

A CRITICAL REVIEW ON PLANNING AND DESIGN ASPECTS OF SUSTAINABLE BUILDING IN DIFFERENT CLIMATIC ZONES

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Abstract- The geographers divide the world in to different ways. Koppen climate classification system is widely used to classify the climatic region. This was Developed by Vladimir Koppen and he classifies the world's Climate in to five climatic zones: Tropical climates, Dry (arid and semiarid) climates, Temperate/ mesothermal climates, Continental / microthermal climates, Polar and alpine climates. Climate is the statistics of weather and they are measured by assessing variations of the humidity, precipitation, temperature, wind, atmospheric pressure and the other meteorological variables for the long periods of time in a given region. Now a day there are variation in climate conditions, these variations are caused by processes internal to the earth, human activities or external forces corresponding to the variation in sunlight intensity. Therefore it is essential to plan the buildings in such a manner the natural forces are acted inside the buildings for better comfort. The reviews on various planning and design aspects of buildings in five climatic zones are presented in this paper.

Keywords-*Climate, Climatic Zones, Sustainable Building*

I INTRODUCTION

The utilization of natural resources by the construction industry is increasing in exponential rate. The amount of pollution from construction sector is at the higher order and also it leads to climatic change worldwide. The rapid industrialization and urbanization leads to development of housing sectors and commercial areas by deforestation activities. The deforestation leads to climatic changes and ultimately the rainfall will not occur during the specific monsoon periods and all the perennial rivers will be converted to non-perennial rivers. The main objective of this paper is to critically review the factors which govern the design of ecofriendly building at different climatic zones.

II REVIEW ON BIOCLIMATIC DESIGN

Khaled Mansy (2006) carried out study on Five locations to represent world climates, it is observed that this paper shows a world's different climatic regions. Certainly, the two most important climatic impacts on the buildings environmental performance are outside temperature and solar radiation. So, an eloquent representation of the world climates must consider the global distribution of an ambient temperatures and geographic location (latitude). The author represents about five international climatic regions such as hot arid climate(Cairo) tropical climate (Singapore) cold climate (Ft. smith) temperate (Milan) polar(resolute). This paper explains about the bioclimatic references for a building design.

Agboola O. P. (2011) carried out study on Importance of climate to architectural designs in Nigeria, it is observed that, for designers or an architect's to design a building in relation with the climate to achieve a comfortable, pleasant and favorable structures, which will ensure a psychological and the physiological relief of the occupants.

Nedhal Ahmed M. Al-Tamimi et al. (2011) carried out study on The effects of orientation, ventilation and different WWR on a thermal performance of residential rooms in the tropics, it is observed that while designing a building, it should maximize the ventilation and minimize the solar radiation. This paper defines a study into the influence of building orientation in a vision of the solar radiation absorbance of different area ratio of a glazed window to the wall, exterior wall and the effect of the natural ventilation on a thermal performance for a residential structure in the tropical area.

Qairuniza Roslan et al. (2016) carried out study on A literature review on the improvement plans of passive

design for the roofing system of the modern house in a hot and humid climate region, it is observed that most houses depend mechanical means for ventilation such as air conditioner, fans to maintain the comfort indoor temperature. The use of fans and air conditioner will also incur additional cost. So the new approaches are suggested to increase the current passive design by ventilated and the cool roof systems. These methods will increase the indoor temperature favorable for the occupant's and also minimize the electrical usage.

Hamed Babaizadeh et al.(2015) carried out study on Life cycle assessment of exterior window shadings in residential buildings in different climate zones, it is observed that during the warmer climatic conditions, the exterior shading system is more important for energy saving in the buildings as these shading system is exposed to the direct sunlight. This study explains about life cycle assessment for the three different types of shading material for energy consumption in a building within the five types of climatic zones.

Sam (2007) carried out a study on Sustainable building technologies for hot and humid climates, it was observed that for a design of the buildings, the outdoor climate and the indoor climate plays a vital role. A sustainable building must be an elegant, quality building efficient and easy to maintain and also the materials or resources used should be efficient throughout the lifecycle of the building. It should ensure comfort of the occupant's and high productivity. The design for sustainable building to achieve in hot and humid climatic regions, first we need to understand about the local climatic factors and the appropriate designs or techniques to be some on urban and architectural designs.

