



# HEAT ADAPTIVE ARCHITECTURE DESIGN COMPETITION

Saitabau Kumary<sup>1</sup>, Ronita Bardhan<sup>2</sup>  
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UNICEF says hundreds of millions of schoolchildren globally missed out on education in 2024 after heatwaves forced the closure of their schools. Low- and middle-income countries are the worst hit. As temperatures rise and extreme events intensify, schools must do more than shelter learning, they must protect it.

This project reimagines the Kenyan Vocation school as:

- Thermally stable
- Socially rooted
- Economically feasible
- Culturally aligned
- Climate resilient

This design charts a path for thermal resilience in Kenya. It showcases that use of simple forgotten local technology is way. It promotes architecture that learns from its environment and in doing so, creates a better one for learners.

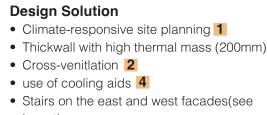
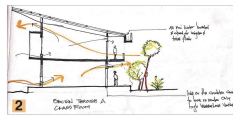
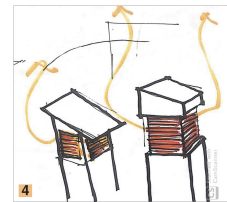
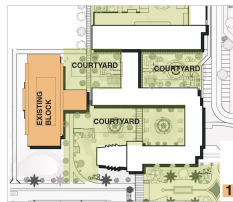
## PROBLEM

Current learning environments are not designed to adapt to future warmer climates, and are prone to Overheating

- Hot, dry climate regions with rising temperatures and more frequent heat extremes leads to overheated classrooms, reduced concentration, and long-term health risks for learners and teachers who spend 8+ hours inside.

## Gap

- Most Kenyan school blocks are simple masonry shells with corrugated iron roofs and little shading or ventilation, so they quickly overheat and are not designed for a warmer future.
- Mechanical cooling (fans/AC) is often unaffordable, unreliable during power cuts, and not climate-friendly, especially for rural/vocational schools.



## Design Solution

- Climate-responsive site planning **1**
- Thickwall with high thermal mass (200mm)
- Cross-ventilation **2**
- use of cooling aids **4**

- Local design translation (Minimal window openings and only on the North & south facade as seen in **3** traditional Maasai architecture)
- Brushwood Louvred windows **3** (ventilation)
- Brushwood sun shades **3**

## MATERIALS

- Walls- stabilized soil blocks finished with roughcast spray render
- Roof-Corrugated Iron roof sheets
- windows-The Louvred part of the window will be done by local Maasai women who have vast experience working with brushwood, similarly for the sunshading devices

Corrugated Iron roof sheets gauge 28

Louvred window made with locally sourced brushwood

Stabilized soil blocks wall finished with roughcast spray render.



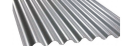
Clerestory window made with locally brushwood

Sunshading device made with locally sourced brushwood

window set back into the wall to provide shading from direct sunlight



Stabilised soil blocks



Corrugated roofing sheets



Brushwood window assembled by local women with guidance. bamboo can be used as an alternative



Brushwood sunshading

## SCALABILITY & FLEXIBILITY

This model can scale across Kenya because:

- It uses materials available across arid Kenya
- It is modular (classroom-based units)
- It does not rely on imported systems
- It can be replicated county by county

Standardization of:

- Roof truss systems
- Shading modules
- Windows

Allows adaptation to different regions.

Spatial flexibility:

- Brushwood screens can be replaced after a number of years
- Classrooms can convert to workshops
- Courtyards support multiple functions
- Buildings can expand incrementally

## CONSTRUCTION COST

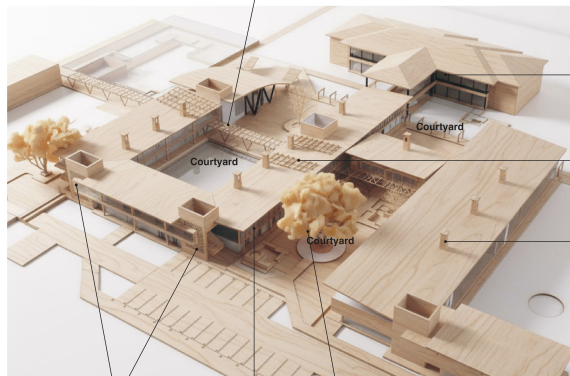
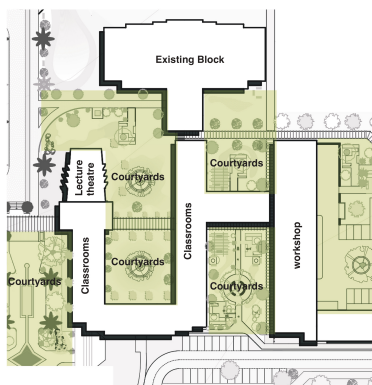
In this remote part of Kajiado county the construction cost ranges between **\$235-275 per square metre**. However considering we are utilizing local technology an labour it might go down to **\$200**

## COMMUNITY PARTICIPATION

The project integrates local technology which create room for involvement of local labour and skills. below are ways in which the community will be involved in the development of this vocation school:

- Training and employing local artisan to make stabilized soil blocks
- Local masons for stoneworks
- Engage the locals to fabricate all the brushwood louvred windows
- The locals to supply and fix all the brushwood needed for the walkways

This 4 key community engagement will ensure the transfer of knowledge and skills to the local community, strengthen maintenance capacity, and foster a strong sense of ownership within the community.



