# *Exploring the World Beneath Our Feet: Cement vs Soil*


***Gozo College Karmni Grima Għarb Primary School, Gozo***

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## Summary


This project investigates the temperature differences between cement surfaces and areas under trees, focusing on how different surfaces affect heat levels. The research question addresses whether trees help in lowering temperatures. With Malta's hot summer temperatures, the objective was to explore natural solutions for cooling down outdoor spaces. The project involved measuring surface temperatures on cement and under tree canopies over time. The results showed that trees do provide shade, and temperatures were consistently lower under the trees compared to exposed cement surfaces in the sun. The conclusion highlights that trees can effectively reduce heat and offer a natural method to help lower temperatures in hot environments like Malta.


## Research Questions

This project aimed to explore the temperature differences between cement surfaces and shaded areas under trees, focusing on whether trees can help in lowering temperatures. The research question at the heart of the project was: Do trees help in lowering temperatures compared to hard, artificial surfaces like cement? This question is scientifically significant because it addresses the impact of urbanization on local climates, especially in hot regions like Malta, where summer temperatures can reach extreme levels. Understanding how natural elements like trees interact with their environment to reduce heat can provide valuable insights into urban planning and climate adaptation strategies.

The research question is of both local and global concern. On a local scale, Malta experiences high summer temperatures, and finding natural ways to mitigate this heat is essential for improving outdoor comfort and energy efficiency. Globally, this question ties into broader environmental issues such as urban heat islands, climate change, and the need for sustainable solutions in cities. The ability of trees to cool their surroundings by providing shade and reducing surface temperatures has implications for sustainable urban development worldwide.

## Research Methods

To answer the research question, we measured the temperatures of cement surfaces and areas under trees on the school grounds over an extended period (Figure 1). Għarb Primary School is located in the western side of Gozo and it is situated on a very quiet street in the heart of Għarb.

Figure 1 Aerial view of the school

**Materials used**

- Infrared Thermometer
- 2 Datasheets, one for each study site
- Clipboard and pen

The GLOBE Atmosphere Protocol was used to collect surface temperature. This includes a standardised methods for measuring the surface temperatures. The students visited the study site for a whole week in October and December 2024 and again in January 2025. Using an infrared thermomenter they measured 9 readings from each site (Figure 2) and data was recorded on the datasheets. The students also observed and recorded the surface conditions, wert or dry, of the study site.

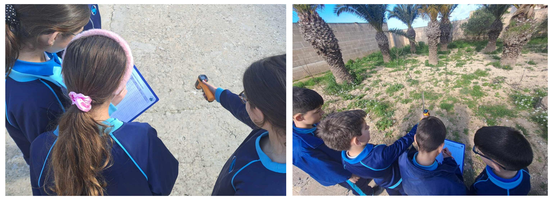

Figure 2 GLOBE students collecting data from study sites

## Results

After the observation period, all data was uploaded to the GLOBE database base (Figure 3).

Figure 3 GLOBE students uploading data to GLOBE database

The screenshots below show data uploaded on the GLOBE website during the observation period between October, December 2024 and January 2025 (Figures 4 & 5).

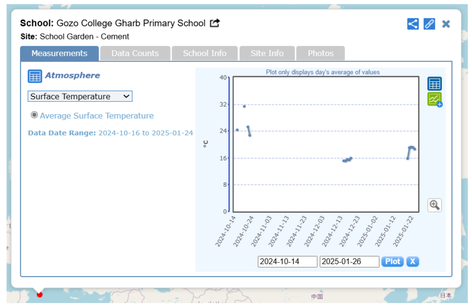


Figure 4 Surface Temperature (Cement) plot of VIZ GLOBE

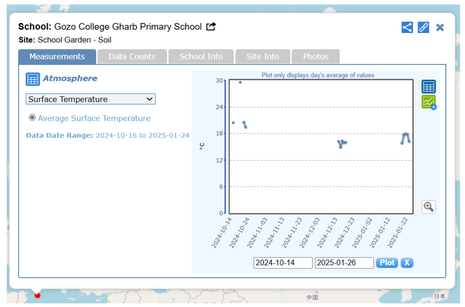


Figure 5 Surface Temperature (Soil) plot of VIZ GLOBE

## Conclusion

This project measured temperatures on cement ground and under tree canopies over a week in October, December, and January, revealing the cooling effects of trees. The data, uploaded to the GLOBE website, showed that tree-shaded areas consistently had lower temperatures than cement surfaces, with differences more pronounced on sunny days (e.g., on October 16, 2024, cement was 24.6°C while soil under trees was 20.6°C). Even on rainy days, when cement and soil temperatures were closer (differing by about 1°C), the trend of cooler temperatures under trees held steady. This cooling is attributed to shade and evapotranspiration from trees, contrasting with cement's heat-absorbing properties. The findings emphasize the value of trees in mitigating urban heat, supporting the idea of planting more trees in school areas and beyond. Future studies could explore longer timeframes, additional seasons, or other surfaces. Overall, the project underscores the importance of green spaces for sustainable, cooler urban environments.

## References


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

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