

# VERNACULAR HOUSES OF LUCKNOW: CUSTOMIZED COMFORT WITHIN

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**Abstract**— Vernacular houses have sustained over generations having added or deducted the non-useful. Various aspects of Comfort include thermal and visual comfort. Vernacular houses can be called comfortable as they have adapted to specific places and user groups. Mud houses located on the fringes of Lucknow City and the downtown city houses at Farangi Mahal in Chowk area are two types of vernacular houses that have existed simultaneously for hundreds of years. Both have subsisted in diverse contexts, have been made of varying materials and techniques and house different communities with altered activity patterns and social structure. Yet both could be called comfortable and sustainable in the real sense of the word.

**Index Terms**— **Keywords:** Comfort; Lucknow; Sustainable; Vernacular etc(*key words*)

## I. INTRODUCTION.

In this age of globalization, Sustainability can be best understood by the Vernacular Architecture of a place, which has sustained for generations with modifications and improvisations keeping it in tune with time. Vernacular architecture all over the world has been examined for historical/ archaeological, anthropological, geographical and romantic aspects to derive clues from the ways these civilizations existed. Though 'more interpretative is the work of architects who seek to recreate the qualities of vernacular traditions without imitating them.....for them, the vernacular is the source of inspiration [1].

The vernacular houses are the best examples of tracing the evolution of civilizations. There might have been many factors contributing to the way these houses evolved, from social, economic, climatic, cultural and even religious. The vernacular houses which have been built after centuries of development, checks and balances and successive minor adjustments can be called 'comfortable'.

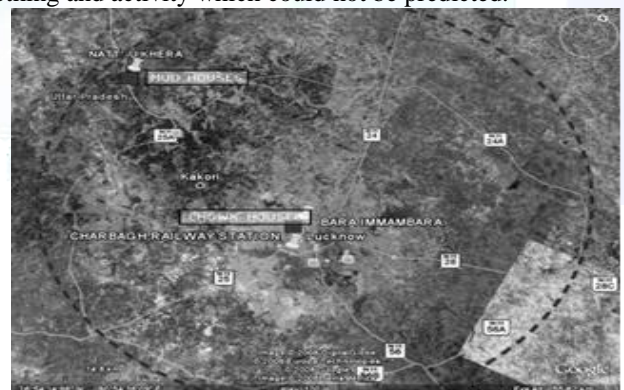
## II. ASPECTS OF COMFORT:

The concept of comfort has many ramifications, both physiological and psychological. Within a built environment a person's comfort may consist of thermal, visual, aural and psychological comfort conditions. Most studies indicate that, to the occupants, the most important consideration in a built space is thermal comfort. Thermal comfort has been defined by ASHRAE as that state of mind

which expresses satisfaction with the thermal environment. Scientists investigating thermal comfort have treated the human organism as a meter of thermal comfort. The ASHRAE describes the state of thermal comfort as neutral on a scale ranging from hot to cold.

There have been various studies that attempt to derive the set of conditions of temperature, humidity and air speed that correspond most closely to this neutral feeling and how tolerant people are of deviations from it. The human meter was studied in a climate chamber where subjective variables are left outside. With results of climate chamber experiments the environmental scientists devised formulas in which neutral conditions could be predicted. Fanger[2] also developed the predicted mean vote (PMV) to set optimum indoor conditions by setting them to achieve a PMV of neutral.

This static model of comfort had its limitations though. Firstly it was difficult to predict what the metabolic heat of the average occupant of a building would be. Secondly for predicting the PMV the clothing people were wearing had to be predicted which was complicated and thirdly as the peoples' expectations of their environment and their reactions are formed by their experience, their reaction to the environment could not be solely explained by its present state. Thus the climate chamber approach did give the neutral temperature but that was applicable only for steady state conditions which were based on assumptions of clothing and activity which could not be predicted.



**Fig.1 Location Of Two Types Of Vernacular Houses At Lucknow. (Source: <http://www.mapsofindia.com/maps/uttarpradesh/Lucknow>)**

Another approach to study thermal comfort was that of the field study approach which also has been used for years. In this case people were again used as comfort meters but were left on their own to carry on their lives in their normal surroundings. The physical conditions that they experienced- temperature, humidity and air movement were also measured in the same way. The tropical summer index (TSI) developed by Sharma and Ali<sup>3</sup> is a good example of the result of a field survey. They established the formulae for  $(TSI = \frac{3}{4} T_g + T_w - 2v)$  where  $T_g$  = globe temperature,  $T_w$  = wet bulb temperature and  $v$  = air velocity. They found that the greatest number of people were comfortable when the TSI was 27.5°C.

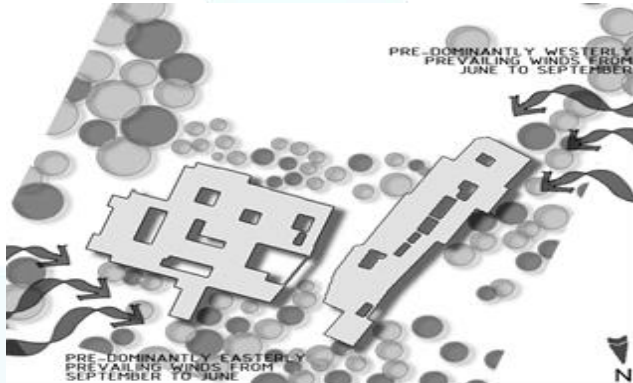


Fig.2. Mud Houses On The Fringes Of The City: Showing Siting & Location.