A covered primary circulation spine connecting all classroom blocks and courtyards. The walkway is shaded with a brushwood canopy, and photovoltaic panels are installed at regular intervals along the structure.

Existing block

Photovoltaic panels are installed to generate solar energy for lighting applications

Malqaf/Wind catcher additional cooling aid

Stair cores are positioned along the east and west façades to act as thermal buffers against intense solar radiation

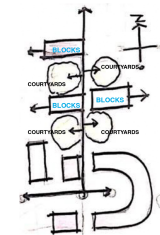
Sunshaded windows

Acacia trees and other xeriscape species are incorporated within the courtyard landscape. These plantings enhance microclimatic comfort by reducing ambient temperatures through evapotranspiration.



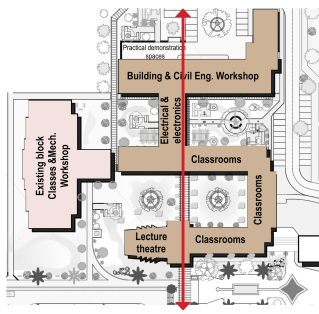
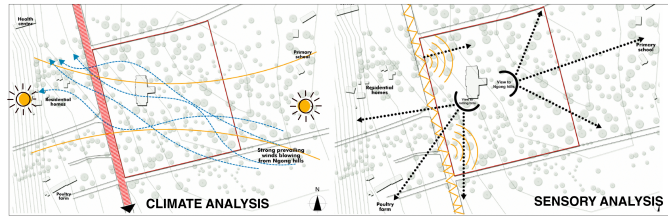
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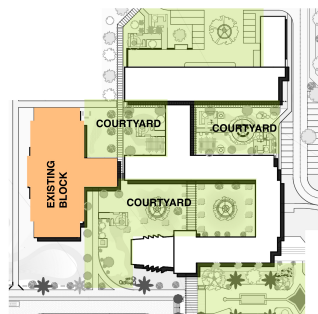
Effective thermal resilience extends beyond the building envelope to include site-level planning decisions. The configuration and placement of buildings across the site are key determinants of thermal performance. The following strategies have been adopted to strengthen resilience.

**EAST-WEST ORIENTATED BLOCKS ARRANGED AROUND COURTYARDS**  
The design features blocks arranged along a spine, with courtyards interspersed to enhance cooling.



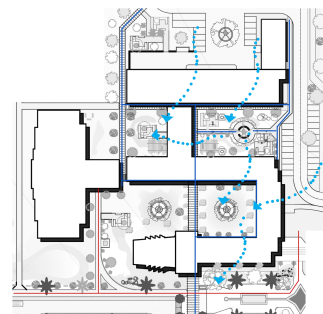
## ORGINIZATION & PLANNING

A primary circulation spine runs along the North-south axis, linking all the classroom blocks and workshop. This main artery is flanked by courtyards on both sides, creating a well-ventilated and naturally lit circulation space. The new design integrates seamlessly with the existing block at both the ground and first-floor levels, ensuring smooth connectivity and continuity throughout the campus.



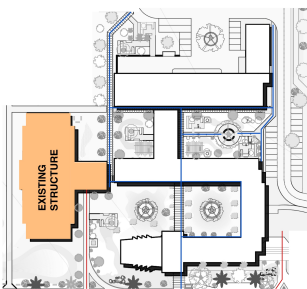
## COURTYARDS

Classroom blocks deliberately arranged to create courtyards and pockets of spaces with conducive microclimate for student relaxation and interactions this courtyard are spaces of spontaneous interactions and discussions between student of different departments and also lecturers



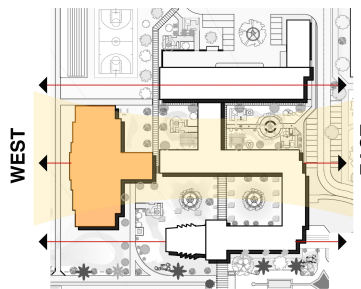
## NARROW ELONGATED BUILDINGS

The narrow blocks have windows on the north and south façades. These louvered windows enable continuous air exchange, promoting natural cooling. Air is drawn in from the courtyard, where it is cooled and moistened by the numerous trees. The narrow plan also allows ample daylight to penetrate the interior, eliminating the need for artificial lighting during the day.



