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SOLAR PASSIVE DESIGN FEATURES IN THE VERNACULAR ARCHITECTURE OF TELANGANA

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Abstract: The concepts and uses of solar passive design elements in Telangana vernacular architecture are examined in this research paper. Telangana's traditional architecture offers significant insights into sustainable and energy-efficient building practices because it is rooted in the local climate, cultural customs, and materials. The study looks at how natural ventilation methods, materials, orientation, and spatial planning have all historically improved thermal comfort without the need for mechanical assistance. The paper identifies passive cooling strategies and their ongoing relevance in modern architectural design through a methodical review and analysis of architectural precedents. This study intends to demonstrate the lasting value of vernacular design approaches in addressing current and future environmental challenges by fusing traditional wisdom with contemporary sustainable practices.

INTRODUCTION

Telangana's vernacular architecture is an exquisite fusion of building methods, climate, and culture. The need for thermal comfort has always been a key factor in the evolution of architecture in areas with harsh climates. Traditional buildings throughout the state have long included solar passive design elements, which naturally heat and cool living areas using the sun's energy. Every aspect of the design, from courtyard-centric mansions in urban centres to mud houses in rural areas, adapts to the hot and dry climate. This study explores the innate wisdom of Telangana's traditional architecture and how local practices fit in with contemporary Sustainability ideals.

AIM

To research and evaluate Telangana's vernacular architecture's solar passive design elements.

OBJECTIVES

•To identify and record Telangana's traditional solar passive techniques.
•To examine the climatic justification for these design solutions.
•To assess how well vernacular techniques accomplish thermal comfort.
•To investigate how conventional passive strategies might be incorporated into contemporary sustainable design.

SOLAR PASSIVE DESIGN FEATURES IN TELANGANA'S VERNACULAR ARCHITECTURE

The architectural legacy of Telangana exhibits a number of clearly defined passive strategies that directly address the climate of the region. All year long, these characteristics guarantee minimal heat gain, sufficient ventilation, and cosy living quarters.

1. Orientation and Building Form

In Telangana, buildings are frequently orientated east-west to reduce the amount of sunlight that reaches longer facades. Narrow streets and densely populated areas provide mutual shading that reduces urban heat, while compact building forms minimise the surface area exposed to the sun.

2. Material Selection

Because of their superior thermal qualities, locally accessible materials like mud, stone, and lime plaster are frequently utilised. In order to maintain comfortable indoor temperatures, thick walls function as thermal mass, absorbing heat during the day and releasing it gradually at night.

3. Courtyards and Open Spaces

A common element of traditional Telangana homes is the courtyard. It provides daylight, improves natural ventilation, and promotes evaporative cooling, which modifies the microclimate. Additionally, the inward-focused layout guarantees thermal control and privacy.

4. Shading Devices and Roof Design

Jalis, verandahs, chajjas, and overhangs are essential elements that let air flow while shielding the interiors from intense sunlight. Tiles or lime concrete roofs that are flat and sloped minimise heat gain and keep water from standing still during the monsoon season.

5. Natural Ventilation

To encourage cross ventilation, windows are positioned at different heights. The stack effect produced by high ceilings guarantees the upward movement of warm air, while ventilators and perforated walls improve airflow.

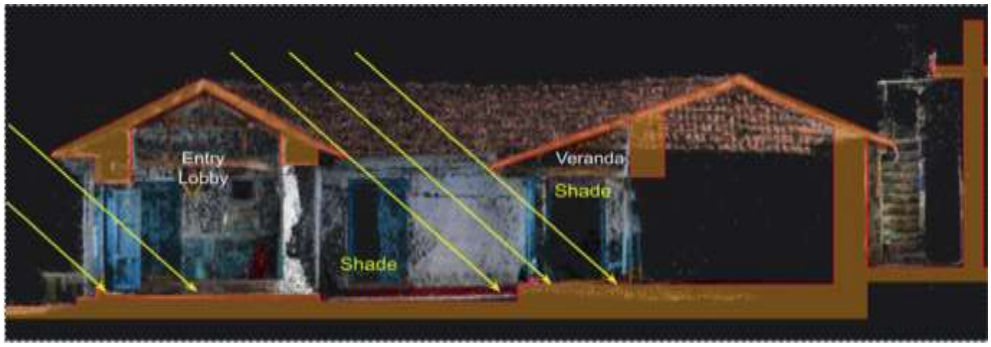

Image Source- springler nature

CULTURAL AND CLIMATIC CONTEXT

The climate of Telangana is primarily hot and dry, with summer temperatures reaching highs and moderate precipitation. The vernacular response incorporates solar passive features as cultural expressions as well as climatic solutions. Communities' local craftsmanship, social structure, and way of life are all reflected in the built environment. Traditional Telangana architecture exemplifies sustainable living by balancing human needs with the environment.

CASE EXAMPLES

• Warangal Traditional Houses:
Passive cooling techniques are best demonstrated by courtyard-centered homes with verandahs, thick mud walls, and shaded entrances.

Image Source- Andhra cultural portal

• Havelis from the Nizam era:
To improve thermal performance, these buildings feature deep verandas, stone masonry, and high ceilings.

Image Source- Wikipedia

• Rural Settlements:
Community-based sustainable planning is demonstrated by the shared walls and compact clustering that lower heat exposure and material consumption.

METHODOLOGY

The study uses a descriptive and qualitative methodology. To learn more about passive design techniques, a literature review, climatic data analysis, and field observation were carried out. Selected vernacular examples' architectural documentation shed light on material usage, spatial organisation, and climate adaptation. Finding lessons relevant to current practice was aided by a comparative analysis with contemporary sustainable design frameworks.

RESULT

The results show that the concepts of solar passive design are naturally incorporated into Telangana's vernacular architecture. Courtyards, orientation, shading, and material selection are all combined to create naturally cool interior spaces that require little

energy. These methods show how traditional knowledge can be combined with contemporary green building technologies and provide useful models for sustainable design in hot, arid areas.

CONCLUSION

The study comes to the conclusion that Telangana's vernacular architecture, with its solar passive design elements, provides timeless lessons in sustainability. These methods, which are based on a thorough understanding of climate and culture, eliminate the need for contemporary mechanical systems to provide thermal comfort, energy efficiency, and environmental harmony. These guidelines can be used by modern architects to create culturally integrated, climate-responsive buildings that support social cohesion and ecological balance.

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