Climatic architectural tradition of India

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ABSTRACT

This paper is an introduction into the architectural tradition of India from a climatic point of view for the PALENC 2005 1st International Conference. Most architects who visit India notice the sensitivity of the traditional architecture to the varied climatic comfort requirements. The traditional architectural skill has always achieved an aesthetic out of the climate sensitive forms. This paper is outlines that approach.

1. INTRODUCTION

Traditional Indian Architecture is based on certain guidelines or otherwise known as "*VAASTU SHILPA SHASTRAS"* (Vas-to be), *VAASTU* principles are similar to the Feng Shui ones which mainly deal with energy and buildings. The two important texts which outline these *Vaastu* principles are "*MANASARA*" (by Manasara) and "*MAYAMATAM*" (by Maya). These books are a result of an in depth analysis and practice of sustainable building construction techniques.

Vaastu is an integral part of the *Vedic* philosophy of India. The *Vedas* are the Holy Scriptures and outline the Hindu way of life. Vaastu falls under the "*Atharvana Veda*" which is the Scripture for engineering. The perfect examples for entire towns built with these principles are the *Harappa* and *Mohenjadaro* excavations from the Indus Valley Civilization around 2,500 B.C. (Fig. 1).

The logic followed was aimed at keeping the occupants comfortable thermally and not just the buildings. The architect was sensitive to the lifestyle and day-night activity patterns of the occupants. Spaces were also designed considering the sacred five elements of earth, wind, water, fire and space.

2. CLIMATIC PRINCIPLES

The main principles of the Vaastu approach are:

2.1 Site Selection and Analysis

Context and site form the first steps towards the building design process. Tests are performed to ascertain whether the site is of "giving" or "taking" nature (economically).

The religious rules followed on site selection confirm the availability of water, ample sunshine (by the orientation) and fresh air devoid of any offensive smell. For example, before building a temple, the site chosen for the project should have a water body nearby preferably in the northeast corner of the plot. The natural topography is seldom disturbed and any grid planned engulfs it rather than flatten it.

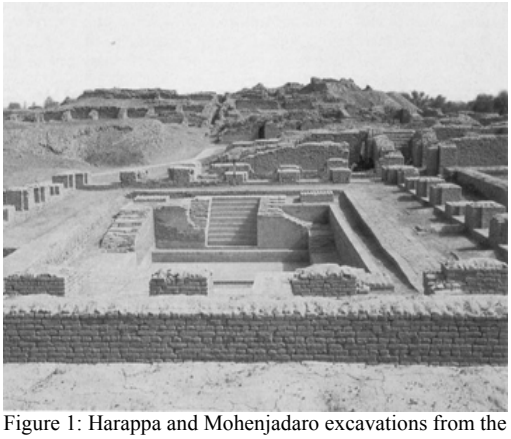

Figure 1: Harappa and Mohenjadaro excavations from the INDUS VALLEY CIVILISATION.

2.2 Orientation

The building is always oriented by the cardinal directions: North, South, East, West, Northeast, Northwest, Southeast and Southwest. Each of these directions is considered as energy by itself. Hence the spaces in different orientation are considered differently for design purposes which is a very climate sensitive approach (Fig. 2). For example the East or the North walls are made more open to light and air as the West is the heat gaining side in the warm humid climates of India.

The placement of the building within the site is the first step toward forming the grid for internal planning. The centre of the plot is generally not where the centre of the building is placed, only exception being temples. The climatic logic behind this is that in the house the outdoor and indoor is designed as one whereas in the temple the building is treated as a monument. Hence the temple buildings dominate the centre of the sites and more often than not the towns where they are seated.

Access and road frontage is also given prime importance. A site which is congested on all four sides with a road or a 'borrowed' frontage is highly discouraged. This is just to ensure adequate room for cross ventilation.

2.3 The grid and the courtyard

The grid system of planning was always followed regardless of the site or building type. The grid was made flexible enough to accommodate any site condition and topography. Grid system is more sustainable in terms of economy and speed of construction. It is also easier to recycle materials if it was built on a grid. Prefabrication also favors the grid.