Source:[http://www.mapsofindia.com/maps/uttarp\\_radesh/](http://www.mapsofindia.com/maps/uttarp_radesh/)  
Lucknow. Developed by the author

There were limitations to these type of surveys also because the conditions the subjects experienced could not be controlled, the range of temperatures which they applied on might be restricted, the relationship between the physical environment and the subjective comfort was blurred by time related factors and the fact that the subjects could change posture clothing etc. and these made the results difficult to interpret.

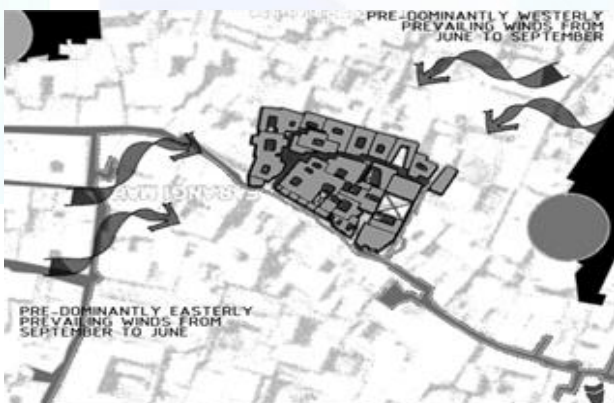


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This field survey established the 'adaptive model' of thermal comfort which meant that we adapt in the short term by our actions and in the long term through our culture to the pressure of our environment. The approach using the adaptive model of thermal comfort was to relate thermal comfort indoors to the conditions prevailing outdoors. This theory found its bearings in the fact that most buildings in hot climates are naturally ventilated and the indoor temperature is related to the outdoor temperature. According to the theory of adaptive model of thermal comfort we adapt ourselves at the byaverage temperature we encounter. In other words we would be comfortable at the average indoor temperature. So the comfort temperature is related to the indoor temperature which is related to the outdoor temperature. So in our quest for the comfortable indoor temperature which is sensitive to the changes from climate to climate and from season to season, the average outdoor temperature is a good measure.



Fig:4. VERNACULAR MUD HOUSES

Humphreys[4] was the first one to show the strength of the relationship between outdoor temperature and the comfort temperature indoors particularly for naturally ventilated buildings. He collected the results from comfort surveys throughout the world and plotted the temperature which the surveys reported as comfortable against the outdoor temperature for the month of the surveys. He established the equation of  $(T_c = 12.1 + 0.53 T_o)$  where  $T_c$  was the comfort temperature and  $T_o$  was the outdoor temperature. Recent work by Nicol et al.<sup>5</sup> in the sub-continent has demonstrated the same effect in a climate similar to that in India. His equation:

$(T_c = 17.0 + 0.38 T_o)$  gave a similar effect as that of Humphreys especially in the summer months. In concurrence to the theory of adaptive model of comfort Nicol et al. have plotted relationship of outdoor temperature, indoor temperature and comfort temperature for four different climatic conditions that existed in the

subcontinent that negate the theory of Neutral temperature and also the static model of thermal comfort. Conclusively, the factors that contribute to the thermal comfort conditions of a built form comprise of siting, orientation, layout, shape, form, materials of enclosing surfaces, and the location, position and orientation of fenestrations.



**Fig:5. Mud Houses: Visual Comfort Within**

In addition to thermal comfort the second most important aspect inducing comfort conditions in a built space is that of visual comfort. Visual comfort is a state of consciousness evolved as a result of physiological and psychological effects. It expresses satisfaction with the visible environment and is defined by illumination and aesthetic environment.



**Fig:6. Vernacular city houses at Firangi Mahal**

Though in addition to thermal comfort, design in relation to climate is also concerned with lighting and visual

comfort<sup>6</sup>, there have been relatively fewer studies on the analysis of visual comfort of buildings, and most of them have been directed at assessing the visual performance than their visual comfort and aesthetic satisfaction. The notion of visual performance would concern the amount of light available for a given task whereas visual comfort and aesthetic satisfaction would depend on the way the light illuminates the surfaces and environment with the aspects of spatial distribution of daylight luminance, luminance ratios, shape from shadows, color rendering, glare and visual noise.

The most controllable causes influencing the quality and quantity of daylight within a room, for a specific building type are: the envelope shape, the geometry, location and orientation of apertures and the surface characteristics. And for understanding visual comfort one should understand notions of spatial distribution of daylight illuminance, luminance ratios, shape from shadows, color rendering, glare and visual noise.[7]

### III. VERNACULAR HOUSES OF LUCKNOW

Lucknow is a densely populated city with a thickly knit fabric consisting broadly of three types of vernacular houses. On the fringes of the city the mud houses are found in clusters forming semi-urban settlements. These have evolved over generations of living. These mud houses built with rammed earth combined with thatch and other indigenous materials have a similar typology and are distributed evenly along the Gangetic plains.

