A Tale of 10 Zones

Gozo College San Lawrenz Primary School aka The Friendly School, San Lawrenz, Gozo, Malta

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Abstract

This investigation was conducted using the GLOBE Surface Temperature Protocol to analyse the surface temperature of ten different zones within one complex- San Lawrenz Primary School. The research was based on the fact that darker surfaces absorb heat energy at a faster rate than lighter ones, resulting in a raised temperature. Observations were done in various conditions from dry to wet ground.

The research was adopted by the whole school community, the pupils, teachers and the ancillary staff. Parents were planned to be involved, but due to COVID-19 mitigation measures they were not allowed inside the school. Nine samples from ten different zones were collected on five days each having different weather conditions.

Though the data supported the hypothesis, the graphs led to several interesting conclusions.

Research Question

Our school covers a large area. It is surrounded by fields. The building consists of the administration block, the classes and the hall, spread over three wings. Pupils and staff often comment that while one wing is very warm, the opposite one is cold compared to the former. During winter, one prefers to stay in the sunny block, however, during summer, pupils prefer to visit the area of the cooler block. Why?

Introduction

Our school has been actively participating in the GLOBE project. It was interesting to continue discovering more information about our school via the Urban Head Island/Surface Temperature Campaign. Thus, it was natural to start this investigation by collecting data from a variety of zones with different surfaces. In all, ten different zones within the school were identified. The GLOBE Surface Temperature Protocol was used. The ten different zones were: tarmac; shade; synthetic turf; even surface concrete; rough surface concrete; soil in direct sun; soil under the trees; soil in the shade; soil facing south direction; soil facing north direction.

Research Methods

Planning the Investigation

First, a short meeting ensued with all the participants, i.e. the whole school community. They were instructed about how to use the GLOBE Surface Temperature Protocol. Attention was given to the position of the hand and the direction which the infra-red thermometer was pointing at.

Apparatus:

- Digital infrared Thermometer
- School Plan with the 10 sites marked
- Datasheet
- Laptop for documentation

Carrying out the Investigation

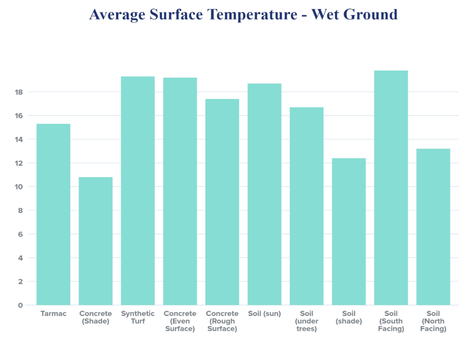
On five different days, at 10.45am, data was collected from ten different zones within the school. The ten different zones were: tarmac; shade; synthetic turf; even surface concrete; rough surface concrete; soil in direct sun; soil under the trees; soil in the shade; soil facing south direction; soil facing north direction. Nine (9) different temperature samples from each zone were collected during each occasion. On each day, the total amount of data collected was 90 surface temperatures to analyse. 450 surface temperatures were collected over five different days to be analysed. The weather conditions of each day were also recorded.

Results

Analyzing Data

Once all the data was collected, the average value for the temperature of each zone for each day was used for comparison reasons and was presented in graph format using bar graphs. Ten sites were created on the GLOBE website and all data was uploaded.

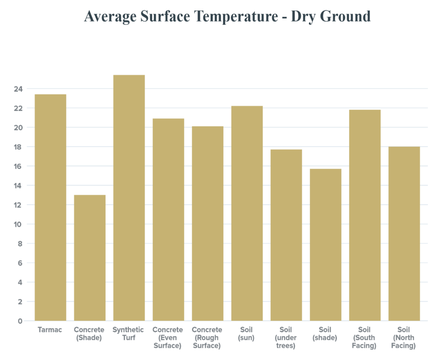
Graph 1: Bar Graph showing average surface temperature on a rainy day



The lowest average temperature recorded was that of concrete in the shade.

The highest average temperature recorded was that of the south facing soil.

Graph 2: Bar Graph showing average surface temperature on sunny days



The lowest average temperature was registered by the concrete

The highest temperature was registered by the synthetic turf.

Discussion & Conclusion

The fact that in wet conditions the soil registered a higher temperature than that of the concrete, could mean that this serves as the ideal conditions for plant food production.

The wet ground registered an overall lower average temperate than that of dry ground.

On dry ground, synthetic materials (turf and concrete) registered slightly higher average temperatures than natural occurring elements (soil). By extrapolation, one might deduce that built up areas should register higher temperatures than those in the countryside.

Black surfaces (tarmac and shredded black rubber tyres in the synthetic turf) absorb a lot more heat especially in dry conditions. This is the opposite case of the average temperature of naturally occurring material.

One can conclude that naturally occurring materials help in keeping low temperatures when the ambient temperature is high, while keeping a relatively high temperature when the ambient temperature is low, thus, promoting ideal conditions for living things.

Recommendations

- It would be interesting to conduct a similar investigation, but this time, during different times in one whole year. This might give an indication how the temperature varies with the seasons or the months.
- A more intensive analysis of the same zones could take place by conducting the same action research, twice for each day: one in the morning and another one in the evening. In this way, one can analyse the heat retention of the different surfaces over a period of hours.

Acknowledgements

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- The School community participated and helped along and believed in this project, even when the weather conditions were not ideal to go outside and take the surface temperatures.

Bibliography

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