The grid was not always symmetric or simple. Complex geometry and curvilinear grids were also adopted. The most common was the grid of a dwelling unit called the *vaastu purusha mandala* (Fig. 3). This grid is a schematic diagram showing the cardinal directions on the four sides of the square and a man's body drawn across the site with his head in the North East direction. An interesting fact about this grid is that it is not static; the man revolves around the square and completes a full circle in one year.

This diagram represents the non static nature of the site itself and the movement of the earth around the sun.

The linear grids can be classified into two types:

a. Yugma or the even grid-where the centre is a point (Fig. 4).

   This grid is mainly used for temples and large temple complexes as the centre is allocated for the Deity's abode. Monumental buildings with open spaces around the central monument also follow this grid. These buildings are mostly public buildings where the usage is only during the day. Hence the shaded open spaces around the building are very well used.

b. Ayugma or the odd grid-where the centre is a square (Fig. 5).

   This grid is used for dwellings and large scale housing projects.

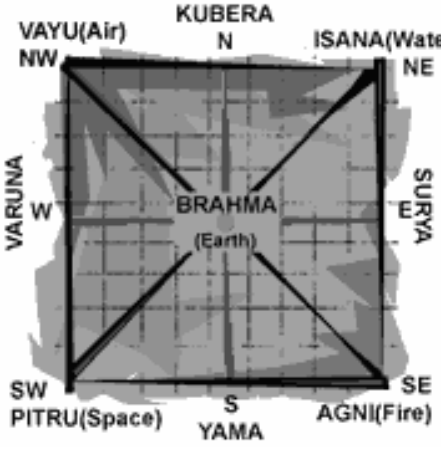

Figure 2: Schematic representation of the CARDINAL DIRECTIONS.

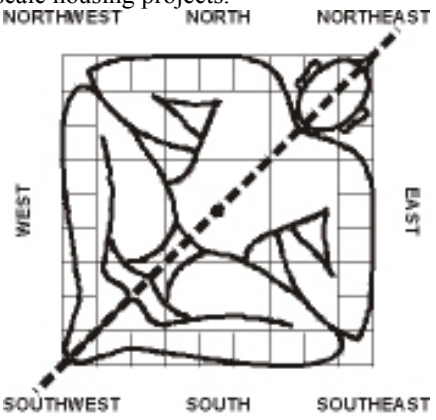

Figure 3: The vaastu purusha mandala with the REVOLVING MAN.

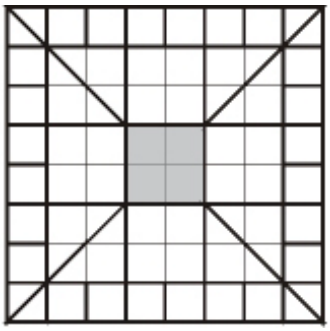

Figure 4: Yugma or EVEN GRID. Shaded portion is the Building.

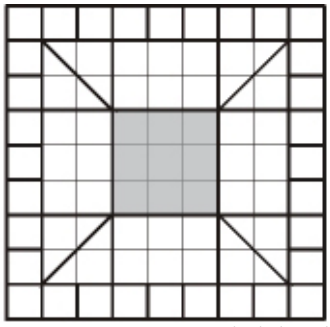

Figure 5: Ayugma or ODD GRID. Shaded portion is the Courtyard.

The central courtyard is the ‘lung space’ of either the house or the housing block. Just to ensure there is a courtyard in every house, the centre of the house is never built up and is called the *Brahmastana*, the genius loci of the house.

2.4 Energy axes and cross ventilation

Energy axis is a row of windows or door or ventilators aligned in the same line. The North South energy axis of a building is called the *Somasutra.* The East West energy axis is called the *Brahmasutra*.

Ideally the *Somasutra* and the *Brahmasutra* should meet perpendicularly in the centre of the courtyard or the *Brahmastana* (Fig. 6). Hence the cross ventilation axes should ideally intersect in the centre of the courtyard.

