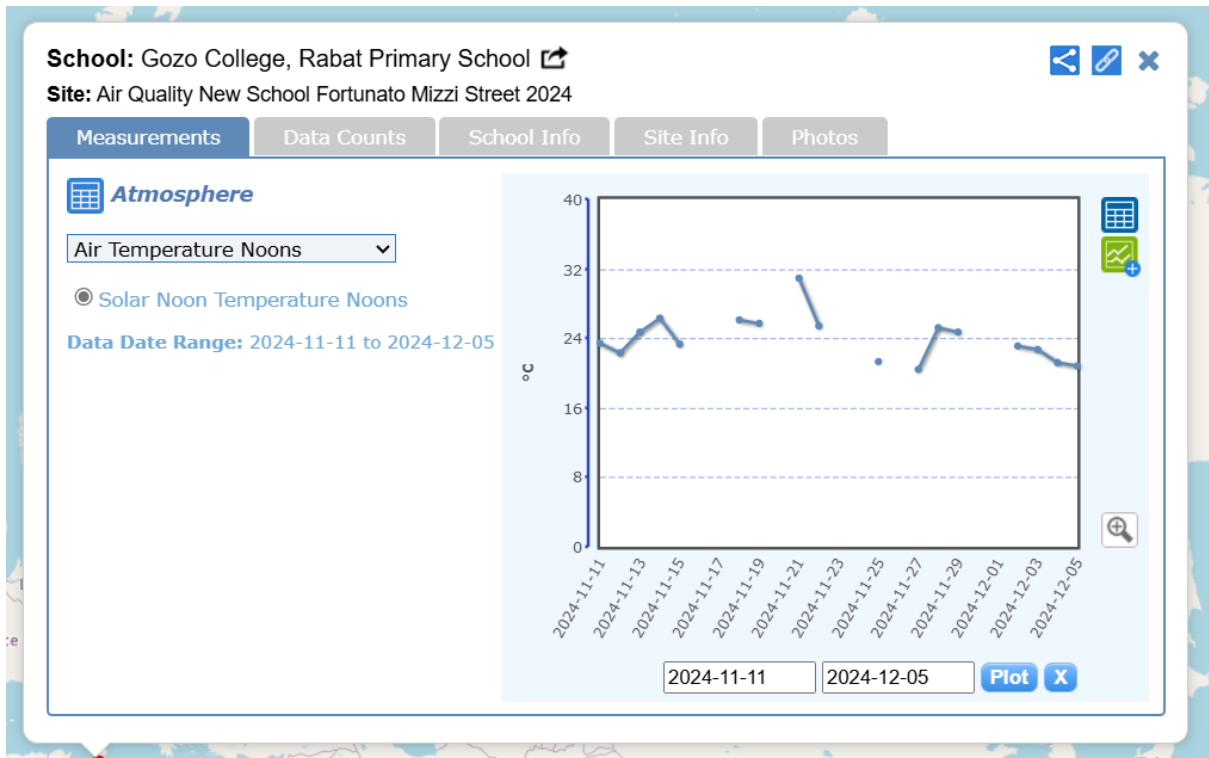


Figure 15 Atmosphere: Air Temperature Noons (GLOBE, GLOBE Science Data Visualization, 2025)