Lawal, A.F(2013) carried out a study on the Climate Responsive Approach to Building Design for Comfort in Warm-Humid Climate, it was observed that the parameters such as mean maximum temperature, rainfall, minimum temperature, relative humidity, solar radiation, temperature and vapor pressure should be carefully analyzed to provide proper climate design recommendation for the achievement of psychological and physiological comfort. This analysis will lead to precise and adequate designs towards prevention of heat gain, orientation of buildings, vegetation and choice for using the building materials.

A.Madhumathi et al.(2014) carried out a study on the Understanding climate for sustainable building design – A case study in warm humid region in India, it was observed that, for design a sustainable buildings, two steps to be carried out. Analysis of the climate and recommendations for the building planning and designing. Sustainable design and the energy efficient practice must be competent to integrate natural energies such as wind and solar radiation for a design. Considering the climate that start early as in allocation of the building lots, day by day operation of a

building and its orientation, which will helpful in achieving the maximum usage of natural energy.

Geeridhari Patle(2011) carried out a study on the Design of green building: A case study for composite climate, it is observed that, the green construction materials can achieve energy efficient cooling and the lighting appliances, significant amount of cost, water conservation system, CO₂ emission and , energy saving is achieved. The materials such as recycled steel, Pozzolana Portland cement and fly ash brick, the substantial amount of CO₂emission and cost saving is achieved. Designing, planning and the use of building materials will have great influence on the energy efficient buildings.

Tejwant singh brar et al. (2014) carried out a study on Solar and green building guidelines for hot arid climate in India, it is observed that, during the hot climate in the hot and the arid zone, the use of electrical energy to be reduced at the time of operation of the building and its life time. The consumption of energy can be reduced by implementing energy conservation techniques that begins at the planning stage such as orientation, use of low energy intensive materials, zoning of spaces, use of common walls.

Basharat Jamil et al.(2011) carried out a study on Thermal performance of dome shaped adobe house-case study for moderate climatic zone of India, it is observed that, for cooling and the heating process, it is beneficial to provide ventilation. The design of the adobe houses was found to be perfect during summer and the winter season. So that the building can achieve thermal comfort without use of fans or air conditioner or any other electric means and there will energy saving by use of passive cooling or passive heating techniques.

Sarieh Zareaian et al.(2013) carried out study on The role of climatic factors for the constructing and designing buildings (from urbanization architecture approach), it is observed that this study effort to considering long term weather condition and climatic data to highlight the role of climate and the weather knowledge during the construction operation. It also includes temperature, direction and the speed of wind, type of rainfall, humidity.

Chetan S. Dhanjode et al.(2013) carried out study on design and development of sustainable construction plans for the residential buildings: A case study for composite climate, it is observed that use of a non-renewable energy with the rise in utilization of renewable energy, reduction of waste formation, elimination of wastes, utilization of materials and equipment's, customs management of consumption, rise in quality of the productive processes and more efficiency.

P.D. Aher et al.(2012) carried out study on the Green building design A sustainable future, it is observed that for a sustainable future, green building is an only solution to achieve this, because the design of the sustainable building is used for minimizing the energy. Compare to the conventional building, the green building

will utilize 30%-40% less amount of water and the consumption of energy will be 40%-50% less. The enhanced productivity of an occupants will be 10%-15% high than the conventional building.

Pavan M Bhattet al.(2012) carried out study on Explanation of Indian climatic zones and incorporation of passive architectural techniques in buildings, it is observed that the energy highly consumed for the indoor comfort circumstance in the building. So the architects, now a day's design the building with low energy consumption, which gives good indoor comfort environments. They can be achieved by passive design in the buildings. The two techniques are used, one is advance and the other is simple. For a simple technique the important factors are considered before the construction of a building and in the advanced technique, some additional features to be added for increasing the comfort level.

