The Impact of Surface Material on Temperature Variations

Team Members: Year 6.1

GLOBE teacher: Marouska Azzopardi Duca; Stephanie Agius Bonaci

St Clare College San Gwann Primary School

Summary

InThe fact that our school is situated at the heart of our village, San Gwann, and that it is lacking vegetative and green areas close by, prompted us to study the effects green areas on urban heat islands. Based on the fact that darker surfaces absorb more heat energy than lighter ones, and so resulting in a raised temperature, we observed and collected data on the surface temperature of four different zones within our school, San Gwann Primary. This investigation was conducted using the GLOBE Surface Temperature Protocol to analyze. Observations were done in various conditions from dry to wet ground. The research was conducted by the students of Year 6.1. Nine samples from four different zones were collected on five days for three months.

Research Question

Our school is situated on a very busy road right at the heart of San Gwann (Fig. 1). We believed that this was one of the reasons why at times it seems much hotter in the north area facing the main road rather than in the east area facing a calmer, more protected side road.

Through this investigation, the students wanted to answer the following question. How do the surface temperatures of different types of surfaces, such as concrete, tarmac and soil change throughout the day?

Figure 1 Aerial view of the school

Research Methods

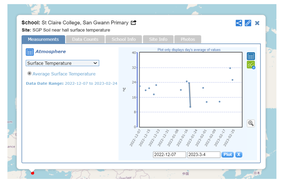
Four sites were identified, three within the school and another just outside the school gate.

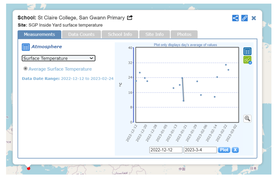
students carried out data collection using an Infrared Thermometer. They measured surface temperatures during the months of December, January and February. Readings were taken from four selected sites: the school ground covered in cement; a patch of soil in the front garden area in the shade facing the main road; a patch of soil at the back of the school in the sun and an area on the main road tarmac just outside the school.

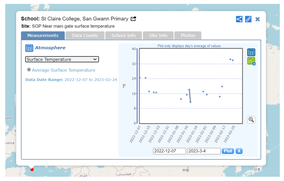
The children were divided into 4 groups so that all the class can take part. Each team was to go to collect data from the four sites on 5 days in December, January and February each. We chose to go at roughly between 12:30 and 13:00 which is a peak temperature during the day. The four different surfaces were: cement, soil in the shade; soil in direct sun and tarmac. Using an InfraRed Thermometer, the four sites were visited several times. Nine temperature samples were taken on each visit and noted using the GLOBE Surface Temperature Data Sheet.

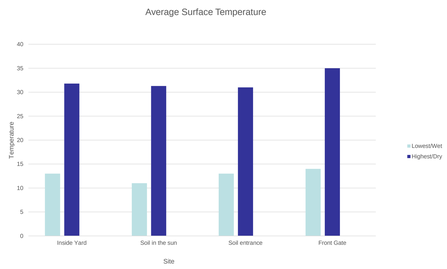
Results

Once all the data was collected, the average value for the temperature of each zone for each day was used for comparison reasons. The screenshots below show data uploaded on GLOBE website.









Conclusions

The lowest temperature recorded was that of soil in both patches. This proves that soil near the entrance which is near the main gate (tarmac surface) would still provide a better temperature even though it is close to the main road and traffic. This further consolidates our point that natural vegetation provides a natural mitigation method that helps cool the environment. The highest temperature was recorded on dry tarmac. When the air temperature was not so hot the surface temperature was lower too. when we recorded data after rain or wet surface the temperature was always lower, even though in the case of tarmac it was the highest of the day. The coolest temperature recorded was wet soil in the shade.

The wet ground registered an overall lower average temperate than that of dry ground. On dry ground, synthetic materials (cement and tarmac) registered higher average temperatures than natural occurring elements (soil). For this reason, one might deduce that built up areas should register higher temperatures than those in the countryside.

Black surfaces like tarmac absorb 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.

As result we suggested that there should be more patches of greenery within the school. In fact, the vertical garden was set up at the second entrance of the school; a number of unused areas of the school were filled with soil and now they can be used for growing plants and vegetables; a herb garden was also set up and the front garden will soon be revamped so that it can be used for growing trees. Also in the meantime, some classes have been sowing trees that will be planted in the garden. We also are planning to take part in the project that will soon take place in San Gwann, where the core area will be turned into a pedestrian-garden area to reduce traffic from the heart of the village (and consequently from near the school).

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