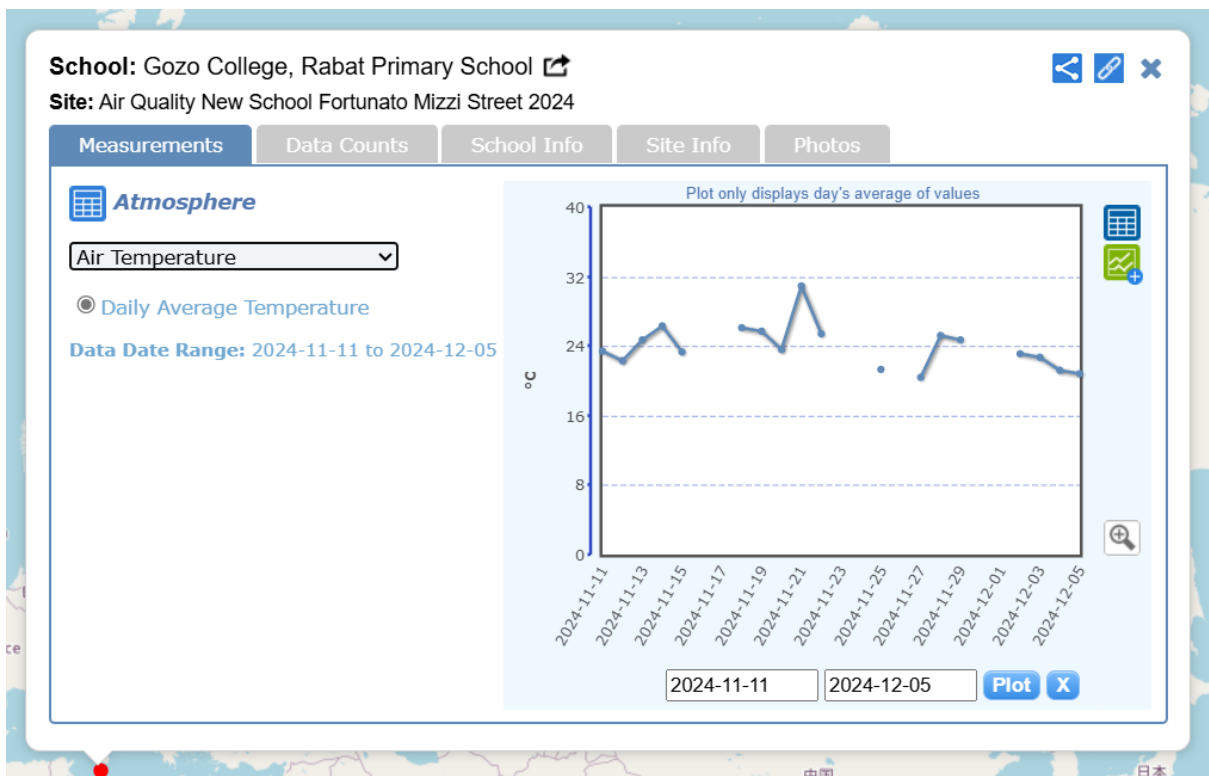


Figure 16 Atmosphere: Air Temperature (GLOBE, GLOBE Science Data Visualization, 2025)