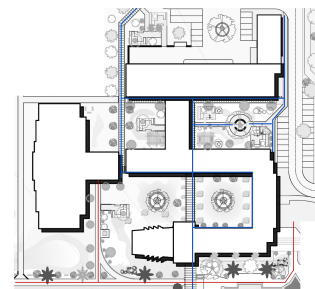
## EXISTING STRUCTURE

The existing structure built by the government of Kenya houses the mechanical engineering workshops, classrooms, and staff offices among other support spaces the building is not oriented to minimize exposure to sunlight the western facade lacks any form of sunshading. This project will be retrofitted by have sunshading devices made from local brushwood and louvered windows for continuous air exchange.



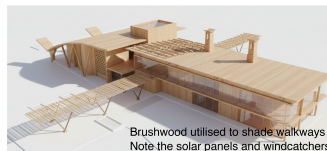
## SOLAR-ORIENTED DESIGN

All the buildings are oriented along the east-west axis to minimize the surface area exposed to direct solar radiation, particularly from the intense afternoon western sun. In addition, the east- and west-facing façades are largely blank to reduce solar heat gain. In some cases, staircase are strategically placed along these sides to act as buffer zones, further limiting heat transfer into the main occupied areas.



## PEDESTRIAN CIRCULATION

The main circulation spines are covered with pergolas that provide shade and shelter. These pergolas also serve a dual function by supporting solar panels, allowing the walkways to generate renewable energy. Beneath them, the pathways are further shaded with bamboo slats, creating a cooler and more comfortable pedestrian experience. Brushwood, which grows abundantly during each rainy season, can also be incorporated as an additional natural shading material. Below is an image of the walkway.



Brushwood utilised to shade walkways  
Note the solar panels and windcatchers



Brushwood Louvered window

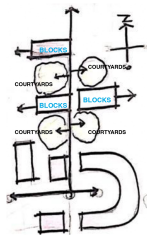


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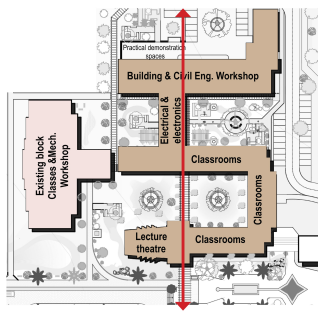
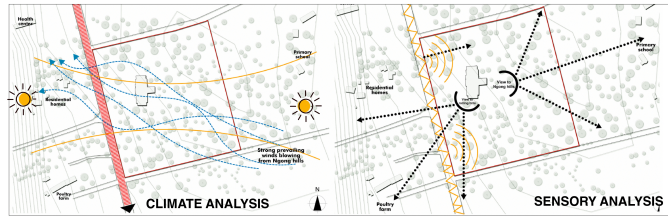


SITE LOCATION



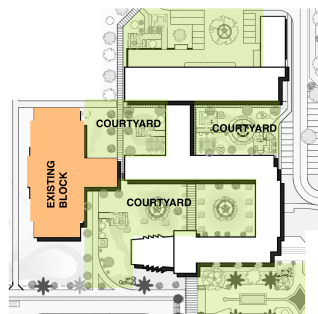
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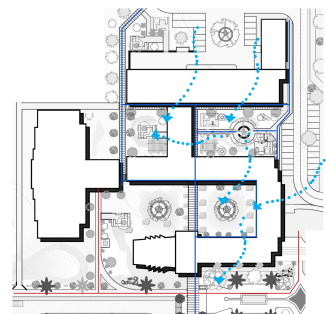
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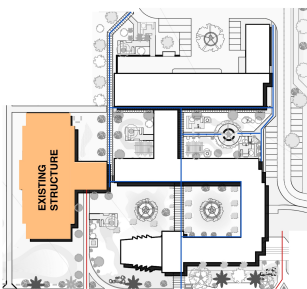
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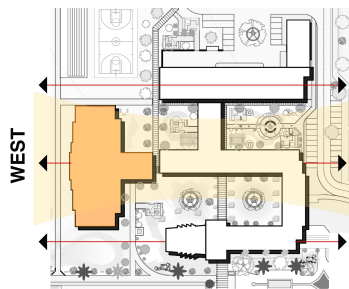
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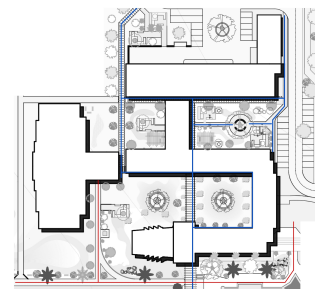
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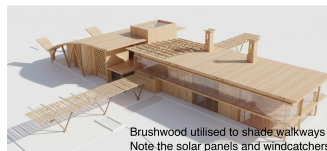
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