In most houses however the axis runs parallel to the courtyard so that there is an uninterrupted passage of doors from the main to the back door.

2.5 Built Form and Construction

The construction of the houses was mostly with

Figure 6: The Central Courtyard of a typical Chettinad house in South India.

vernacular materials and the material decided the form of the building. For example most of the walls were of stone, brick or laterite and are load bearing structures. The usage of vernacular materials is most effective for these areas, both from the climatic as well as the recycling point of view. The genius of the architect lay in stretching the material to its limits.

Roofs and shading devices were incorporated into the street aesthetic. The roofs in the Kerala houses were also performing the ventilation stack effect as there was a ventilator incorporated with the roof (Fig. 7).

The roofs of temple buildings were very ornate and were mostly carved out of stone. Since stone was the principal material used in temple construction the thermal mass is high and results in delayed time lags. This was ideal for temples as during the hottest times of the day it was cool inside the temple complex. As the temple was not used during the night the heat released from the thermal mass was not a problem.

Figure 7: The stack effect roof of Kerala House in South India.

3. CLIMATE SPECIFIC SPACES

Apart from the general building principles which incorporate climate as an integral part of it, there are some very climate specific structures in traditional Indian Architecture. A few such examples are outlined below.

3.1 Stepped wells of Gujarat

"The vavs or baolis (step-wells) of Gujarat consist of two parts: a vertical shaft from which water is drawn and the surrounding inclined subterranean passageways, chambers and steps which provide access to the well. The galleries and chambers surrounding these wells were often carved profusely with elaborate detail and became cool, quiet retreats during the hot summers" (Tadgell, 1990). These stepped wells (Fig. 8) are also a social phenomenon with many gatherings.

3.2 Havelis of Rajasthan

Havelis are balconies and verandahs (Fig. 9) designed for semi-outdoor seating in rich merchant houses in Rajasthan. Highly ornate pillars and stone trellis work keeps the sun out whilst providing natural ventilation. In Jaisalmer, a town of Rajasthan, these havelis are noted for their efficiency in the desert climate.

3.3 The "THINNAI" or outdoor drawing rooms of Tamil Nadu

The thinnai was the outdoor living room (Fig. 10) with in-built seating and with generally a sloped roof on top designed entirely for day use when the temperature got unbearable inside with little air movement. It was also a place where vendors brought in the goods and sold it to the household, a meeting space for friends and the most comfortable place for an afternoon nap. Sometimes these thinnais doubled up as small scale classrooms in the village.

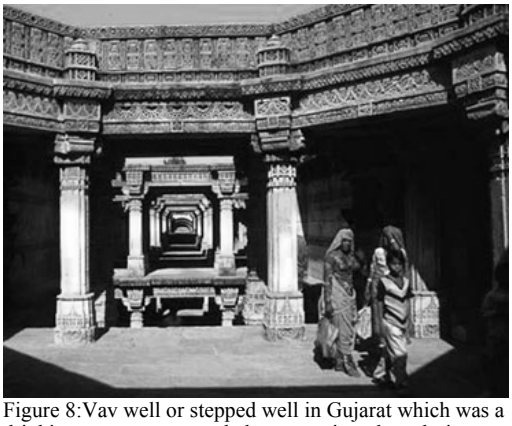

Figure 8:Vav well or stepped well in Gujarat which was a drinking water source and also a meeting place during summers in Gujarat.

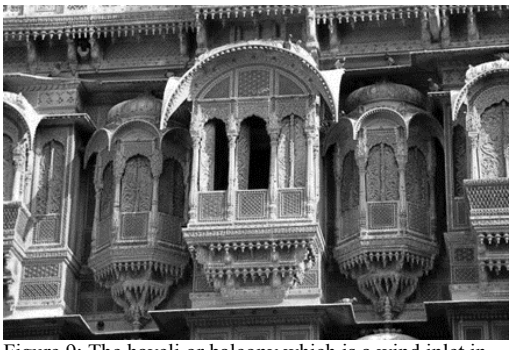

Figure 9: The haveli or balcony which is a wind inlet in the first floor of a merchant house in Rajasthan.