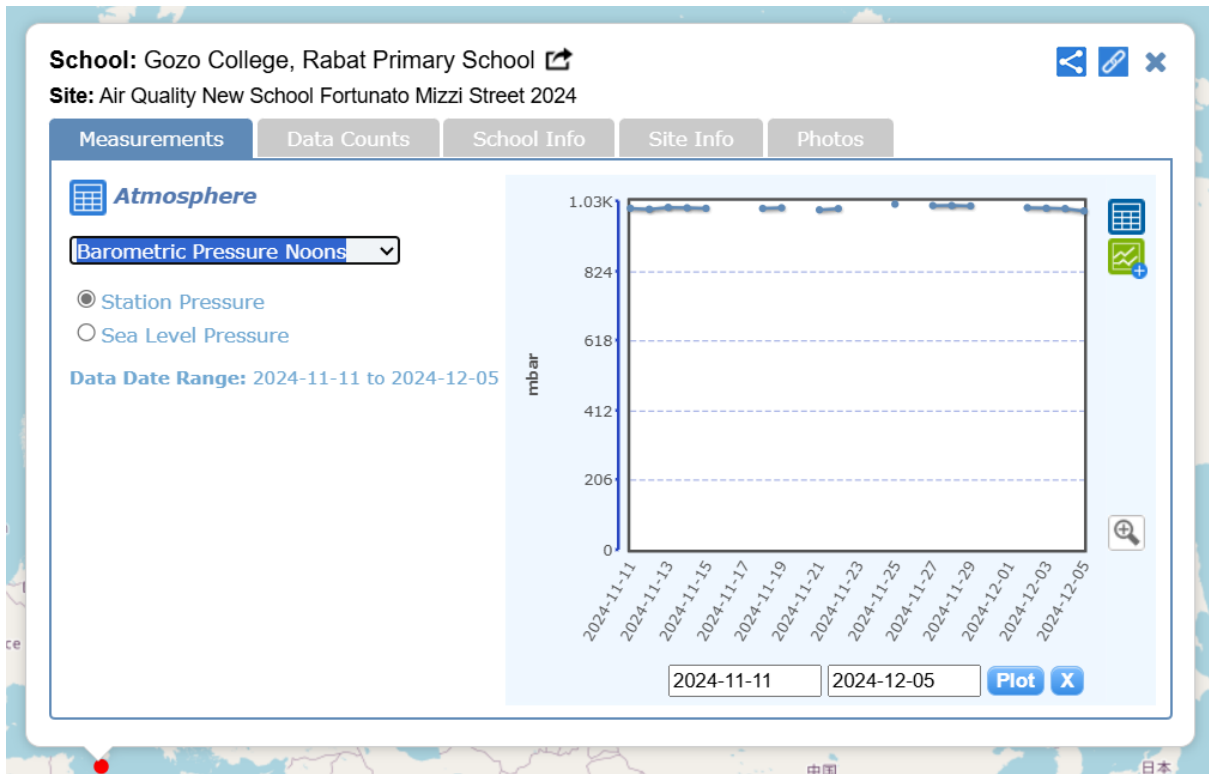


Figure 17 Atmosphere: Barometric Pressure Noons (GLOBE, GLOBE Science Data Visualization, 2025)

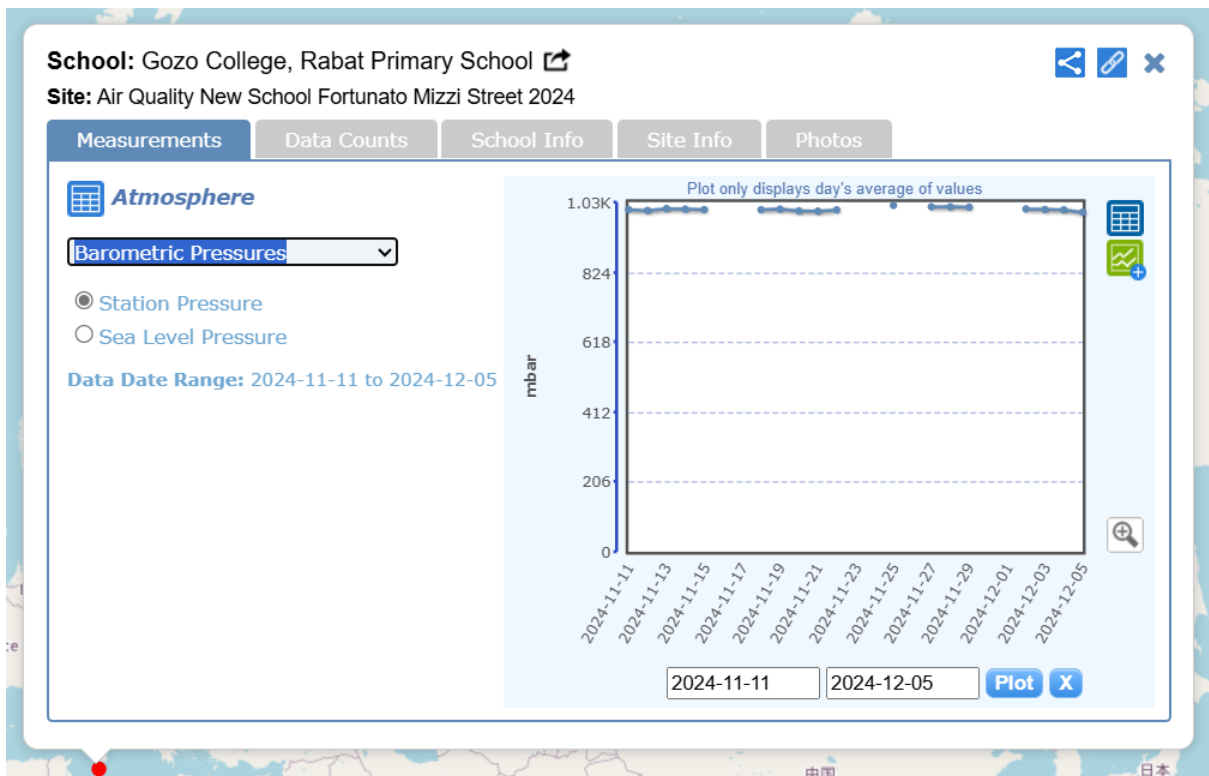


Figure 18 Atmosphere: Barometric Pressures (GLOBE, GLOBE Science Data Visualization, 2025)