The houses in the old city area of Lucknow are a mixture of old and new walls, jammed together covering a large area. The city houses of the Farangi Mahal area in Chowk, made of lakhori bricks and lime mortar with wooden spars and stone were built by French cloth merchants in the early seventeenth century. They are historically important, have similar generic type and have been least altered from their original contexts. There are variations in these houses but the basic pattern remains remarkably consistent.

### IV. COMFORT IN VERNACULAR HOUSES AT LUCKNOW

The two types of houses located in dissimilar contexts within city limits seem to exhibit simultaneous thermal and visual comfort. Since solar radiation is the source of both light and heat its influence on the conditions of both thermal and visual comfort could be co-related. Moreover India having tropical climate and Lucknow being located in the Gangetic plains it experiences a composite climate. The seasons change from Hot and Dry between March To May to Warm And Humid between June and September and cold and wet from November To January through the year. The changing position of sun through the day and all through the year results in changing thermal and visual conditions yet it

is remarkable to visualize the internal spaces of the houses both thermally and visually comfortable.

#### V. EVOLUTION OF SOCIETY & CULTURE IN VERNACULAR HOUSES AT LUCKNOW.

The mud houses situated on the fringes of the city forming semi-urban settlements have been occupied by families largely engaged in farming besides other occupations. Predominantly habited by Hindu population the generic mud house form consists of an aangan (courtyard) or a series of hierarchical courts enveloped by kamras (rooms) of various sizes separated by the dalaan (verandah). The chowka (kitchen) is a space within the dalaan separated by a short wall. The external dalaan (verandah) becomes an effective transition from the outside to inside or the public and private. The windows are small and limited opening to the verandahs either facing outside or the internal courtyard.

Subsequent to the analysis of activity patterns in these mud houses all through the day in varying seasons throughout the year, the verandahs and courtyards remain the most inhabited areas despite a great deal of shifting from the innermost areas to the outermost. These might have resulted from the informal living patterns of the occupants while the simultaneous response of the aforementioned spaces to the climate also made them comfortable. Moreover complying with the concept of adaptive comfort the occupants have made these houses comfortable for themselves and vice-versa by adding layers of usage over generations of living. Consequently these houses have retained their generic form over years with additions to it in form of partitions, divisions, overhangs etc.

Although Lucknow, has always had a larger Hindu population than the Muslims, the Muslim influence has been disproportionately large and it is difficult to differentiate between Hindu and Muslim house type. The city houses of Farangi Mahal are a characteristic example of the same. A typical house consists of two courtyards side by side. The larger one, the mardana or men's quarter, opens onto the street through a narrow gateway and the zenana or women's quarter can only be entered from the men's courtyard. Around each side of both courtyards are rooms, often with a small verandah that helps to shade the rooms from the sun and allows the inhabitants to enjoy the open air while being partially protected by the verandah roof. The rooms round the courtyards seldom have any windows in the far walls other than small high grills for ventilation, and it is unusual to find interconnecting doors between the rooms except in larger and grander houses. Of course, there are variations, depending upon the inclination and, more important, the purse of the owner, but the basic pattern remains remarkably consistent.

The sequence of movement from the street to the private interior core of the dwelling is broken by the presence of a separate entry room<sup>8</sup>. The structural system of the dwelling constitutes timber joists resting on timber beams supported on the walls or the columns. The walls and the columns are made of Lakhori bricks and lime mortar which was locally manufactured.

The Farangi Mahal, as it exists today is a fantastic mixture of old and new walls, jammed together, covering a large area. A large central courtyard around which the pre-nawabi houses were placed is still discernible. The entrance to this quarter was from a secondary street and was marked by a large gateway. To the immediate right, upon entering the quarter is the main building which in the 18th century became the famous 'Farangi Mahal' Madrasa. Its configuration is similar to the Lucknow house type, in fact most building types, but it differs in its scale, in that it is much larger. There is an indirect entry which leads into a central courtyard surrounded by four iwans which lead off into rooms. The upper floor is accessible by a staircase leading off from the court and is essentially an open terrace, with rooms on only one side. There are also other courtyards with similar configurations, connected to the first. It is possible to discern European style of architecture, especially in the second courtyard. Essentially Farangi Mahal is an eclectic mix of architecture, styles, with layers having been added to it over time.

Sustainability has been about being able to keep something going over a long period of time. Vernacular houses are the best examples of the continuity of culture and tradition in a progressive society. They have been able to respond to the climate of a specific place besides taking the evolution of human civilization. The vernacular houses at Lucknow are primarily of two types the semi-rural mud houses housing the informal agrarian people on the fringes of the city and the downtown Farangi Mahal houses accommodating culture specific population for centuries. Both these vernacular houses exhibit a system of living that has transcended barriers of time. Despite not altering from their generic forms, layers of usage have made it suitable in their contemporary context also. Moreover their living spaces still respond to the extremities of the climatic conditions and flexible planning and adaptive comfort make them sustainable in every sense of the word.

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