ABSTRACT

In recent years, the entire globe is facing the risk of global warming and the depletion of fossil fuels; reduction in energy consumption along with sustainable development is a priority for many countries which includes India. Today, we generally acknowledge that the building sector consumes about one-third of the total energy consumption worldwide and this may vary according to the building type and location. With technological advancements in heating, air conditioning and illumination, a high degree of comfort within the buildings is achievable even in the adverse climates. But, as a result, the wisdom of designing with climate was often ignored. In hot humid climate, around 60% percentage of people in India are opting for mechanical means of ventilation (air conditioning, fans etc) whereas in cold climate; one would prefer for an oversized heating system (BEE 2009). The design of the building could be the same whether placed in the arid desert or the snow bound mountain. With energy emergencies and shortages from 1970s, high energy used to create comfort in the buildings became apparent, thus making climatic design and energy efficiency important. In traditional methods architects and builders used to design with respect to local climate and nature which decreased the environmental pollution and energy consumption. India is constantly in the state of energy crisis thereby research to reduce energy consumption in the building sector through climate responsive strategies without compromising human comfort is essential.
Vernacular architecture is widely recognized as a practical, effective and most popular solution. Energy Conservation issues and environmental problems in recent years have increased the interest in traditional architecture which is well known for its energy saving designs. The vernacular and traditional building in every area is a product of accumulated experiences and practices of many centuries and that can constitute to a continuous source of knowledge. The use of local materials, the harmonization with the local environment and its local climate are some of the factors, which contributes to the distinct architectural identity of every area. These are the main reasons why various researchers have examined traditional and vernacular buildings throughout the world with respect to bioclimatic and environmental architecture. These researches deal with the subject of the environmental performance of vernacular architecture in two different ways: qualitatively and quantitatively.

The qualitative approach involves the assessment of the environmental performance of the different elements of buildings and settlements in relation to the prevailing climatic conditions, whereas the quantitative approach is based on in situ measurements of different climatic parameters inside and outside the examined buildings, which leads to conclusions concerning the thermal performance of the houses. This study focuses on the coastal regions of Tamilnadu, in an attempt to detect, document and analyze the design principles and the elements of its traditional architecture which is aimed to investigate the building physics phenomenon in the present study which includes thermal comfort (temperature, humidity, air
movement etc.), visual comfort (lighting quality and aesthetics) and the aural comfort (acoustical control) in vernacular buildings prevailing in the coastal regions of Tamilnadu.

Sample vernacular houses are chosen with the age in between 150 - 200 years old along the coastal line of Tamilnadu located at Parangipettai, Tharangambadi, Nagappattinam and Thoothukudi which are incidentally being the age-old harbor towns of Tamilnadu. The study of four different typologies of buildings in the coastal region is based on the large scale experimental research regarding the aspects of the building physics during summer and winter seasons with the help of custom made instrument known as Architectural Evaluation System (AES). In this research, qualitative data concerning the typology, the form, the materials, construction techniques, lighting and ventilation are presented for all the four different typology of traditional buildings. The thermal comfort, visual comfort, aural comfort study was analyzed using the Mini meteorological station, lux meters, sound meters and computer simulation was done using Ecotect software.

The four different typology of houses like wind catcher houses at Nagappattinam, courtyard houses at Tharangambadi, tiled roof houses at Parangipettai and clear storey houses at Thoothukudi were evaluated qualitatively and quantitatively. The analysis concluded that Wind catcher houses slightly outperformed the courtyard houses, tile roofed houses and clear storey houses in thermal, visual and aural comfort parameters. Finally, conclusions are drawn to outline the design principles, so as to make use of these design principles in the future building designs.