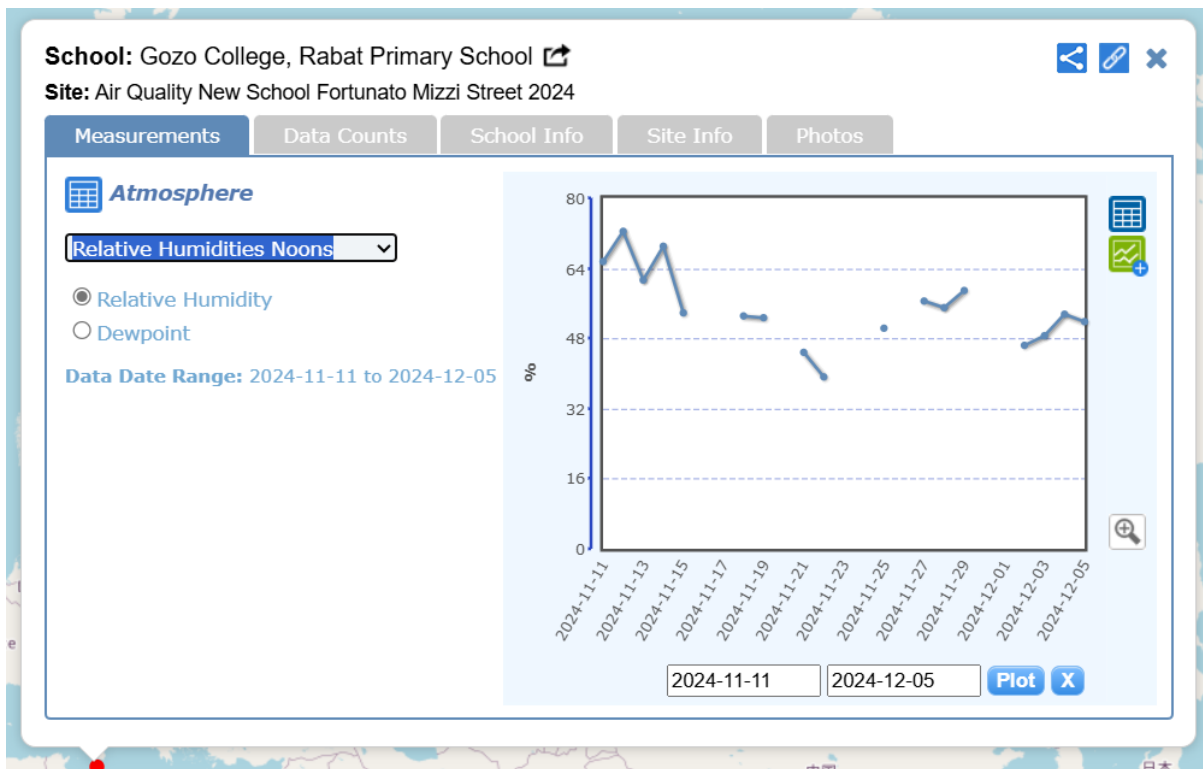


Figure 19 Atmosphere: Relative Humidities Noons (GLOBE, GLOBE Science Data Visualization, 2025)