Ar. Abdul Halim Babbut et al. (2016) carried out study on Bio-climatic Design strategies for buildings in Delhi, India, it is observed that this study explains about the bioclimatic design strategies for a construction of buildings in the composite climatic condition. This study develops various characteristics of an architectural components such as spacing, position of openings, thermal capacity, layout of the building, air movement, protection of openings, size of the openings and insulation of external features of the buildings, roofs, walls.

Nisha Kumari et al. (2007) carried out study on Performance evaluation of greenhouse having passive as well as the active heating in different climatic zones of India, it is observed that this study explains about the performance of various shapes and structures of a greenhouses having equal central height as well as the floor area. These types of buildings are designed for the purpose of controlling the humidity, temperature, solar radiation and carbon dioxide(CO_2) levels in the above ground environments.

Michael A. Adebamowo et al.(2013) carried out study on Low energy design of buildings in the tropics; The case of Lagos, Nigeria, it is observed that there will be a need of air conditioning for residential and office building in the tropical climate. So this paper provides energy efficient designs for the buildings to provide acceptable indoor quality and proper thermal comfort with the less usage of energy.

Abel Tablada et al. (2005) Carried out study on a Thermal comfort of naturally ventilated buildings in warm-humid climates: field survey, it is observed that there are three objectives to discuss about present arguments in a field of thermal comfort for the buildings found in the warm humid climates. This shows results of a survey and the methodology that concerns about thermal perception of an occupants and to implement a comfort adaptive models.

Elimisiemon Monday Chris mn et al.(2016) carried out study on Mitigating climate change through

green architecture, it is observed that this paper implements the U.S. Green Building Council (USGBC) (2015) principles of sustainable house design and the green building. This study determines that the buildings are susceptible to the change of the climate. So there is need for an engineers, builders, clients and architect to encourage and to implement green architectural practices to moderate the change of climate effect for the sustainable environment.

Aliakbar Shamsipour et al. (2013) carried out study on Climatic design and assimilation of activity spaces (case study on Soheil residential complex in 19th district of Tehran), it is observed that with a principle of the climatic designs, the maximum simple inactive energy preparation will serve as reducing energy cost and will give thermal comfort for the indoor environment in the buildings.

Fatemeh Biabani Moghadam Baboli et al.(2015) Carried out study on Design characteristics and adaptive role of the traditional courtyard houses in the moderate climate of Iran, it is observed that the construction work will utilize total energy worldwide and they are the reason for degradation of global environment. This study describes about thirty-four courtyard house in the Babul, which has a moderate climate and provide the good thermal comfort of the users.

Afsaneh Zarkesh et al.(2012) carried out study on Region Based Classification of Design and Construction Consistent with Climate, it is observed that four climatic regions with designs connected to the building construction are studied and reviewed with respect to four climatic zones. These are done by considering sustainable building design.

Ecem Kara (2015) carried out study on Design strategies of the residential building in warm and humid climatic zones – Turkey, it is observed that there is important need to inspect the most environmental way of attaining thermal comfort inside the building and also to provide thermal comfort in turkey houses with a use of passive design instead of using mechanical means for ventilation.

Allen Khin Kiet Lau et al. (2016) carried out study on Potential of shading devices and glazing configurations on cooling energy savings for high-rise office buildings in hot-humid climates: The case of Malaysia, it is observed that high rise office buildings with fully glazed facades in Malaysia are facing the problems of high solar radiation through the glazed facades. This study explains about providing shading devices in the west and east facades and to provide cooling in the buildings and to minimize the cost.

Petra Vladykova (2011) carried out study on the, An energy efficient building for the Arctic climate, it is observed that the use of normal hydronic system can be omitted by increasing the savings in the investment of traditional hydronic system for heating purposes. They are used in energy saving components such as super-efficient windows to provide positive solar gain in the buildings,

ventilation system by heat recovery and increasing the insulation in the sealed building shell.

III CONCLUSION

This study concludes about that the sustainable building design will minimize the utilization of natural energy resources consumed by the building sector. This also provides thermal comfort in the indoor environment and will reduce the use of mechanical means such as lighting, fan, air conditioner etc. this sustainable building will reduce the cost.

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