4. THE FOUR GOLDEN PRINCIPLES

The four golden rules in architecture which were outlined in the great epic "Ramayana", the story of Lord Rama, summarise Indian architecture as a whole. They are function or *bhogadayam*, aesthetics or *sukha darsham*, harmony or

Figure 10: View of a 'chettiar' house thinnai in Tamil Nadu.

ramyam and the 'all encompassing' factor or *poornam*.

The perfect example which explains all the four principles is a temple structure which is designed and built by the most skilled architects (Fig. 11).

Function or *bhogadayam* which was given the first priority keeps climate among the first considerations in architectural design. Bioclimatic approaches to new forms and materials were explored. The architects never considered climate as a force to fight or win but to enhance and enjoy. Even extremities in climate were handled with master skill and remarkable comfort levels were achieved.

There was no question of thinking about climate in the last stage of design and trying to come up with 'quick fix' solutions. Most of the forms were aimed at long term benefit and well thought about before the designed building is built.

The aesthetics or *sukha darsham* were not 'added on' to the building but were an integral part of it. It is sometimes difficult to tell apart where the functional aspect stops and the aesthetic one starts.

Figure 11: The Brihadisvara temple is a masterpiece located at Thanjavur a town in the state of Tamil Nadu, India. The temple stands 216 ft. tall. One very interesting feature of this tall structure is that the shadow of the hemispherical crown on top never falls on the ground.

Harmony or *ramyam* was achieved by geometry and play of shapes, Solids and voids. The architectural language was of simple spaces with complex ornamentation, which in most cases had a use along with its aesthetic appeal. For example a rain water gutter was so well sculpted in the Temples that one just thinks it is for the delight of the eye.

Lastly, the 'all encompassing' factor or *poornam* of Indian Architecture was a result of the perfect blend of the above-mentioned three factors which makes it feel eternal.

5. CONCLUSION

"The earth nurtures all plant forms and other flora. The Indian tradition considers the Earth or *Bhoomi* a primary mother goddess or female principle while the life energy contained in it is considered a male principle. And since the built space grows out of the earth organically, exploding into form, it is seen as a manifestation of the energy of the female principle. The land or *Bhoomi* possesses vibrant stillness, which is anchored in the soil, which is the energy of the male principle. Though the Earth is considered a primary mother goddess, in the Indian tradition the male and female are inextricably linked. The movement from stillness to action is the source of bliss and the secret of creation. The still centre within the Earth is male / *Shivam,* and the energy that is the energy of creation of manifested reality is *Shakti* / female" (Ananth, 1999).

The main aim of this paper is to introduce the environmental awareness which is spiritually instilled in the traditional Indian architecture. It is also to inspire a much needed view about climate responsive architecture today. As we have seen in the principles, the scientific concepts were followed meticulously and through this pure science a form of spiritual philosophy was invoked. This delicate balance between science, art and philosophy gives Indian Architecture its unique character.

India is a land of unity in diversity. It has varied climates, cultures and 'feels' to it. The common link which binds all the differences is the deep philosophy and spirituality. Due to this architecture was not just a 'discipline' or a busi-

ness as it has become now. It was considered holy and its practice sacred. Hence we get total dedication and commitment to excellence which is why the traditional buildings in India are not only climatic masterpieces but also ‘all encompassing’ truths of architecture.

REFERENCES

Ananth, S., 1999. Workshop for Vaastu workbook Module 1, Chennai: Roger Green.

Tadgell, Ch., 1990. The History of Architecture in India. London: Phaidon Press.

BIBLIOGRAPHY

Brown, P., 1959. Indian Architecture, Bombay Taraporevala and co.

Davies, Ph., 1989. The Penguin guide to the monuments of India, Vol II., London: Viking.

Kaur, H., in article ‘Vavs, the step wells of Gujarat’ Web Resource: http://www.dancewithshadows.com/vavs_stepwell_gujarat.asp

Michell, G., 1989. The Penguin guide to the monuments of India, Vol I, London: Viking.