Tinytag data loggers assist sustainable building project in Tanzania

**[Subtitle] Temperature and relative humidity data loggers were used by a team of architects to test the efficiency of building design at cooling indoor temperatures in the Children’s Eco Village in Mkurunga, Tanzania.**

[Short description] In the UK, architects and engineers optimise building design to ensure that buildings are kept warm during the cold months. When British architects Andy Simmonds Adele Mills of Simmonds Mills Architects were asked to design new housing and educational facilities for the Tanzanian Children’s Eco Village (run by UK based NGO, Islamic Help), they, alongside energy consultant Alan Clarke, came across the new challenge of optimising buildings for *cooling* in the year-round warm climate of Tanzania.

The **Tanzanian Children’s Eco Village** was established in 2012 to improve the lives of orphaned children in Tanzania. The project encourages and prioritises sustainable, environmentally conscious and affordable building practices.

As part of the sustainable directive, the experienced team at **Simmonds Mills Architects** were interested in exploring the opportunity of applying **‘Passive House’** principles of energy efficiency and high comfort levels to their building designs.

**Passive House** (or Passivhaus) is a **recognised global building standard for energy efficiency**. It was created as a framework for sustainable building design, whereby the energy costs from heating and/or cooling is reduced by passive benefits from a building’s design. By applying Passive House techniques to a building’s design, **its ecological footprint will be reduced**.

To be certified as a ‘Passive House’ a building must meet certain **energy efficiency requirements**, including coming under the **15kWh/ m2/yr cooling demand**. However, to achieve this standard in the Eco Village, the buildings would have required expensive materials and air conditioning units that would incur higher energy costs compared to using traditional building strategies that would incur lower energy running costs.

Coming up against the challenges of working with a cooling climate and doing so in a resource-efficient way led the team to come up with a **low-cost, low-tech design** which did not require air conditioning for cooling and would provide occupants with high levels of comfort.

To test the viability of the design, **a test-build was constructed between November 2017 and September 2018** using locally sourced building materials. To assess how the new building design and the building materials fared against the existing buildings at cooling indoor temperatures, the team began temperature and relative humidity monitoring using **Tinytag data loggers**.

**Gemini Data Loggers** donated five **Tinytag Plus 2 TGP-4500 data loggers**—rugged and waterproof units which are suitable for monitoring outdoor applications. Two data loggers were placed in the test-build, two in a control house and one was placed outside to track the outdoor conditions.

The data loggers were left in place for a monitoring period of three months from November 2018 to January 2019 and yielded promising results. Comparison of the data from the test unit and the control house revealed that **the bedrooms in the test build were much cooler** during the day than in the control house, and that **the test-building cooled much faster** at night than the control house.

However, **the data also identified some problems in the design** of the test unit, such as a two-hour lag after sunset where the bedrooms in the test building did not cool down and remained at a daytime temperature.

Following these findings, **Simmonds Mills Architects** adapted their designs by changing the sizing of window and ventilation openings in the building and reducing the amount of heat-retaining concrete blockwork used (reducing thermal mass). Like the house designs, the design of the school also includes an open ventilated and extended roof structure, providing **a passive route to vent hot air** that otherwise builds up above the ceilings, and large roof overhangs to shade the windows, external walls and outside gathering spaces.

The combination of extensive shading, excellent cross ventilation, hot air shedding combined with insect protection measures and minimising thermal mass helps to **keep internal temperatures as low as possible** throughout the daytime., In the house bedrooms, this helps to keep temperatures closer to the night-time temperatures as they start to fall after sunset.

The preliminary work carried out by Simmonds Mills Architects has been important to ensuring that **the eventual buildings use minimum energy while providing maximum comfort** for their occupants, while simultaneously promoting **sustainable, energy efficient, and affordable building practices** in Tanzania.