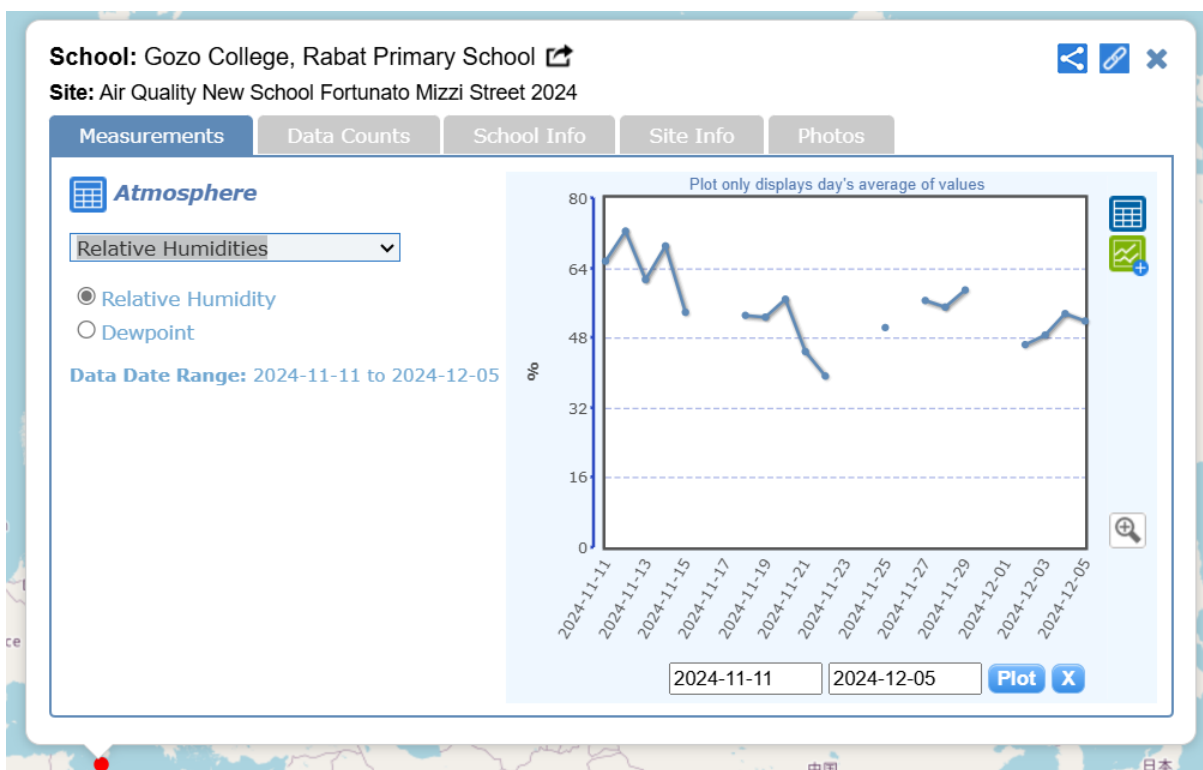


Figure 20 Atmosphere: Relative Humidities (GLOBE, GLOBE Science Data Visualization, 2025)

Taking all of this into account, atmospheric conditions 2% colder; traffic increased by 126% and our NO₂ 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!

Bibliography

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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.





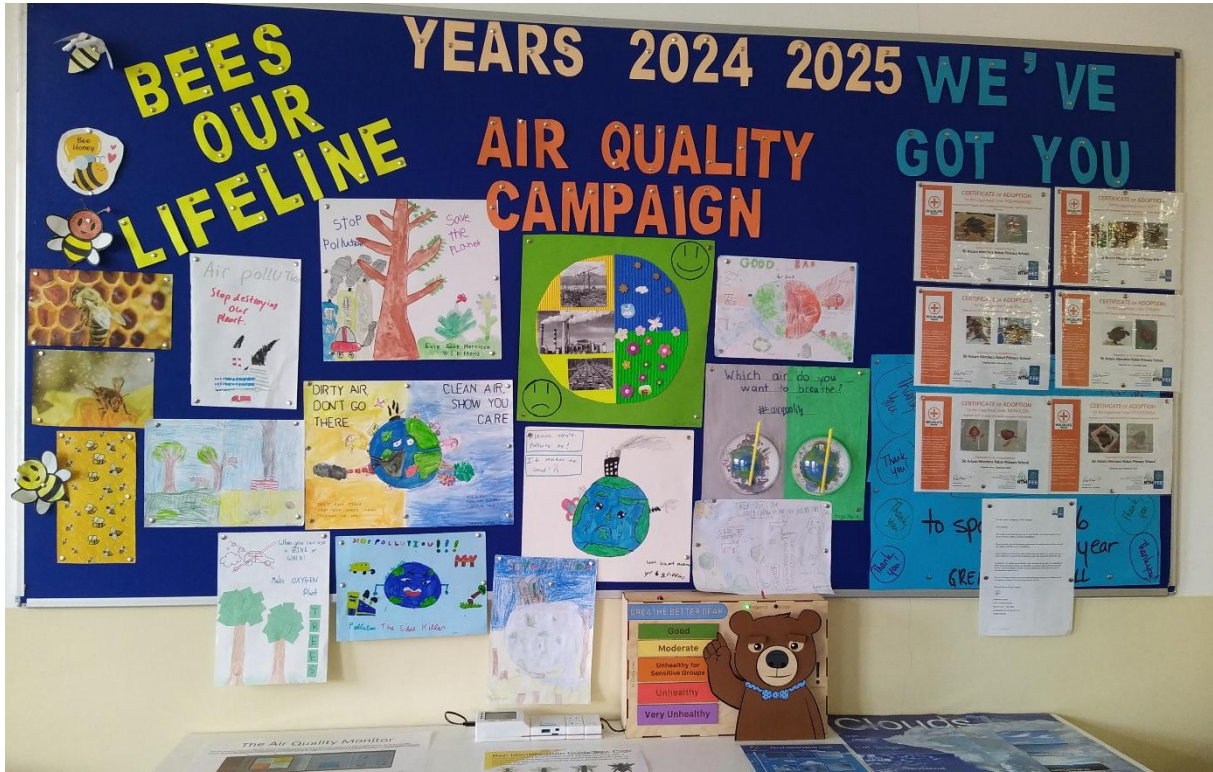
I am a data scientist

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



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...

