



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Melia Crimaldi	Project Number J1108
Project Title Cooling the Urban Heat Island Effect!	
<p style="text-align: center;">Abstract</p> <p>Objectives This project studied green roof options to reduce city and individual build temperatures. The question studied was: Can special materials (plants or sun absorbing materials) reduce building and city temperatures (the urban heat effect)? The hypothesis predicts that cool roofs will lower a cities and building temperatures because it absorbs or reflects heat and prevents buildings from absorbing and releasing heat back into the atmosphere.</p> <p>Methods A scaled down city model of Louisville, Kentucky built and used in the testing since it is one of the top 10 cities with the biggest difference between urban and rural areas. Using Google Maps data a 1"(2.54 cm)=30ft(9.1 meters) model was built with 19 buildings (8 with black roofs, 3 had chemical cooling roofs, and 8 had plant roof). In Test 1, 6 temperature sensors where placed in the model city. 4 inside the buildings and 2 in the model city's centers. The temperature was record every 15 minutes using the data logger for 1 week at a time. The data was compared to see if the different buildings have different temperature results. In Test 2, the similar city set up was used with a chemical cooling roof made from HotSnapZ hand warmers.</p> <p>Results Test 1: The temperatures inside the yellow and green plant roofed buildings are lower than the temperatures of the normal black roofed buildings. The data shows that green roofs using plants are generally cooler than normal black roof buildings. The yellow plant roof had a maximum inside building temperature of 28.7 °C, which was 9 °C cooler than the black buildings. The green roof had an maximum inside building temperature of 32.9 °C, which was 5 °C cooler than the black buildings. So, on average, a plant roof lowered the temperature inside the building by 7 °C. Further, the plant roof buildings created lower maximum temperatures in the city center data. On average, the plant buildings created a 1.3 °C lower temperature in the city center than the black roof building. Test 2: Two sensors recorded temperature data and show that the Chemical Cooling Green Roof had lower temperatures than the normal black roof. On average the Chemical Cooling Green Roof was about 3 °C cooler than the black roof.</p> <p>Conclusions The experiment and results proved that the hypothesis was correct. The inside building temperature was cooler for both the plant roof buildings by an average of 7 °C and chemical cooling roofs by an average of 3 °C when compared to the normal black roofs. The outside city center temperatures for the green roofed city was cooler than the normal black roof city by an average of 1.3 °C.</p>	
Summary Statement The researcher has shown that cool roofs lower building inside temperatures and outside surrounding temperatures in urban environments and reduce the urban heat island affect.	
Help Received I designed and built the model city myself with help from my dad when using the power saw and nail gun. I also got help from him with the statistical comparison of the data.	